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Adopted by:







# Larimer County Urban Area Street Standards

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Repealed and Reenacted 4/1/07

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# CHAPTER 1 – GENERAL PROVISIONS

# 1.1 AUTHORITY OF THIS DOCUMENT

These regulations, along with all future amendments, shall be known as the Larimer County Urban Area Street Standards (hereinafter called "these Standards" or "Urban Street Standards"). These Urban Street Standards have been adopted by each of the Local Entity Governing Bodies.

# 1.2 INTENT AND PROVISIONS

These Standards shall be required for all development projects within the jurisdiction of Local Entities, which are listed in **Section 1.2.1**, and their Growth Management Areas (GMA). These Standards shall also apply to any public and private transportation improvements that may be outside of the GMA's limits, but are integral to the planned infrastructure systems of the GMA. These standards do not apply to other unincorporated areas of Larimer County.

The Local Entity's review and approval of any plans, reports, or drawings or the Local Entity's inspection and approval of any improvements constructed by the Developer in accordance with these Standards, does not constitute a representation, warranty, or guarantee by the Local Entity that such improvements are free from defects or will operate adequately for the purpose intended.

The chapters and appendices that make up these standards pertain to planning, design, approval, construction, inspection, testing, and documentation of street improvements. The intent of this manual is to establish the minimum acceptable standards.

# 1.2.1 Local Entities Included Under the Urban Street Standards

The following Local Entities are covered by these Standards:

- A. The City of Loveland, Colorado
- **B.** The City of Fort Collins, Colorado

#### C. Larimer County, Colorado (unincorporated GMAs only)

Larimer County, Colorado jurisdictions covered by these Standards include the GMA boundaries around the City of Loveland and the GMA boundaries around the City of Fort Collins.

#### D. When Standards Differ Among Local Entities

A majority of the requirements in these Standards apply uniformly among all of the above entities. Where requirements differ among entities they will be distinguished with one or more of the following descriptions:

- 1. Loveland (GMA and city limits)
- 2. Fort Collins (GMA and city limits)

- 3. Loveland (city limits only)
- 4. Fort Collins (city limits only)
- 5. Loveland (GMA only)
- 6. Fort Collins (GMA only)

#### 1.2.2 Objectives of Street Standards

#### A. Minimum Standards

These Standards shall be the minimum standards necessary for design and construction of all transportation public improvements in the Local Entities. Special situations as determined by the Local Entity may require different facilities and/or standards. For items not covered by these Standards, the Local Entities may require the use of resource standards in Section 1.3 below.

#### **B.** Objectives

It is the objective of these Urban Street Standards to address the following:

- 1. <u>Public Safety and Convenience</u>. To protect the public health, safety, and welfare to the greatest extent possible and minimize public inconvenience resulting from construction and maintenance activities within the public rights-of-way.
- 2. <u>Maintaining Public Use</u>. To assure that bicycle, pedestrian and vehicular uses of rights-of-way are the primary uses thereof and that the rights-of-way are properly maintained during construction and repair work in these areas.
- 3. <u>Standardizing Criteria</u>. To protect the Local Entity's infrastructure investment by establishing standardized design, materials, construction, and repair criteria for all public improvements.
- 4. <u>Optimizing Use</u>. To optimize the use of the limited physical capacity of public rights-of-way held by the Local Entity.
- 5. <u>Permit System</u>. To provide an efficient permit system which regulates and coordinates activities in an effective and safe manner.
- 6. <u>Fees</u>. To adopt fees that provide fair compensation to the Local Entity for related services and activities provided by such Local Entity.
- 7. <u>Protecting Private Property</u>. To protect private property from damages that could occur because of faulty design and construction of public improvements upon public rights-of-way.
- 8. <u>Inspection</u>. To provide criteria for inspection of public and private improvements, by the Local Entity or Local Entity designated inspector, in order to assure conformance with approved plan's uniformity, proper construction techniques, and to ensure that acceptable materials are used for the construction process of such public and/or private improvements.

# 1.3 **RESOURCE STANDARDS**

The following Resource Standards (the latest editions unless otherwise stated) may be used as reference material when certain design or construction methods and materials are not specifically addressed in these Standards and require approval of the Local Entity Engineer.

# A. List of Resource Standards for Reference

- 1. Colorado Department of Transportation, **Standard Specifications for Road and Bridge Construction**.
- 2. Colorado Department of Transportation, Standard Plans (M&S Standards).
- 3. Colorado Department of Transportation, Roadway Design Manual.
- 4. American Public Works Association, Standard Plans.
- 5. American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets.
- 6. Institute of Traffic Engineers (ITE), Trip Generation Volumes 1 through 3.
- 7. Institute of Traffic Engineers (ITE), appropriate design publications.
- 8. National Cooperative Highway Research Program (NCHRP) Report 279, Intersection Channelization Design Guide, 1985.
- 9. Institute of Traffic Engineers, Highway Capacity Manual.
- 10. ASTM, American Society for Testing and Materials.
- 11. Federal Americans with Disabilities Act, (A.D.A.) Regulations.
- 12. U.S. Department of Transportation, Manual on Uniform Traffic Control Devices (M.U.T.C.D.)
- 13. Federal Highway Administration, Roundabouts: An Informational Guide.
- 14. American Association of State Highway and Transportation Officials, Guide for the Development of Bicycle Facilities.

# 1.4 AUTHORITY OF THE LOCAL ENTITY ENGINEER

The Local Entity Engineer shall have the authority on behalf of the Local Entity to determine that all design and construction is completed to a level that is equal to or exceeds the requirements set forth in these Urban Street Standards.

# 1.5 ENFORCEMENT RESPONSIBILITY

It shall be the duty of the Local Entity Engineer acting on behalf of the Local Entity to enforce the provisions of these Urban Street Standards.

# 1.6 AMENDMENTS AND REVISIONS TO STANDARDS

These Standards may be periodically amended as necessary to provide additional clarity or to reflect changes in policy or in construction or engineering practice. Such revisions to these Standards may consist of either "policy" revisions or "technical" revisions. For unincorporated Larimer County, any revision, whether "policy" or "technical" shall become effective only after approval by the Larimer County Board of Commissioners, following receipt of recommendation from the Larimer County staff. For all other Local Entities, the revision procedures set forth in Section 1.6.2 (Revisions) shall apply.

# 1.6.1 Updated Standards

Each Local Entity will maintain an electronic file of their Standards. All updates and revisions will be available on the Larimer County web page.

#### 1.6.2 Revisions

From time to time, this document will require revisions. Revisions shall be grouped as either policy revisions or technical revisions.

#### A. Policy Revisions

Policy revisions shall be considered major changes, changes in law and changes that will cause significant increased cost or controversy. Policy revisions also include those changes that relate to the public use and convenience, such as changes in standard street width. Policy revisions require a public hearing process for their adoption. Each Local Entity staff shall make recommendations to the Local Entity Governing Body concerning the proposed policy revision prior to the adoption by the Local Entity Governing Body by an ordinance or resolution (as applicable) making such revision. No policy revision shall become effective until it has been properly adopted by the Local Entity Governing Body.

#### **B.** Technical Revisions

Technical revisions shall consist solely of such minor additions, revisions, and corrections to these Standards as may, in the judgment of the Local Entity Engineer, be necessary to better conform to-good engineering and/or construction standards and practice. The Local Entity Engineer shall approve only those proposed technical revisions that: (1) are consistent with all existing policies relevant to the revision, (2) do not result in any significant additional cost to persons affected by the revision, and (3) are consistent with existing law. Technical revisions shall become effective when approved, in writing, by each Local Entity Engineer. If technical revisions are deemed necessary, the revisions may occur through one of two processes.

1. <u>Normal Technical Revision Process.</u> The normal technical revision process will occur during planned periodic revisions. Technical revisions determined necessary by each Local Entity Engineer shall be accomplished (without a public hearing process) through discussion and agreement among all Local Entities.

- 2. <u>Accelerated Process.</u> The accelerated process may occur outside of the planned periodic revision schedule. If a technical revision is determined to be immediately necessary, the Local Entities may discuss and agree upon the revision. If all Local Entities have agreed upon such revision, then the change shall be made and notification given on the web page. The Local Entities will notify all document holders of the change.
- 3. Each Local Entity staff shall report such technical revisions to its Local Entity Governing Body as a part of a periodic review and update process.

# 1.7 DEFINITIONS OF TERMS AND ABBREVIATIONS

When the following words, phrases, or abbreviations appear in these Standards, they shall have the following definition and meaning:

AASHTO – American Association of State Highway and Transportation Officials.

**ABC** – Aggregate Base Course.

Access for Land Uses – The physical location where a legal traversable path may be constructed for vehicular movement between a parcel of land and the public right-of-way.

Access Management – The concept of a public agency controlling the location of access points in order to achieve the dual purposes of providing access to individual land uses and limiting access on higher order streets in order to facilitate the smooth flow of traffic with a limited amount of impedance.

Access Management Plan – A plan adopted by the Local Entity Governing Body defining access locations and requirements based on the traffic impact study evaluation of existing and proposed traffic, access points, and intersections. An access management plan supplements the Local Entity's Transportation Master Plan, specifically adopted to regulate access on specific streets.

**ACF** – Adequate Community Facilities – also known as Adequate Public Facilities (APF). See County Land Use Code definitions.

ACI – American Concrete Institute.

AISC – American Institute of Steel Construction.

**Alley** – Minor public throughways that abut the side or rear of residential, industrial or commercial property and are used for vehicular access.

ANSI – American National Standards Institute.

**Applicant** – The person or designated agent providing pertinent information for preparation of permit, TIS, etc. This is often the Developer.

Approach Taper - A taper from the point where all approaching traffic must shift laterally, to the point of the beginning bay taper.

APWA – American Public Works Association.

**Arterials** – That part of the roadway system serving as the principal network for through traffic flow. Arterials connect areas of principal traffic generation and important rural highways entering the urban areas. Arterials may contain 2, 4, or 6 through lanes, as designated on the Local Entity Master Street Plan.

ASA – American Standards Association.

**ASTM** – American Society for Testing and Materials.

ATSSA – American Traffic Safety Services Association.

Attached Sidewalk – Sidewalk that is adjoining the curb.

**Bay Taper** – A taper from the edge of the adjacent through traffic lane to the beginning of the full width of the turn lane storage.

**Bicycle Facilities** – A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking facilities, mapping of all bikeways, and shared roadways not specifically designated for bicycle use.

**Bicycle Lane (Bike Lane)** – The portion of the shoulder or roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

**Bicycle Path** (**Bike Path**) – A bikeway physically separated from motorized vehicular traffic by open space or barriers and either within the City right-of-way or within an easement.

**Bicycle Route** (**Bike Route**) – A segment of a bicycle system, designated by the Local Entity. Bicycle routes have appropriate directional or informational markers, with or without specific bicycle route number.

**Bikeway** – Any road or path that is designed for bicycle or pedestrian traffic, but not necessarily for their exclusive use.

**Bridge** – Any structure conveying a roadway or path over a body of water or other feature. Bridges shall be designed to carry a varying combination of loading, including vehicular, bicycle, and/or pedestrian traffic.

BP – Building Permit.

Calendar Day – Each and every day shown on the calendar, beginning and ending at midnight.

**Capital Expansion Fee (CEF) Program** – A program that has been established by the Local Entity for the purpose of funding certain transportation improvements. The streets funded by a CEF Program primarily serve the overall transportation system, not just a single development.

**CDOT** – Colorado Department of Transportation.

**Chicanes** – Offset curb extensions which change the path of vehicular travel from straight to curvilinear.

**City** – City of Loveland or City of Fort Collins, Colorado.

**CMP** – Corrugated Metal Pipe.

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**Code** – The latest official adopted ordinances, policies, codes, and/or regulations of Larimer County and the Cities of Fort Collins and Loveland, Colorado.

**Collector** – A street that provides both land access service and traffic circulation within residential neighborhoods and commercial and industrial areas. The primary purpose is to collect traffic from local streets and properties and channel it into the arterial system.

**Commercial** – A business area of a municipality where ordinarily there are many pedestrians during day or night hours. This definition applies to densely developed business areas outside, as well as within, the central section of a municipality.

**Committed (Roadway) Improvements** – Improvements identified in the Local Entity's Capital Improvement Program or CEF Program or identified as a financial obligation of a Developer.

**Connective Access Between Public Streets** – The physical location where one public street in one development connects to a public street in another development.

**Construction Coordination Meeting** – A meeting between the Local Entity, utility companies, the Developer, and other required attendees prior to the commencement of construction of the public improvements.

**Construction Costs** – Generally, the cost of all right-of-way, earthwork, paving, drainage, structures, signing and striping, traffic control, lighting, landscaping, curb and gutter, sidewalk, and utility relocation work necessary to complete the required improvements.

**Consultant Engineer** – A Colorado licensed professional engineer working on behalf of the Developer.

**Continuity** – The continuous length of a roadway segment that is uninterrupted by 90 degree turns or controlled intersections.

**Contract Documents** – The executed contract agreement, approved plans, and technical specifications, prepared by a Colorado licensed professional engineer, for constructing a facility.

**Contractor** – The person, firm, or organization to whom a construction contract is awarded by the Developer, or who has been issued a right-of-way work permit by the Local Entity. Agents, employees, workers, or designers employed by the Contractor are also bound by the terms of the contract or permit.

**Corner Clearance** – At an intersecting street, the distance measured along the curb line from the projection of the intersecting street flowline to the nearest edge of the curb opening.

**Corner Sight Distance** – The distance necessary for the driver of a motor vehicle stopped at a stop sign on a Minor Street or driveway to see approaching vehicles, pedestrians, and bicyclists along the intersecting major street and have sufficient space to make any allowed move to cross the Major Street or merge with traffic on the Major Street without causing vehicles, pedestrians, or bicyclists traveling at or near the design speed on the major street to slow down. The controlling distance for design is the longest distance, generally the distance necessary to merge with traffic.

**Cross Slope** – Slope of the pavement surface, excluding gutter, measured perpendicular to the street centerline.

Days – Intended as calendar days and not working days unless stipulated as working days.

DCP – Development Construction Permit.

**Deceleration Lane** – A right-turn lane or left turn lane lengthened to provide for safe reduction of travel speed.

**Departure Taper** – A left-turn bay from the point where through traffic beyond the intersection begins a lateral shift to the left to the point where the through lane is adjacent and parallel to the centerline.

**Design Speed** – The speed determined for design which takes into account the physical features of a street influencing vehicle operation; the maximum safe speed maintainable on a specified section of street when conditions permit design features to govern. Design speed is 5 to 10 mph higher than the posted speed limit to provide a factor of safety and allow for other conditions or uses of the street that may affect vehicle operation.

**Designer** – The person or persons responsible for the creation and submission of contract documents or construction plans for the purpose of one-time construction of a facility. This person shall be a Colorado licensed professional engineer.

**Detached Sidewalk** – Sidewalk that is offset from the curb.

**Developer** – The private party or parties desiring to construct a public or private improvement within Local Entity rights-of-way or easements, securing all required approvals and permits from the Local Entity, and assuming full and complete responsibility for the project.

**Development** – Construction of improvements on land that is essentially vacant.

**Development Agreement** – The contract between the Local Entity and the Developer that defines public improvement requirements, costs, and other related public improvement issues.

**Development Construction Permit** – Permit to construct public or private improvements for a project or within an unimproved right-of-way, obtained by application to the Local Entity.

**Director** – The Local Entity Service Director who oversees the Engineering Division (Fort Collins, Director of Planning, Development, and Transportation) (Loveland, Director of Public Works) (Larimer County, Director of Public Works).

**Distance Between Double Driveways** – The distance measured along the curb line between the inside edges of two adjacent curb openings.

**Document Holder** – All parties who have acquired these Standards by official registration with any Local Entity.

**Driveway** – A private access from a public or private roadway.

**Driveway Approach** – The portion of the driveway lying in the public right-of-way or public access easement between the street gutter lip or roadway of a public street and the right-of-way

or public access easement line, for the full width of the access, including both apron and side slopes.

**Easement** – The property right of the Local Entity to use lands owned in fee by a private party for the purposes of maintenance, access, drainage, or other use, as specified on a plat or deed of dedication.

**Edge Clearance** – The distance measured along the curb line from the nearest edge of the curb opening to a point where the property line extended intersects the curb line.

**Expressway** – A divided major roadway for through traffic with partial control of access and usually with interchanges at major crossroads.

**Eyebrow** – A bulb or semi-circular extension of a curb on the outside edge of a street or at an "L" turn to provide more street frontage for adjacent lots.

**Fees** – Monetary charges which compensate the Local Entity for services rendered or infrastructure constructed.

**FEMA** – Federal Emergency Management Agency.

**Fence** – An artificially constructed barrier of wood, masonry, stone, wire, metal, or other manufactured material, or combination of materials, erected to enclose, partition, beautify, mark, or screen areas of real property.

FHWA – Federal Highway Administration, Department of Transportation.

**Field Order** – A written notice given by the Local Entity Inspector to the Designer, Contractor or Developer detailing a change, request, mandate, or corrective action necessary to conform to these Standards, approved plans, or other applicable Local Entity Codes.

**Final Acceptance** – The written notification from the Local Entity, after the Local Entity Engineer finds the Warranty Period to be satisfactorily completed, that all public improvements are free of defects and the Local Entity releases the Developer from future maintenance obligations.

**FIRM** – Flood Insurance Rate Map.

**Franchise Agreement** – An agreement between the Local Entity and certain private utility companies, specifying terms and conditions for use of the Local Entity's public rights-of-way or other public lands.

Freeway – A divided major roadway with full control of access and with no crossings at grade.

**Frontage** – The distance along the street right-of-way line of a single property or development within the property lines. Corner property at an intersection would have a separate frontage along each street.

**General Development Plan** The initial plan used by the City of Loveland to show preliminary development concepts.

**GMA** - **Growth Management Area Overlay Zone District** – The areas defined in the Larimer County Master Plan as existing or future potential annexation areas. Wherever these standards associate "GMA" with a particular city, "GMA" refers to that city's annexation areas. Examples are Loveland (GMA only) or Loveland (GMA and city limits).

**HBP** – Hot Bituminous Pavement. Pavements constructed with a mix of aggregate and asphaltic/bituminous cement. (Similar acronyms used by other references may include: ACP – Asphalt Concrete Pavement, HAC – Hot Asphalt Concrete, HMA – Hot Mixed Asphalt, and similar variations.)

**High Volume Access** – Access from a public roadway designed to service 350 or more vehicle trip ends per day or 35 or more vehicle trip ends per hour.

HMA – Hot Mix Asphalt

**Improved Arterial Street** – That portion of an arterial street that has been totally or partially constructed to arterial street standards and accepted by the Local Entity.

**Improved Arterial Street Network** – The system of improved arterial streets which are interconnected and which are defined on the Local Entity map titled "Improved Arterial Streets Network" maintained by the Local Entity Engineer.

**Improvement Agreement** – The Subdivision Improvements Agreement, Public Improvements Agreement or Development Agreement, which are written documents of terms and conditions related to a one-time development of a specific project within the Local Entity's jurisdiction. Such agreements are made between the Local Entity and Developer to outline responsibilities and duties of each party. (Refer to **Appendix B-2** for Public Improvements Agreement.)

**Improvements** – All public or private improvements within Local Entity rights-of-way or easements.

Industrial or Warehouse – Any establishment that manufactures or stores an article or product.

**Initial Acceptance** – This is the Local Entity's document and process, by which the Local Entity initially accepts for ownership, maintenance, and warranty the public improvements identified in the approved plans and Improvement Agreement for a specific project.

**Insignificant Traffic Impact Development** – A development project of less than 3 dwelling units or a development generating fewer than 20 trips per day.

**Inspector** – An authorized representative of the Local Entity Engineer, assigned to make inspections to assure work is completed in compliance with plans, standards and specifications.

**Intersection Nose** – The radius or distance from the end of the storage bay to the near edge of the cross-route exit lane for the left-turning vehicle. For left-turn bays the cross-route exit reference is normally the centerline of an unchannelized 2-way street or the far edge of the median in a channelized street.

Intersection Sight Distance – Refer to Corner Sight Distance.

**"Issued for Construction" Plans** – Design plans that conform to these Standards and are signed and stamped by the Designer and signed by the Local Entity Engineer, ready for distribution to the Contractor for construction.

**ITE** – Institute of Transportation Engineers.

**Landscaping** – Materials including, without limitation, grass, ground cover, shrubs, vines, trees, and non-living materials, commonly used in landscape development, as well as attendant irrigation systems.

**Lane Width** – The width of a travel lane measured from the centerline of the lane striping to the centerline of the parallel lane stripe, or to the face of the curb in Fort Collins (city limits only), or lip of gutter in Loveland (city limits only), whichever is applicable.

Lift – The maximum specified thickness of material that may be placed at one time.

Lip – Defines the outermost edge of the gutter pan.

**LMC** – Loveland Municipal Code.

**Local Entity** - The Local Entity that possesses legal authority to establish laws and regulations pertaining to the health, safety and welfare of the residents living within its jurisdictional boundaries. For the purposes of this document the Local Entities are Larimer County, the City of Fort Collins, the City of Loveland and other municipalities that adopt these Standards.

**Local Entity Engineer** – The Engineering Division Manager, City Engineer, or County Engineer, or another Local Entity representative authorized to act on behalf of the Local Entity. In Fort Collins (city limits only), reference to the Local Entity Engineer for traffic-related items shall mean the City Traffic Engineer.

**Local Entity Governing Body** – The Larimer County Commissioners and the City Councils of Fort Collins and Loveland.

**Local Streets** – All street facilities that are not in one of the higher systems. Their primary purpose is to provide direct access to abutting lands and connections to the higher classification streets.

Main Member – Any member designed to carry the loads applied to the structure. The trusses.

**Major Street** – A Major Collector or Arterial street. Major Streets are typically designated on the Master Street Plan or Transportation Master Plan.

Manager/Administrator. – The highest level of staff authority within the Local Entity.

**May** – A permissive condition.

**Mini-Roundabout** – Elevated circular islands placed in the center of a street intersection to reduce vehicular travel speeds by requiring the motorist to travel in a counter clockwise direction around the circular island.

**Minor Development Project** – Projects limited to one parcel which do not generate more than five peak hour vehicular trips per day.

Minor Street – A Local or Minor Collector Street.

MSP - Master Street Plan – Fort Collins, see TMP.

MUTCD – Manual on Uniform Traffic Control Devices.

Neckdowns – A narrowing of the roadway for traffic calming at intersections or mid-block.

**Neighborhood** – A residential or commercial area defined by ordinance, resolution or common understanding.

**Official** – A person appointed by the Local Entity to administer these Standards.

**Opinion of Cost (Cost Estimate)** – Unit costs, based on those approved by the Local Entity and assigned to materials and related quantities. The Opinion of Cost shall be broken down by Phase, when applicable, for each project and shall be submitted by the Designer at the time of first plan review by the Local Entity.

Ordinance – A law established by the Local Entity Governing Body.

**Original Cost of Design and Construction** – The cost of financing, engineering, construction, and any other costs actually and reasonably incurred that are directly attributable to the improvements.

**OSHA** – Occupational Safety and Health Administration.

**Overall Development Plan** – A plan used by the City of Fort Collins for phased development projects to generally describe preliminary improvements.

**Parkway** – Refer to Tree Lawn.

**P.C.** – Point of curvature.

**P.C.R.** – Point of curb return.

**Pedestrian Walkway** – A public facility for pedestrian traffic either within the right-of-way of the vehicular traffic roadway or within a public easement (e.g., public tunnels).

**Permittee** – The holder of a valid permit issued in accordance with these Standards or other Local Entity related process.

**Phasing Plan** - A plan that defines improvements to be completed in specified parts over a defined sequence.

**P.I.** – Point of intersection.

**Plans** – Construction plans (**mylar only**) signed by the Local Entity depicting public improvements to be constructed for the project.

**Pre-Construction Meeting** – A meeting between the Designer and assigned agents and the Inspector to review proposed work necessary to construct the project, **prior** to proceeding with the work. A meeting may be required for each project, at the Inspector's discretion.

**Private Improvements** – Improvements similar to Public Improvements, but which are installed within private easements and requiring a Development Construction Permit.

**Professional Engineer** (**P.E.**) – A Colorado licensed professional engineer.

**Professional Land Surveyor (P.L.S.)** – A Colorado licensed land surveyor.

**Project** – The public or private improvement(s) designated in the approved plans, which are to be constructed in conformance with these Standards. The term "Project" includes any and all public or private improvement projects for or within the Local Entity, whether development projects, private utility projects, or capital improvement projects.

**Project Supervisor** – The person appointed by the Developer or Contractor for management and control of the work on the project as performed by the Contractor and Subcontractors.

**Proposed Roadway Improvements** – Those roadway improvements deemed necessary due to the impact of the project development.

**P.T.** – Point of tangency.

**Public Improvement Construction Plans** – Detailed and working plans including plan and profile, details, notes and any other information necessary for complete construction of the required improvements. Also refer to Utility Plans.

**Public Improvements** – Those public-type facilities to include: pavement, curb and gutter, sidewalk, pedestrian/bike/equestrian paths, storm drain facilities with related appurtenances, culverts, channels, bridges, water distribution or transmission facilities with related appurtenances, sanitary sewer collection facilities with related appurtenances, water and waste water treatment facilities, pavement markings, signage and striping, traffic signals and related appurtenances, erosion control and right-of-way grading, or earth excavation processes integral to construction of other public improvements listed herein.

**Punch list, Initial or Final** – A written list of work items, compiled by the Inspector, which do not conform to these Standards, the plans or other associated Local Entity Codes that govern the project.

**Raised Crosswalk** – A roadway crossing that slightly elevates the pedestrian crossing surface above the general roadway surface. A raised crosswalk is a traffic calming device.

**Record Drawings** – Original design drawings updated by a Professional Engineer depicting all modifications from the design that occurred during construction.

**Redevelopment** – Removal or modification of existing improvements and construction of new improvements or substantial remodeling.

**Reimbursement Agreement** – An agreement between the installing Developer and the Local Entity for the purpose of reimbursing the installing Developer for the front footage charge, when collected from the Developer of an adjacent property.

**Report** – A bound document, the contents of which may contain certain necessary analyses, surveys, tests, exhibits, and other pertinent data supporting the subject matter.

Right-of-way – (Also "public right-of-way.") A public street, way, alley, sidewalk, or easement.

**Right-of-way Permit** – A document, with or without conditions specified by the Local Entity, which allows a Developer to construct any public or private improvements within an improved right-of-way or easement.

**Roadway** – The portion of the highway, arterial, collector, or local street, including shoulders, intended for vehicle and/or bicycle use.

**Roundabout** – A circular street intersection used as a traffic control device in lieu of a multiway stop or a traffic signal. (Refer to Standard Drawing 8-10)

**Scoping Meeting** – A required meeting for the Applicant and Applicant's traffic engineer to review all the requirements for a Transportation Impact Study.

**Secondary Member** – Member not designed to carry primary loads. The deck, stringer and floor beams.

**Setback** – The lateral distance measured perpendicular to the street and extending from the rightof-way line, or other specific feature, to the closest point of a structure.

**Shall** – A mandatory condition.

**Shared Roadway** – Any roadway upon which a bicycle lane is not designated and which may be legally used by bicyclists regardless of whether such facility is specifically designated as a bikeway.

Should – An advisory condition, recommended, but not required.

**Sidewalks** – Paved or otherwise improved area for pedestrian use, located within the public street rights-of-way that also contain roadway for vehicular traffic.

**Specifications** – Construction specifications and standards adopted by the Local Entity.

**Speed Humps -** Paved humps placed in the street roadway with the intent to slow vehicular traffic. The geometrics of the speed hump determine how fast it can be navigated.

**Standards** – Larimer County Urban Area Street Standards, inclusive of all secondary/supplemental codes and any subsequent amendments.

**Stop Work Order (S.W.O.)** – A written instruction/notice from the Local Entity, revoking the Developer's and/or Contractor's rights to continue work on the project due to nonconformance with these Standards.

**Stopping Sight Distance** – The distance required by the driver of a vehicle traveling at the design speed to bring the vehicle to a stop after an object on the road becomes visible. This distance is measured from the driver's eye, 3.5 feet above the pavement to the top of an object 6 inches high on the pavement anywhere on the roadway.

**Storage Length** – The distance from the end of the bay taper to the nearest flow line extension of the intersecting street.

**Street** – A public way for vehicular, pedestrian, and bicycle travel, including the entire area within the right-of-way. This includes alleyways.

**Streetscape** – Pedestrian and landscape improvements in the right-of-way, generally occurring between the curb and the right-of-way line. Streetscape generally includes sidewalks, street trees, pedestrian lighting, fencing, furnishings, and landscaped areas, including medians and irrigation.

**Structure** – Anything constructed or erected with a fixed location below, upon, or above grade, including without limitation foundations, traffic signals, fences, retaining walls, buildings, inlets, vaults, poles, bridges, and major drainage facilities.

**Subcontractor** – A person, other than the Contractor, supplying labor and materials, or labor only, for the Project, and working for the Contractor or the Local Entity.

**Substantial Completion** – Major completion of all Work for the Project, prior to certain inspection(s) or the creation of Punch lists.

**Surety** – A financial instrument— such as cash, letter of credit, bond or escrow agreement as approved by the Local Entity—securing the Developer's responsibility to complete construction of Public or Private Improvements within an approved Project. Surety shall also mean a financial instrument securing the Developer's obligations throughout the Warranty Period.

TIS - Transportation Impact Study, as described in Chapter 4.

TMP – Transportation Master Plan or element thereof, including the Master Street Plan.

**Trail** – Any path used by pedestrians or bicyclists within a public right-of-way or easement. This would include concrete, gravel, or natural surfaces.

Transportation Master Plan (TMP) – Includes the Master Street Plan.

**Traversable Barriers** – A barrier placed across any portion of a street that is traversable by bicyclists, pedestrians, inline skaters, and emergency vehicles only.

**Traversable Path** – Consists of a curved curb transition, a curb cut, or a drive-over curb, along with a paved driveway width.

Tree Lawn – Area of right-of-way between the face of the curb and the sidewalk.

Turn – A roadway curve with a design speed of 30 mph or less.

**USGS** – United States Geological Survey.

**Utility Plans** – Public Improvements Construction Plans. The term "Utility Plans" is used only in Fort Collins (city limits only).

**Variance** – A deviation from these Standards that has been duly and properly approved by the applicable Local Entity.

**Vesting approval** (Loveland city limits only) – vesting approval is generally granted by the City Council for most development application types. Exceptions include phased PDP developments that are part of an approved GDP, and preliminary plats with a standard zoning designation

which are granted vesting approval by the Planning Commission. Minor subdivisions are approved through an administrative action by City staff.

**Warranty Period** – The period of time that the Developer or Contractor is responsible for material and workmanship defects in the public improvements, until written notification by the Local Entity of final acceptance of the public improvements.

**Wheel Path** – The 3-foot wide wheel traveled portion located on both sides of the travel lane and starting 2 feet from the center of the travel lane.

Width of Curb Opening (W) – The width of curb opening measured at the curb line, excluding the curb transitions or curb returns.

**Work** – All construction activity, including materials, labor, supervision, and use of tools and equipment necessary to complete the Project in full compliance with these Standards, approved Plans, or Improvement Agreements.

**Working Day** - 7 a.m. to 6 p.m., Monday through Friday, excluding any holidays observed by the Local Entity.

# 1.8 INTERPRETATION OF STANDARDS

In the interpretation and application of the provisions of these Urban Street Standards, the following principles apply:

#### 1.8.1 Governing Standards

Whenever a provision of these Standards or any provision in any law, ordinance, resolution, rule, or regulation of any kind contains any restrictions covering any of the same subject matter, the standards that are more restrictive or impose higher standards or requirements shall govern.

# **1.8.2 Prior Acceptance of Construction Plans**

These Urban Street Standards shall not modify or alter any street construction plans that have been filed with and accepted by the Local Entity prior to the effective date of the ordinance or resolution adopting these Standards. This exception shall be subject to the conditions and limitations under which said plans were accepted by the Local Entity Engineer.

# 1.9 DEVELOPMENT PROCEDURES AND POLICIES

#### 1.9.1 General

The purpose of this section is to describe the development procedures and policies of the Local Entities as they pertain to planning, design, approval, and construction of streets for which approval by the Local Entity is required.

# **1.9.2 Street Construction Policy – On-Site and Off-Site Requirements**

#### A. Street Construction Responsibility

The responsibility for the design and construction of all new streets and the widening of existing streets necessary to provide adequate transportation service to, or within, a development rests exclusively with the Developer, except as outlined in **Section 1.9.2 C** ("Adequate Transportation Service" is described in Chapter 4). This responsibility includes the acquisition and/or dedication of all necessary rights-of-way and easements. This responsibility applies to on-site streets, adjacent streets, transition sections, and connections to the arterial street system. Certain portions of these improvements may be eligible for reimbursement. Reimbursement for off-site improvements. Reimbursement policies are presented in **Section 1.9.3**. The following list outlines the improvements that are considered to be an integral part of the street construction.

- 1. Street grading and subgrade preparation or stabilization.
- 2. Concrete curb and gutter.
- 3. Concrete sidewalk.
- 4. Pavement section including aggregate base courses and asphaltic or Portland cement concrete pavement.
- 5. Traffic signals.
- 6. Traffic signing and pavement markings.
- 7. Railroad crossings.
- 8. Ditch and drainage crossings.
- 9. Street lighting.
- 10. Water distribution system.
- 11. Sanitary sewer system.
- 12. Storm drain system.

# **B.** Required Street Improvements

1. <u>General</u>. The Developer is responsible for all improvements required of their development. In some cases, a financial security in a form acceptable to the Local Entity may be allowed in lieu of construction of all or part of an improvement. Such allowances must be authorized in writing by the Local Entity Engineer.

Variances allowing less than minimum improvements may be allowed as provided in Section 1.9.4. Conversely, in discretionary actions such as

annexations and certain rezoning actions, the Local Entity may require <u>more</u> than the minimum improvements provided for in these standards.

2. <u>On-Site Criteria</u>. The Developer is responsible for all improvements internal to the site. Necessary right-of-way and easements must be dedicated to the Local Entity prior to or concurrent with approval of the development.

Minimum easement requirements for City of Fort Collins (city limits and GMA). A minimum 15 foot wide utility easement shall be provided behind the righ-of-way adjacent to all arterial roadways. A minimum 8 foot wide utility easement shall be provided adjacent to all public alleys, and a minimum 9 foot wide utility easement shall be provided behind the right-of-way for all other street classifications.

- 3. <u>Off-Site Criteria</u>. The Developer is responsible for the following improvements external to the site boundaries.
  - a. <u>Streets Adjacent to the Development Boundaries</u>. Where street upgrades are needed to comply with these Standards and/or Local Entity's Transportation Master Plan, the Developer shall be responsible for the design and construction of street improvements adjacent to the exterior boundary of the subject Property. When such improvements are designed and constructed, they shall be extended along the entire boundary(s) of the Property at the horizontal and vertical location that establishes the approved alignment for the long-range transportation facility as defined in these Standards.
    - Minimum Requirements for Loveland (city limits and GMA). At a minimum, the Developer shall always be responsible for the equivalent of half the collector street adjacent to the development (vertical curb, gutter, a 5-foot sidewalk, and 17 feet of pavement). The Developer may also be responsible for curb, gutter, and sidewalk, as well as all or part of the remaining pavement on the opposite half of the adjacent street.
  - b. <u>Transitions</u>. Where an improved street must be tied into an existing street, transition areas must be provided to safely shift traffic back onto the existing street. Transition plans must meet the length and design requirements provided in these standards. Transitions shall typically be designed and constructed off-site from the Project. The off-site transition(s) may be installed as a permanent street improvement (i.e., long-range pavement thickness and location) or as a temporary improvement (i.e., interim thickness and location as approved by the Local Entity Engineer). Permanent off-site transitions may be eligible for future reimbursement by the Local Entity or a future Developer, while temporary off-site transitions will not be eligible for reimbursement. Transitions adjacent to the Development may be approved by the Local Entity in situations where the long-range improvements are constructed adjacent to the Property and traffic safety or operational concerns warrant a waiver of the off-site transition requirement.

c. <u>Connection to the Arterial Street Network</u>. Any Development which does not have direct access to an improved arterial street within the Improved Arterial Street Network will be required to improve certain off-site streets to provide adequate access to the nearest Improved Arterial Street.

Improved access must be provided in the most reasonable and/or most heavily traveled route, as determined by the Local Entity Engineer. In some cases, more than one off-site street may need to be improved. Pavement thickness shall be based on a 20-year design life including both projected site generated and background traffic growth. To facilitate construction of off-site street improvements, routing traffic through nearby residential areas will not be allowed unless the required traffic volume level of service for the respective street classification is maintained.

- 1) <u>Minimum Requirements for Loveland (city limits).</u> Where required, street improvements must include, at a minimum, a 34-foot wide paved street, edge of pavement to edge of pavement, and 4-foot gravel shoulders along the edge of pavement.
- 2) <u>Minimum Requirements for Fort Collins (city limits)</u>. Where required, street improvements must include the following:
  - a) For arterial and collector streets such improvements shall consist, at a minimum, of constructing a thirty-six foot wide paved street cross section on a base that is adequate to accommodate the ultimate design of the street either (1) as designated on the Master Street Plan, or (2) in accordance with the Standards, whichever is applicable
  - b) For all other street classifications, the off-site street improvements shall be designed and constructed to City standards including, without limitation, curb, gutter, sidewalk, and pavement.
  - c) All intervening streets that connect to the Improved Arterial Street Network shall include the width and improvements necessary to maintain a level of service as defined by Part II of the City of Fort Collins Multi-modal Transportation Level of Service for the length required to connect to the Improved Arterial Street Network.
- 3) <u>Minimum requirements for Loveland (GMA) and Fort Collins (GMA)</u>. The need for off-site improvements within the Fort Collins and Loveland GMA's shall be determined by the Local Entity Engineer and shall meet the requirements of numbers 1) and 2) above.
- d. <u>Off-Site Right-of-Way and Easements</u>. Prior to approval of any development which requires acquisition and dedication of off-site right-of-way or easements, the Developer shall provide legal documentation demonstrating their ability to obtain such right-of-way or easements without any restrictions and at no cost to the Local Entity.

Prior to final approval of plat and construction plan documents, all off-site rights-of-way and easements must be dedicated and recorded with the County Clerk.

In some circumstances where off-site right-of-way is necessary but acquisition of such right-of-way or easements can not be obtained from the property owner, the Local Entity may consider a condemnation action. In such cases the developer must demonstrate that a number of criteria have been met.

- **C. Waiver from Off-Site Construction Responsibility.** A Developer may not be responsible for constructing the off-site street improvements needed to serve that development if circumstances meet any of the following conditions:
  - 1. Improvements are included in the most recent Local Entity street capital improvement plan, the funds necessary for construction of the improvements have been appropriated, and the improvements are scheduled for construction by the Local Entity within three years from the time of Local Entity Governing Body approval of the final plat for the development; or
  - 2. Improvements are included in a fully funded plan by another public agency, such as the Colorado Department of Transportation, and are schedule for construction within three years from final plat approval; or
  - 3. Improvements are included in a binding agreement with another developer or private party, for which financial security acceptable to the Local Entity that fully covers the costs of the improvements is held by the Local Entity; or
  - 4. The proposed development is a Minor Development Project within Loveland (city limits or GMA) or within Fort Collins (GMA only).
- **D.** Waiver from All Street Construction Responsibility. In Loveland (GMA only) and Fort Collins (GMA only) the obligation to design and construct any street improvements may be waived for an Insignificant Traffic Impact Development.

# 1.9.3 Reimbursement Policy

Developments may be eligible for reimbursement of street and trail improvements made off-site and/or adjacent to the development if the requirements of the reimbursement policy for new street construction are followed (see next subsection). In addition, in Loveland (city limits only) those improvements for which street capital expansion fees are collected are also eligible for credit or reimbursement under the provisions of this section. In Fort Collins (city limits only), reimbursement may be received as long as the applicant follows all of the requirements provided in the City Code.

# A. Larimer County Reimbursement Policy

The above policy does not apply to applications submitted to Larimer County. Reimbursement for Larimer County shall be in accordance with Larimer County Land Use Code, Section 9.5, and will be considered on a case by case basis.

#### **B.** Additional Policies in Loveland (City Limits Only)

- 1. Non-Capital Expansion Fee Streets Loveland (city limits only)
  - a. <u>General</u>. When any Developer, as a Local Entity–required condition of development, constructs a public street, alley, or pedestrian-bike way to serve property through undeveloped areas or areas that may be redeveloped, or constructs a public street, alley, or pedestrian-bike way along the perimeter of the property, the entire cost of such engineering and construction, including acquisition of all necessary rights-of-way, shall be the responsibility of such person or Developer.
  - b. <u>Front Footage Charge</u>. If the following conditions are satisfied, the installing Developer may enter into a reimbursement agreement with the Local Entity such that, as a condition of approval of subsequent development or redevelopment of property adjacent to the newly constructed public street, alley, or pedestrian-bike way, the Local Entity may collect a front footage charge from the abutting Developer prior to the issuance of any building permits for the abutting property. The front footage charge shall be established by prorating the total amount of original certified costs to the lineal frontage of all properties abutting the constructed improvement.
  - c. <u>Notice of Agreement</u>. The Local Entity shall not attempt to make such collection until the reimbursement agreement is properly prepared and executed and the owners of abutting property have received or reasonably should have received notice of the reimbursement agreement.
  - d. <u>Letter of Intent</u>. Within 30 days of the completion and acceptance by the Local Entity of such improvements, the Developer shall notify the Local Entity in writing of its intent to enter into a proper reimbursement agreement with the Local Entity.
  - e. <u>Full Payment</u>. All costs for the construction of improvements must be fully paid by the Developer before such person shall be entitled to reimbursement under any agreement established hereunder.
  - f. <u>Documentation of Costs and Obligated Properties</u>. After written acknowledgment by the Local Entity of receipt of said written intent to enter into a reimbursement agreement, the Developer shall have 60 days to provide the Local Entity Engineer with copies of the following:
    - 1) A letter from the Designer with detailed breakdown of all fees that are directly attributable to the street, alley, or pedestrian-bike way improvements eligible for reimbursement and a statement certifying that all such fees have been paid in full.
    - 2) A letter from the Developer's Contractor with a detailed breakdown of costs for all improvements eligible for reimbursement and a statement certifying that all such costs have been paid in full.

- 3) A letter from the Developer's financing office certifying any financial charges assessed that are eligible for reimbursement.
- 4) An accurate map prepared by a licensed Engineer or Surveyor which shows:
  - a) the location and limits of the eligible street, alley, or pedestrian-bike way improvements;
  - b) the name, address, and telephone number of the owner of each property abutting the eligible improvements;
  - c) the frontage of each property (with lineal footage shown);
  - d) the reimbursement amount due from each property based on the original certified costs, divided by the frontage of all abutting properties, multiplied by the frontage of the individual property;
  - e) the book, page, and reception number from the records of the County Clerk and Recorder or the name of the recorded plat from which the information for each property was obtained; and
  - f) any other information deemed necessary by the Local Entity Engineer to properly prepare a reimbursement agreement.
- g. <u>Reimbursement Agreement Forms</u>. After receipt of written notice from the Local Entity Engineer documenting Certified Costs, the Developer shall provide three signed original Reimbursement Agreement forms to the Local Entity. (Refer to **Appendix B-1** for Reimbursement Agreement.) Following execution of the agreement by the Local Entity, two signed originals shall be returned to the Developer, who shall record the agreement with the Larimer County Clerk and Recorder.
- h. <u>Notification of Agreement</u>. After execution and recording of the reimbursement agreement, the installing Developer shall certify, by affidavit, that all owners of properties obligated to provide reimbursement have been notified in writing through certified mail with return receipt requested. The Local Entity shall then cause to be published a public notice listing the properties and reimbursement amounts. The Local Entity shall endeavor to provide notice on future plats of property obligated to provide reimbursement of the recorded agreement, but the failure to provide notice shall not relieve the owner of the platted property of any reimbursement obligation.
- i. <u>Inflation Adjustment</u>. The amount of the reimbursement assessed by the Local Entity for each adjacent property as it develops shall be based on the certified costs of the improvements plus an adjustment for inflation based on the construction cost index for Denver, Colorado, as published monthly by "Engineering News Record." The Local Entity Engineer's determination concerning total eligible costs shall be final.

- j. <u>Collection</u>. The Local Entity's obligation to reimburse the Developer shall be contingent upon the Local Entity's actual collection of the front footage charge from the abutting developer. The Local Entity shall have no obligation to reimburse any funds that it fails to collect, for whatever reason, provided that the Local Entity made a good faith attempt to collect such funds.
- k. <u>Payment</u>. When the front footage charge is collected, the Local Entity shall reimburse the installing Developer to the extent of such collection after deducting a service charge of \$500 or 3 percent of the amount collected, whichever is greater, to cover the Local Entity's legal, engineering, and administrative costs.
- 1. Funds collected pursuant to a reimbursement agreement shall be paid to such person as identified in the agreement, and if such person cannot be found, to an alternate if designated in the agreement.
- m. <u>Limitations</u>. Any right to reimbursement pursuant to this provision shall not exceed a period of 10 years from the acceptance by the Local Entity of the street, alley, or pedestrian-bike improvements. The Local Entity Governing Body may approve extensions of the reimbursement agreement for additional 10-year periods. No such reimbursement shall be made unless the person entitled to reimbursement has fully satisfied their obligations under any other agreements with the Local Entity.
- 2. Capital Expansion Fee Streets Loveland (city limits only). Upon prior budget appropriation by the city council and approval by the director, any person obligated to pay any of the street capital expansion fees set forth in Section 16.38.020 of the Loveland Municipal Code may receive a reimbursement against a portion of the amounts paid for public improvements installed and paid for by such Developer on specified arterial streets designated in the adopted street capital improvement plan. Payment of such reimbursement shall be subject to the following:
  - a. <u>Required but Unnecessary Street Over-Sizing Improvements Policy</u>. If the Local Entity requires a Developer to construct street over-sizing improvements that are not necessary to safely serve the development and these improvements are identified as part of the street capital improvement plan, then the Local Entity will reimburse the Developer for approved construction costs as soon as funds are available after completion and final acceptance of the street improvements by the Local Entity. If the Local Entity is unable to reimburse the Developer because of insufficient funds in the street capital improvement plan budget, the Developer will be paid interest at the same rate the Local Entity is earning on its pooled investments during the reimbursement period beginning three months after acceptance of the approved over-sizing improvements until reimbursement is completed.
  - b. <u>Required and Necessary Street Over-Sizing Improvements Policy</u>. If the oversizing improvements are necessary to safely serve the development, as determined by the Local Entity, and the improvements are part of the street

capital improvement plan, the Local Entity shall reimburse the Developer for approved construction costs *or as predefined in a development agreement*. Interest will not be paid on the reimbursement because the need for the improvements was dictated by the development; however, construction costs will be adjusted from the date of acceptance to the date of reimbursement based on the annual street CEF adjustment factors.

- c. <u>Timing of Reimbursement</u>. In the previous two situations, reimbursement will be made at such time that the improvements are scheduled for construction based on the most recently adopted street capital improvement plan, if Local Entity funds are available for such reimbursement. If funds are not available, the Developer will be reimbursed as soon as street capital improvement plan funds are sufficient, provided, however, that the reimbursements will be made on a "first completed, first reimbursed" basis. At the option of the Local Entity, the Developer may be entitled to all or a portion of the street capital expansion fee revenue paid by the development to the Local Entity. The Local Entity shall reimburse the Developer over time as the Local Entity receives the street CEF revenue from the project. The reimbursement shall be made once a year, unless otherwise determined by the director, until the development is completed or until the full reimbursement is made.
- d. <u>Development Obligation</u>. On capital improvement plan streets, each development is obligated for providing the financial equivalent of a Collector street adjacent to their property meeting all current standards. This includes 34 feet of pavement at the thickness appropriate for a Collector street, vertical curb and gutter, and a 5-foot wide sidewalk. The limits of this obligation may extend off site, as determined by the Local Entity when required to connect street improvements adjacent to the property with the portion of the existing arterial street that meets the current standards.

If a development is approved in an area that is far removed from any other existing curb, gutter, sidewalk, or bike lane, the Local Entity has the option of requiring the Developer to put the money necessary to construct the required curb, gutter, sidewalk, or bike lane into the street capital improvement plan account to be used by the Local Entity to build the curb, gutter, sidewalk, or bike lane when it is needed in the future.

e. <u>Development Reimbursement</u>. The development may be eligible for reimbursement for one-half of the Collector street equivalent improvements from future developers of any vacant property on the other side of the improved street as outlined in the preceding **Section1.9.3 A**. The CEF reimbursement policy for over-sizing (described in **Sections 1.9.3 B.1** and **1.9.3 B.2**) would also apply.

If a Developer can show that the land on which the development is located has already fulfilled its financial obligation for the equivalent of a Collector street on a partially improved capital improvement plan arterial adjacent to the development, all additional street improvements required by the Local Entity would be reimbursed from the street capital improvement plan fund. The amount of reimbursement shall be based on the following:

- 1) An amount predetermined in an approved development agreement; or
- 2) The quantities from the approved construction plans as determined by the Developer and approved by the Local Entity; and
- The unit costs shall be the average cost paid by the Local Entity on the most recent competitively bid Local Entity contracts, adjusted for inflation by the appropriate Engineering News Record construction cost index, if necessary; or
- 4) The unit costs will be actual unit costs paid by the Developer if those costs are the lowest bid prices established through a competitive bidding process conducted by the Developer in accordance with Local Entity policies and state statutes.

The Developer shall provide a detailed quantity breakdown of the capital improvement plan eligible street improvements.

# 1.9.4 Variances and Appeals Processes

#### A. Variances

Any design that does not conform to these Standards must be approved by the Local Entity Engineer. Variances from these Standards will be considered administratively on a case-by-case basis following a written request for a variance prepared by a Professional Engineer and submitted to the Local Entity Engineer. If the special district, developer, contractor, or utility responsible to the Local Entity for public improvements desires to design and construct such improvements in variance to criteria in these standards, such variance(s) shall be identified in a written attachment to the initial submittal of construction plans to the Local Entity Engineer. The design submitted for review shall show the variance. To assist with their plan preparation, designers may submit variance requests, along with sufficient documentation to support the variance, prior to formal submittal of construction plans for informal advisory consideration. Such advisory consideration shall not be binding on the Local Entity Engineer, but may help to guide the requestor in the preparation of plans. Variances may be considered by either of the following two administrative processes:

- a. Variances requested as part of an application for approval of a preliminary plat only shall be shown on the preliminary plat (or on the preliminary construction plans) and shall also be specifically substantiated and justified in a letter addressed to the Local Entity Engineer. In Loveland (city limits only), variances requested as part of a combined application for approval of a preliminary plat and preliminary development plan shall be described (complete with technical justification) in the regulatory procedures section on the preliminary development plan.
- b. Variances requested as part of the submittal for approval of final public improvements construction plans shall be shown in the plans and shall also be

specifically substantiated and justified in a letter addressed to the Local Entity Engineer. A summary of all approved variances shall be listed in the general notes on the approved plans.

- 2. The variance request(s) shall include the following:
  - a. <u>Identifying Issue</u>. Identification of the standard to be waived or varied and why the standard is unfeasible or is not in the public interest.
  - b. <u>Proposing Alternate Design</u>. Identification of the proposed alternative design or construction criteria.
  - c. <u>Comparing to Standards</u>. A thorough description of the variance request including impact on capital and maintenance requirements, costs, and how the new design compares to the standard.
  - d. <u>Justification</u>. The Professional Engineer must determine and state that the variance will not be detrimental to the public health, safety and welfare, will not reduce design life of the improvement nor cause the Local Entity additional maintenance costs. The proposed plan (as varied) must advance the public purpose of the standard sought to be varied equally well or better than would compliance with such standard.
  - e. <u>Approval or Denial of Variance</u>. Based upon review of the plans and additional information submitted, and an analysis of the criteria set forth in this subsection (2), the Local Entity Engineer may approve or deny the variance request. If the Local Entity Engineer approves the variance request, the plans will continue to be reviewed and approved within the typical review process. If the Local Entity Engineer denies the variance request, the developer shall subsequently submit revised plans in compliance with these Standards. The Local Entity Engineer shall provide a written response outlining the basis for all approvals or denials of variance requests.

#### **B.** Appeals

1. <u>Appeal to the Director</u>. If a variance request is denied by the Local Entity Engineer, the Developer may appeal the decision to the Director. All appeals shall be processed through the Local Entity Engineer. The Developer shall give written notice of appeal to the Director within 10 days after denial by the Local Entity Engineer. The Director shall respond within 15 working days after receipt of the Developer's notice to appeal. If the Director overturns the Local Entity Engineer's decision, the developer may then proceed with the requested variance(s) in the plans.

If the Director concurs with the Local Entity Engineer's decision, the Developer shall bring the Plans into compliance with these Standards, or appeal the Director's decision to the Local Entity Governing Body. In Fort Collins (city limits only) and Loveland (city limits only), the Director's decision shall be final.

2. <u>Appeal to Governing Body</u>. In Fort Collins (GMA only) and Loveland (GMA only), the Developer may appeal to the Local Entity Governing Body within 10

days from receipt of denial from the Director. The appeal shall be placed on the agenda for consideration by the Local Entity Governing Body in accordance with Local Entity procedure, but no later than 60 days following receipt of the written notice of appeal. The Local Entity Governing Body shall hold a public hearing on the appeal in accordance with Local Entity procedure. All notices and appeals shall be in writing. Any such appeal shall constitute a "new hearing" on the variance request before the Local Entity Governing Body.

# **1.9.5 Maintenance of Private Improvements**

# A. Compliance

When a request is made for the Local Entity to assume maintenance of any private improvement, it shall be the responsibility of the person(s) making the request to satisfactorily demonstrate that the private improvement is constructed in accordance with these Urban Street Standards.

# **B.** Review

The Local Entity will review these requests under normal review procedures.

# C. Refusal of Responsibility

The Local Entity will not accept maintenance responsibilities for private street improvements (and public street improvements in the unincorporated GMA unless otherwise agreed to by formal agreement or supplemental regulations) associated with land development activities. Private improvements that were not constructed in accordance with the applicable design and construction standards and specifications shall not be accepted for maintenance by the Local Entity.

# 1.10 COST ESTIMATE AND DEVELOPMENT AGREEMENT

Any Applicant for final plat approval must provide the Local Entity with an itemized estimate of all Public Improvements (as defined by Colorado law) associated with the development. Cost estimates are used to establish the amount of collateral to be provided by the Applicant to secure the requirements of the Development Agreement. An amount equal to 15 percent of the total cost estimate shall be added to the total cost to cover construction contingencies.

After review and acceptance of the cost estimate by the Local Entity Engineer, it shall be incorporated into a Development Agreement of a format suitable to the Local Entity Attorney. The Development Agreement should be executed by the Developer prior to the Local Entity approval of the final plat. Collateral must be provided by the applicant in the form and amount as defined in **Chapter 24**, Acceptance Procedures and Record Drawings/Warranty.

# 1.11 WORK SCHEDULE

Normal working day hours are 7 a.m. to 6 p.m., Monday through Friday. No work shall be permitted on weekends or holidays without written approval from the Local Entity Engineer. Work activity done at times other than during normal working hours may require reimbursement to the Local Entity for the overtime cost to the Local Entity. Work requests beyond normal working hours must be submitted to the Local Entity Engineer a minimum of 5 working days prior to the requested date.

# 1.12 UTILITY COORDINATION

The Developer shall coordinate construction with affected private utility companies and notify said utilities in accordance with their notification requirements at least 5 Working Days prior to interruption of service or operation. Prior to construction, the Developer shall be responsible to make special arrangements with private utilities for any relocation necessary within the approved project and to coordinate such relocation activities with adjacent affected property owners. The Developer shall be responsible to notify said utilities of any damage to utility systems caused during construction.

# 1.13 URBAN INFILL AND REDEVELOPMENT AREAS IN LOVELAND (CITY LIMITS ONLY)

For infill and redevelopment projects located in downtown Loveland and surrounding neighborhoods, flexibility shall be considered in the establishment of the requirements for road improvements, driveway placement, access management and other *Larimer County Urban Area Street Standards* (LCUASS) requirements (as deemed appropriate by the Local Entity Engineer). These downtown areas have an established traditional grid network of streets and existing road and access conditions. These conditions are unique and distinctive when compared to undeveloped and developing "greenfield" areas around the periphery of the City where there are fewer barriers to the application of standard LCUASS requirements.

#### 1.13.1 Design and Access Flexibility for Core of City

In core areas of the City, the imposition of roadway design and access criteria that are more suitable for greenfield locations is often contrary to their existing and intended urban character. In these areas, pedestrian access and circulation require greater priority relative to vehicular transportation, and design flexibility is needed to accommodate such considerations. For example, such design consideration may include, but may not be limited to the following:

#### A. Smaller Turning Radii

Smaller turning radii for roads and driveways to facilitate pedestrian activity by slowing vehicular turning movements and reducing walking distances for pedestrians. For local streets, where appropriate, templates for larger vehicular turning movements may factor broader lane usage to allow for smaller corner radii. Also, allowance should be made for bulb-outs at corner locations, and other traffic calming measures to slow vehicular traffic, and reduce pedestrian crossing distances and the exposure of

pedestrians to high speed traffic. Mid-block pedestrian crossings may also be appropriate in some cases where deemed appropriate by the Local Entity Engineer.

#### **B.** Alternate Driveway Spacing

Standard driveway spacing requirements may be modified to factor existing driveway locations and the individual access needs of smaller redevelopment and infill development sites within smaller development blocks created by the existing grid network of streets.

# C. Alternate Trip Generation Rates

Trip generation rates for mixed-use projects and projects located with good access to transit may be modified to reflect internal trip capture and the availability of alternate transit modes and pedestrian trips if verified by the applicant's traffic engineer in a scoping meeting with the Local Entity Engineer.

# **D.** Alternate Speed Limits

Overall, slower design speeds may be desirable in traditional neighborhoods as they greatly increase the safety and comfort of pedestrians.

# E. Other Trip Generation Factors

The grid network of streets located in the core areas provides a greater number of trip alternatives for motorists. These alternative routes may be factored into trip generation and distribution analysis so that traffic is distributed more evenly throughout the grid with less burden or demand placed on individual intersections and turning movements. Alleyways can also provide some circulation as long as the traffic volumes or delay do not exceed ACF thresholds.

#### F. Alternate Street Widths

Some LCUASS street standard suggested widths may be more suited to greenfield developments than to redevelopments where land is limited and where the surrounding street network functions well with narrower streets than those recommended in the LCUASS guidelines.

#### G. On-Street Parking

On-street parking may be encouraged because it reduces the need for off-street parking; serves as a buffer between pedestrians and motorists; and slows passing vehicular traffic. Diagonal parking may be appropriate for some streets on a case-by-case basis.

#### H. Maintain Connectivity

Development and redevelopment in the core areas should maintain and enhance connectivity for pedestrians, cyclists and motorists as appropriate.

# 1.13.2 Preserve Public Health, Safety and Welfare

Any of the above flexibility in applying the LCUASS standards in these areas shall not be detrimental to the public health, safety and welfare nor will it reduce the design life of the improvement or cause the city of Loveland additional maintenance costs.

# 1.14 COMPLETE STREETS IN FORT COLLINS

In accordance with the Vision of the Transportation Master Plan new or redeveloped streets shall be developed as Complete Streets. Complete Streets include accommodations for each mode of travel recognizing that all streets are different and that the needs of various users will need to be balanced in a flexible manner. The standards as adopted within *Larimer County Urban Area Street Standards* (LCUASS), for areas within Fort Collins, shall support the accommodation of all travel modes. Implementation may be flexible to respond to the context and character of corridors, with the ultimate intent of safely accommodating all modes.

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# CHAPTER 2 – SUBMITTAL AND REVIEW PROCEDURES

# 2.1 GENERAL

## 2.1.1 General Submittal Criteria and Procedures

This chapter gives criteria and procedures for submitting engineering drawings as required by these Urban Area Street Standards. All other requirements for planning can be found in the Fort Collins Development Manual, the Loveland Municipal Code (Chapter 16), and the Larimer County Land Use Code.

# 2.1.2 Authorization/Certification

#### A. Designer's Signature

All documents, including plans and other submittals noted below, shall be prepared, stamped, signed, and dated by a Professional Engineer. Each sheet in the plan set shall contain the Designer's statement as shown in **Chapter 3**, **Information Requirements for Construction Plans**, and shall be signed and stamped by the Designer and submitted to the Local Entity.

#### **B.** Additional Requirements

The Designer should be aware that whenever unusual or serious problems are anticipated or encountered for a proposed construction project, additional information and analysis beyond the minimum requirements of these specifications and criteria will be required.

#### C. Final Authorization

No plans are considered final and ready for construction until signed and stamped by the Designer and signed by authorized Local Entity officials. Refer to **Chapter 3**, **Information Requirements for Construction Plans**.

#### **D.** Construction Traffic Control Plans

Plans for traffic control during construction for the development project must be accepted by the Local Entity prior to any issuance of permits.

# 2.2 SUBMITTALS AND CONTENT

# 2.2.1 Checklists.

Checklists that identify the specific information requirements for the documents are included in **Appendix E**. Additional checklists for the various land use applications are available from the Local Entity. A complete submittal package for review shall include a completed checklist.

# 2.2.2 Public Improvement Construction Plans

Refer to Chapter 3, Information Requirements for Construction Plans, for further description and requirements.

# 2.2.3 Landscape Plan

## A. Plan Content

The landscape plan shall indicate the treatment of all landscaped area within and adjacent to the right-of-way. The design objective of the plan must be clear and supported by a written statement. The plan must show the inter-relationship between all existing and proposed buried utilities and the required landscape elements such as trees, irrigation, vegetation, turf, screening, buffering, walls, and fencing.

#### **B.** Choosing Appropriate Plants

Plant material must be adaptable to the physical conditions indicated by the landscape plan locations and must meet specifications of the American Association of Nurserymen (AAN) for number one grade.

#### C. Fort Collins (City Limits Only) Requirements

The landscape plan shall include all items addressed in the Ft. Collins Landscape Requirements in Appendix C, *City of Fort Collins Streetscape Design Standards and Guidelines*.

# D. Loveland (City Limits Only) Requirements

The landscape plan shall include all items shown above and shall be included in the Public Improvement Construction Plan set.

# 2.2.4 Soils Investigation Report

Refer to Chapter 5, Soils Investigations and Report, for the content and requirements for the soils report.

# 2.2.5 Pavement Design Report

Refer to Chapter 10, Pavement Design and Technical Criteria, for the content and requirements for the pavement design report.

# 2.2.6 Work Area Traffic Control Plan

The plans shall be designed in accordance with MUTCD, Section VI.

# 2.2.7 Street Cross Sections

Typical and unique street cross sections shall be submitted for each general category street, including the proposed width, treatment of curbs and gutters, sidewalk systems,

and bikeway systems where deviations are proposed from these Standards. Refer to checklists for location and presentation of cross sections.

# 2.2.8 Drainage Report, Erosion Control Report, and Hydrologic Report

The Developer is required to submit drainage, erosion control, and hydrologic reports (for subsurface water refer to **Chapter 5**, **Soils Investigation**) in compliance with Local Entity Standards.

# 2.2.9 Opinion of Costs

As a separate attachment to the Plans, an Opinion of Costs for all Public Improvements will be required. The Opinion of Costs shall include, but not be limited to, the items listed in **Chapter 20, Public Improvements Cost Estimate**. The items shall be identified by unit price and total cost for each item for each type of Project.

# 2.2.10 Transportation Impact Study

Refer to **Chapter 4, Transportation Impact Studies,** for study criteria and process and report content. The Developer may be required to submit a transportation impact study during the Local Entity's planning process. The Developer is required to use the recommendations of this report in the Plans submittal.

# 2.2.11 Final Plans

# A. Mylar Requirements

Requirements for mylars or plans to be submitted to the Local Entity for permanent retention (Larimer County does not require mylars, only requires 4 sets of signed and stamped blueprints):

- 1. Must be on good quality mylar or mylar sepia so that clearly legible blueprints or reproductions can be made from it on standard reproduction equipment. (i.e., 4 mil mylar, single or double matte)
- 2. Must be high quality print. No smudges or blurred text will be accepted. No photocopied mylars will be accepted.
- 3. Must be in good condition and unblemished. Torn, folded, or stapled mylars will not be accepted.
- 4. Must not have any attachments or any information attached by adhesive.
- 5. Must be 24 inches x 36 inches in size.
- 6. Signatures are to be in black indelible ink marker (i.e., black ultra-fine Sharpie<sup>™</sup> or equivalent NO ballpoint ink or pencil).

#### **B.** Plans Requiring Final Mylars

The following will require final mylars for Loveland (city limits only) and Fort Collins (city limits only):

- 1. Final plats
- 2. Annexation maps
- 3. Special review site plans
- 4. Construction Plans
- 5. Final development plan, in Loveland (city limits only)
- 6. General development plan, in Loveland (city limits only)
- 7. Overall development plan, in Fort Collins (city limits only)
- 8. Landscape plans
- 9. Record drawings

#### 2.2.12 Revisions to Signed Plans

Requests to revise the Public Improvements Construction Plans (the Plans) after the Local Entity has reviewed and approved the Plans shall be made in conformance with the following criteria:

#### A. Minor Revision

- 1. Shall be limited to revisions in alignment of the pavement section, depth of structural section, locations of curbs and gutters or sidewalks, relocation of traffic control devices, etc., which do not alter or impair the overall functional aspects of the improvements or work necessary to install the improvements.
- 2. May be administratively approved, at the discretion of the Local Entity Engineer, by written confirmation. Written confirmation shall be by initial and date noted in the revision box on the mylar plans. If the Local Entity Engineer does not approve the Minor Modification request, the Developer shall immediately comply with the plans or these Standards. The Local Entity Engineer's decision shall be the final decision regarding Minor Revisions unless appealed.

# **B.** Major Revisions

- 1. Shall be a revision to the approved plans which is not specifically covered under the provisions for Minor Revisions and which affects the functional aspects of the improvements or work to install the improvements. (i.e. change in street width or horizontal alignment, change in functional classification, etc.).
- 2. The Major Modification cannot be administratively approved. The Developer is required to resubmit the Preliminary Plat or Preliminary Development Plan for review and subsequent approval by Staff, Planning Commission and/or Governing

Body. Additionally, all work related to the Major Revision may not be allowed to continue until the Local Entity has approved the Major Revision or appeal.

# 2.2.13 Record Drawings

Record Drawings shall include the statement in **Chapter 24, Acceptance Procedures** and **Record Drawings/Warranty,** and be signed, stamped, and dated by the Professional Engineer. The Record Drawings shall be prepared utilizing the original mylar plans. They must show any deviations from the approved plans. Record Drawings must be signed and stamped with the Professional Engineer's statement that the changes have not changed the intent of the approved plans.

# A. City of Loveland Requirements

The Record Drawings shall be submitted on mylar, as well as, in an approved electronic submittal format.

#### **B.** Larimer County Requirements

Two sets of Record Drawings shall be submitted in an approved blue-line submittal format.

# 2.3 SUBMITTAL PROCEDURES

## 2.3.1 City of Fort Collins

The City of Fort Collins has specific procedures for submittal, review, and approval within the development process. All submittals necessary for engineering requirements are discussed above in **Section 2.2**. An outline and checklist for the following procedures are available in the City of Fort Collins Development Manual:

- Project Development Plan
- Final Compliance Review
- Subdivision Plat (Final)

# 2.3.2 City of Loveland

The City of Loveland has specific procedures for submittal, review, and approval within the development process. All submittals necessary for engineering requirements are discussed above in **Section 2.2**. The procedures for submittal, review, and approval of all construction documents, other than the plan set, shall be found in the **Loveland Municipal Code (Chapter 16)** as well as below.

# A. Submittal Types that Require Public Improvement Construction Plans

- 1. Final plats
- 2. Final development plans
- 3. Special review site plans

4. Building permits that require new or modified transportation improvements.

## **B.** Submittal Requirements

- 1. <u>Content and Format of Plans</u>. Preliminary and Final Public Improvements Construction Plans submitted to the City shall be prepared pursuant to Chapter 16.20.070 and 16.20.090 of the Loveland Municipal Code. The plans shall also be formatted and contain appropriate items pursuant to the checklists in **Appendix E** of these Standards.
- 2. <u>Review and approval process</u>. The review and approval process for Preliminary Public Improvements Construction Plans shall comply with Chapter 16.20.70 of the Loveland Municipal Code. All Preliminary Public Improvements Construction Plans shall be submitted directly to the City's Current Planning Division.

The review and approval process for Final Public Improvements Construction Plans shall comply with Chapter 16.20.090 and shall also comply with the following criteria:

- a) All Final Public Improvements Construction Plans shall be submitted directly to the City's Current Planning Division. Completion dates for City review of each submittal of the plans will be forwarded to the Consultant Engineer (or Developer) once the submittal has been found to be complete.
- b) Upon completion of each City Department's review, the Consultant Engineer will be notified by each Department to pick up the respective review set of plans.
- c) After the Consultant Engineer has addressed all review comments from each City Department, the Consultant Engineer shall re-submit 5 revised blue/blackline sets of plans in accordance with a) above.
- d) Step b), above, may be repeated until such time as the City deems the plans to be approvable. At that time, the Consultant Engineer will be contacted by the City with a request to submit the original mylar title sheet with one final revised blue/blackline set of plans.
- e) Upon subsequent review and approval by the City of the mylar title sheet and the final revised set of plans, the Consultant Engineer (or Developer) will be contacted to pick up the approved mylar title sheet.
- f) Prior to the commencement of construction of public improvements within the Project, the Consultant Engineer (or Developer) shall return seven blue/blackline sets of the plans along with one complete set of mylar plans. The blue/blackline and mylar plans shall be copies of the originally signed and stamped plans. All mylar plans shall be per City "Mylar Submittals" criteria in Section 2.2.11.

# 2.3.3 Larimer County GMA

The following specific Larimer County requirements apply to both Fort Collins (GMA only) and Loveland (GMA only):

Larimer County has specific procedures for submittal, review, and approval within the development process. All submittals necessary for engineering requirements are discussed above in Section 2.2. The procedures for submittal, review, and approval of all construction documents, other than the plan set, shall be found in the Larimer County Land Use Code.

# CHAPTER 3 – INFORMATION REQUIRED FOR PUBLIC IMPROVEMENT CONSTRUCTION PLANS

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# CHAPTER 3 – INFORMATION REQUIRED FOR PUBLIC IMPROVEMENT CONSTRUCTION PLANS

# 3.1 GENERAL

## 3.1.1 Plan Set

The Developer is required to submit a complete Plan covering the design for all Public and Private Improvements in the Project. This Plan set shall include as a minimum one cover sheet with general notes, construction note sheet(s), improvement design sheet(s) (one for each improvement), and appropriate detail sheets.

#### A. Loveland (City Limits Only)

The checklist in **Appendix E-4** is required with any submittal to the City of Loveland. This checklist must also be included in all resubmittal packages.

# 3.1.2 Final Mylars

Final mylar plan sheets shall be 4 mils thick, matted both sides, photostat, (silver) or original mylar plot. Sticky backs are allowed, however, a sepia mylar must be submitted for the Local Entity final mylar set. In Fort Collins (city limits only) mylars must be of scannable quality and sticky backs generally will not provide scannable quality. Refer to **Chapter 2, Submittal and Review Procedures,** for additional detail.

#### A. Loveland (City Limits Only)

Electronic files of all drawings will be required upon the submittal of Record Drawings.

# **B.** Fort Collins (City Limits Only)

Final mylars submitted must be of good quality to obtain clear computer scanned copies for archiving, see Appendix E-6, Scannable Quality Mylars, for detailed requirements.

# 3.1.3 Vertical Datum

Plans shall conform to vertical datum criteria provided by the Local Entity. Assumed vertical datum or adjustment equations are not allowed.

Fort Collins (City Limits Only)All projects within the Fort Collins (city limits only) must use benchmarks documented in the City of Fort Collins Vertical Control Network. The information is available at the City Engineer's office.

Loveland (GMA and City Limits)The Loveland bench network must be extended to the project site, at the developer's expense, for all projects in Loveland GMA. The reference benchmark from the City of Loveland '95 Level Net Survey shall be identified in the Public Improvement Construction Plans.

# 3.1.4 Expiration of Plan Set

Public improvement construction plans shall be valid for a period of three years from the date of approval by the Local Entity Engineer, except as noted below.

# A. Fort Collins (City Limits Only)

In Fort Collins (city limits only) plans shall be valid for a period of three years from the date of Development approval or plan approval, whichever is earliest.

# **B.** Larimer County GMA

In Fort Collins (GMA only) and Loveland (GMA only), expiration shall be as stated in the development agreement.

# C. New Review after Expiration Date

Use of these plans after the expiration date will require a new review and approval process by the Local Entity prior to commencement of any work shown in these plans.

# 3.2 GENERAL FORMATTING AND REQUIRED INFORMATION

The following information is provided for the Developer when determining Plan format and design requirements required by the Local Entity. This information should be considered the minimum information to be provided.

# 3.2.1 Checklist

The Local Entities require the use of the checklist in Appendix E-4.

# 3.2.2 Size of Plan Sheets

All sheets in the construction plan set shall be 24 inches x 36 inches.

# 3.2.3 Title Block

A title block is required on every sheet and cover sheet submitted for review and acceptance. The title block shall be located in the extreme lower right hand corner, the right side margin, or along the bottom edge of the sheet. For Fort Collins(city limits only), provide an area 4" x 6" on each sheet for the Local Entity to place a stamp of approval.

# A. Required Information

List of information that shall appear in title block on each sheet:

- 1. The subdivision or Development name and filing number (if applicable).
- 2. The type of improvement.
- 3. Designer's Name, address, including zip code, and telephone number, and FAX number;
- 4. Sheet number (consecutive, beginning with the cover sheet).

# 3.2.4 Standard Signature Blocks

All sheets including the cover sheet should display standard Local Entity signature blocks in the lower right hand quadrant of the sheet. Annotate the signature blocks as shown in **Appendix E-3**. These are the signatures required only for the Local Entity signoffs.

# 3.2.5 Incomplete Plans

Incomplete plan submittals will not be reviewed but returned to the Applicant.

# 3.2.6 Stamped Plans & Designer Statement

All sheets shall include the Designer's signature, stamp and date and shall be wetstamped and signed in accordance with the regulations established by the State of Colorado Board of Registration.

# 3.2.7 Scale

#### A. General

All Plan and profile sheets:

- 1. <u>Horizontal</u>. 1 inch = 20, 30, 40, or 50 feet.
- 2. <u>Vertical</u>. 1 inch = 5 or 10 feet.
- 3. <u>Overall Plan</u>. 1 inch = 100 feet.
- 4. <u>Cross Sections</u>. Vertical exaggeration ratio shall be 5:1.

# **B.** Bar Scale and Other Options

Show bar scale. Other scales may be used upon Local Entity approval.

# C. Signing and Striping

All signing and striping plans require a scale of 1 inch = 30 feet.

# D. Key Map

1 inch = 1,000 feet

# E. Vicinity Map

1 inch = 1,000-1,500 feet

# 3.2.8 Dates

All sheets shall have dates shown in the Title Block for both Plan preparations and subsequent revisions. An electronic date shall appear on all electronic files to be submitted.

# 3.2.9 North Arrow

All design sheets shall have a north arrow oriented toward the top or right side of applicable sheets.

# 3.2.10 Background Facilities

Each sheet shall show all existing facilities in a ghosted or alternate line weight or type.

# 3.2.11 Private Improvements

Private Improvements, such as roadways, driveways, utilities, etc., shall be clearly shown and labeled as such on each sheet of the Construction Plans.

# 3.2.12 Legend of Symbols

Each sheet shall include a legend that identifies the symbols pertaining to the sheet.

# 3.2.13 Key Map

For plan sets that include 3 or more plan and profile sheets, each Plan and profile sheet shall provide a key map showing the location of the street being detailed.

# 3.3 SHEET TITLE NAMES AND SPECIFIC REQUIREMENTS

This section outlines the minimum required information to be included on specific sheets of the Plan set. The following sheets are listed in the order they should appear in the Plan set. Some sections of the Plan set may have more than one sheet, but should be labeled alike.

# 3.3.1 Cover Sheet

All sets of construction drawings shall include a cover sheet with the following information provided:

#### A. General Construction Notes

General Notes shall be shown on this sheet. They are listed in Appendix E.

# B. Vicinity Map

- 1. <u>Information to Include</u>. The vicinity map shall show the location and name of all Arterial roadways within one mile of the proposed construction, and all other roadways within 1/2 mile of the proposed construction. The project area shall be indicated by shading. The vicinity map shall show all Arterial roadways and major drainage ways. Section, Township, and Range shall also be shown.
- 2. <u>Size</u>. Minimum size of vicinity map shall be 10 inches x 10 inches and to a scale.

# C. Engineer/Owner Contacts

The name, address, and phone number of the Developer (owner) and Consultant Engineer shall be listed on the cover sheet.

# **D.** Index

Each cover sheet shall include an index of all sheets within the Plan set.

# E. Indemnification Statement

The indemnification statement shall be shown on the cover sheet. Annotate the following on Cover Sheet only:

These plans have been reviewed by the Local Entity for concept only. The review does not imply responsibility by the reviewing department, the Local Entity Engineer, or the Local Entity for accuracy and correctness of the calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial responsibility by the Local Entity for additional quantities of items shown that may be required during the construction phase.

# F. Preamble (Project Title)

The project title and general location shall be shown in the top middle of the page. The title shall begin as follows and shall be in bold/large font:

# PUBLIC IMPROVEMENT CONSTRUCTION PLANS

for

# (MARKETING NAME OF PROJECT)

# (OFFICIAL PLATTED NAME OF PROJECT)

Name of Local Entity

# G. Legend of Symbols

Provide standard symbols for all appurtenances related to each type of facility.

# 3.3.2 Construction Notes

Refer to **Appendix E-2** for standard construction notes.

# 3.3.3 Right-of-Way Grading and Erosion Control

These Plan sheets shall be drawn at a legible scale (1"=10' to 1"=50') which will clearly convey design and construction intent. Plan sheets shall display a legend of symbols. All erosion control devices (temporary and long term) shall be included, as well as revegetation methods with specific notes. Plan must show grades of all drainage facilities.

For average lot sizes under 1 acre, the plan must show overlot grading with topographic contours before and after completion of grading.

# 3.3.4 Street Improvements

The Plans shall include Plan and Profile views for each street proposed in the development. Cross-section sheets are required for all Arterial and some Collector roadways. In addition to the requirements set forth elsewhere in these Urban Street Standards, the following information shall be shown on all Roadway plans submitted for review and approval.

# A. Plan View

The plan view shall include, but not be limited to, the following:

- 1. Existing and proposed Property and/or right-of-way lines, easements, and/or tracts. Type and dimension of easement or tract is to be clearly labeled. Dimensions of Property and right-of-way lines are to be marked.
- 2. Survey lines and stationing lines shall normally be based on centerline of street; other profiles may be included but shall be referenced to centerline stationing. Stationing in cul-de-sacs shall be on the centerline to the center of the bulb with flowlines dimensioned within the bulb.

Survey lines and stationing lines shall deviate from centerline of street to parallel the roadway for situations where two sides of a divided roadway are not parallel.

- 3. Stationing shall read in ascending order in the direction of the north arrow or to the right.
- 4. Roadways and Roadway names.
- 5. Existing utilities and structures (shown as phantom lines), including, but not limited to:
  - a. Storm sewer and appurtenances.
  - b. Fence lines and gates.
  - c. Water lines and appurtenances.
  - d. Ditches or swales.
  - e. Electric lines and appurtenances.
  - f. Curbs and gutters.
  - g. Sewer lines and appurtenances.
  - h. Pavement limits.
  - i. Telephone lines and appurtenances.
  - j. Bridges or culverts.

- k. CATV lines and appurtenances.
- l. Guardrails.
- m. Signs.
- n. Gas lines and appurtenances, etc.
- 6. Station and critical elevation (flowline, invert of pipe, etc.) of all existing and proposed utility or drainage structures. Location of utilities shall be identified with horizontal and vertical dimensions as measured from roadway centerline profile grade.
- 7. Storm drainage flow direction arrows, particularly at intersections and all high and low points.
- 8. Match lines, stations and consecutive sheet numbers, beginning with cover sheet.
- 9. Station and elevation of all horizontal curves including PI, PC's, PT's, etc.; high or low point and PI of all vertical curves; existing and proposed, centerline bearings, distances, and complete curve data.
- 10. Curb return radii, existing and proposed. Stations and elevations of all curb returns; mid-point elevations and additional locations necessary, flowline-flowline intersection elevations, and percent of grade from the P.C.R. to flowline-flowline intersections of all crosspans.
- 11. Mid-block handicap ramp locations at "T" intersections.
- 12. Centerline stations of all proposed driveways and all intersecting roadways.
- 13. Survey tie lines to section corners or quarter corners, consistent with that shown on the plat.
- 14. Typical roadway cross-section for all roadways, existing or proposed, within and adjacent to the proposed development. These cross-sections shall appear on the detail sheet, or if no detail sheet has been used, the first sheet of the submittal showing roadway design.
- 15. <u>Intersections</u>. Any roadway intersections shall include construction and lane details for the new construction and existing facilities for a minimum of 150 feet beyond the limits of construction.
- 16. Basis of plan view and profile elevations shall be the same, i.e., flowline and flowline, top of curb and top of curb, etc.
- 17. <u>Cul-de-sacs</u>. High point and grades shown with percent arrows at critical points (cross-slope and flow line).

# **B.** Profile

Profiles shall include, but not be limited to, the following:

- 1. All streets shall be designed to show profile of center line and flow lines. This requirement may be waived by the Local Entity Engineer when profile grades exceed 1.0% for flow lines and standard cross sections and cross slopes are used. In such cases, additional vertical data may be required at intersections and on curves.
- 2. Original ground (dashed) and design grade (heavy, solid). Both grades are to be plainly labeled for all centerline and flowline profiles.
- 3. Design elevations shall be provided for the centerline and for curb and gutter flowlines. The basis of Record Drawing information shall be the same as the design and grade (flowline and centerline, etc.).
- 4. Stationing shall be depicted as a continuous line for the entire portion of the Roadway shown in the plan view, with the centerline station of all proposed driveways and all intersecting roadways clearly labeled.
- 5. All existing curbs, gutters, sidewalks, and pavement adjacent to the proposed design. The existing profile grades shall be measured by survey. Previously approved designs or Record Drawings are not an acceptable means of establishing existing grades.
- 6. <u>Existing and New Utilities</u>. Elevation and location of all utilities in the immediate vicinity of the construction shall be shown on the plans.
- 7. Station and elevation of all vertical grade breaks, existing (as-built) and proposed.
- 8. Distance and grade between VPI's.
- 9. Vertical curves, when necessary, with VPI, VPC, and VPT, high or low point (if applicable) stations and elevations. All vertical curves shall be labeled with length of curve (L) and K=L/A where A is the algebraic difference in slopes, in percent.
- 10. Profiles for all curb returns (except medians).

# C. Typical Street Section(s)

Provide any applicable horizontal or vertical dimensions, in addition to providing a section of all improvements within the right-of-way. A section should be provided for each roadway type planned within the project.

# **D.** Cross-Sections

1. <u>Roadway Cross-Sections</u>. Roadway cross-sections shall be provided at intervals deemed necessary by the Local Entity to effectively evaluate connection with the existing facilities, (typically every 50 feet horizontally).

Cross-sections shall be required on arterials and any other roadways as deemed necessary by the Local Entity Engineer. The cross-sections shall indicate:

- a. Profile grade design point (centerline, flow-line, top of curb, lip of gutter, etc.).
- b. Roadway width.

- c. Right-of-way.
- d. Pavement cross slope.
- e. Pavement thickness.
- f. Structural material components of the pavement, base and subbase, together with specifications for treatment of subgrade and installation of pavement structural members.
- g. Tie in of proposed improvements with existing ground.

# E. Key Map

- 1. Clearly depict each sheet's relative position compared to the overall project. The Roadway or area that the design pertains to will be shaded.
- 2. Minimum scale is 1 inch = 500 feet, showing the location and name of all roadways within and adjacent to the proposed construction and all future roadways. Scale should be indicated. The key map should be oriented consistent with detail in the sheet, i.e., same north.

# 3.3.5 Street Improvements Details

All pertinent details related to street improvements shall be shown on a detail sheet (or sheets) for the Project.

# 3.3.6 Traffic Signing and Pavement Markings

All permanent and temporary traffic signing and pavement markings shall be shown on the signing and striping plan, with the existing and proposed street system used as the base layout. Locations of signs and pavement markings shall be indicated by station/offset, or other specific dimensions indicating exact locations. This sheet shall also contain any construction or application notes, (e.g., application temperatures, surface cleaning methods to be used prior to application, etc.).

# A. Area Map

Separate signage and striping plans are to consist of an overall area map noting all specific use areas, such as schools, parks, recreation centers, library, commercial, industrial, etc.

# **B. Road Segment Pages**

The pages following the area map are to be broken down into road segments, for notation of signage and striping details.

# C. Signing Plan

The permanent signing plan should:

1. Show the general longitudinal location of each sign (horizontal offset and station).

- 2. Specify the sign legend and sign type (from MUTCD).
- 3. Specify the sign size.
- 4. Provide the construction drawing shown in Appendix "A" of installation dimensions (height, distance from curb, etc).
- 5. Detail post and base dimensions and installation plan (showing sleeves, depth below surface, and materials used, according to Local Entity standards).
- 6. Specify the blank gauge of the sign.
- 7. Note the reflectorization provided.

#### **D.** Striping Plan

The striping plan must show:

- 1. Color and type.
- 2. Lane widths, taper lengths, storage lengths, etc.
- 3. Striping/skip interval.
- 4. Typical treatments for acceleration/deceleration lanes, turning lanes, and crosswalks.
- 5. Type of material (epoxy, latex, thermoplastic).
- 6. Station and offset or dimensions to all angle points, symbol locations, and line terminations.

# 3.3.7 Landscape Plan

Landscape Plan sheets shall show all Plan views and details necessary for construction. The Landscape Plan sheets shall include all existing and all proposed plantings, shrubbery, trees, and all irrigation systems and appurtenances.

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Summary

# CHAPTER 4 – TRANSPORTATION IMPACT STUDY

# 4.1 INTRODUCTION

# 4.1.1 General

This chapter contains the policies and guidelines necessary for the preparation of Transportation Impact Studies (TIS) for development proposals for the Local Entity. The policies exist to ensure consistent and proper traffic planning and engineering practices when land use actions are being considered within the Local Entity. The guidelines provide for a standard process, set of assumptions, set of analytic techniques, and presentation format to be used in the preparation of the TIS. For projects within Loveland (city limits only) it also provides the technical requirements that must be satisfied in order for a land use application to comply with the Adequate Community Facilities ordinance found in Title 16.41 of the Loveland Municipal Code. For projects within Fort Collins (city limits only) it also provides the process, requirements, and terms that apply to TIS certification by the Local Entity Engineer and reservation of intersection capacity for the project. Additionally for projects within Fort Collins (city limits only) it also provides the technical requirements that must be satisfied in order for the project. Additionally for projects within Fort Collins (city limits only) it also provides the technical requirements that must be satisfied in order for a land use application to comply with the Adequate Collins (city limits only) it also provides the technical requirements that must be satisfied in order for a land use application by the Local Entity Engineer and reservation of intersection capacity for the project. Additionally for projects within Fort Collins (city limits only) with the Adequate Public Facilities ordinance found in Title 3.7.3 of the Fort Collins Municipal Code.

# 4.1.2 Applicant Responsibility

The responsibility for assessing the traffic impacts associated with an application for development approval rests with the Applicant. The Local Entity serves in a review capacity. The assessment of these impacts shall be contained within a TIS report as specified herein. It shall be prepared under the supervision of, and sealed by, a Licensed Professional Engineer in the State of Colorado with experience in traffic engineering and transportation planning/engineering.

For all State Highways within the study area, the Applicant is required to meet the requirements of the Colorado Department of Transportation.

# 4.1.3 Capacity and Safety Issues

Development of property has a direct impact on transportation, including vehicular, transit, bicycle, and pedestrian traffic. In order to meet capacity and safety needs as they relate to the traffic generated from a particular land use, specific improvements can be made. The goal of the TIS is to address the traffic related issues that result from the new development and to determine the improvements required such that appropriate levels of service are safely maintained. The various objectives of vehicular movement, pedestrians, bicyclists, and others must be balanced in the development review process. A combination of elements is needed to provide streets that serve all transportation modes. The TIS will provide information and guidance as plans are developed and decisions made for the approved plan.

#### A. Vehicular Traffic Improvements.

Examples of capacity and safety improvements for vehicular traffic include: road widening, turn lanesacceleration and deceleration lanes, intersection through lanes, traffic signals, stop signs, design speed adjustments, and modifications to access points.

#### **B.** Pedestrian Traffic Considerations and Improvements.

Examples of safe, comfortable, and convenient pedestrian services are narrower roadways with fewer lanes, short blocks, low traffic speeds, tree-lined sidewalks, smaller corner radii, well-defined crosswalks, median refuges and channelized islands in large street crossings, on-street parking, and bicycle lanes. Underpasses or overhead structures are examples of safety improvements if vehicular traffic causes unsafe conditions for pedestrians, space is available, and construction is feasible.

#### **C.** Bicycle Traffic Improvements.

The addition of on-street bicycle lanes or off-street bicycle paths may be needed to achieve connectivity between the proposed project and the existing bikeway system.

#### **D.** Transit Traffic Improvements.

Examples of Transit Traffic Improvements include accommodation of public transit facilities such as buses, bus stops, bus bays, stations, and transit stop facilities.

# 4.1.4 TIS Process Overview

#### A. Define TIS

- 1. Attend Scoping Meeting: Section 4.2.1.
- 2. Confirm the type of study, Master or Individual TIS: Section 4.2.2.
- 3. Identify Level of Analysis: Section Error! Reference source not found.
- 4. Write an amendment letter if required: Section 4.2.3.

#### **B.** Define Study Parameters

- 1. Develop the project description: Section 4.3.1.
- 2. Determine which Analysis Horizons to use: Section 4.3.2.
- 3. Determine the limits of the study area: Section 4.3.3.
- 4. Determine the evaluation components for the applicable type of TIS: Section 4.3.4.

# C. Evaluate Traffic Volume

1. Vehicular Traffic

- a. Existing Traffic
  - 1) Perform roadway traffic turning movement counts: Section 4.4.2 A.
  - 2) Determine intersection level of service: Section 4.4.2 B.
  - 3) Analyze roadway link volumes: Section 4.4.2 C.
- b. Background Traffic
  - 1) Determine short-range turning movement projections: Section 4.4.3 A.
  - Determine long-range volume projection: Section 4.4.3 B or Section 4.4.3 C.
- c. Project Generated Traffic
  - 1) Determine trip generation rate: Section 4.4.4 A.
  - Determine project generated traffic volume; i.e. the committed capacity in Loveland (city limits and GMA) and Fort Collins (GMA) : Section 4.4.4 D.
  - 3) Determine the trip distribution and assignment: Section 4.4.4 F and Section 4.4.4 G.
- 2. Pedestrian and Bicycle Traffic and Facilities
  - a. Existing Traffic.
  - b. Background Traffic.
  - c. Project Traffic.
  - d. Total Traffic.
  - e. Existing and Planned Facilities

# **D.** Conduct Project Impact Analysis

- 1. Vehicular Traffic
  - a. Identify the project impact using evaluation elements for the selected type of TIS: Section 4.5.1 in Loveland (city limits and GMA) and Section 4.5.2 in Fort Collins (city limits and GMA).
  - b. Evaluate each element under the following traffic conditions:
    - 1) Existing traffic conditions.
    - 2) Future traffic conditions without the proposed development.
    - 3) Future traffic conditions with proposed development.
  - c. Identify all significant negative impacts: Section 4.5.1
- 2. Pedestrian Traffic

Conduct the same procedure as for vehicular traffic in above Section 4.5.3 B

3. Bicycle Traffic

Conduct the same procedure as for vehicular traffic in above Section 4.5.3 B

## **E.** Determine Mitigation Measures

1. Vehicular Traffic

Refer to **Section 4.6**. Also refer to **Section 4.6.1** if transportation demand management is used for mitigation.

- 2. Pedestrian Traffic
- 3. Bicycle Traffic

#### F. Determine Study Recommendations.

Identify the improvements that are needed to achieve the required LOS for the proposed land use action and background traffic in each design year.

- 1. Vehicular Traffic
- 2. Pedestrian Traffic
- 3. Bicycle Traffic

## G. Present the Completed TIS

- 1. Submit the specified number of copies of the stamped and signed completed study to the Local Entity as an attachment to the land use application.
- 2. Revise and resubmit the TIS as necessary to address review comments provided to the applicant by the Local Entity Engineer.

# H. TIS Certification and Intersection Capacity Reservation (Fort Collins city limits only)

- 1. Approved studies are certified by the Local Entity Engineer. See Section 4.7.3.
- 2. Certified Full TIS's reserve intersection capacity for the life of the project development application. See Section 4.7.3.

# 4.1.5 Listing of Attached TIS Worksheets

The worksheets listed below are included at the end of this chapter, as Attachments A through I. Note that Attachments E through I apply only to projects in Loveland (city limits and GMA) and Fort Collins (GMA).

#### A. Base Assumptions

Refer to Section 4.2.1 B, Meeting Setup and Content.

Page 4-4

**B.** Pedestrian Analysis Worksheet

Refer to Section 4.2.1 B, Meeting Setup and Content.

C. Transportation Worksheet

Refer to Section4.2.2 B,

D. Recommended Improvements Summary -

Refer to Section 4.7.1 D, Summary Presentation. This sheet is an example of what a Developer must submit.

**E.** Peak Hour Traffic Volume Worksheet for Arterial Links - Loveland (city limits and GMA) and Fort Collins (GMA)

Refer to Section 4.5.3 A, Motor Vehicle Impact Evaluations. This sheet is an example of what a Developer must submit.

F. Peak Hour Traffic Volume Worksheet for Non-Arterial Streets - Loveland (city limits and GMA) and Fort Collins (GMA)

Refer to the discussion of Link Congestion in Section 4.5.3 A, Motor Vehicle Impact Evaluations. This sheet is an example of what a Developer must submit.

G. Street Traffic Volume Summary Table - Loveland (city limits and GMA) and Fort Collins (GMA)

Refer to the discussion of Link Congestion in Section 4.5.3 A, Motor Vehicle Impact Evaluations. This sheet is an example of what a Developer must submit.

# H. Peak Hour Intersection Level of Service Summary - Loveland (city limits and GMA) and Fort Collins (GMA)

Refer to the discussion of Intersection Delay in Section 4.5.3 A, Motor Vehicle Impact Evaluations. This sheet is an example of what a Developer must submit.

# 4.2 REQUIREMENTS AND STUDY TYPES

# 4.2.1 Scoping Meeting

# A. Purpose.

The purpose of the scoping meeting is to determine the type of study to be completed and the parameters for the study for a specific development project. The parameters determined in the scoping meeting represent general agreement between the Local Entity and the consulting engineer, but they may not be all-inclusive. The Local Entity retains the right to determine the level of study and to require any additional information and / or analysis to complete an evaluation of the proposed development project.

## **B.** Meeting Setup and Content.

The Applicant is required to contact the Local Entity to arrange for a Scoping Meeting to discuss the TIS requirements and determine the base assumptions. It is incumbent upon the Applicant to bring a completed Transportation Impact Study Base Assumptions Form and a complete Pedestrian Analysis Worksheet (included at the end of this chapter as Attachments "A" and "B") to the meeting and be prepared to discuss the following:

- 1. Previous TIS prepared for the site, if any;
- 2. Location of the site;
- 3. Proposed access(es) and its relationship to adjacent properties and their existing/proposed access;
- 4. Preliminary estimates of the site's trip generation and trip distribution at build-out;
- 5. Identification of proposed year of build-out;
- 6. Trip adjustment factors proposed, if any;
- 7. Approved and proposed developments in the study area, and the associated committed roadway improvements;
- 8. Anticipated roadway improvements to be provided by the Applicant;
- 9. Phasing plan proposed;
- 10. Potential bicycle and pedestrian connections to the nearest attraction (existing or imminent) within 1320' of the site. This distance may be increased up to 1.5 miles for residential projects near existing or proposed school sites.

11. Special analysis needs.

#### C. Results of Meeting

The Scoping Meeting shall conclude with the Local Entity and Applicant in mutual agreement with regard to determining the type of study and level of detail and extent to which the TIS will need to address each of the following:

- 1. Study area for the impact analysis;
- 2. Other developments within the study area;
- 3. Existing intersection counts;
- 4. Intersections to be studied in detail;
- 5. Background traffic volume forecasts;
- 6. Location of the nearest bicycle and pedestrian facilities and
- 7. Special analysis needs. (Non-traditional peak hour volumes for some uses, neighborhood impacts, access management plans, etc.)

8. For studies involving signalized intersection analysis the local entity will provide detailed assumptions for evaluation methodology and/or software files to be utilized.

# **D.** Documentation after Meeting

The approved scoping meeting form and attachments shall be inserted into the TIS.

# E. Time Between Scoping Meeting and Project Submittal

If a scoping meeting was conducted more than six months prior to submittal, the Local Entity Engineer may require another scoping meeting.

# 4.2.2 Types of Study

# A. Master TIS.

Where large complex projects are planned or a project is phased over a multi-year build-out, it may be appropriate to prepare a Master TIS for the overall land use action followed by periodic updates for specific phases. The Master TIS must include overall phasing of improvements to coincide with project phasing. Updates to the Master TIS shall be submitted with the land use applications for the specific phases. The updates shall be either Full, Intermediate or Memorandum level studies as determined by the local entity engineer..

# B. Full TIS.

A Full TIS shall be required if one or more of the following conditions occur:

- 1. The site generated traffic is expected to exceed 1,000 trips/day or 100 peak hour trips by any travel mode, or
- 2. New high volume access is requested for an arterial street or State Highway.
- 3. There is significant citizen concern due to expected traffic impacts.
- 4.

# C. Intermediate TIS.

An Intermediate TIS may be required if any of the following requirements are met:

- 1. The site generated traffic via any travel mode is expected to be between 501 trips/day and 1,000 trips/day inclusive, or the peak hour trip generation is between 51 and 100,
- 2. Site traffic will impact adjacent, existing residential areas.
- 3. There is significant citizen concern due to expected traffic impacts.

# **D.** Transportation Memorandum.

A Traffic Memorandum, in lieu of a more detailed study, may be considered if all the following requirements are met:

- 1. The site generated traffic via any travel mode is expected to be less than or equal to 500 trips/day, and/or the peak hour trip generation is less than or equal to 50.
- 2. Any new access requests are for local or collector streets only.

# E. No TIS Required.

Upon submittal of a Transportation Worksheet (Attachment "C") by the Applicant and/or written acceptance by the Local Entity Engineer, the TIS requirement may be waived if all of the criteria below are satisfied:

Note that in Loveland (GMA and city limits), the proposed land use will be exempt from demonstrating compliance with the transportation Adequate Community Facilities requirements, if the TIS requirement is waived.

- 1. Daily vehicle trip-end generation is less than 200 trips/day and/or the peak hour trip generation is less than 20.
- 2. There are no proposed minor or major street intersections on collectors, arterials, or State Highways;
- 3. If the property is being redeveloped, the increase in the number of vehicular trips for the proposed use does not exceed the trip generation from the existing use by more than 20 peak hour trips or 200 daily trip ends;
- 4. Any new or change in the type of traffic to be generated (i.e. the addition of new truck traffic) is not expected to adversely affect the traffic within, and adjacent to, the property;
- 5. The scale or use of the proposed development or redevelopment is not likely to cause less than acceptable levels of service on the adjacent public streets, accesses, and intersections; and
- 6. The proposed development or redevelopment is not in the vicinity of a street or intersection with a history of safety and/or accident problems.
- 7. There is no change of land use with access onto a State Highway.
- 8. Site traffic will not impact adjacent, existing residential areas.
- 9. There is no significant citizen concern due to expected traffic impacts.
- 10. Site traffic will not negatively impact adjacent bicycle or pedestrian facilities.

# 4.2.3 Revisions and Updates

A revision or update to an approved TIS may be required when a previously approved land use action proposes an expansion, a change to access, or a change in use where new trip generation estimates exceed the original trip generation estimates (or actual trips in the case of existing land uses), by 20 percent or by more than 20 peak hour trips or 200 daily trips, whichever is less. If the currently approved study was prepared within the last three years, an amendment letter addressing the changes may be accepted and satisfy the requirements of this guideline. The letter must address: a) an estimate of site trip generation, b) existing site trip generation, c) the differences between anticipated estimates and existing trip generation and d) changes to the bicycle or pedestrian facilities. If the original study is older than three years, an entirely new study may be required by the Local Entity Engineer.

# 4.3 **STUDY PARAMETERS**

# 4.3.1 **Project Description**

A description of the proposed project will be prepared and include the type of land use and size of the proposed project (number of dwelling units or building square footage). Any proposed phasing will be discussed and the anticipated completion date established. A figure depicting the proposed site plan will also be included and the proposed vehicular access locations will be described. This section will also include a description of how pedestrian and bicycle travel will be accommodated within the proposed site plan. This will include a discussion of types of sidewalks (attached/detached), pathways, and connections to local and perimeter destinations.

# 4.3.2 Analysis Horizons.

Three study horizons are required for a Master or Full TIS analysis: the existing (current), the short range (short range build-out) and the long range (20 year). It may be acceptable for the short range and long range horizons to be identical for some large projects.

# A. Existing Horizon.

The intent of completing an analysis of the existing (current) study horizon is to establish a baseline of traffic conditions.

# **B.** Short Range Horizon.

The intent of the short range planning horizon is to investigate the immediate impacts of the completed, proposed project on the existing and committed roadway network. The short range planning horizon year is defined as one year after the full occupancy of the project. If the project is proposed to occur over multiple phases, each phase shall be evaluated for impacts one year after the occupancy of that phase for the short range analysis.

# C. Long Range Horizon.

The third planning horizon is the long range planning horizon. It shall be based on the current Regional Transportation Plan 20-year planning horizon and related modeling, except where the existing counts identify discrepencies in the regional model. In such situations, the current counts shall be increased by application of a growth rate established by the Local Entity or as approved by the Local Entity Engineer. The

intent of the long range planning horizon is to evaluate the implications of the fully developed proposed project on the long-range traffic condition. Data from the current official North Front Range Transportation & Air Quality Planning Council (MPO) regional computer model is available by contacting the Local Entity. This study horizon is for the Local Entity's use as an indicator of traffic for planning purposes and the determination of the necessary Right-of-Way. The Local Entity Engineer may elect to disallow use of the regional model when the data is deemed unreliable.

# 4.3.3 Study Area

The limits of the transportation network to be studied shall be defined for all levels of TIS analysis and are based on the size and extent of the application for development approval, the existing and future land uses, and traffic conditions on and near the site.

In Fort Collins (GMA and city limits), the study area determination begins with major streets and intersections within one mile of the project. This may be increased or decreased, at the discretion of the Local Entity Engineer. The exact limits of the study area are to be based on good engineering judgment, and an understanding of existing and future land use and traffic conditions at and around the site. The limits of the study area shall be agreed upon at the Scoping Meeting. In the case of a Master TIS, its identified study area shall generally be used for all subsequent updates.

The concerns related to specific land use actions on specific studies vary greatly, at a minimum, the factors to be considered for the establishment of the limits of the study area should include:

# A. Master TIS

- 1. All adjacent and internal collector and arterial streets and intersections.
- 2. <u>Loveland (GMA and city limits)</u>. Offsite collector and arterial links within the study area that are impacted by 10% or more by the project, or provide the primary connections between the project and the urban services, unless otherwise approved by the Local Entity Engineer.
- 3. <u>Fort Collins (GMA and city limits)</u>. Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping.
- 4. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within 1320 feet of the site.
- 5. Access to the most direct transit facility or transit route within 1,320 feet of the site.
- 6. Any pedestrian routes within 1-1/2 miles of a school.

# **B. Full TIS**

- 1. All adjacent streets, intersections, and High-Volume Driveways.
- 2. Nearest offsite major intersection(s).

- 3. <u>Loveland (GMA and city limits)</u>. Offsite collector and arterial links within the study area that have impacted intersections as defined in items 5 and 6 below or provide the primary connections between the project and the urban services in Loveland (GMA and city limits).
- 4. Internal public roads, including establishing the road classification.
- 5. Loveland (GMA and city limits). Additional offsite major intersections where:
  - a. The project contributes a 10 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a level of service of C or better in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer, or
  - b. The project contributes a 5 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a level of service of D or worse in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer.
- 6. <u>Loveland (GMA and city limits)</u>. Additional offsite minor intersections where the project contributes a 30 percent increase in volume (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where any existing leg of the intersection is currently operating at a level of service of E or worse.
- 7. <u>Fort Collins (GMA and city limits)</u>. Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping.
- 8. Pedestrian and bicyclist destinations (existing or imminent) within 1320 feet of the site.
- 9. Access to the most direct transit facility or transit route (existing or imminent) within 1,320 feet of the site.
- 10. Any pedestrian routes within 1-1/2 miles of a school (residential land uses only).

# C. Intermediate TIS

- 1. All adjacent streets, intersections, and High-Volume Driveways;
- 2. Loveland (GMA and city limits). The nearest offsite major intersection(s) only if:
  - a. The project contributes a 10 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a level of service of C or better in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer, or
  - b. The project contributes a 5 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a level of service of D or worse in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer.

- 3. <u>Loveland (GMA and city limits)</u>. Offsite collector and arterial links within the study area that have impacted intersections as defined in item 2 above.
- 4. <u>Fort Collins (GMA and city limits).</u> Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping
- 5. Internal public roads, including establishing the road classification;
- 6. Pedestrian and bicyclist destinations (existing or imminent) within 1320 feet of the site.
- 7. Access to the most direct transit facility or transit route (existing or imminent) within 1,320 feet of the site.
- 8. Any pedestrian routes within 1-1/2 miles of a school (residential land uses only).

#### **D.** Traffic Memorandum

- 1. All adjacent streets, intersections, and High-Volume Driveways;
- 2. Internal public roads, including establishing the road classification;
- 3. Continuity and adequacy of pedestrian and bike facilities adjacent to the site.
- 4. Access to the most direct transit facility or transit route adjacent to the site.

# 4.3.4 Evaluation Elements

#### A. Master TIS.

The purpose of the Master Transportation Impact Study is to provide a general sense of the overall impacts to the transportation system and to identify the larger scale improvement needs necessitated by the proposed development (i.e. roadway widening, connecting key gaps in the street system, etc.).

While the Master Transportation Impact Study does not need to include intersection analyses, they may be required by the local entity engineer, or included at the Applicant's option especially if the Applicant intends to proceed with a specific phase of the project immediately following approval of the General Development Plan in Loveland (GMA and city limits) or Overall Development Plan in Fort Collins (GMA and city limits).

In cases where a developer seeks vesting with a General Development Plan or Overall Development Plan, the Master Transportation Impact Study is required to present all the detailed information required in a Full or Intermediate Transportation Impact Study as determined by the Local Entity

For example, for a large General Development Plan or Overall Development Plan with a multi-phase build-out, the Master TIS would not only address the overall project, but also identify key measurable criteria that would trigger the construction of some incremental portion of the overall infrastructure improvement plan. Typically
at the Preliminary Development Plan (PDP) or Preliminary Plat stage, with each phase of the project a new TIS specific to that phase would be prepared. This new study would verify the accuracy of the original traffic projections, both on-site and background, and check the criteria identified for infrastructure improvements, and other pertinent information.

The key elements of the project impact assessment for a Master TIS shall include the following minimum evaluations:

- 1. Conformity with the adopted Transportation Master Plan including any adopted access control plans.
- 2. In Loveland (GMA and city limits), peak hour link volume and level of service (see Table 4-1 and Table 4-2);
- 3. Intersection analysis as identified during scoping (see peak hour level of service requirements in Table 4-3);
- 4. Adherence to relevant adopted planning documents (such as corridor plans);
- 5. Functional classifications and anticipated typical sections for any new roadways.
- 6. Appropriateness of access locations;
- 7. Multi-modal and TDM opportunities;
- 8. Pedestrian/bike requirements and/or improvements;
- 9. Safety and accident analysis.
- 10. Other items as requested by the Local Entity Engineer and agreed to in the Scoping Meeting.
- 11. Neighborhood and public input issues.

#### **B.** Full TIS.

The key elements of the Full TIS shall be specified by the Local Entity Engineer from the following list:

- 1. Conformity with the adopted Transportation Master Plan, including any adopted access plans.
- 2. In Loveland (GMA and city limits), peak hour link volume and level of service (see Table 4-1 and

Table 4-2);

- 3. Adherence to relevant adopted planning documents (such as corridor plans);
- 4. Peak hour intersection and driveway level of service (see

Table 4-2 and Table 4-3);

- 5. Appropriateness of access locations;
- 6. Location and requirements for turn lanes or acceleration/deceleration lanes at accesses or intersections, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements per Local Entity or CDOT requirements;
- 7. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing, etc.);
- 8. Multi-modal and TDM opportunities;
- 9. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within the study area;
- 10. Recommended traffic control devices for intersections which may include two way stop control, four way stop control or yield signs, school flashers, school crossing guards, crosswalks, traffic signals or roundabouts.
- 11. Traffic signal and stop sign warrants.
- 12. Progression analysis for signalized intersections.
- 13. Appropriateness and/or any needed changes to existing roadway signing, striping, and other traffic control devices.
- 14. Safety and accident analysis.
- 15. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.
- 16. Neighborhood and public input issues.

#### C. Intermediate TIS.

No Long Range Horizon analysis is required as part of an Intermediate TIS. The key elements of the TIS shall be specified by the Local Entity Engineer from the following list:

- 1. Conformity with the adopted Transportation Master Plan, including any adopted access plans.
- 2. Adherence to relevant adopted planning documents (such as corridor plans);
- 3. Peak hour link volume and level of service, in Loveland (GMA and city limits) (see **Table 4-1**);
- 4. Peak hour intersection and driveway level of service (see

Table 4-2 and Table 4-3);

- 5. Appropriateness of access locations;
- 6. Location and requirements for turn lanes or acceleration/deceleration lanes at accesses or intersections, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements per Local Entity or CDOT requirements;
- 7. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing etc.);
- 8. Multi-modal and TDM opportunities;
- 9. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within the study area;
- 10. Recommended traffic control devices for intersections which may include two way stop control, four way stop control or yield signs, school flashers, school crossing guards, crosswalks, traffic signals, or roundabouts.
- 11. Traffic signal and stop sign warrants.
- 12. Progression analysis for signalized intersections.
- 13. Appropriateness and/or any needed changes to existing roadway signing, striping, and other traffic control devices.
- 14. Safety and accident analysis.
- 15. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.
- 16. Neighborhood and public input issues.

#### **D.** Traffic Memorandum.

No Long Range Horizon is required as part of a Traffic Memorandum. The key elements of the Memorandum shall be specified by the Local Entity Engineer from the following list:

- 1. Peak hour link volume and level of service, in Loveland (GMA and city limits) (see **Table 4-1**);
- 2. Peak hour driveway and/or intersection level of service (see

Table 4-2 and Table 4-3);

- 3. Appropriateness of access locations;
- 4. Location and requirements for turn lanes or acceleration/deceleration lanes at the access, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements per Local Entity or CDOT requirements;
- 5. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing etc.);
- 6. Continuity and adequacy of pedestrian and bike facilities within the study area;
- 7. Appropriateness and/or any needed changes to existing roadway signing, striping and other traffic control devices.
- 8. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.
- 9. Neighborhood and public input issues.

### 4.4 TRAFFIC ANALYSIS

#### 4.4.1 Analysis Methodolgy

Assessment techniques shall include a capacity and level of service (LOS) analysis for the key intersections identified in the study area during the identified analysis time periods. The analyses shall be completed using the operational analysis methodology shown in the latest edition of the <u>Highway Capacity Manual</u> published by the Transportation Research Board. Base assumptions and signal timing parameters for the analysis shall be approved by the Local Entity, and any changes from existing noted in the TIS.

Roundabout analysis shall be completed as detailed in Appendix I of these standards (Roundabout Design Manual) or as otherwise specified by the Local Entity Engineer.

# 4.4.2 Existing Traffic

#### A. Roadway Traffic Volumes/Traffic Counts.

Current A.M. and P.M. peak hour traffic counts as specified by the Local Entity Engineer shall be obtained for the roadways within the study area for one, nonholiday Tuesday, Wednesday, or Thursday. Each peak hour count shall be conducted over a two hour period (or as specified by the Local Entity Engineer) and shall include fifteen (15) minute count data to clearly identify the peak hours.

Weekend counts and/or average daily counts on local streets may also be required where appropriate when requested by the Local Entity Engineer. Local Entity or CDOT average weekday traffic (AWT) counts may be used when available. Pedestrian counts and bike usage should be obtained. Vehicle classification counts may be required.

In any case, these volumes shall be no more than one year old (from the date of application submittal), unless otherwise approved by the Local Entity Engineer. The source(s) of each of the existing traffic volumes shall be explicitly stated (CDOT counts, new counts by Applicant, Local Entity counts, etc.) Summaries of current traffic counts shall be provided. The Local Entity may require the use of seasonal adjustment factors depending on when data was collected and if the project is considered to be in an affected area (i.e. tourism).

#### **B.** Intersection Level of Service.

- 1. <u>Existing and Short Range Horizon</u>. Use calculated peak hour factors or 0.85, whichever is higher. Traffic signal timing parameters for the existing conditions will be the actual signal timing in effect unless determined otherwise by the Local Entity.
- 2. <u>Long Range Horizon</u>. A peak hour factor of 0.95 may be used for the Long Range Horizon. Greater values may be used if approved by the Local Entity Engineer.

# C. Roadway Links In Loveland (GMA and City Limits)

Roadway links shall be analyzed. Acceptable maximum traffic volumes allowed for the specific class of roadway are shown in **Table 4-1**.

# 4.4.3 Background Traffic

#### A. Short Range Volume Projections.

The traffic forecast for the short range planning horizon shall be the sum of existing traffic volumes plus cumulative development traffic from approved land use actions (or, in Fort Collins [city limits only], projects with reserved intersection capacity established through a certified TIS), plus background growth (as adjusted to avoid duplicative consideration of the identified development traffic from the approved land uses already considered). The cumulative development traffic shall be based, in part, on the A.M. and P.M. peak hour and ADT data established and accepted from planned and approved land use actions within and near the study area.

In Loveland (GMA and city limits), 100% of the committed trips from the build out of the planned (i.e. documented in a complete land use application accepted by the City) and approved projects in the study area must be included in the short range volume projection. The assumed baseline surface transportation network should reflect existing facilities (without the proposed project improvements) plus any committed improvements by the Local Entity, other public agencies, and/or other approved land uses within the study area as described in Title 16.41.080.C of the Loveland Municipal Code.

In Fort Collins (GMA and city limits), only the percentage of trips from the approved projects that are expected to be generated in the short range year must be included.

In both communities, the short range planning horizon background traffic growth rate shall be based on a growth rate from the Scoping Meeting based on one of the following methodologies:

- 1. Straight line projection for the build out year between the existing traffic volumes and the twenty year North Front Range Transportation and Air Quality Planning Council's (MPO) regional model forecast, CDOT rates or
- 2. Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this), or
- 3. Area-wide traffic count analysis which considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods.

#### **B.** Long Range Volume Projections in Loveland (GMA and City Limits)

Long range A.M. and P.M. peak hour planning horizon traffic volume projections shall be based on the traffic modeling volumes contained in the most recent update to the Transportation Master Plan. Special requests for projections not contained in the accepted and published model results will require special approval by the Local Entity Engineer. Note that the modeled projections are based on future year population and employment projections that reflect a regional perspective on growth and development. The Applicant will need to investigate the land use assumptions as they apply to the transportation network to be studied to document in the TIS any projection adjustments if necessary. For the long range planning horizon network analysis, all planned and funded surface transportation facilities as per the Local Entity's Transportation Master Plan within the study area may be included for the baseline assumptions. In addition, use the growth rate agreed upon with the Local Entity Engineer.

#### C. Long Range Volume Projections in Fort Collins (GMA and City Limits)

Long range peak hour planning horizon traffic volume projections shall be based on one or more of the following as determined in the scoping meeting:

- 1. Straight line projection for the build out year between the existing traffic volumes and the twenty year North Front Range Transportation and Air Quality Planning Council's (MPO) regional model forecast, CDOT rates or
- 2. Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this), or
- 3. Area-wide traffic count analysis which considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods, or
- 4. Growth rate agreed upon with the Local Entity Engineer.

### 4.4.4 Project Traffic

#### A. Trip Generation Rate.

Trip generation should be calculated from the latest data contained within the Institute of Transportation Engineers' Trip Generation Manual or be based on local data approved by the Local Entity Engineer. Other industry publications (such as the ITE Journal or other sources) may be approved by the Local Entity. Data limitations, data age, choice of peak hours (for the land use or adjacent street traffic), choice of independent variables, and choice of average rate versus statistically significant modification should be discussed in the study when appropriate. When data is not available for a proposed land use or a modification is proposed, the Applicant must conduct a local trip generation study following procedures prescribed in the ITE Trip Generation Manual and provide sufficient justification for the proposed generation rate. This rate must be approved by the Local Entity prior to its use in the written study.

#### **B.** Preliminary Land Use Assumptions.

The trip generation values contained in studies submitted prior to the establishment of a site-specific development plan shall be based on the maximum number of dwelling units permitted for the approved land uses, and/or the maximum trip generation rates for the non-residential development proposed land use action. When a TIS is being developed for a project with an established site-specific development plan, trip generation shall be based on actual dwelling unit counts and square footage(s) proposed on the final plan.

#### C. Trip Generation Table.

The Applicant shall prepare a Trip Generation Table, listing each type of land use within the site at build-out, the size and unit of measure for each land use, trip generation rates (total daily traffic, A.M. and P.M. peaks), directional splits for each in/out driveway, the resultant total trips generated. The data source shall be stated (state ITE land use code, if used). Build-out land uses and trip generation shall be used for both the short range and long range planning horizons. Land use action proposed that is of a type that build-out in the short-range is not feasible due to the size of development (as agreed upon by the Local Entity at the Scoping Meeting), may propose phases (such as 2-year increments) for the development.

#### D. Committed Trips/Capacity in Loveland (GMA and City Limits)

To assure the public and the Local Entity that the traffic impact analysis adequately addresses the full impact of the development, the trip generation stated in the TIS will establish the maximum number of trips permitted entering and exiting the development. If the amount of committed trips is reached prior to full occupancy, the Local Entity reserves the right to request from the owner, at the owner's expense, supplemental traffic analyses prior to the issuance of additional building permits. This information shall demonstrate that uncommitted capacity is available on the transportation network to serve the excessive trips, or that additional transportation mitigation improvements can be reasonably installed to maintain compliant operation with the excessive trips. If no additional capacity is available, or no reasonable mitigation conforming to the requirements of these street standards can be implemented, the Applicant shall obtain a exception from the City Council for the non-conformity with the ACF requirements or scale back the intensity of the proposed land uses as needed to achieve compliance. If the project is fully occupied and it is determined that the approved land use action's traffic exceeds that which was included in the approved TIS, the Local Entity Engineer is authorized to require the property to conduct additional traffic analysis and provide additional mitigation measures.

#### E. Adjustments to Trip Generation.

Trip-making reduction factors may be used after first generating trips at full ITE rates or pre-approved rates from other sources. These factors fall into two categories: those that reassign some portion of generated trips to the background stream of traffic, and those that remove or move generated trips. In all cases, the underlying assumptions of the ITE trip generation rates must be recognized and considered before any reductions are used in the TIS.

Several situations will be closely reviewed. One is when the traffic study assumes rates where the collection of mixed uses, such as at a shopping center, result in lower peak hour trips than when applying individual rates to each land use. Another is when reductions in the trip generation rates are assumed based on reductions due to travel demand management. Finally, adjustments may be considered for higher than typical mode split. Adjustments to trip generation must be agreed to by the Local Entity Engineer during TIS scoping.

- 1. <u>Pass-by Trips</u>. This first category may be considered when trips to the proposed development currently exist as part of the background traffic stream, referred to as a pass-by trip. Pass-by percentages identified in the ITE Trip Generation report or other industry publications may be considered with appropriate explanation and documentation. Pass-by traffic must remain assigned to driveways and access points. They are not additive to the background traffic stream. A technical appendix, table or map that illustrates the re-diversion of pass-by trips is required which may be submitted as a legible, hand-written work sheet(s).
- 2. <u>Internal Site Trips/TDM.</u> Analytic support documentation of internal site trips, transit use, and TDM (Transportation Demand Management) actions shall be provided to show how trip adjustments are derived. Optimistic assumptions regarding transit use and TDM actions will not be accepted unless accompanied by specific implementation proposals that will become a condition of approval. Such implementation proposals must have a high expectation of realization within a 5-year period after project initiation.
- 3. Mode Split. Mode split assumptions and subsequent reduction in vehicular trips may be considered with appropriate explanation and documentation.

#### F. Trip Distribution.

Trip distribution must be documented in the TIS. It may be based on the professional engineer's judgment applied to one or more of the following: regional MPO traffic volume projections, gravity model, market analysis, existing traffic flows, or applied census data. Regardless of the basis of the estimates, the procedures and rationale used in determining the trip distributions must be fully explained and documented.

### G. Trip Assignment.

The project traffic will be assigned to the roadway system according to the trip distribution established above. The resulting project site generated traffic and total site traffic will be depicted on figures for each analysis horizon. These figures will include peak hour traffic volume information, plus daily traffic volume information for Fort Collins (GMA and city limits). Separate maps or values are required when the trip distribution differs by more than 10% between the short and long range analysis horizons.

# 4.4.5 Total Traffic

The total traffic projections will be determined for each of the analysis horizons identified earlier in the base assumptions. The total traffic projections will include the existing traffic, plus the future background traffic, plus the project generated traffic. The future total traffic projections will be depicted on figures for each study year. Based upon the total traffic projections and the Local Entity's street standards and Transportation Master Plan, the Applicant shall provide roadway functional classification recommendations. For Loveland (GMA and city limits), a roadway projected to carry between 3,500 and 5,000 vehicles per day would be recommended as a Major Collector Street, where as if the projected traffic was between 1,000 and 2,500 vehicles per day, it would be recommended as a Connector Local Street.

# 4.5 **PROJECT IMPACTS**

# 4.5.1 Significant Negative Impacts In Loveland (GMA and City Limits)

Significant Negative Impacts are defined as:

#### A. Exceeding Maximum Traffic Volume.

When the project's (land use action) traffic causes the estimated traffic to exceed the established maximum traffic volumes allowed for the specific classes of roadways; or

#### **B.** Exceeding the LOS standard.

When the added project traffic causes any portion of an intersection to exceed the LOS standard; or

#### C. Exceeding Design Total for Any Roadway Link

When the project traffic, when added to all other traffic in the design year, will cause the total estimated traffic on any roadway link for the design year to exceed the ACF maximum traffic volume allowed for that roadway link; unless the project traffic is less than or equal to two percent of the ACF maximum traffic volume on each noncompliant link; or

#### **D.** Failing the ACF delay standard

When the project traffic when added to all other traffic in the design year, will cause any movement or leg of an intersection to fail the ACF delay standard; unless the increased delay caused by the project is less than or equal to two percent of the ACF delay standard for that movement or leg of the intersection.

#### E. Calculation Basis

The project traffic analysis shall be calculated based upon the cumulative increase in traffic and/or the cumulative increase in intersection delay of all phases, lots, tracts or other subsections of a GDP or any subsection not contained within a GDP.

### 4.5.2 Significant Negative Impacts in Fort Collins (GMA and City Limits)

This section applies primarily to vehicular related impacts associated with the proposed project. A project is defined as significantly impacting a study intersection when one of the following criteria are satisfied:

#### A. For Signalized Intersections.

- 1. When the added project traffic causes movements, approaches or the overall intersection to fail the minimum acceptable level of service standards in Table 4-3; or
- 2. When the background traffic conditions (without project traffic) causes an intersection to fail the minimum acceptable level of service standards; and when the project traffic causes more than a two (2) percent increase in the overall intersection delay; or
- 3. When added project traffic is determined to create potential safety problems.

#### **B.** For Unsignalized Intersections.

- 1. When the added project traffic causes movements at an intersection or the overall intersection to fail the minimum acceptable level of service standards in Table 4-3; or
- 2. When backstacking (queuing) would create impeded traffic flows and/or excessive congestion; or
- 3. When added project traffic is determined to create potential safety problems.

#### 4.5.3 Project Impact Assessment.

The key elements of the project impact assessment include evaluations of issues outlined for a specific Analysis Level. Refer to **Section 4.3.4** for a listing of the Evaluation Elements.

#### A. Motor Vehicle Impact Evaluations

- 1. Existing Condition Diagrams in Loveland (GMA and city limits). Drawings shall be prepared and included in the report to document traffic counts, lane geometrics (including striping, signing and other pavement markings), traffic control, existing access locations, lane lengths, widths, tapers, and any other notable features. When arterial roadways are impacted by the proposed project, the report shall include a tabulation or diagram which identifies the number of existing and proposed accesses contained within, and up to one-quarter mile of, the evaluated arterial link and/or intersection
- 2. Link Congestion in Loveland (GMA and city limits). Using the peak hour traffic volumes forecast and the maximum traffic volumes allowed for the specific classes of roadways, a general evaluation should be made of the street system for the specified analysis horizons. The base peak hour volumes to be used for determination of the acceptable maximum traffic volumes allowed for the specific class of roadway are shown in Table 4-1. Arterial and Non-arterial worksheet examples are provided in Attachments "E" and "F" for the applicant's use in establishing the acceptable threshold value for each roadway within the study area. These worksheets must be included in the TIS for review and approval by the Local Entity Engineer. A summary report of the level of service evaluations for roadway links shall be presented in the TIS. See Attachment "G" for a format example.

Within one block (approximately 500 to 1000 feet) of an intersection with a street of higher functional classification, additional through and turning lanes may be required on a street to meet the level of service requirements in **Table 4-1** and/or for the intersection. The additional lanes shall not be considered a reclassification of the street.

Motor vehicle LOS Standards (Roadway Link			
Facility Classification	Unadjusted Base Peak Hour Volume (per lane)	Level of Service	
Alley	20 vph (2-way)	А	
Lane	20 vphpl	A	
Local Residential	60 vphpl	А	
Local Commercial/Industrial	160 vphpl	А	
Minor Collector	300 vphpl	В	
Major Collector	550 vphpl	В	
2 Lane Arterial	800 vphpl	С	
4 Lane Arterial	800 vphpl	С	
6 Lane Arterial	800 vphpl	С	
State Highways, except US-34 between Madison & Wilson, US- 287 between 50 <sup>th</sup> & 8 <sup>th</sup> SE, and Interstate 25.	950 vphpl	D	

# Table 4-1Loveland (GMA and City Limits)Motor Vehicle LOS Standards (Roadway Links)

- 3. Intersection Delay
  - a. An A.M. and P.M. peak hour intersection level of service analysis shall be conducted for each intersection analyzed in the TIS, based on procedures specified in the most recent release of the Highway Capacity Manual. In Loveland (GMA and city limits), specific level of service summary work sheets shall be included in the TIS. See Attachments "H" and "I" for sample forms for reporting the results of the intersection level of service evaluations.
  - b. The principal objective of the intersection level of service traffic impact analysis is to identify whether the traffic from the proposed project when added to the short range planning horizon traffic will result in a significant impact and an unacceptable level of service. For definition purposes, the thresholds for acceptable level of service are as shown in

**Table** 4-2 and **Table 4-3** . All intersection components shall meet thefollowing requirements:

# Table 4-2Loveland (GMA and City Limits)Motor Vehicle LOS Standards (Intersections)

Intersection Component	Major Intersection <sup>1</sup>	Minor Intersection <sup>2</sup>	Driveway
Overall (City Limits)	LOS C	LOS C	No Limit
Overall (GMAs)	LOS D	LOS D	No Limit
Any Leg	LOS D	LOS E	No Limit
Any Movement	LOS E	LOS F	No Limit
4 1 1 1 11 1			

<sup>1</sup> Includes all signalized and unsignalized arterial/arterial and arterial/ major collector intersections.

<sup>2</sup> Includes all unsignalized intersections (except major intersections) and high volume driveways

<sup>3</sup> There are no LOS standards for I-25 Interchanges.

<sup>4</sup> On State Highways, overall LOS D is acceptable.

# Table 4-3Fort Collins (GMA and City Limits)Motor Vehicle LOS Standards (Intersections)

	Overall	Any	Any		
		Approach leg	Movement		
Signalized	D <sup>1</sup>	E	E <sup>2</sup>		
Unsignalized	E <sup>3</sup>	$F^4$			
Arterial / Arterial					
Collector / Collector					
Unsignalized	D <sup>3</sup>	F <sup>4</sup>			
Arterial / Collector					
Arterial / Local					
Collector / Local					
Local / Local					
Roundabout	E <sup>3,5</sup>	E <sup>54</sup>	E⁵		
<sup>1</sup> In mixed use district including dow	ntown as defined	l by structure pla	n, overall LOS		
E is acceptable					
<sup>2</sup> Applicable with at least 5% of tota	l entering volume				
<sup>3</sup> Use weighted average to identify o	<sup>3</sup> Use weighted average to identify overall delay				
<sup>4</sup> Mitigation may be required	•				

<sup>4</sup> Mitigation may be required

<sup>5</sup> Apply unsignalized delay value thresholds to determine LOS

- 4. <u>Driveway Access</u>. The design, number, and location of access points to collector and arterial roadways must be submitted for approval by the Local Entity Engineer. State Highway accesses require the issuance of an Access Permit from CDOT. The number of access points must be kept to a minimum and be designed to be consistent with the type of roadway facility. If multiple adjacent roadways are available for access, access should be taken from the lowest classified roadway available. Access points will be reviewed and approved by the Local Entity based on the following information:
  - a. Access location(s) as shown on the site plan.
  - b. Proposed traffic turning movements.
  - c. Analysis of on-site (driveway) stacking/queuing and impacts to adjacent streets.
  - d. Signalization requirements and design in accordance with these guidelines.
  - e. Geometric design of the access and proposed improvements to the Local Entity facilities in accordance with these standards.
  - f. Compliance with the CDOT State Highway Access Code and any adopted access management plans if access is requested to a State Highway.
  - g. In Fort Collins, access spacing standards shown in Table 7-3.
- 5. Traffic Signals.
  - a. Proposed and existing access points, proposed intersections, and existing intersections affected by the land use actions being analyzed in the report that have any potential for signalization will be reviewed and discussed during the scoping meeting. Discussion will include review of existing signals/potential modifications, proposed signals, school signals for school crossings, school flashers, pedestrian signals/crossings, and any other potential for signal devices and signal interconnect issues.
  - b. During the Scoping Meeting an outline of locations for signal warrant analysis will be agreed upon. Generally, most traffic signal locations have been predetermined by each Local Entity Engineer and policies have been set in the comprehensive Transportation Plan of the Local Entity for its planning area including the Growth Management Area.
  - c. Signal Warrant Analysis for potential signal locations shall consist of a review of the applicable signal warrants contained in the Manual on Uniform Traffic Control Devices.

- d. If any location proposed for signalization is not spaced according to the appropriate Comprehensive Transportation Plan or Local Entity's signal spacing policy, then a traffic signal progression analysis shall be required. The analysis limits, parameters (including allowable phasing, split times, walk timing, clearances and methods) to be used for the study will be discussed at the Scoping Meeting.
- e. Alternatives to signalization at potential signal locations will be discussed in the scoping meeting and the report. The alternatives to adding new intersections to be discussed should include no new intersection, limited movements, and roundabouts.
- f. If any signal timing and/or phasing changes are proposed, an appropriate signal progression analysis may be required.

#### **B.** Pedestrian and Bicycle Impact Evaluations.

All projects are expected to achieve the minimum acceptable LOS standard for onsite and off-site bicycle and pedestrian facilities. Refer to the *City of Fort Collins Multimodal Level of Service Criteria Manual* located in **Appendix H** and **Loveland** (**GMA and city limits**), **Table 4-4** for detailed descriptions of the LOS standards. Pedestrian and bike facility demand shall be identified and related items for discussion should include:

- 1. School routing plans per the MUTCD between the project and all schools within 1-1/2 miles of the project boundary;
- 2. The demand for pedestrian and bike facilities to serve high pedestrian activity areas within the land use;
- 3. The need for links of bicycle or pedestrian facilities to neighboring land uses or attractions (trails, etc.) within 1320' (or greater if applicable to unique pedestrian oriented destinations) of the project site;
- 4. Existing and proposed sidewalk width, separation from traffic, and space available for trees, transit stops (if any), or other related elements (if any).
- 5. Geometric improvements and recommended traffic control devices to accommodate pedestrians and bicyclists;
- 6. Existing and proposed pedestrian and bike facilities shall be evaluated for compliance with the following elements:
  - a. <u>Directness</u>. Walking distance to destinations like transit stops, schools, parks, and commercial or activity areas should be direct. Measurement of directness is the ratio of the Actual distance to a destination via a sidewalk or pathway divided by the Minimum distance characterized by a grid street system.
  - b. <u>Continuity</u>. The sidewalk/ walkway system should be complete, without gaps. The pedestrian corridor should be integrated with the activities along the corridor and should provide continuous access to destinations.

- c. <u>Street Crossings</u>. Safety and comfort is essential while crossing streets, intersections and mid-block crossings. Factors that affect the LOS include: number of lanes to cross, crossing delay for pedestrians, signal indication, cross-walks, lighting, raised medians, visibility, curb ramps, pedestrian buttons, convenience, comfort, and security.
- d. <u>Visual Interest and Amenity</u>. Pedestrians enjoy visually appealing environments that are compatible with local architecture and include street lighting, fountains, and benches.
- e. <u>Security</u>. Pedestrians should be visible to motorists, separated from motor vehicles and bicycles, and under adequate street lighting.
- f. <u>Surface Condition</u>. Pedestrian facilities should be free from obstructions, cracks, and interruptions.

#### Table 4-4 Loveland (GMA and City Limits) Pedestrian Levels of Service

QUALITY INDICATORS	Α	В	С	F
SECURITY	Well used, good lighting levels and unobstructed lines of sight	Unobstructed lines of sight, good lighting levels	Sidewalk configuration and parked cars present sight problems, moderate lighting	Major pedestrian visibility problems, streetscape is pedestrian intolerant
DIRECTNESS	< 1.4	1.4-1.8	1.8-2.2	> 2.2
CONTINUITY	Quality, continuous pedestrian networks that are physically separated from street and built to current standards	Continuous sidewalk network on both sides of the street. May not be built to current standards	Sidewalk network where there may not be sidewalks on both side of the street or there are minor interruptions in connectivity	Breakdown in pedestrian network to where each pedestrian chooses a different route
STREET CROSSINGS Signalized Intersection	3 or fewer lanes to cross, clear indications (striping, etc.), well marked crosswalks, good lighting, standard curb ramps, automatic pedestrian signal, pedestrian amenities, unobstructed views	4 or 5 lanes to cross, clear indications, well marked crosswalks, pedestrian refuge area, standard curb ramps, pedestrian amenities, standard curb ramps, unobstructed views	6 or more lanes to cross, clear indications, well marked crosswalks, pedestrian refuge area, standard curb ramps, pedestrian amenities, unobstructed view	Missing 5 elements of A, 4 elements of B, and 2 elements of C
STREET CROSSINGS No Signal	Well-marked cross walks, good lighting levels, standard curb ramps, street character suggests pedestrian crossing, unobstructed views	Missing 1 element of A	Missing 2 elements of A	Missing 3 or more elements of A
VISUAL APPEAL AND PEDESTRIAN AMENITIES	Visually appealing and compatible with local architecture and artist themes, wide sidewalks, window shopping, pedestrian lighting, trees and street furniture	Wide sidewalks, visual clarity, some street furniture and landscaping	Functionally operational with less importance placed on visual appeal	Design ignores pedestrian with negative metal image, intimidating
SURFACE CONDITION	Smooth asphalt or concrete with few breaks or cracks	Relatively smooth asphalt or concrete with frequent breaks or cracks	Rougher, broken surface such as older concrete or cobblestone	Difficult, unpaved terrain such as hiking trails

# C. Special Studies.

This section provides the Local Entity with opportunities to request specific focused traffic analyses that may be unique to the proposed land use action. The Applicant

and the Local Entity will determine if special studies are required in the Scoping Meeting. These may include, but are not limited to the following:

- 1. Access Management Plan Analysis in Loveland (GMA and city limits). If a development is proposing a new access location on an arterial and an Access Management Plan does not exist, the Local Entity may require the Applicant to provide an Access Management Plan
- 2. Access spacing,
- 3. Accident/safety concerns (accident statistics),
- 4. Truck routing,
- 5. Emergency and snow routes,
- 6. Hazardous material routes.
- 7. <u>Neighborhood Transportation Impact Evaluation</u>. The TIS may be required to include a focused analysis of the potential project related impacts on adjacent residential neighborhood quality of life issues such as potential cut-through traffic and speeding/volume concerns. If it is determined that a neighborhood transportation impact evaluation is required the following procedure should be followed:
  - a. Examine existing transportation conditions within the neighborhood. This should follow the same procedure as set forth earlier for the transportation impact analysis. Daily and peak hour traffic volumes should be collected for the local streets to be included in the analysis.
  - b. Determine project generated traffic for all modes within the neighborhood and show on a figure.
  - c. Determine total traffic projections for the local streets. This should follow the same procedures as described earlier, including other projects and area wide growth if applicable.
  - d. Determine if the proposed project would create significant impacts to the residential streets using the criteria stated earlier.
  - e. If necessary, develop measures, including but not limited to traffic calming techniques, to mitigate any significant impacts.
  - f. The neighborhood TIS should also discuss how pedestrians and bicyclists would access the proposed project to/from the adjacent neighborhood(s), and the need for special facilities to enhance direct pedestrian and bicycle connectivity.
- 8. <u>Sight Distance</u>. Sight distance concerns that are anticipated or observed which may impact driveway, intersection, or roadway operation and safety need to be discussed in the TIS. Recommendations regarding stopping sight distance, intersection sight distance, and passing sight distance needs should be provided by

the Applicant's traffic engineer for detailing on the final development, site plan, or final construction plans.

### 4.6 **MITIGATION MEASURES**

When a project's vehicular impacts are determined to not meet the minimum acceptable level of service standard, the TIS shall include feasible measures, which would mitigate the project's impacts. The mitigation measures are intended to be *in addition to* the minimum required improvements necessary to meet the Local Entity's standards and codes. The goal of the mitigation measure(s) should be to minimize the demand for trips by single occupant vehicles and to increase the use of alternative modes.

**In Fort Collins (GMA and city limits),** the intersection LOS should be recalculated to reflect the effectiveness of the proposed mitigation measures and show that the project-related impacts have been reduced to an acceptable LOS for all transportation modes (vehicle, bicycles, pedestrians, and public transit). The LOS findings should be shown in tabular form. The following mitigation categories are listed in order of priority:

# 4.6.1 Transportation Demand Management (TDM) Measures in Fort Collins (GMA and City Limits)

Transportation Demand Management measures are designed to facilitate the use of alternate transportation modes in an effort to decrease demand on the roadway system by single occupant vehicles. A detailed description of the proposed TDM measures and implementation plan must be included in the TIS for any project seeking TDM-related trip reductions. If the TDM program is acceptable to the City of Fort Collins Transportation Services, the applicant will be allowed to reduce total project vehicle trips by an amount commensurate with applicable trip reduction policies.

#### A. Examples of TDM measures

- 1. Vehicle trip reduction incentives and services offered by employers to encourage employees to utilize alternative modes of travel such as carpooling, vanpooling, riding public transit, bicycling, walking, telecommuting, etc.
- 2. Vehicle trip reduction incentives and services affecting visitors to the project, such as shoppers, clients, patrons, etc.
- 3. Financial support for the capital and/or operating costs of enhanced transit or vanpool service to the project.
- 4. Provision of a mix of land uses in close proximity, facilitating trip making by walking, bicycling, or local shuttles.
- 5. Provision of on-site facilities that encourage the use of alternate forms of transportation, such as bicycle lanes and amenities, enhanced pedestrian connections, telecommuting facilities, etc.
- 6. Site trip cap and/or parking cap including trip-monitoring agreements.

### 4.6.2 Transit Capacity and Access Improvements.

#### A. Suggested elements of a transit program

- 1. Contributions of equipment or funds to increase the capacity of existing transit systems
- 2. Transit shuttles provided by applicant (e.g., bus, taxicab, van, etc.)
- 3. Contributions toward transit stations or centers

#### 4.6.3 Traffic Signal Operations Improvements.

Traffic Signal Operational improvements would include upgrading signal to include additional signal phases and/or, signalization of an unsignalized intersection. Signalization of project access drives would not be considered as a mitigation measure. The Local Entity Engineer must approve signal improvements and/or installations.

#### 4.6.4 Street Widening and Other Physical Improvements

Mitigation measures, which include street widening, and other physical improvements must be demonstrated to be physically feasible and must meet minimum City standards and codes for both on-site and off-site improvements.

### 4.6.5 Street Restriping and Parking Regulations

The Local Entity Engineer must approve proposed striping and parking regulation mitigation(s). Generally, street restriping is not a preferred mitigation measure because it often requires parking regulations, which may cause secondary impacts in certain commercial and residential areas. Therefore, any parking impacts should be clearly identified and proposed for mitigation to the extent feasible.

#### 4.6.6 Geometric Improvements

Turn lanes and other auxiliary lane needs shall be identified for each access. Warrants and design standards are shown in Chapter 8. In addition to the standards shown in Chapter 8, all proposed project entrances onto State Highways shall be evaluated as to whether they require acceleration lanes or deceleration lanes as per the current Colorado Department of Transportation State Highway Access Code. The design speed shall be selected from the ranges given in the **Street Design Technical Standards Table 7-3** or **7-4**.

#### 4.6.7 Variances

Requests for variances to the requirement for mitigation measures should follow the process outlined in Section 1.9.4.

## 4.7 **REPORT CONCLUSIONS**

#### 4.7.1 Recommended Improvements

The findings of the Transportation Impact Study should be provided in summary format, including the identification of any areas of significant impacts and recommended improvements/mitigation measures to achieve the LOS standards for all modes

#### A. Geometric Improvements.

The TIS shall include recommendations for all geometric improvements such as pavement markings, signs, adding through or turn lanes, adding project access and assorted turn lanes, acceleration lanes, and changes in medians. Sufficient dimensions/data shall be identified to facilitate review. Anticipated right-of-way needs shall also be identified. This information shall be made available to the project civil engineer for use in preparing scaled drawings.

#### **B.** Responsibility.

The Applicant shall describe the location, nature, and extent of all transportation improvements that the Applicant recommends to achieve the required Level of Service for each analysis horizon's year. In addition, the party(ies) responsible to complete the improvements shall be identified. For this discussion, the following definitions apply:

- 1. <u>Master Planned</u>. Improvements planned having committed funding, including those identified in short range capital improvement programs by the City of Loveland, a special district, MPO, CDOT or other agency. These may be identified in the Scoping Meeting. The Local Entity will provide this information to the Applicant.
- 2. <u>Background Committed</u>. Improvements committed to by previously approved development as identified in the Scoping Meeting provided by the City at the Scoping Meeting.
- 3. <u>Applicant Committed</u>. There are two conditions when improvements need to be identified:
  - a. Existing plus cumulative traffic with planned and background improvements exceed established levels of service, the Applicant shall identify mitigation to offset project impacts.
  - b. Existing plus cumulative traffic with planned and background improvements do not exceed established levels of service, but the addition of project traffic lead to non-compliance, the Applicant shall identify mitigation to achieve established levels of service.

#### C. Proposed Transportation Demand Management.

If TDM measures are recommended to mitigate the traffic impact of the proposed land use action, a specific TDM Implementation Proposal shall be developed and presented to the Local Entity. If accepted, this Implementation Proposal will become a condition of approval of the land use action requested. Each TDM Implementation Proposal shall be developed in conformance with the Local Entity's and the MPO's Transportation Demand Management Program.

#### **D.** Summary Presentation.

The Applicant shall submit a Recommended Improvements Summary Table similar to the example shown in Attachment "D" to present the recommendations. The recommended improvements identified on the Recommended Improvement Table shall be categorized as Master planned, Background Committed, or Applicant Committed. Each project should include a description of its location, the type of project, right-of-way needs (for roadways), and signal or turn lane improvements (for intersections). Commitment to funding and constructing the improvements should be identified, either by local governments, districts, or by the Applicant.

# 4.7.2 Adequacy Statement in Loveland (GMA and City Limits)

The TIS shall include a clear statement clarifying whether or not the transportation facilities will be adequate and available to serve the proposed development within one year of full build out of the project. The statement shall include specific reference to the facility status paragraph (selected from items A through E in Title 16.41.110 of the Loveland Municipal Code) that supports the adequacy conclusion.

#### A. Alternative Solutions.

The Applicant should assure that all practical solutions (project phasing, reductions in development intensity, etc) have been considered when developing the list of necessary improvements, so that the resulting operating conditions are made to approach the established level of service.

#### **B.** Cost Considerations.

When identifying improvement possibilities (either by the Applicant, the Local Entity or the State) necessary to yield an acceptable level of service, the cost of the improvements shall not be considered a limiting constraint within the context of the TIS.

# 4.8 TIS CERTIFICATION AND INTERSECTION'S CAPACITY RESERVATIONS IN FORT COLLINS CITY LIMITS ONLY

#### 4.8.1 TIS Certification

When a TIS is submitted to the Local Entity Engineer for review, the developer will submit an application for TIS certification.

Once all Local Entity TIS review comments have been satisfactorily addressed, the Local Entity Engineer will issue a letter documenting that the TIS has been accepted and certified by the Local Entity Engineer.

A TIS must be certified by the Local Entity Engineer prior to approval of its associated development application.

# 4.8.2 Effect of TIS Certification

Once a TIS has been certified, its findings regarding compliance with the Level of Service standards contained in 3.6.4 of the Fort Collins Land Use Code will remain valid for the effective life of the development application unless the character of the proposed development that is the subject of the development application is significantly changed.

### 4.8.3 Pre-Submittal TIS Certification

A TIS may be certified prior to the submission to the City of a development application for the project. Any such independent certification shall be valid for a period of one year, within which a complete development application for the project must be received by the City, or the TIS certification shall lapse. If a complete development application for the project is received by the City the TIS certification shall be valid for the life of the development application.

### 4.8.4 Intersection Capacity Reservation

Once a TIS has been certified, the projected traffic volumes associated with the project must be included in the background traffic assumptions of all subsequent TIS that address intersections included in the certified TIS. The Local Entity Engineer will provide this information to the developer in the scoping meeting. A certification of a Master TIS will not reserve intersection capacity. Reserved intersection capacity may not be transferred between projects.

#### A. Intersection Capacity Reservation Lapse:

If a development application should lapse for whatever reason, any intersection capacity reserved by the project shall also lapse.

# Attachment A Transportation Impact Study Base Assumptions

Project Information					
Project Name					
Project Location					
TIS Assumptions					
Type of Study	Full:			Intermedia	ate:
Study Area Boundaries	North:			South:	
	East:			West:	
Study Years	Short Range:			Long Ran	ge:
Future Traffic Growth Rate					
Study Intersections	1. All access dri	ves	5.		
	2.		6.		
	3.		7.		
	4.		8.		
Time Period for Study	AM: 7:00-9:00	PM: 4:00-	6:00	Sat Noo	n:
Trip Generation Rates				·	
Trip Adjustment Factors	Passby:		Caj	ptive	
Overall Trip Distribution	SE	EE ATTACH	Ma IED S	rket:	
Mode Split Assumptions					
Committed Roadway Improvements					
Other Traffic Studies					
Aroos Doquiring Special Study					
Areas Requiring Special Study					

Traffic Engineer:

Local Entity Engineer:

### Attachment B Transportation Impact Study Pedestrian Analysis Worksheet

		DESTINATION						
		Rec.	Res.←	Inst.	Ofc/Bus.	Com.	Ind.	Other
								(Specify)
(1	Recreation							
nd use	1) Residential							
t lar	Institution							
jeci	(school, church, civic)							
in (pra	Office/Business							
Origi	Commercial							
	Industrial							
	Other (specify)							

#### INSTRUCTIONS:

Identify the pedestrian destinations within 1320' (1.5 miles for schools) of the project boundary in the spaces above. The pedestrian Level of Service for the facility/corridor linking these destinations to the project site will be based on the directness, continuity, types of street crossings, walkway surface condition, visual interest/amenity, and security of the selected route(s).

 $\leftarrow$  12 Dwelling units or more.

# Attachment C Transportation Worksheet

This form must be completed and submitted when requesting a waiver of the TIS submittal and compliance requirements. This form is not required with building permit applications for residential projects proposing twelve dwelling units or less and no substantial access changes on a collector or arterial roadway.

Project Name:	Developer:
Date:	By:
Property Legal Description (lot, block,	Title:
subdivision)	Address:
	Phone #:
	Fax #:
	Email:

#### **NON-RESIDENTIAL DEVELOPMENT:**

Provide the following information for all non-residential projects:

#### A. Existing use:

1. Description of existing land use: (if none, proceed with Proposed Use)

2.	Existing building area (square footage) for above use(s):	(2)
3.	Number of employees on site each day:	(3)
4.	Daily trip ends for employees [mult. line (3) by the number 4]:	(4)
5.	Number of customers on site each day:	(5)
6.	Daily trip ends for customers [multiply line (5) by the number 2]	(6)
7.	Number of venders on site each day (include trash, ups, etc):	(7)
8.	Daily Trip Ends for venders [mult. line (7) by the number 2]:	(8)
9.	Total Vehicular Daily Trip Ends [line (4) plus line (6) plus line (8)]: (	9)

10. Source of trip generation data (circle one): ITE, business records, traffic engineer,

	personal estimate, other: support your data.	Attach documentation to
11.	Number of accesses existing onto the public street(s) from this	property:
12.	Number of pedestrians visiting the site each day:	
13.	Number of bicyclists visiting the site each day:	
14.	Do sidewalks exist along street(s) adjacent to the property?	YesNo
15.	Are bike lanes existing (striped) along major collector or arteria property (on both sides of the street)?	al street(s) adjacent to this YesNoNA
16.	Is the property adjacent to a major collector or arterial stree transportation plan? YesNo	et as shown on the City's
	B. Proposed use:	
1.	Description of proposed land use:	
2.	Proposed building area (square footage) for above use(s):	(2)
3.	Anticipate number of employees on site each day:	(3)
4.	Daily Trip Ends for employees [multiply line (3) by the number 4]:	(4)
5.	Anticipate number of customers on site each day:	(5)
6.	Daily trip ends for customers [multiply line (5) by the number 2]:	(6)
7.	Anticipate number of venders on site each day:	(7)
8.	Daily Trip Ends for venders [multiply line (7) by the number 2]:	(8)
9.	Total Daily Trip Ends [line (4) plus line (6) plus line (8)]:	
10.	Source of trip generation data (circle one): ITE, business personal estimate, other: Attach documentation to support your data.	records, traffic engineer,
11.	Proposed number of accesses onto the public street(s) from include any existing accesses proposed to remain for use):	this property (does NOT
11.	Number of existing accesses proposed to remain and be used:	
13.	Number of pedestrians visiting the site each day:	
14.	Number of bicyclists visiting the site each day:	
15.	Are sidewalks proposed to be installed (or exist in good cor adjacent to the property?	ndition) along the street(s) YesNo

- 16. Are bike lanes existing or proposed to be installed (to be striped with any required no parking signs installed) along major collector or arterial street(s) adjacent to this property (on both sides of the street)? Yes\_\_\_\_No\_\_\_NA\_\_\_
- 17. Is the property adjacent to a major collector or arterial street as shown on the City's current transportation plan? Yes\_\_\_No\_\_\_

If the total trip new trips, (that is the difference between the daily trip ends calculation for any existing use and the total daily trip ends calculated for the proposed use), is less than 200 and if peak hour and/or daily traffic counts demonstrate that the existing traffic plus the site generated traffic volumes are within the limits set by City Street Standards, the applicant may request a waiver of the Traffic Impact Study submittal requirements by signing below.

Signature		Date	
	Full TIS Required:	Intermediate TIS Required:	TIS Waived:
	By:	Date:	

#### **RESIDENTIAL DEVELOPMENT:**

The following residential development projects require an Intermediate or full Traffic Impact Study.

- 1. Any application proposing more than 20 single family detached dwelling units.
- 2. Any application proposing more than 24 multi-family dwelling units where dwelling units are within duplex, triplex, or four-plex structures.
- 3. Any application proposing more than 34 multi-family dwelling units where dwelling units are within structures containing five or more units.
- 4. Any application proposing a substantial access change onto a major collector or arterial roadway.

Fill out the table below and indicate in the table the number of dwelling units or access changes proposed for the type(s) of residential development included in your development. If the number of dwelling units and changes in access are less than the thresholds established above and if peak hour and/or daily traffic counts demonstrate that the existing traffic plus the site generated traffic volumes are within the limits set by City policy, the applicant may request a waiver from the TIS requirement by signing your name below.

Signature		Date
Full TIS Required:	Intermediate TIS Required:	TIS Waived:
By:	Date:	

NUMBER	RESIDENTIAL DEVELOPMENT TYPE
	Single family detached/dwelling units
	Multi-family dwelling units in duplex, triplex, or four-plex structures
	Multi-family dwelling units in structures containing five or more units
	Access changes onto a collector or arterial roadway
Yes No	Sidewalks exist along streets adjacent to this property, and exist offsite to provide a pedestrian connection to this property?
Yes No	Bike lanes exist and are striped on the major collector or arterial street(s) adjacent to this property (on both sides of the street) and exist offsite to provide a bicycle connection to this property? The property is not adjacent to a major collector or arterial street as shown on the City's 2020 Master Transportation Plan.
Yes No	Sidewalks are proposed to be constructed for this use.
Yes No	Bike lanes along the major collector or arterial roadways (both sides of street) are proposed to be constructed for this use.
NA	The property is not adjacent to a major collector or arterial street as shown on the City's 2020 Mater Transportation Plan

# Attachment D Recommended Improvements Summary

	Responsible Party								
Improvement Description and Location <sup>1</sup>	Applicant Committed	Background Committed <sup>2</sup>	Master Planned <sup>3</sup>						
Year 200_ (Short Range)									
Year 202_(Long Range)									

- 1. Describe improvement type and location (i.e. intersection or roadway widening, number of lanes needed, functional classification). Example: Widen First St from Boise Ave to Denver Ave to 2-lane arterial standards. Be certain to include any necessary offsite bicycle and pedestrian improvements.
- 2. The responsible party or project must be identified in this table for any improvements assigned in this column.
- 3. Master planned improvements committed by the City or State must be approved and fully funded at the time this table is completed.

Attachment E (Loveland city limits and GMA, and Fort Collins GMA) Peak Hour Traffic Volume Worksheet for Arterial Links										
Directions: For the street segment under study, add or subtract the adjustment factor from each row to a base volume of 800 vehicles per lane.										
ENGINEERING FACTORS Condition VPHPL Condition PHV/L Condition VPHPL Condition PHV/L										
Lane Width	10'	-20	11'	0	12'	10	12'	10		
Shoulder Width/Bike Lane w/o gutter	less than 2'	-20	2' to 5'	0	between 5' and 8'	20	8' or more	30		
Intersection Spacing	less than 660'	-20	660' to 1,320'	0	1,320' to 2,640'	10	1/2 mile or greater	40		
Driveway Frequency	more than 50/mile	-20	20 to 50/mile	-5	1 to 19/mile	0	no driveways	40		
Number of Through Lanes	two	0	four	40	six	50	six	50		
Percent Turning Vehicles	more than 30%	-10	10% to 30%	0	less than 10%	40	less than 10%	40		
Auxiliary Lanes	none, but needed	-30	lefts where needed	20	min. st'd. lefts, rights	30	CDOT st'd. lefts, rights	40		
Access Control	none, but needed	-20	painted left turn lane	0	st'd. physical median	30	median wider than 30'	50		
Parking On-street	both sides	-40	one side	-20	none	20	none	20		
Percent Truck Traffic	more than 5%	-10	1% to 5%	0	less than 1%	20	less than 1%	20		
Signal Progression (%Band width)	less than 10%	-30	11 to 30%	0	30% to 50%	40	more than 50%	60		
HUMAN FACTORS										
Pedestrian Activity	more than 60 per hour	-20	10 to 60 per hour	0	less than 10 per hour	20	less than 10 per hour	20		
Sidewalk Width	no walk (less than 3')	-20	3' to 4'	-5	5' to 8'	0	10' or more	20		
Sidewalk to Traffic Lane Distance	less than 5'	-10	5' to 15'	0	16' to 30'	20	more than 30'	30		
Designated Pedestrian Crossings	more than 2 per mile	-10	2 per mile	-5	1 per mile	0	none	20		
Proximity to Schools	within 500'	-10	500' to 1,000'	-5	more than 1,000'	0	more than 1,000'	0		
Designated School Zones	2 or more per mile	-10	1 per mile	-5	none	0	none	0		
Bicycle Activity	more than 30 per hour	-10	5 to 30 per hour	-5	less than 5 per hour	0	less than 5 per hour	0		
At Grade Trail Crossings	2 or more per mile	-20	1 per mile	-10	none	0	none	0		
Adjacent Land Use (Zoning)	residential	-20	com/industrial	20	agricultural/open space	40	agricultural/open space	40		
Typical Home Orientation	face arterial	-10	not front facing	0	not front facing	0	not front facing	0		
Typical Building Setback	less than 30' to curb	-30	30' to 50'	0	between 50' and 150'	10	more than 150'	50		
Bufferyard Width/Intensity	no mitigation	-20	some mitigation	0	high level mitigation	20	high level mitigation	20		

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Larimer County Urban Area Street Standards – Repealed and Reenacted October 1, 2002 Adopted by Larimer County, City of Loveland, City of Fort Collins

# Attachment F (Loveland city limits and GMA, and Fort Collins GMA) Peak Hour Traffic Volume Worksheet for Non-Arterial Streets

COLLECTOR STREETS: For the street segment under study, add or subtract the adjustment factor in each row to a base volume of 300 vphpl (minor) or 550 vphpl (major) to determine the maximum ACF peak hour traffic.

Evaluation Criteria Condition		Factor	Condition	Factor	Condition	Factor
Lane Width	10'	-20	11'	0	12'	15
Shoulder/Bike Lane Width not		10	2' to 4.0'	0	E' or moro	15
	less than 50/mile	-10	2 10 4.9	0		15
Driveway Frequency	more than 50/mile	-10	20 to 50/mile	-5	0 to 19/mile	0
Auxiliary Lanes	none, but needed	-20	lefts where needed	20	meets CDOT Access code	50
Parking On-street	both sides	-20	one side	-10	none	20
Pedestrian Activity	more than 60 per hour	-20	10 to 60 per hour	0	less than 10 per hour	20
Sidewalk Width	no walk (less than 3')	-20	3' to 4'	-5	5' to 8'	10
Sidewalk to Traffic Lane Distance	less than 5'	-5	5' to 15'	10 16' to 30'		20
Designated Pedestrian Crossings	more than 2 per mile	-10	2 per mile	-5	0 or 1 per mile	0
Proximity to Schools	within 500'	-10	500' to 1,000'	-5	more than 1,000'	0
Designated School Zones	2 or more per mile	-20	1 per mile	-10	none	0
Bicycle Activity	more than 30 per hour	-10	5 to 30 per hour	-5	less than 5 per hour	0
Adjacent Land Use (Zoning)	residential	0	com/industrial	50	agricultural/open space	70
Typical Home Orientation	face Collector	-10	not front facing	0	not front facing	0
Typical Building Setback	less than 30' to curb	-20	30' to 50'	0	between 50' and 150'	10
LOCAL STREETS	S: For the street segme	ent unde	er study, add or suk	otract the	e adjustment factor	

in each row to a base volume of 60 vehicles per lane to determine maximum ACF peak hour traffic.

Evaluation Criteria	Condition	Factor	Condition	Factor	Condition	Factor
Land Use	residential	0	non-residential	100		
Street Width w/o parking	less than 24'	-25	24' to 28'	0	more than 28'	25
Street Width w/parking	less than 36'	0	36' to 42'	50	more than 42'	100

Attachment G (Loveland city limits and GMA, and Fort Collins GMA) Street Traffic Volume Summary Table									
	Street Segment	Existing Traffic Volume	Date Existing Volume Taken	Regional Growth Traffic (2005)	Traffic from Build-out of Other Proposed Development *	Site Generated Traffic (2005)	Total Traffic	ACF Traffic Threshold	ACF Compliance (Y/N)
1	Madison; 1st to 7th	600	Jun-99	30	50	10	705	550	YES*
2									
3	Madison; 7th to Eisenhower	650	Jun-99	40	50	15	770	800	YES
4									
5	Boise; Eisenhower to 11th	800	Jul-00	70	100	30	1,000	1,100	YES
6									
7	Boise; 11th to 1st	700	Jul-00	70	80	30	880	1,100	YES
8									
9	Boise; 1st to SH402	450	Jul-00	50	50	20	570	600	YES
10									
11	1st, Boise to Madison	600	Jul-00	80	80	10	780	600	YES*
12		0			0.7				
13	1st; Madison to St. Louis	650	May-99	80	80	10	830	600	YES*
14						_		100	
15	/th; Boise to Madison	60	Aug-00	5	5	5	75	100	YES
16									
1/									
10									
20									
* •									
Approved developments, not yet built: Aspen Knolls 2nd; winona 16th; Kedi-Shop 2 <sup>m</sup>									
" Proposed developments, not yet approved: Allendale 16th; Winona 17th; Pine Tree 3rd; Apple Farm Estates									
Not	Notes/Comments: (*) Within the 2% ACF allowance for streets already at capacity								
#### Chapter 4 – TRANSPORTATION IMPACT STUDY Section 4.8 TIS Certification and Intersection's Capacity Reservations in Fort Collins City Limits Only

Attachment H (Loveland city limits and GMA, and Fort Collins GMA) Peak Hour Intersection Level of Service Summary							
Intersection and		2006 w/o		2006 w/			
Critical Movements	Exis	sting	Proj	ect	Project		ACF
	AM	PM	AM	PM	AM	PM	Compliant?
SIGNAL CONTROL	LOS	LOS	LOS	LOS	LOS	LOS	(Yes/No)
Madison@1st Street 4-WAY	В	С	С	С	С	С	YES
Northbound Left	С	D	D	D	D	E	YES
Northbound Through	В	В	С	С	В	С	YES
Northbound Right	А	С	С	D	В	В	YES
Southbound Left	С	С	С	D	E	E	YES
Southbound Through	A	В	D	C	C	С	YES
Southbound Right	A	A	В	C	D	В	YES
Eastbound Left	D	D	В	D	В	D	YES
Eastbound Inrough	В	В	D	В	D		YES
Eastbound Right	A	A		В		В	YES
Westbound Left	В		В	D		D	YES
Westbound Pight	B	B	B	B	B	B	TES VES
Reice @det Street 4 WAY	D	<u>ь</u>	ь С	ь С	<u>с</u>	6	VEC
Northbound Loft	D				5	ں -	IES VES
Northbound Left		D			D	E	YES
Northbound Through		Б			D		TES VES
Southbound Loft	A	C					VES
Southbound Through	Δ	B		C			VES
Southbound Right	Δ	Δ	B	C		B	VES
Easthound Left			B	D	B	ם	YES
Eastbound Through	B	B	D	B	D	C	YES
Eastbound Right	A	A	C	B	C	B	YES
Westbound Left	В	C	B	D	C	D	YES
Westbound Through	В	C	D	B	B	В	YES
Westbound Right	В	B	B	B	В	В	YES
Madison@7th Street 2-WAY	В	С	С	С	С	С	YES
Northbound Left	C	D	D	D	D	F	YES
Northbound Through	B	B	C	C	B	C	YES
Northbound Right	A	C	C	D	В	B	YES
Southbound Left	С	C	C	D	E	Е	YES
Southbound Through	А	В	D	С	С	С	YES
Southbound Right	А	А	В	С	D	В	YES
Eastbound Left	D	D	В	D	В	D	YES
Eastbound Through	В	В	D	В	D	С	YES
Eastbound Right	А	А	С	В	С	В	YES
Westbound Left	В	С	В	D	С	D	YES
Westbound Through	В	С	D	В	В	В	YES
Westbound Right B B B B B YES						YES	
Stop Sign LOS CriteriaLOS A = < or =10 seconds average delay							

# CHAPTER 5 – SOILS INVESTIGATIONS

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## **CHAPTER 5 – SOILS INVESTIGATIONS**

## 5.1 GENERAL

### 5.1.1 General Requirements

Three categories of testing and reports are required for all projects requiring right-of-way grading and paving; geotechnical report, final pavement design (refer to **Chapter 10**, **Pavement Design and Report**) report, and extra testing (e.g., imported fill).

#### A. Geotechnical Report.

This report evaluates the characteristics of the soils and the general issues of groundwater, soil stability, and swell potential. If groundwater is found within certain parameters, a subsurface water investigation is required. A geotechnical report is required for street and related improvements within the right-of-way, public easements, or slope easements. This report is required as part of the preliminary plat submittal.

#### B. Final Pavement Design Report.

This report is required for all projects with roadway improvements. The soil investigation associated with this report will occur after grading for roadways and utilities is complete. This report must be submitted and approved prior to any nonstructural concrete or paving installation (refer to **Chapter 10, Pavement Design and Report**).

#### C. Extra Testing.

If fill material is required for the project, this material shall also be tested before placement.

### **D.** Supervision by Engineer.

All sampling and testing of soils shall be performed under the direct supervision of a Professional Engineer who must sign and stamp the report.

## 5.2 SOIL TESTING FOR GEOTECHNICAL REPORT

### 5.2.1 Timing of Soil Borings

#### A. Initial Borings.

The information from the initial soil borings must be summarized in the geotechnical report. The entire site shall be sampled for initial testing. This is required because street locations may not yet be determined or may change.

#### **B.** Structures.

Soil borings for design of structures shall be taken prior to the design of the structure.

#### C. Imported Fill for Right-of-Way Grading.

All fill material shall be tested by the Developer and approved by the Local Entity prior to its use on the project. The material should meet minimum requirements and be equal to or better than existing conditions. No material shall be imported which has a liquid limit greater than 40 and plasticity index greater than 20 unless otherwise approved by the Local Entity.

## 5.2.2 Frequency of Testing

#### A. Basic Requirements.

A minimum of two borings shall be provided for each project. The number of borings should be dependent on project size and geotechnical Engineer's recommendations. The Local Entity Engineer may require more frequent testing.

#### **B.** Structures.

Testing frequency for structures shall satisfy **AASHTO Bridge Design** requirements and **CDOT Materials Testing** requirements.

### 5.2.3 Location of Samples

#### A. Basic Requirements.

Samples shall be taken to a minimum depth of 10 feet below the finished grades.

#### **B.** Groundwater or Bedrock.

Borings shall extend deeper if needed to determine if bedrock or high groundwater levels are design concerns. Minimum depth to bedrock shall be three feet below the finished subgrade surface.

#### C. Number of Samples.

Use standard care in determining the number of samples that are needed to characterize soils.

#### **D.** Structures.

Samples for structures shall be taken to a minimum depth of 10 feet below the footing elevation. Additional depth may be required for piers or piles.

## 5.3 SOIL GROUPING

### 5.3.1 General

To simplify subgrade support testing, soil samples may be combined to form soil groups consistent with the **AASHTO** classification, group index, and location for the area investigated. Groupings shall not mix samples with different **AASHTO** classifications. (For example, soils with swell potential greater than 2 percent may not be grouped).

## 5.3.2 Composite Samples

#### A. Composite Samples.

Composite samples may be obtained by mixing portions of each sample within a soil group to provide a uniform sample of the soil group. The composite samples shall be representative of the worst case subgrade soils for the project site unless separate designs are proposed for distinct soil groups and sufficient field sampling is conducted to determine the special limits of each soil unit identified. Composite samples used for Hveem, subgrade strength testing (R-values) shall not be improved in R-value strength by mixing soils with a higher sand content with material of less strength. Appropriateness of the composite sample shall be evaluated through the comparison of soil gradation and Atterberg limits and soil gradations for the site soils as compared with the subject composite sample.

Test	Geotechnical Report	Final Pavement Design Report
Visual	Х	Х
Liquid Limit	Х	Х
Plastic Limit	Х	Х
Moisture	Х	Х
Percent Passing 200	Х	X
Gradation (Granular Soils)	Х	Х
AASHTO Classification	Х	Х
Subgrade Support		
R-Value		Х
Swell Evaluation(Preliminary Considerations)	Indicator: Low/Moderate/High For Moderate or High, Run Swell Tests	Mitigation and Detailed Analysis
Percentage of Soluble Sulfates	Х	Х
Standard Penetration Test	Х	Х
Groundwater	Х	Х
Bedrock Level	Х	Х
Corrosion Potential Resistivity	X	

Table 5-1 Poquired Tests

#### **B.** Specific Tests for Composite Samples.

Composite samples shall be classified using the methods described in **Section 5.4.2**. Composite samples remolded in the laboratory shall not be used for swell/consolidation testing.

#### C. Soluble Sulfate Test.

A minimum of one soluble sulfate test shall be run on each composite sample.

## 5.4 **TESTING**

### 5.4.1 Required Tests

The tests marked with an "X" in Error! Reference source not found. are required for the subgrade soils investigations or final pavement design testing. Refer to **Chapter 10**, **Pavement Design and Report** for Final Pavement Design.

### 5.4.2 Classification Testing

Soils shall be classified visually and tested to determine the properties listed in **Section 5.5**. Sands and gravel samples shall be analyzed for gradation where needed to comply with classification requirements.

## 5.4.3 Subgrade Support Testing

Individual subgrade or composite samples shall be tested for subgrade support value. The geotechnical report shall clearly state whether or not the subgrade soil is capable of supporting the proposed construction and design traffic loads. In Loveland, the top foot of subgrade shall have an R-value of 20 or greater. Recommendation for subgrade stabilization, if required, shall also be provided. The final pavement report shall contain specific mitigation. Refer to **Chapter 10, Pavement Design and Report**, for requirements.

### 5.4.4 Right-of-Way Fill Material Testing

### A. Test Prior to Use.

All imported fill material shall be evaluated for swell and R-value and approved by the Local Entity Engineer prior to use in the right-of-way.

### **B.** R-value and Plasticity Index.

All imported fill shall have an R-value and plasticity index equal to or better than the subgrade material within the right-of-way.

#### C. Expansion Potential.

Imported fill shall not have a liquid limit greater than 40 and plasticity index greater than 20.

## 5.5 GEOTECHNICAL REPORT

#### 5.5.1 Basic Report Requirements

A geotechnical report shall be submitted with the preliminary plat. The report shall show results from all required testing in **Table 5-1**. The report shall also include a description of site characteristics, e.g., topography, drainage features, etc.

#### 5.5.2 Detailed Report Requirements

In addition to the basic report requirements, each soils report shall include the following items (refer to **Chapter 10, Pavement Design and Report**, for pavement design report requirements).

#### A. List of Required Items

- 1. Site location and description
- 2. Laboratory test reports with evaluations (classification tests)
  - a. Visual classification
  - b. Liquid limit AASHTO T89 or ASTM D4318
  - c. Plastic limit AASHTO T90 or ASTM D4318
  - d. In-situ moisture content
  - e. Percent passing No. 200 sieve AASHTO T11 or ASTM C117-90
  - f. Gradation of granular (sand & gravel) materials AASHTO T27, ASTM D422 or ASTM C136
  - g. AASHTO classification and group index AASHTO M145
  - h. Standard Penetrations Test
  - i. Swell Evaluation
- 3. Boring logs
- 4. Soil and groundwater conditions. The expected seasonal elevation variation shall be summarized.
- 5. Depth to bedrock. To indicate shallow bedrock. Include mitigation requirements if bedrock is within 3 feet of subgrade.
- 6. Percentage of soluble sulfates.
- 7. Recommendations and discussions
- 8. Mitigation plans
- 9. Additional tests. These may be required for trench backfill evaluation, fill evaluation, etc.

- 10. Elevation of groundwater encountered in each boring
- 11. Engineer seal and signature. Required.

### 5.6 SUBSURFACE WATER INVESTIGATION

#### 5.6.1 When a Subsurface Water Investigation Is Required

#### A. Criteria.

If groundwater or bedrock is encountered or predicted to be encountered within 5 feet of the original or proposed ground surface, a subsurface water investigation report shall be submitted for approval by the Local Entity Engineer. This report is required to ensure mitigation of high groundwater effects upon public improvements within the right-of-way. This information may be a separate report or may be included in the geotechnical report.

#### **B.** Requirement Waiver.

This report requirement may be waived if the Applicant and Designer certify that the street subgrade elevations will be a minimum of 3 feet above the "maximum" predicted (seasonal highest) water table.

#### C. Exception for Buried Utility Construction.

This report is not required for temporary dewatering activity needed to facilitate construction of buried utilities. However, all applicable state requirements must be followed.

#### 5.6.2 Report Requirements

The subsurface water investigation report shall include the following information.

#### A. List of Required Information

- 1. Site location and description. Include locations of any irrigation ditches and wetlands.
- 2. Elevation of water table, direction of flow, flow rates, groundwater barriers, and seasonal high water level.
- 3. Potential sources of groundwater. Include proximity to irrigation ditch systems.
- 4. Water rights.
- 5. Other relevant subsurface information such as water ownership (water rights), groundwater quality (contamination or other undesirable characteristics)
- 6. Potential future groundwater conditions
- 7. Subsurface drainage recommendations, including its effects on all conditions, including sensitive habitat.

- 8. Cone of influence.
- 9. Control measures and designs
  - a. <u>Subsurface Drains</u>. If subsurface drains are recommended, the drains must have a gravity discharge without any possibility of back flow or blockage of the outlet. Any subsurface drain system shall be owned and maintained by the Developer or the Developer's assigned successor(s). These drains may discharge into the Local Entity's storm drainage system, including inlets or detention ponds, upon approval of the Local Entity Engineer. The underdrains may not drain to the gutter/flowline of public streets. Anticipated impacts to the groundwater table on adjacent properties must be quantified. The plat and construction plans shall clearly state that the City / County has no maintenance responsibility for this utility and any damage caused by said maintenance shall be repaired by the entity in charge of maintenance to preexisting conditions or better.
  - <u>Drain Lines</u>. The drain lines may be installed in the sanitary sewer trench, at an elevation of one sewer diameter lower than the sanitary sewer line, except in Loveland (city limits only). Refer to the section/subsection titled **Drainage** Systems Subdrains in Chapter 7 for location in Loveland (city limits only). Flexible pipe will not be accepted.
  - c. <u>Drain Line Separation from Sewer</u>. The drain line shall be marked to specifically distinguish the drain from the sanitary sewer line.
  - d. <u>Pipe</u>. The drain line shall be an approved material pipe, for long-term 100 years minimum design life, with appropriate cleanouts.
  - e. <u>Drain Outlet</u>. The outlet of the drain into an inlet structure or detention pond shall be designed to prevent any possibility of backflow and blockage of the drain line.
- 10. Professional Engineer's seal and signature.

### 5.7 SOIL PROBLEM MITIGATION

Mitigation plans for soil problems revealed by the soils investigation shall be submitted to the Local Entity Engineer. The following specific factors shall be addressed:

### 5.7.1 Mitigation Plans and Approval

All special problems found in soils investigation (e.g., expansion, frost, soluble sulfates, shallow bedrock, heave, groundwater, soil instability, utility backfill, etc.) shall be addressed in the mitigation plans. All mitigation procedures must be approved by the Local Entity Engineer prior to their implementation.

## 5.7.2 Mitigation for Swell

If the swell of any subgrade soils is 2.0 percent or greater, the pavement design report must provide mitigation measures for said soils. Soil swell testing shall be conducted with soil samples that have an initial moisture content equal to or less than 4 points below optimum moisture for said material. The mitigation measures shall reduce destructive swell potential under the public improvements, including landscaping, to an acceptable level of less than 2.0 percent at 150 psf surcharge. The swell test report shall specify sample conditions, surcharge pressures, and other key testing factors.

## 5.7.3 Swell Mitigation Measures

Possible measures for mitigation may include the following:

### A. Over-Excavation.

Over-excavation and replacement with suitable non-expansive or low-expansive material to a depth sufficient to mitigate expansion is a common mitigation method.

#### **B.** Chemical Treatment.

Chemical treatment may be used to mitigate expansive characteristics of the soil.

#### C. Subdrains.

Subdrains may be effective at reducing the groundwater, thereby reducing swelling. However, subdrains will be subject to all of the subsurface drain requirements in these Standards.

#### **D.** Moisture Treatments.

Condition with moisture and compact to an appropriate level of compaction for the expansive condition, including stability requirements. The geotechnical engineer shall specify the target moisture content based on laboratory testing. Moisture content of the prepared subgrade soils shall be tested within 24-hours prior to paving. If unstable paving conditions due to over moistened soils appear, the contractor shall cease paving and the geotechnical engineer shall develop other forms of mitigation.

#### E. Other Procedures.

Other procedures may be proposed for review and approval by the Local Entity Engineer. The chosen method must work for the full life expectancy of the improvements.

## 5.7.4 Mitigation of Unstable Subgrade (Examples)

### A. Over-Excavation.

Over-excavation and replacement with suitable non-expansive material to a depth sufficient to stabilize the subgrade is a common mitigation method.

#### **B.** Chemical Treatment.

Chemical treatment to eliminate unstable characteristics of the soil is another common mitigation method.

#### C. Other Procedures.

Other procedures may be proposed for review and approval by the Local Entity Engineer.

## 5.7.5 Specific Mitigation Requirements

#### A. Extent of Mitigation.

Moisture treatment alone may not be sufficient. If soil problem mitigation is made, the soil treatment shall extend to the back of curb, or to the back of walk for attached or monolithic walk. For detached walk, separate mitigation procedures may be required.

### **B.** Approval of Chemical Treatment.

Mitigation procedures that alter existing soil conditions (such as lime, fly ash, or cement treatment) shall follow an approved mix design process. Additional testing is required to verify that no swell is introduced in the chemical treatment.

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## **CHAPTER 6 – PERMITS**

## 6.1 GENERAL

This chapter pertains only to the Loveland (GMA and city limits) and Fort Collins (GMA and city limits) with the exception of **Section 6.5.4**, **Special Transport Permit**. Work in the Larimer County GMA will follow the policies and procedures in place in Larimer County at the time of the recording of the plat.

## 6.1.1 Permits Required

All Contractors, public utility agencies, and property owners installing public or private improvements, or storing materials or equipment, within any public rightof-way or easement must obtain the required permit prior to the commencement of the work. The following are permits required prior to doing certain described activities in the public right-of-way:

### A. Development Construction Permit (DCP)

All public improvement construction connected with an approved development project must follow the process outlined in Section 6.2.

#### **B.** Right-of-Way Permit (RWP)

All work in public rights-of-way and easements must be permitted in accordance with the criteria outlined in **Section 6.3** 

#### C. Revocable Encroachment Permit

All encroachments of private improvements in the Right of Way must follow the process outlined in **Section 6.4**.

#### **D.** Oversized Load Permit

All permits for oversize loads, special transports and moving buildings, houses, and mobile homes must follow the process outlined in **Section 6.5**. Additional costs to the Local Entity and other agencies (escorts, street repairs, utility adjustments, etc.) shall be the responsibility of the applicant.

#### E. Permit for House Numbers on Curbs in Fort Collins (City Limits Only)

A permit is required for painting house numbers on Local Entity curbs. All House Numbers on Curbs permits must follow the process outlined in **Section 6.6A**.

#### F. Hazardous Materials

The permit is not valid for vehicles transporting hazardous materials. All moving of hazardous materials must be permitted through the State of Colorado.

## G. Blasting Permit (Approved by the Local Fire Authority)

The Contractor's blasting procedures shall conform to Federal, State, and local ordinances and shall be approved by the local fire authority. The Contractor shall acquire all required permits prior to the start of blasting. All permits for blasting must follow the process outlined in **Section 6.6B**.

## H. Stockpiling in Fort Collins (City Limits Only)

A permit is required for stockpiling fill material on vacant land in anticipation of future use of the material. Follow the process outlined in **Section 6.6C**.

## I. Grading, Excavating, and Fill Permit in Loveland (City Limits Only)

Earthwork (excavation, grading, clearing, grubbing, or filling) on private property is governed by Chapter 33 of the Uniform Building Code. A permit is required for most earthwork construction on private property. See **Appendix B-3** for the City of Loveland's grading permit policy.

### J. State and Federal Permits

Land development activity and the construction of public infrastructure often require additional permits from state and federal agencies. Examples include an **Emission Permit** for fugitive dust (issued by the **Colorado Department of Public Health and Environment**), a **Discharge Permit** for storm water associated with construction activity (issued by the **Colorado Department of Health**), and a **Section 404 Permit** for impacts to wetlands or waterways (issued by the **US Army Corps of Engineers**). Applications and submittal requirements for these permits may be obtained from the City of Loveland Building Division, or directly from the issuing agency.

## 6.1.2 Application

Applications for the various permits are available at the public counter of the Local Entity Engineer. The application form must be completed and submitted to the Local Entity Engineer along with the required items stated on the permit application.

## 6.1.3 Review and Approval of Submittals

The application will be reviewed by the Local Entity. If additional information is required, the Applicant will be contacted. The Local Entity will check to make certain that the Applicant has provided the required bond and when applicable the license and insurance certificates.

Once the permit application and all required submittals have been reviewed and found to be complete, the Permit may be issued by the Local Entity.

## 6.1.4 Issuance of Permit

The Permit is issued to the Applicant after all fees have been collected. Refer to **Section 6.7** for fees.

Any modifications to the approved permit including any scope or schedule changes must be submitted in writing to the Local Entity Engineer for review and approval.

The Local Entity may authorize a private entity to issue permits for all work described in this chapter.

## 6.1.5 Plans

Any plans required for permit process shall clearly indicate the proposed work and its location. Refer to **Chapter 3, Information Requirements for Construction Plans** and the supplemental traffic plan submittal requirements for Loveland (city limits only) contained in **Appendix B-3**.

## 6.1.6 Warranty and Surety

Refer to Chapter 24, Acceptance Procedures and Record Drawings/ Warranty, for Warranty Period and surety to remain in place for the construction of all Public Improvements.

## 6.1.7 Permit Standards and Conditions

### A. General Requirements

The Applicant shall be responsible for all of the following requirements which are relevant for the Project:

- 1. <u>Approval of Permit.</u> Permits are issued subject to the approval of the Local Entity, State, or other governmental agencies having either joint supervision over the section of road, or authority to regulate land use by means of zoning and/or building regulations.
- 2. <u>Other Agency Approval.</u> Permit Applicants are responsible for obtaining separate permits or permission as may be required. Examples may be when work is proposed within the state highway, railroad or irrigation company rights-of-way or private property.
- 3. <u>Easements.</u> It shall be the Applicant's responsibility to determine the necessity of any Easements and to obtain those Easements and approvals that may be required.
- 4. <u>Submittals and Fees.</u> Applicant shall pay all required fees, provide insurance, surety (if required), and provide appropriate plans, if necessary.
- 5. <u>Coordination of Utility Work.</u> The Applicant shall be responsible for coordinating any utility work including relocation of the utilities (e.g., power poles, transformers, signals, etc.).

- 6. <u>Affected Area.</u> The Applicant is responsible for returning the areas affected by construction to equal or better condition. The Applicant is responsible for repairing any damage to private or public property or other adjacent right-of-way that occurs during construction.
- 7. <u>Not Transferable.</u> The permit may not be transferable or assignable except as designated in the Development Agreement. The Applicant may subcontract the work to be performed under a permit, provided that the Applicant remains responsible for the performance of the work identified in the permit, the insurance and Surety, and the Warranty period. If permit is transferred, a new construction coordination meeting may be required.
- 8. <u>Supplemental Permit.</u> No work outside the scope of the approved permit may occur without the approval of the Local Entity Engineer. It is the Applicant's responsibility to notify the Local Entity of the issues and apply for a supplemental permit for the additional work.
- 9. <u>Time for Approval and Issuance</u>. The Local Entity may require up to 10 working days for approval of the permit after receipt of the complete application package.
- 10. <u>Public Display.</u> All required permits and approved plans must be available on the job site at all times during construction and placement of traffic control devices.
- 11. <u>Erosion Control Inspector</u>. The Local Entity erosion control inspector must be notified at least 24 hours prior to any planned construction. Refer to **Chapter 23, Street Inspection and Testing Procedures,** for additional detail.
- 12. <u>No Reimbursement of Fees.</u> In general, once the permit is approved and fees are collected, no permit fee will be reimbursed, even if the permit has expired before construction takes place.

### B. Requirements to Preserve Quality of Streets and Traffic Flow

1. <u>Traffic Control Plans.</u> A Traffic Control Plan (TCP) shall be submitted prior to or submitted with the permit application for all proposed work for approval by the Local Entity. In Loveland (city limits only), work in/on residential streets may not need a separate TCP but all signs, barricades and other necessary traffic control devices shall be placed in accordance with the **MUTCD, Part VI**.

All work described above shall be performed by a Traffic Control Supervisor and a certificate for the Traffic Control Supervisor shall be submitted with the plan. The plan shall detail all devices, hours of work, days, dimensions of tapers and barricades, work area, etc. The plan shall provide a device summary on the sheet. The Local Entity may require the Developer to notify the local newspaper and/or the impacted residents, depending on the size and type of project, a minimum of 48 hours prior to the commencement of work.

- 2. <u>Traffic Flow During Peak Hours.</u> No interference with traffic flow on Arterial or Collector streets shall be permitted during the hours of 7:00 a.m. to 8:30 a.m. or from 4:30 p.m. to 5:30 p.m. unless authorized in writing by the Local Entity Engineer.
- 3. <u>Barricades, Warning Lights, and Signal Lights.</u> Any person performing work in the public right-of-way shall place barricades, warning lights, and any other safety devices at the location, sufficient to warn the public of the hazard and which are in compliance with the MUTCD. The Contractor shall be responsible for the maintenance of all barricades at all times.

On all Collector and Arterial Roadways (and some local streets, as determined by the Engineer,) there shall be an individual responsible for the Traffic Control and able to be contacted 24 hours a day. This individual shall be certified as a Traffic Control Supervisor (TCS), by the American Traffic Safety Services Association (ATSSA) and/or Colorado Contractors Association (CCA).

- 4. <u>Protection of Existing Improvements.</u> Ensure protection as follows:
  - a. <u>Existing Installations</u>. The Contractor shall at all times take proper precautions and be responsible for the protection of existing street and alley surfaces, driveway culverts, street intersection culverts or aprons, irrigation systems, mail boxes, driveway approaches, curb, gutter, and sidewalks, and all other identifiable installations that may be encountered during construction.
  - b. <u>Utilities</u>. The Contractor shall at all times take proper precautions for the protection of existing utilities, the presence of which are known or can be determined by field locations of the utility companies. The Contractor shall contact the UNCC (One Call) at 1-800-922-1987 for utility locates a minimum of 2 working days prior to his proposed start of work.
  - c. <u>Existing Improvements</u>. Existing improvements to adjacent property such as landscaping, fencing, utility services, signs, driveway surfaces, etc., that are not authorized for removal, shall be protected from injury or damage resulting from the Contractor's operations.
  - d. <u>Survey Markers</u>. The Contractor shall at all times take proper precautions for the protection of property pins/corners and survey control monuments encountered during construction. Any damaged or disturbed survey markers shall be replaced by a registered land surveyor at the Contractor's expense.

- e. <u>Responsibility for Repair</u>. The repair of any damaged improvements as described above shall be the responsibility of the permit holder.
- f. <u>Minimizing Inconvenience</u>. The Contractor shall abide by the requirements set forth by the permit to minimize inconvenience to traffic and any inconvenience to adjacent property owners.
- 5. <u>Permanent Pavement Patches.</u> All permanent pavement patches and repairs shall be made with "in-kind" materials. For example, concrete patches in concrete surfaces, full depth asphalt patches with full depth asphalt, concrete pavement with asphalt overlay patches will be expected in permanent "overlaid" concrete streets, etc. In no case is there to be an asphalt patch in concrete streets or concrete patch in asphalt streets. Any repair not meeting these requirements will be removed and replaced by the Contractor at their expense.
- 6. <u>Pavement Less than 5 Years Old.</u> In streets that are less than five (5) years old the Local Entity reserves the right to deny any street excavation or require repairs that are over and above these specifications.
- 7. <u>Work to be Done in Expedient Manner.</u> All work shall be done in an expedient manner. Repairs shall be made as rapidly as is consistent with high quality workmanship and materials. Use of fast setting concrete and similar techniques may be required and are encouraged whenever possible without sacrificing the quality of repair.

Completion of the work including replacement of pavement and cleanup shall be accomplished immediately after the repair work or activity involving the cut is done. Extension of time for completion shall be with the written approval of the Engineer. If the repairs are not completed in the allotted time, the Local Entity has the right to repair the street and bill the full cost of work and administrative expenses to the Contractor. The Local Entities require a reasonable continuous, diligent effort from the Contractor to complete work and daily cleanup.

- 8. <u>Inspection Requests.</u> It shall be the responsibility of the person performing the work authorized by the permit to notify the Local Entity Engineer or his authorized representatives that such work is ready for inspection. The Local Entity Engineer requires that every request for inspection be received at least 24 hours before such inspection is desired. Such requests may be in writing or by telephoning or faxing the Local Entity Engineer. Refer to **Chapter 23, Street Inspection and Testing Procedures,** for additional discussion regarding inspections.
- 9. <u>Removal and Replacement of Unsatisfactory Work.</u> Removal and replacement of unsatisfactory work shall be completed within fifteen days of written notification of the deficiency unless deemed an emergency requiring immediate action. If deemed an emergency for health/safety reasons, the contractor must complete the work immediately. In the event

the replacement work has not been completed, the Local Entity will take action against the Contractor's bond to cover all related costs.

10. <u>Road Closures.</u> Road closures will only be allowed with the written approval of the Local Entity Engineer. Proper posting and public notification will be required 7 days in advance of any closure. Forms of notification may include door hangers, variable message signs and press releases.

## 6.1.8 Stop Work Orders

Any person, corporation, quasi-governmental agency, special district, public utility, or private utility company that has performed work without first having obtained a permit or has performed work in the right-of-way that is considered a safety hazard or has non-conforming items that have not been addressed will be issued a notice to stop work. All specified work shall be discontinued until such time that the appropriate repair or permits are in place. The Local Entity Engineer or Inspector is authorized to issue Stop Work Orders. The stop work order shall contain a written statement of the violations that caused the issuance. Immediately upon receipt of a stop work order, the Applicant shall consult with the Local Entity Engineer to resolve the violations. See **Appendix E-5** for sample document.

## A. Stop Work Fines

Any Applicant who does not immediately discontinue work upon issuance of a stop work order shall be subject to fines. The Applicant may be fined up to \$1,000 per day in accordance with Local Entity code requirements.

### **B.** Mitigation Expenses

In cases where the Local Entity deems it necessary to effect a remedial action or repair to mitigate any dangerous or unsafe circumstances, due to emergencies or untimely performance by the Applicant, the Local Entity may bill the Developer for all of its costs. Untimely performance occurs when the contractor has not performed the remedy within 24 hours of notification. Emergency repairs are expected to be implemented immediately.

- 1. <u>Costs for Repairs</u>. Mitigation repair costs shall include, but not be limited to the following:
  - a. Administrative charge.
  - b. All labor costs (at Local Entity rates).
  - c. All material costs.
  - d. All equipment costs.
- 2. <u>Stoppage of Work.</u> Once a Stop Work Order has been issued, no specified work may continue under the permit and no subsequent permits will be

issued until the Local Entity receives full payment for permit and/or poor workmanship or safety issues have been resolved.

### 6.1.9 Insurance Requirements

The insurance requirements are intended to protect the public, as well as the Contractor who is providing any construction services in the public right-of-way.

### A. Listing of Specific Requirements

The Developer is responsible to provide insurance prior to the issuance of the permit in accordance with the following requirements:

- 1. The Applicant and/or the Applicant's contractor shall present proof of carrying a liability and property damage insurance policy or policies known as Commercial General Liability, for the period of time required for complete installation of facilities authorized by the permit, including the repair and restoration of the road facilities, and also, during such future periods of time when operations are performed involving the repair, relocation or removal of said facilities authorized by the permit. Coverage shall be provided against any claim, demand, suit, or action for the property damage, personal injury, or death resulting from any activities of the applicant, his officers, employees, agents or contractors in connection with the construction, installation, repair or removal of the said facilities authorized by the permit.
- 2. The policy shall include as named insured: The Local Entity, Local Entity Authority, its officers, agents and employees, except as to claims against the applicant, for personal injury to any members of the Council, its officers, agents and employees, or damage to any of its or their property. The said insurance shall provide coverage of property damage insurance, public liability insurance, and bodily injury insurance in the amount of not less than \$1,000,000 each, or such other maximum amount as may be specified in the Colorado Governmental Immunity Act, and protecting the Local Entity against any and all claims for damages to persons or property resulting from construction and/or installation of any required improvements pursuant to the permit.
- 3. The policy will provide that the Local Entity shall be notified at least 30 days in advance of any reduction in coverage, termination or cancellation of the policies. Such notice shall be sent to the Local Entity Engineer by certified mail, return receipt requested.
- 4. The Applicant shall also obtain and keep in force during the duration of all work covered under the permit a policy of Automobile Liability insurance with similar terms as mentioned above. This policy shall insure the Applicant against any liability for personal injury, bodily injury or death arising from the use of motor vehicles and shall cover operations on or off the site of all motor vehicles controlled by the Applicant.

## 6.1.10 Licensing in Fort Collins (City Limits Only)

The City of Fort Collins requires contractor's licenses, bonding, and insurance prior to the issuance of permits. Please refer to the Local Entity for further information in addition to the following:

## A. Contractor's License

A right-of-way Contractor's license shall be required to perform work in the public right-of-way. Additionally, any person wishing to perform work in one of the following categories shall first qualify for and obtain an endorsement on their right-of-way Contractor's license to perform such work.

- 1. <u>Categories Requiring Endorsement</u>. The categories are as follows:
  - a. Asphalt.
  - b. Utility.
  - c. Non-Structural Concrete.
  - d. Structural Concrete.
  - e. Exception: A homeowner is not required to obtain a license to install their own sidewalk adjacent to their property.

## **B.** Bonding

The right-of-way Contractors license shall be accompanied by a license and permit bond in the amount of \$20,000. Each endorsement shall be accompanied by a separate license and permit bond in the amount of \$10,000. The bond shall be conditioned upon compliance with all provisions of the permit for all work in the public right-of-way and the ordinances of the Local Entity. All bonds shall be continuous with a minimum cancellation notice of 60 days.

In the event the bond is canceled, the license will be immediately revoked and no further work will be allowed to occur. However, the bond must remain effective through the warranty period associated with all previously completed work items. The bond is used as the Local Entity's insurance in case the Contractor is unwilling or unable to repair problems found during the Warranty Period or during construction. The Local Entity can choose to complete the repairs either through its own resources or by hiring a different construction firm.

### C. Insurance

Any license application shall be accompanied by an original certificate of commercial general liability insurance insuring the contractor according to **Section 6.1.10**.

## 6.2 **DEVELOPMENT CONSTRUCTION PERMIT**

### 6.2.1 Application

A Development Construction Permit (DCP) shall be required prior to any construction or installation of new public infrastructure or new private improvements within the public right-of-way as shown on a set of public improvement construction plans reviewed and signed by the Local Entity Engineer. The DCP is required to coordinate the transition from completion of the development review process to the construction process. This permit will be issued after all project plans and documents noted in the standards are finalized and approved.

No work is allowed to occur within the right-of-way until the Developer obtains an approved DCP. If work commences in the right-of-way without a permit, a Stop Work Order will be issued. Refer to **Section 6.1.8** for Stop Work Order procedures.

See Appendix E-6 for application and permit sample.

For projects within the Development Review process, the permit application and approval process are part of the review process. For projects where the development review and approval process are complete, allow 5 to 8 weeks from permit application to permit issuance.

#### 6.2.2 Submittals

A complete application for the DCP includes the following:

- 1.  $8-1/2 \ge 11$  inch copy of the approved site plan.
- 2. Signed and approved construction plans (3 copies).
- 3. Proposed project schedule.
- 4. Project quantities and cost estimate for all public improvements to be constructed, as well as all private improvements that are required to be inspected by the Local Entity. These quantities and costs are to be submitted in an electronic spreadsheet format as required by the Local Entity.
- 5. Permit fee.
- 6. Additional items may be required and marked on the application by the Local Entity Engineer.
- 7. Application completed and signed by the Developer.

#### 6.2.3 Construction Coordination Meeting.

If required by the Local Entity, a construction coordination meeting will be held by the Local Entity staff to meet the involved parties, to review the plans and schedule, to exchange information about the project, to help establish communication lines and discuss key issues about the project. This is not a construction meeting to solve problems or discuss details of the project. Separate preconstruction meetings, if needed, are the responsibility of the Developer. See **Section 6.2.3** C for list of meeting attendees.

## A. Scheduling

All Construction Coordination Meetings will be scheduled by each Local Entity.

### **B.** Items Required Prior to the Meeting

The review is based on the receipt of the following items, which must be completed and/or received by the Local Entity Engineer a minimum of one week and a day prior to the anticipated meeting date (8 calendar days).

- 1. Completed application as outlined in Sections 6.2.1 and 6.2.2 and Appendix E.
- 2. Public improvement plans ready for Local Entity signature (Mylars requested).
- 3. Easement documents submitted for recording.
- 4. Development Agreement as reviewed by and agreed to by the Developer and the Local Entity. (The Development Agreement must be finalized prior to Final plat approval.)
- 5. Final plat ready for signatures.
- 6. Traffic control plan.

### C. Meeting Attendees

The following people are required to attend the Construction Coordination Meeting:

- 1. Developer's Construction Manager.
- 2. Designer.
- 3. Developer.
- 4. Developer's Architect/Land Planner (Optional).
- 5. General Contractor or representatives for each contractor if no General.
- 6. Subcontractors (Optional, if the Developer has a general contractor)
- 7. Local Entity Staff.
- 8. Utility representatives are encouraged to attend but are not required.

## 6.2.4 Issuance of Permit.

Upon completion of the application process and construction coordination meeting outlined above, the following must be completed and submitted to the Local Entity before the DCP is issued:

- 1. Public Improvement Construction Plans including a mylar copy and 3 signed sets of prints received by the Local Entity. In Loveland (city limits only), 6 signed sets of prints are required.
- 2. Development Agreement signed by the applicant.
- 3. Any estimates needed.
- 4. Plat filed with Larimer County Clerk and Recorders Office.
- 5. Construction Traffic Control Plan submitted and approved. See Section 6.3.3 A.
- 6. Revised schedule updated to reflect results of construction coordination meeting.
- 7. Performance surety received.
- 8. Liability and property damage insurance policy on file except in Fort Collins (city limits only).
- 9. Applicable construction inspection fee paid. See discussion of inspection fees at the end of Chapter 23, Street Inspection and Testing Procedures.
- 10. In Fort Collins (city limits only), erosion control deposit paid.
- 11. Additional requirements of the permit.
- 12. Applicant's signature on the permit.

## 6.2.5 Expiration and Extension

### A. Commence within 60 Days

The permit shall be void if work does not commence within 60 days from the date of issuance of the permit. The Applicant will forfeit the permit fee and must re-apply for a new permit. However, the Applicant may apply for a permit extension or renewal prior to expiration.

### **B.** Renewal of Permit

If the infrastructure is not completed within one year from the date of issuance of the Development Construction Permit, an extension of the permit of up to 90 days must be applied for at least 2 weeks prior to expiration of the permit.

#### C. New Permit after Expiration

If the permit expires and infrastructure improvements remain incomplete, construction work must stop and a new permit must be applied for. The new permit is subject to all submittal requirements and permit fees. Multiple extensions may be approved by the Local Entity.

## 6.2.6 Performance and Warranty Surety Requirements

Newly constructed streets and related public improvement infrastructure shall carry a performance guarantee and a repair and maintenance guarantee covering design and construction defects. The performance guarantee period shall commence with the construction of the public improvements and the repair and maintenance (i.e. warranty) guarantee period shall commence after completion and initial acceptance of the work. Refer to **Chapter 24, Acceptance Procedures and Record Drawings/Warranty**, for further information.

#### A. General Requirement for Surety

All Applicants shall provide surety in the form of a bond, letter of credit, or other forms of cash or escrowed funds in the amount of 100 percent of the estimate of costs for public improvements. In Loveland (city limits only), the required surety is 15%.

#### **B.** Possible Waiver for Other Entities

Other municipalities, quasi-governmental agencies, special districts, electric, gas, and communication utilities may not be required to provide a surety.

#### C. Reduction of Surety

As the project progresses, the Applicant may request from the Local Entity a reduction of the surety. In Fort Collins (city limits only), surety shall not be reduced to less than 25% of the full amount. In Loveland (city limits only), reductions in surety are not applicable until completion of the warranty period.

- 1. <u>Points at Which Surety Reduction May Be Requested</u>. The Local Entity will accept written requests to reduce the project sureties at key milestones in the construction process.
  - a. At completion of buried utilities.
  - b. Preliminary street improvements are completed.
  - c. Final street improvements are installed.
  - d. Other key points in the construction process, as approved by the Local Entity Engineer.

These requests may be limited to the substantial completion of key improvements as determined by the Local Entity's Inspectors. However, at no time, prior to final acceptance shall the surety be reduced to less than 15 percent of the total value of the Public Improvements. In Fort Collins (city limits only), the surety shall be reduce to no less than 25 percent of the total value of the Public Improvements.

- 2. <u>Warranty Surety</u>. The Warranty Surety shall be 15 percent for all projects unless otherwise approved by the Local Entity Engineer. In Fort Collins (city limits only) the amount of surety shall be based on the potential cost of repairs and shall not exceed 25% of the total cost of the public improvements. (See City of Fort Collins codes for specific details).
- 3. <u>Reduction Request Process</u>. The Applicant must submit a request in writing to the Engineering Division providing documentation as to the status of the improvements to be reviewed and a request to release monies for the completion of this work.
- 4. <u>Release for Surety</u>. See Chapter 24, Acceptance/Warranty Procedures and Record Drawings.

## 6.3 **RIGHT-OF-WAY PERMIT**

## 6.3.1 Uses for Right-of-Way Permit

A Right-of-Way Permit is required prior to beginning any repair or modification of existing public infrastructure or private improvements within the public right-of-way. It is also used to authorize the construction of minor public or private improvements that do not require the review and approval of public improvement construction plans, but instead is shown on an approved site plan. The right-of-way permit also applies to three additional types of work:

### A. Storage of Materials and Equipment in the right-of-way

A Right-of-Way Permit shall be required for the storage of materials and equipment within the public right-of-way adjacent to a work site. This also includes borrow pits and fill material stockpiles.

### **B.** Excavation in right-of-way

A right-of-way permit shall be required for all excavation performed within the public right-of-way.

## C. Access to Public Streets

A right-of-way permit and a CDOT access permit (if applicable) shall be required for construction or modification of all private or public accesses into the public right-of-way, except where such construction or modification is authorized with a Development Construction Permit.

## 6.3.2 Application

The permit application and information is available at the public counter in the Local Entity's Engineering Division. See **Appendix E-7** for application and permit example.

## 6.3.3 Submittal Requirements

## A. Plans

Plans that clearly show the proposed work must be included with the permit application. The plans must be drawn to a proper scale to show the location and position of the proposed work, including street right-of-way (features, names, dimensions and property lines), existing utilities, topographic and man-made features, existing drainage patterns and any other information needed to clearly present the proposed work. Any plan's that propose changes in the original design, other than constructing improvements in accordance with standard construction drawings, are required to be prepared by a Professional Engineer and conform to the requirements of Chapter 3 of these Standards

## **B.** Work Area Traffic Control Plan

A work area traffic control plan shall be submitted with application for work within, or any access to, a public right-of-way.

The traffic control plan shall be a minimum of  $8-1/2 \ge 11$  inches. The plan shall detail the work zone location, dimensions and the traffic control devices (including dimensions of tapers, closure area, etc.) proposed as well as construction traffic routing requirements. The plan may require additional detail at the discretion of the Local Entity Engineer due to unique or unusual conditions.

### C. Proposed Project Schedule

A time schedule stating the desired time when the work will commence, be performed, and be completed shall be submitted.

### **D.** Project Quantities and Estimates

An estimate of quantities and costs for all public improvements as well as private improvements that are required to be inspected by the Local Entity in accordance with **Chapter 20**, **Public Improvements Cost Estimate** shall be submitted. These costs are used in the determination of permit fees.

## E. Certificates of Insurance

Certificates of insurance for commercial general liability and automobile liability shall be submitted. Refer to Section 6.1.9, concerning insurance requirements.

### F. Hours of Construction

The standard hours of inspection are 7 a.m. to 6 p.m. Construction work hours will be limited on the permit. Refer to **Section 6.1.7 B.2**.

### G. General Conditions

The construction shall be done in accordance with these Standards and the General Notes in **Appendix E-1**.

## 6.3.4 Approval and Expiration

A minimum of 5 working days is required for the Local Entity Engineer's approval. The permit expires 30 days from date of approval unless otherwise stated on the permit.

## 6.4 **REVOCABLE ENCROACHMENT PERMIT**

A revocable encroachment permit shall be required where any portion of street, alley, sidewalk, or other public right-of-way is occupied in connection with erection, construction, remodeling, or demolition of any building or improvement. Erection of any fence, barrier, post, or other obstructions or encroachments with any street, alley, sidewalk, or public right-of-way within the Local Entity shall require a revocable encroachment permit as well.

## 6.4.1 Short Term Revocable Permit

The short-term revocable permit is intended for temporary uses and short term encroachments having duration of less than 90 days.

## 6.4.2 Long Term Revocable Permit

The long-term revocable permit is intended for uses in the right-of-way of over 90 days. The costs, duration and approval of each long-term permit will be determined on a case by case basis.

## 6.4.3 Approval, Expiration, and Renewal

A minimum of 5 working days is required for the Local Entity Engineer's approval. The permit may be issued for no more than 90 days and may be renewed for 90-day periods with written application and payment of fees.

## 6.4.4 Requirements

The permit may require the installation of fencing and adequate lighting and marking to protect pedestrian and vehicular traffic. If required, a protected walkway shall be built and maintained around obstructions. No parking is allowed within 15 feet of the fire hydrant.

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## 6.4.5 Removal

All obstructions shall be removed within 10 days after the completion of work. If encroachments or obstructions are located contrary to the terms of the permit they shall be removed within 10 days of notice.

## 6.5 OVERSIZED LOAD PERMIT

## 6.5.1 Moving Over-Length, Over-Sized, Over-Weight Vehicles

A permit is required for the movement of all over-length, over-sized and/or overweight vehicles.

#### A. Oversized Load Permit

This shall be required for vehicles in accordance with the Model Traffic Code.

#### **B.** Approval and Expiration

A minimum of 5 working days is required for the Local Entity Engineer's approval. The permit expires at the end of the calendar year.

#### C. Proof of Insurance

Proof of insurance in the following amounts must be submitted:

- 1. \$1 million General Liability insurance.
- 2. \$1 million Auto Liability insurance.

### 6.5.2 Moving Buildings, Houses, and Mobile Homes

A permit is required for the movement of all buildings, houses, or mobile homes on public streets.

#### A. Notification

All of the following departments shall be notified a minimum of 24 hours prior to moving of the structure or mobile home: Local Entity Forester, Water & Sewer Department, Police Department, Light & Power, Traffic Engineering, and all other affected utility companies.

#### **B.** Expiration, Renewal

The permit may be issued for no more than 90 days and may be renewed for 90-day periods with written application and payment of fees.

#### C. Proof of Insurance

Proof of insurance in the following amounts must be submitted:

1. \$1 million General Liability insurance.

2. \$1 million Auto Liability insurance.

## 6.5.3 Hazardous Materials

All moving of hazardous materials must be permitted by the State and/or Local Entity fire authority. The Oversized Load permit is not valid for vehicles transporting hazardous materials.

## 6.5.4 Special Transport Permit, Larimer County

Submittal requirements for obtaining a special transport permit are as follows:

#### A. Proof of Insurance

Proof of insurance in the following amounts must be submitted to and approved by Larimer County Risk Management before the Special Transport Permit will be issued.

- 1. \$1 million General Liability insurance.
- 2. \$1 million Auto Liability insurance.
- 3. Larimer County shown as "Additional Insured" on both.

#### **B.** Routing Map

The routing map must be submitted, checked for bridge weight restrictions, overhead utilities, and other obstructions, and approved before the permit will be issued.

#### C. Axle Configuration

The proposed axle configuration will also be checked against the listed items for the routing map, particularly for any bridge weight restriction.

#### **D.** Utility Notification

The Applicant will be required to notify any affected utility companies on the proposed route.

### 6.6 OTHER PERMITS

### A. Permit for House Numbers on Curbs in Fort Collins (City Limits Only)

A permit is required for painting house numbers on Local Entity curbs. The numbers are to relate to and identify the house on the lot directly adjacent to or abutting the curb on which the numbers are painted.

- 1. <u>House Number Standard Specifications</u>. All house numbers shall be painted on curbs in accordance with the standard specifications as follows:
  - a. Height. 4 to 5-inch numbers.

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- b. Width. Half-inch stroke width.
- c. Colors. White lettering, black background.
- d. Type. Basic block style lettering.
- e. Location.
  - 1) Corner Lots. The numbers shall be located on the curb, on the same side of the house as the house numbers.
  - 2) Interior Lots. The numbers shall be located on the curb, to the side of the drive approach that is closest to the center of the house.
- 2. <u>Approval and Expiration</u>. A minimum of 2 days is required for the Local Entity Engineer's approval. The permit expires at the end of the calendar year.

## **B.** Blasting Permit

- 1. <u>General</u>. The Contractor's blasting procedures shall conform to Federal, State, and local ordinances. The local Fire Authority issues the blasting permit. In addition, the Contractor shall acquire all required permits prior to the start of blasting.
- 2. <u>Storage of Explosives</u>. The Contractor shall use the utmost care to protect life and property. All explosives shall be safely and securely stored in compliance with local laws and ordinances, and all storage places shall be clearly marked "Dangerous Explosives." No explosives shall be left unprotected where they could endanger life or property.
- 3. <u>Safety Precautions</u>. When blasting in trenches, the Contractor shall cover the area to be shot with earth backfill or approved blasting mats. Prior to blasting, the Contractor shall station floggers and provide signal of danger in suitable places to warn people and stop vehicles. The Contractor shall be responsible for all damage to property and injury to persons resulting from blasting or accidental explosions that may occur in connection with the use of explosives.

### C. Stockpiling Permit in Fort Collins (City Limits Only)

- 1. <u>General</u>. A permit is required for stockpiling fill material on vacant land in anticipation of future use of the material.
- 2. <u>Application Process</u>. Applications are available at the City of Fort Collins Engineering Department at 281 North College Avenue. A completed and signed application is to be submitted to the Engineering Department with the following items:
  - a. Site Grading and Erosion Control Plan prepared by a Professional Engineer licensed in Colorado (6 copies)
  - b. Floodplain Use Permit application (if applicable)

- c. Proposed schedule for the hauling and stabilizing of stockpiled fill material
- d. Proposed haul route shown on a City map (for hauling greater than 100 cubic yards to the site)
- e. Proposed traffic control plan for hauling operations that will impede or may impact traffic
- f. Other information may be required for large hauling operations
- 3. <u>Process Time Required</u>. Plan for a minimum of 3 weeks to review and process the application before a permit can be issued. Projects that have complex issues, such as floodplain or natural area impacts, may take longer to process.
- 4. <u>Permit Issuance</u>. A Stockpiling Permit will be issued following review and approval of the application and the Site Grading and Erosion Control Plans, by the City to ensure that the placement of stockpiles will not cause harm to the public features regulated by the City.
- 5. <u>Permit Expiration</u>. Stockpiling permits expire 30 days from the date of issuance, unless otherwise designated by the Local Entity Engineer. The Permittee may apply for an extension within two (2) working days of the expiration date.
- 6. Please Note:
  - a. In no way does this permit to stockpile relate to approval or denial of further development on the property.
  - b. No material may be placed in a floodplain without a Floodplain Use Permit.
  - c. Be certain that the Stockpile material is suitable for the intended future use of the site.

## 6.7 FEES

Fees are established separately by each Local Entity. Applicants should refer to the applicable Local Entity regulations for the current fees. Appendix B-4 includes lists of the fees current for the date listed. Fees will change from time to time, therefore, the listed fees may not be correct.

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# CHAPTER 7 – STREET DESIGN AND TECHNICAL CRITERIA

# 7.1 GENERAL

This chapter defines layout criteria and other design criteria that shall be followed for locating and designing all streets. The chapter provides the following information:

- How streets are to be located (layout criteria);
- Street classifications and purposes; and
- Minimum design criteria that must be met.

# 7.1.1 Conforming to Standards and Master Plans

The Project's street design and layout shall conform to these Standards and with the Local Entity's Transportation Master Plan (TMP) and other applicable plan documents such as Master Plans, Corridor Plans, Area Plans, codes and standards adopted by the Local Entity Authority.

# 7.1.2 Construction Drawings Relating to Chapter 7

**Appendix A** includes Construction Drawings that are a part of these Standards. Note that "F" and "L" denote Fort Collins or Loveland on drawings that are specific to just one Entity and its related Growth Management Area. Please refer to the Construction Drawing List at the beginning of **Appendix A**.

# 7.2 STREET LAYOUT REQUIREMENTS

The locations of Major streets shall be in accordance with the TMP. Other streets shall be located in accordance with all other applicable street layout requirements.

# 7.2.1 Logical Placement and Extension

All streets shall have a logical relationship to the existing topography and to the location of existing or platted streets within adjacent properties. Certain streets within the Project may need to be extended to the Project boundary to provide for the future logical extension of the street through adjacent properties.

In the City of Fort Collins, street layout shall conform to the Connectivity and Block Size Standards in the *City of Fort Collins Land Use Code*.

To ensure connectivity, enhance general circulation and to provide secondary points for access, the street layout for all subdivisions should include the following connecting street spacing:

## A. Fort Collins (city limits only)

At least one connecting street to neighboring vacant land for every 660 feet in Fort Collins (city limits only).

## **B.** All Other Urban Areas

At least one connecting street to neighboring vacant land for every 1320 feet in all other areas.

# 7.2.2 Master Planned Arterial and Major Collector Streets

The TMP for each Local Entity shows the approximate locations of all Arterial streets and some Collector streets for the Local Entity and its Growth Management Area (GMA). The TMP shall be used for establishing approximate locations of Major streets. The Local Entity Engineer shall hold approval authority for specific locations for all Arterial and Collector streets.

# A. Transportation Master Plan (TMP) Documents

The relevant TMP documents for each Local Entity are as follows:

- 1. City of Fort Collins current Master Street Plan.
- 2. City of Loveland current Transportation Plan
- 3. Larimer County Transportation Plan.
- **B.** Larimer county will use the Local Entity's current Master Street Plan to identify a road's classification and determine a road's right-of-way and typical sections within their respective Growth Management Areas. However, Larimer County reserves the right to use the classification shown on the Larimer County Road Functional Classification Map.

# C. New Streets

New Arterial streets are unlimited in continuity. The maximum permitted length between 90 degree turns and sign-controlled or roundabout intersections is 2 miles on Major Collector streets.

# 7.2.3 Local and Minor Collector Streets

Layout of new Local streets and Collector streets not covered by the Local Entity's TMP shall meet the needs of the specific development and satisfy all other specific requirements of this chapter. The Local Entity retains the authority to designate collector streets and retains authority for approval of the overall street layout.

# A. Neighborhood Traffic Safety and Traffic Calming

A major component in street layout is neighborhood traffic safety. This is an essential transportation issue in the Larimer County urban areas. Traffic calming is the implementation of physical and perceptual techniques intended to slow or divert traffic on existing or planned roadways. It is often a reactive approach to minimize high speeds and volumes of vehicular traffic. Significant efforts in traffic calming have been put forward on existing Roadways and in the development of new Roadways to limit traffic speeds and traffic volumes in neighborhoods and to provide for safer travel for all modes of transportation including pedestrian, bicycle, and vehicular. In addition, new streets shall be laid out to minimize opportunities for cut-through traffic. See **Chapter 18, Neighborhood Traffic Safety**.

## B. Roadway Use

The necessity or desire for traffic safety and calming stems from the perception that at times Local or Minor Collector roadways, particularly in residential areas, do not function as they are intended. Local Roadways and Minor Collectors are intended as a low volume roadways used for direct access to residences fronting on the street and as a multi-modal system that is shared by vehicular, bicycle, and pedestrian traffic equally in a manner that minimally impact residents who reside in these areas.

## C. Commercial

Commercial Local streets have less multi-modal conflicts and are permitted to have longer continuity and less restrictive traffic calming requirements.

# D. Maximum Length

New Minor Collectors and Local streets are limited in continuity. The maximum permitted length between 90 degree turns and controlled intersections is 660 feet on local streets. The maximum continuous length for a Minor Collector is 2640 feet.

# 7.3 STREET CLASSIFICATIONS

All streets are classified as Arterial, Collector, Local streets, Lanes, or Alleys. These classifications relate to the function of the streets. Lower order streets function primarily as access to individual lots, and higher order streets function primarily for the purpose of mobility (expeditious movement of people and goods). Each Local Entity has adopted an expanded classifications system that is to be used within their respective jurisdictions.

Each classification used must conform with the Local Entity TMP, when applicable, and meet all of the criteria for the specific classification. The primary test for the new streets not shown on the Local Entity's TMP shall be the anticipated traffic volumes for the desired classification (refer to **Chapter 4, Transportation Impact Study,** for traffic study requirements).

# 7.3.1 Street Classifications for Each Local Entity

# A. City of Fort Collins Classifications

**Figures 7-1F** through **7-13F**, located at the end of this chapter, show street classifications and specific requirements for Fort Collins (city limits and GMA). provides a summary of the classification requirements. In Fort Collins (city limits and GMA), variations of these classifications may be approved with the adoption of subarea plans and other specific plans of the Local Entity. Classifications and related figure numbers are as follows:

<u>Figure No.</u>	Street Classification
Figure 7-1F	6-Lane Arterial Street
Figure 7-2F	4-Lane Arterial Street
Figure 7-3F	2-Lane Arterial Street
Figure 7-4F	Major Collector Street
Figure 7-5F	Minor Collector Street
Figure 7-6F	Commercial Local Street
Figure 7-7F	Industrial Local Street
Figure 7-8F	Connector Local Street
Figure 7-9F	Residential Local Street
Figure 7-11F	Alley (A) (Drainage to Center)
Figure 7-12F	Alley (B) (Drainage to One Side)
Figure 7-13F	Rural Residential Local Street 7-1F

# **B.** City of Loveland Classifications

**Figures 7-1L** through **7-11L**, located at the end of this chapter, show street classifications and specific requirements for Loveland (GMA and city limits). **Table 7-2** provides a summary of the classification requirements. Classifications and related figure numbers are as follows:

Figure No.	Street Classification
Figure 7-1L	6-Lane Arterial Street
Figure 7-2L	4-Lane Arterial Street
Figure 7-3L	2-Lane Arterial Street
Figure 7-4L	Major Collector Street/Commercial Collector Street
Figure 7-5L	Minor Collector Street
Figure 7-6L	Commercial/Industrial Local Street
Figure 7-7L	Residential Local Street
Figure 7-8L	Lane
Figure 7-9L	Alley (A) (Drainage to Center)
Figure 7-10L	Alley (B) (Drainage to One Side)
Figure 7-11L	Rural Road

# 7.4 GENERAL DESIGN ELEMENTS

All streets shall be designed in accordance with design speeds specified for each street classification in the above-referenced figures and Table 7-3 or Table 7-4.

# 7.4.1 Alignment

Horizontal and vertical street alignments should conform to existing land layout plus the following criteria:

## A. Horizontal Alignment

On Arterial and Major Collector roadways, curve radii and tangents shall be as large as possible using the minimums only where necessary. However, minimum radius curves shall be used on Local Residential, Minor Collector, and Connector Local streets unless otherwise required. Angle point direction changes are not allowed. All changes in direction shall be made using standard curves.

- 1. <u>Horizontal Curve Radii</u>. The minimum allowable centerline radii for horizontal curves shall be as designated in **Table 7-3** or **Table 7-4**. Reverse and compound curves should be used only when a single radius curve will not work. For driver safety, compound curves shall have a ratio no greater than 1.5 where the value of the larger radius is divided by the smaller radius.
- 2. Minimum Tangent Length
  - a. Intersection. Whenever a street intersects a street of higher or equal classification, a tangent length ( as measured in a straight line from the nearest gutter flowline of the intersected street to the point on the centerline of the intersecting street) shall be provided for safe sight distance and safe traffic operation. The minimum required tangent lengths indicated in **Table 7-3** and **Table 7-4** apply to the, the leg(s) for which the crown is not carried through

the intersection. The angle of departure shall not exceed 10 degrees for the length of tangent.

b. Reverse Curves. The tangent between reverse curves shall be no less than the length shown in **Table 7-3** and **Table 7-4**.

		Table 7-	1		
Fort Collins	(GMA and City	/ Limits)Street	Standards	- General	<b>Parameters</b>

Street Classification:	6-Lane Arterial	4-lane Arterial	Modified 4-lane Arterial *n	2-lane Arterial	Major Collector (without parking)	Minor Collector (with parking)	Commercial Local	Industrial Local	Connector Local	Residential Local	Alley *a	Rural Residential Local
Right of Way (ROW) Width	141'	115'	102'	84'	66'	76'	72'	66'	57'	51' *m	12'- 20'	46'
Roadway Width	107'	83'	74'	52'	42'	54'	50'	44'	36'	30'	12'-20'	28'
Median Width	19'&7' *b	19'&7' *b	Optional *c	None	Optional *c	Optional *c	Optional *c	Optional *c	Optional *c	None	None	Optional *c
No. of Travel Lanes	6	4	4	2	2	2	2	2	2	1	1	2
Travel Lane Width *p	11'-12'	11'-12'	11'	11'	11'-12' *d	11'	10'	11'12'	10'	16'	12'-20'	0
Designated Bike Lanes?	Y	Υ	Y	Υ	Y	Υ	Υ	N *e	N *e	N *e	N *e	N *e
Bike Lane - width (P)rotected, (B)uffered	7' P	6' B	6.5' *o B	7' B	7' B	5' w/parking 6' w/lt turn' B	7' or 8' *h B	0'	0' or 6' *f B	0' *i	0'	0'
Parking Lane Width	None	None	None	None	None	8' or None *j	7' or None *j	10'	8' or None *j	7'	None	Not Defined
Lane Striping Req'd (T)ravel, (B)ike, (P)arking	T,B	T,B	T,B	Т,В	T,B	T,B,P	T,B/P or T,B	None	T,P or None	None	None	None
Min. Parkway Width	10'	10'	8'	10'	7'	6'	6'	6.5'	6'	6' *m	NA	9'
Min. Sidewalk width * k	7'	6'	6'	6'	5'	5'	5'	4.5'	4.5'	4.5'	None	None
Left Turn Lanes Req'd?	Y	Y	Y	Y	N or Y *d	N or Y *j	N or Y *j	N	N or Y *j	N	NA	N
Left Turn Lane Width	12'	12'	11'	11'	0' or 12'	0' or 12'	0' or 12'	0'	0' or 10'	0'	NA	0'
Speed Limit, mph	40 - 45	35 - 45	35 - 45	30-45	30 – 35	25 - 30	25	25	25	25	15	25
Fence minimum setbacks, feet from parkway edge of sidewalk	10'	8'	8'	8'	7'	7'	7'	6.5'	6.5'	6.5'	3' or 8' *l	9' *d
Driveway & Street Access	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Unlimited	Unlimited	Unlimited	Unlimited
Curb & Gutter Vertical or Driveover	V	V	V	V	V	V	V	V	V	V or D	V or D	V or D
*a The maximu *b Medians sh *c Additional s *d To provide I 12' wide left *e Bikes share *f If bike lanes *g An 11' lane *h A 7' wide bi *I Additional s volumes of	Im length of all be 19' wid treet width sh eft turn lanes turn lane wit travel lanes are required for shared pa ke lane is pro- treet width u bike traffic wi	of an Alley shall be 600 feet.         wide standard width or 7'wide where a 12' left turn lane is needed.         n shall be required for development requested medians.         nes at intersections, 8' additional roadway width is required to provide an with 5' buffered bike lanes and 11' travel lanes.         ues with 5' buffered bike lanes and 11' travel lanes.         ues with motor vehicles.         ired, additional street width will be required to provide 6' wide bike lanes.         d parking and bikes is provided.         provided when parking is removed for a left turn lane.         h up to 4' wider may be required in the travel lane to accommodate higher c within and leading to activity areas.         * 0         * 0         * 0         * 1         * 0         * 0         * 1         * 1         * 2         * 3         * 4         * 4         * 5         * 6         * 7         * 8         * 9         * 1         * 1         * 2         * 3         * 4         * 4         * 5         * 6         * 7         * 7         * 8					red. cipated higher pedestrian om the alley ROW. With a ck is 3' from the alley ened by 1 foot, thereby -of-way situations and oncrete gutter pan pon review and approval					

		-	Table 7-2		
Loveland (	GMA and City	y Limits	) Street Standards -	General	Parameters

Street Classification:		Major Arterial Minor Arterial (4-6 Lanes) (2 Lanes)		Major Collector	Minor Collector	Local Com/Ind	Local Resid	Lane	Alley	
Functional Parameters	No. of Dwelling Units Served	NA	NA	>300	101-300	NA	21-100	<20		
	Average Daily Traffic At Build-out	16,001-48,000	7,001-16,000	3,001-7,000	1,001-3,000	201-1,000	201-1,000	Max. 200	Max. 200	
	Access	See Table 7-4	See Table 7-4	1 forward access per lot (if access cannot be provided from a lower classification	Max. 2 per Street Frontage	No limit	No limit	No limit	No limit	
	Continuity (see definitions)	Unlimited	Unlimited	2 miles	2640' Max	660' Max	660' Max	660' Max	660' Max	
Land Use	Min. right-of-way	120' or 140' 5,11	100'	80'	67'	60'	50'	34'	20'	
Requirements	Min. Utility (Each Easement Side)	14'	14'	14'	14'	14'	14'	14'	10'	
Geometric Parameters	Minimum Street Width (Flowline to flowline)	80-116' <sup>4,12</sup>	38'-76' <sup>4</sup>	48' (w/parking) 38' (no parking)	44' (w/parking) 36' (no parking)	34' (w/parking)	34' (w/parking)	34' (w/parking) 28' (restricted parking <sup>7</sup> )	20' (in 20' ROW <sup>8</sup> )	
	Min. Lane Width <sup>9</sup>	12'	12'	12'	11'		-			
	Turn Lanes	Required <sup>3</sup>	Required <sup>3</sup>	Not Req.	Not Req.	Not Req.	Not Req.	Not Req.	Not Req.	
	Bicycles	5'-7' lane	5'-7' lane²	5'-7' lane <sup>2</sup> 12' lane (when combined w/ parking)	5'-7' lane <sup>2</sup> 11' lane (when combined w/ parking)	Share Street	Share Street	Share Street	Share Surface	
	Sidewalk Width <sup>1</sup>	6' min.	6' min.	6' min.	5' min.	5' min.	5' min.	5' min.	NA	
	Sidewalk Location	Detached by 10' min.	Detached by 10' min.	Detached by 6' min.	Detached by 6' min.	Attached or detached	Attached or detached	Attached or detached – one side only	NA	
	Curb Type	Vertical	Vertical	Vertical	Vertical, Drive over or Rollover	Vertical, Drive over or Rollover	Vertical, Drive over or Rollover	Vertical, Drive over or Rollover		
1       Sidewalk m         2       5' width exit         3       Left turn lai         4       Minimum w         5       Required o         6       Sidewalks i         7       One side o	hay not be required in ind clusive of gutter nes always required, righ ridths must be increased n Taft Ave., Wilson Ave., may be attached when a nly	ustrial zones with init t turn lanes required to provide auxiliary t Eisenhower Blvd., H djacent to single fam	ial development if TIS indicates need. urn lanes where needed wy 287, and 14th St. SW ly residential homes	8 May be reduced 9 Lane width is me 10 Commercial / Inc 11 This width includ 12 This width includ	<ul> <li>8 May be reduced to 16' when necessary due to existing obstructions (power poles, etc.)</li> <li>9 Lane width is measured from lip of gutter to center of lane stripe.</li> <li>10 Commercial / Industrial area</li> <li>11 This width includes turn lanes and minimum right of way at the intersection</li> <li>12 This width includes turn lanes and double lefts at the intersection</li> </ul>					

Design Element		Arterial				Collector		Local	Local		
U U		4 or 6 lane		2 lane		Major	Minor	Comm/Industrial	Residential	1 7	
Overall Design Pa	rameters					· · ·		•	•		
Design Speed / Posted Speed		50/40-45 (6) 50/35-45 (4)		50/30-45		40/30-35	40/25-30	30/25	30/25 connector 25/25	15	
Stopping Sight Dist	ance	400'		400'		275'	275'	200'	200'	100'	
Horizontal Alignm	ent	-									
Minimum centerline (with no super-elevation	e radius ation)	1075'		1075'		600'	600'	275'	275' connector 165'	50'	
Maximum super-ele	evation	0.04 ft/ft		0.04 ft/ft		0.04 ft/ft	NA	NA	NA	NA	
Minimum tangent b at intersections <sup>1</sup>	etween curves or	200'		200'		150'	100'	100'	100'	20'	
Vertical Alignmen	t	-									
Maximum Centerlin	e Grade	5%		5%		6%	8%	8%	8%	8%	
Minimum Gutter Flo	owline Grade	0.5%		0.5%		0.5%	0.5%	0.5%	0.5%	0.5%	
Minimum K-values for Vertica	Crest	110		110		60	60	30	30 connector 20 all others	10	
Curves	Sag	90		90		60	60	40	40 connector 30 all others	20	
Intersection Desig	IN										
Minimum sight dista and intersections	ance at driveways	1030'		1030'		660'	660'	310'	260'	210'	
Access Managem	ent	Without Raised Median	With Raised Median	Without Raised Median	With Raised Median						
Distance	Signalized	2640'⁵ Mi	n.	2640'⁵ Mi	n.	NA	NA	NA	NA	NA	
between intersections <sup>2</sup>	Unsignalized	460' – 660' <sup>5</sup> 1320' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 660' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 1320' <sup>6</sup> Min.	460' – 660' ⁵ 660' <sup>6</sup> Min.	330' Min.	250' Min.	200' Min.	200' Min.	NA	
Distance between high volume driveways and intersections <sup>2</sup>		460' – 660' <sup>5</sup> 1320' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 660' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 1320' <sup>6</sup> Min.	330' Min.	200' Min.	175' Min.	175' Min.	150' Min.	NA	
Distance between driveway edges		460' – 660' ⁵ 660' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 660' <sup>6</sup> Min.	460' – 660' <sup>5</sup> 660' <sup>6</sup> Min.	330' Min.	75' Min.	30' Min.	30' Min.	12' Min.	No limit	
Corner clearance bet	ween	460' – 66	0' 5	460' – 66	0' 5	175' Min.	100' Min.	175' Min.	50' Min.	40' Min.	
Driveway approach	street config. <sup>3</sup>	Radial cu	Radial curb return		ırb return	Curb cut <sup>4</sup>	Curb cut <sup>4</sup>	Curb cut <sup>4</sup>	Curb cut <sup>4</sup>	Curb cut <sup>4</sup>	

Table 7-3 Fort Collins (GMA and City Limits) Street Standards - Technical Design Criteria

Intersection tangents are measured from flowline of the intersected street at intersections. Note: Two curves in the same direction must be separated by a tangent at least two times the minimum tangent 1 lengths shown in Table 7-3 and Table 7-4.

2 These distances are measured as As shown in Figure 9-1.

3

4 5

Table indicates residential driveways. All commercial driveways shall be constructed with radial curb returns (see Section 9.3.2). Radial curb returns are also allowed where traffic volumes meet the requirements for a High Volume Driveway. For a distance less than 460' an administrative variance must be approved by the Local Entity Engineer; for a distance greater than 660' a modification in accordance with the Land Use Code will be required.

 Table 7-4

 Loveland (GMA and City Limits) Street Standards - Technical Design Criteria

Design Element		Arterial			Collector		Local		Lane	Alley	
		4 or 6 la	ine	2-lane		Major	Minor	Comm/Industrial	Residential		
<b>Overall Design P</b>	arameters										
Design Speed /											
Posted Speed		50/45		45/40		40/35	30/25	30/25	25/25	20/20	NA
Stopping Sight	Distance	400'		325'		275'	200'	200'	150'	125'	100'
Horizontal Align	ment										
Minimum center	line radius	1075'		825'		600'	275'	275'	165'	90'	50'
(with no super-e	levation)										
Maximum super-	elevation	0.04 ft/tt		0.04 ft/tt		0.04 ft/ft	NA	NA	NA	NA	NA
Minimum tangen or at intersection	t between curves	200'		200'		150'	100'	100'	50'	0	0
Vertical Alignme	nt										
Maximum Center	rline Grade	5%		5%		6%	8%	8%	8%	8%	8%
Minimum Gutter	Flowline Grade	0.5%		0.5%		0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Minimum	Crest	110		80		60	45 <sup>6</sup>				
K-values for Vertical Curves	Sag	90		70		60	40	40'	30	20	20
Intersection Des	ign										
Minimum sight d	listance at	1030'		830'		660'	310'	310'	260'	210'	210'
driveways and in	ntersections										
Access Manager	nent	Without Raised Median	With Raised Median	Without Raised Median	With Raised Median						
Minimum	Signalized	2640'		2640'		NA	NA	NA	NA	NA	NA
distance between intersections <sup>2</sup>	Unsignalized	1320' <sup>3</sup>	660'	1320' <sup>3</sup>	660'	330'	250'	200'	200'	200'	NA
Minimum distand volume driveway clearance betwe driveways and ir	ce between high /s and corner en high volume htersections <sup>2</sup>	1320' <sup>3</sup>	660'	1320' <sup>3</sup>	660'	200'	175'	175'	150'	NA	NA
Minimum distand driveway edges	ce between	660'	660'	660'	330'	75'	30'	30'	12'	12'	No limit
Minimum corner clearance between driveways or alleys and intersections <sup>2</sup>		1320' <sup>3,4</sup>		660'		175'	100'	100'	80'	60'	50'
Driveway approa	ch configuration	Radial cu	rb return	Radial cu	rb return	Curb cut <sup>5</sup>					
<ul> <li>Tangents are measured from flowline of intersecting street at intersections. See Section 7.4.1, A, .2. for more information.</li> <li>These distances are measured as shown in Figure 9-1.</li> <li>Only allowed if shown to comply with ACF ordinances.</li> <li>600' for speeds ≤ 45 mph subject to Traffic Impact Study findings.</li> </ul>											

<sup>6</sup> AASHTO values may be used within 100' of controlled intersections, or other locations where speeds are reduced.

- c. Broken Back Curves. Two curves in the same direction (broken back curves) shall be separated by a tangent with a length of at least 2 times the minimum length shown in **Table 7-3** and **Table 7-4**.
- 3. <u>Consistent Radii</u>. All curves along a street shall be designed with radii that are approximately equal. The purpose of this limitation is to provide consistency and minimize unexpected difficult or quick maneuvers for the driver.
- 4. <u>Curves with Small Deflection Angles (10° or less</u>). To reduce the appearance of kinks in the street, minimum lengths of curve shall be designed with minimum arc lengths as shown in **Table 7-5**.

	_
Street Classification	Minimum Centerline Arc Length (ft.)
Arterial	400
Collector	300
Local, Commercial & Industrial	200
Local, Residential	100

Table 7-5Centerline Arc Lengths

- 5. <u>Horizontal Curves on Vertical Curves</u>. For driver safety, horizontal curves shall not begin near the top of a crest vertical curve nor near the bottom of a sag vertical curve.
- 6. <u>Transitions for Roadway Shifts or Lane Drops</u>. Refer to requirements for redirect /approach and bay taper, Figures 8-2 and 8-3.
- 7. <u>Coefficient of Friction</u>. The coefficient of friction shall conform to the values in Figure III-1 of the **AASHTO "Green Book."**
- 8. <u>Off-Site Design Centerline, Flowlines and Cross Sections</u>. To assure that future street improvements will meet these Standards the centerline, flowline, and cross sections of all streets, except cul-de-sacs, shall be continued for 500 feet beyond the proposed construction. The grade and ground lines of all Arterials shall be continued and additional 500 feet for a total of 1000 feet beyond the end of the proposed construction.
- 9. Joining Existing Improvements. Connection with existing streets shall be made to match the existing alignment grade of the existing improvements, in accordance with horizontal alignment criteria.
- 10. Street Widening at Turns. See Section 7.6.3
- **B.** Vertical Alignment
  - 1. <u>Maximum and Minimum Grades for Streets</u>. The maximum and minimum grades for specific street classifications are shown in to **Table 7-3** and **Table 7-4**. The

centerline grade in the bulb of a cul-de-sac shall not exceed 3 percent. For Fort Collins (city limits only), the flowline grade in the bulb of a cul-de-sac shall be a minimum of 1 percent. Where sidewalks and/ or ramps cross the flowline ADA requirements shall be met for the flowline grades.

- 2. <u>Minimum Flowline Grades</u>. Minimum flowline grades for gutters shall be 0.50 percent, except the bulb of cul-de-sacs where the minimum shall be 1.0 percent.
- 3. <u>Grade Breaks</u>. No single point grade break shall exceed 0.40 percent, except for the flow line in sag curves where the maximum grade break is 1.0%. In curb returns, a grade break may be as great as 3.0% for extreme circumstances., Grade Breaks, except for those located within curb returns shall be spaced at least 25 feet apart. (25 feet minimum between grade breaks).
- 4. <u>Requirements for Using Vertical Curves</u>. Vertical curves are required for grade changes that exceed 1.0 percent. Both centerlines and the curb and gutter flowlines shall be designed with vertical curves to meet the requirements of Figures 7-17 and 7-18. A series of grade breaks may be used in lieu of a specified vertical curve as long as the series of breaks meet the vertical curve criteria in these Standards for the design speed. K-values for design shall conform to Table 7-3 or Table 7-4. No grade changes are allowed at the beginning or end of a vertical curve, the curve information shall be based on the curve going into or out of the vertical curve. In sag curves on flow line, the minimum grade requirement shall override the slope within the vertical curve.
  - a. Minimum Length Crest and Sag. **Figures 7-17** and **7-18** give minimum length of crest and sag vertical curves for various algebraic differences in grade. Street designs shall meet or exceed these minimums.
  - b. Crest Curves. For crest curves, the street centerline, curb, and gutter shall be designed with vertical curves in accordance with minimum requirements shown on Figure 7-17. K-values for design shall conform to Table 7-3 and Table 7-4.
  - c. Sump Sag Curves. For sag curves the street centerline shall be designed with a vertical curve with minimum length as shown on **Figure 7-18**. The minimum flowline grade on a sag curve shall be 0.5 percent. Curb and gutter shall be constructed with no vertical curve in these areas. The grade into an inlet located in a sump shall have a .5 percent grade into and out of the inlet. The inlet(s) themselves in these situations do not need to meet the minimum flowline grades.
- 5. <u>Joining Existing Improvements</u>. Connection with existing streets shall be made to match the existing grade of the existing improvements, in accordance with vertical alignment criteria. (Grade breaks shall not exceed allowable.)
- 6. <u>Vertical Clearance</u>. Vertical clearance above a roadway is a minimum of 13.5 feet.
- 7. <u>Intersection Approach Grades</u>. Intersection approach grades are discussed in **Chapter 8, Intersections**.

8. <u>Off-Site Continuance of Grade and Ground Lines</u>. To assure that future street improvements will meet these Standards the centerline and flowline profiles, the grade and ground lines of all local and collector streets, except cul-de-sacs, shall be continued for 500 feet beyond the proposed construction. The centerline and flowline profiles, the grade and ground lines of all Arterials shall be continued 1000 feet beyond the proposed construction.

## C. Sight Distance

Sight distance is the distance necessary for a vehicle operator to perform expected functions and be able to do so without causing a hazard for the driver or other vehicle operators for the specific design speed of the street. Vehicles shall perform moves without causing other vehicles to slow from the average running speed. In no case shall the distance be less than the stopping sight distance. This includes visibility at intersections and driveways as well as around curves and roadside encroachments.

- 1. <u>Stopping Sight Distance for Vehicle Crest Curves</u>. Stopping sight distance is calculated As follows:
- 2. Object height is 6 inches above road surface and viewer's height is 3.50 feet above road surface. Stopping Sight Distance on Horizontal Curves. Where an object off the pavement restricts sight distance, the minimum radius of curvature is determined by the stopping sight distance (see Figures 7-15.1 and 7-15.2). In no case shall the stopping sight distance be less than as specified in Table 7-3 or Table 7-4. The sight distance design procedure shall assume a 6-foot high fence (as measured from actual finished grade) exists at all property lines except in the sight-distance easements that may be required to preserve the needed sight distance.

Stopping sight distance on horizontal curves is based upon lateral clearance from the inner edge of pavement to sight obstruction, for various radii of inner edge of pavement and design speeds. The position of the driver's eye and the object sighted shall be assumed to be 6 ft. from the inner edge of pavement, with the sight distance being measured along this arc. Stopping sight distances are given in **Table 7-6**.

Stopping and Fassing Sight Distance					
Design Speed (Mph)	Stopping Sight Distance (feet)	Passing Sight Distance (feet)			
20	125	800			
25	150	1000			
30	200	1100			
35	250	1300			
40	275	1500			
45	325	1650			
50	400	1800			

Table 7-6Stopping and Passing Sight Distance

From AASHTO "Green Book" Table III-1, Table III-5 and Table VII-3 (For Intersection and Driveway Sight- Distance, see Figure 7-16.)

- 3. <u>Passing Sight Distance (Rural Applications Only)</u>. Two-lane roads shall provide adequate passing zones. Required passing sight distance for given design speeds is given in **Table 7-6**. Passing zones are to be provided on 2 lane roads, which may be classified as 4 and 6 lane Arterials and occasionally on 2-lane Arterials and Major Collectors.
- 4. <u>Corner Sight Distance</u>. The corner sight distance provides for vehicles to enter traffic and accelerate to the average running speed. Corner sight distance shall be measured as shown in **Figure 7-16**.
- 5. <u>Sight Distance Triangles and Easements</u>. All sight-distance easements must be shown on the street plan/profile plans. All sight distances must be within the public right-of-way or a sight distance easement. If the line of sight crosses onto private property, a "Sight Distance Easement" shall be dedicated to provide the required sight distance. The easement or right-of-way shall be dedicated to the Local Entity, however, maintenance shall be noted on the final plat as the responsibility of a private entity such as the property owner or the home owners association.
- 6. <u>Sight Obstructions</u>. Any object within the sight distance easement more than 30 inches above the flowline elevation of the adjacent street shall constitute a sight obstruction, and shall be removed or lowered. Such objects include but are not limited to berms, buildings, parked vehicles on private property, cut slopes, hedges, trees, bushes, utility cabinets or tall crops.

Mailbox clusters must be installed a minimum of 2 feet from back of walk and not cause any sight obstruction. Mailboxes must not pose a fixed object hazard for vehicles and pedestrians. Since parked vehicles are under the control of the Local Entity, parked vehicles shall not be considered an obstruction for design purposes. The city may limit parking to protect visibility. The sight distance shall be measured to the centerline of the closest through-lane in both directions.

In no case shall any permanent object encroach into the line-of-sight of any part of the sight-distance triangle. Street trees required by the Local Entity are excepted from this requirement. Trees are permitted if pruned up to 8 feet.

7. Sight Distance (City of Loveland and Loveland GMA only). In addition to the sight distance triangle requirements, a clear space zone is required within all curb returns (measured from point of curb return to point of curb return) where no trees, shrubs, aesthetic structures/features, monument signs, or objects that have the potential to hinder driver visibility, and/or pedestrian and bicycle safety, are allowed. See Figure 7-34L.

#### **D.** Interim Pavement Edge

In situations where curb and gutter are not installed along the roadway edge and/or in situations where the full street widening in accordance with the Street Classification

is not being constructed an asphalt shoulder shall be provided that is the same width as existed prior to construction or 4 feet, whichever is greater. A minimum 2 foot gravel shoulder shall be provided beyond the edge of asphalt.

# 7.4.2 Cross Slope

Cross slope on a pavement is provided to drain water from the street surface. The design of cross slope shall consider driver comfort and safety.

## A. Minimum Cross Slope

A minimum cross slope on all streets shall be 2.0 percent. Minimum cross slope on reconstruction or overlays is 1.5 percent.

## B. Maximum Allowable Cross Slope

Maximum allowable cross slope on all new construction shall be 3 percent. Maximum allowable Cross Slope on any reconstruction or overlays of existing roadways shall be 4 percent.

## C. Cross Slope for Street Modifications

When widening an existing street or adding turn lanes to an existing street, the resulting cross slope of the widened portion shall be within the limits stated above and the new Cross Slope shall be no less than the existing cross slope.

However, if the cross slope of the existing street exceeds the Standards then new curb and gutter shall be designed such that the existing pavement, when overlaid, will result in a straight line cross slope grade that meets these Standards. Alternatively, the existing pavement may be removed and reprofiled to comply with these Standards.

## **D.** Cross Slope for Cul-de-Sacs

Refer to Figure 7-19 for cul-de-sac bulb cross slopes.

## 7.4.3 Superelevation on Horizontal Curves

The purpose of superelevating a roadway is to maintain the riding comfort on smaller than standard curves. Superelevation may only be used when other means of design will not work. The following criteria shall be followed:

## A. Where Superelevation Is Permitted

Superelevation may be allowed for curves on Arterial and Major Collector streets in order to reduce the minimum centerline radius. In no case shall superelevation exceed 4.0 percent cross slope. As specified in **Table 7-3** or **Table 7-4**, superelevation shall not be used to reduce minimum radii on Local or Minor Collector Streets.

## **B.** Run-Out

When superelevation is used, a minimum 100-foot run-out shall be used entering and exiting the superelevated portion.

# C. Drainage

Where the superelevation is used, the gutter shall always be an inflow type. The water must enter a storm sewer system or other acceptable outlet from the street rather than crossing the street in sheet flow or in crosspans.

# 7.4.4 Design Speed

Each roadway classification has a specific design speed. See Table 7-3 or Table 7-4.

# 7.4.5 Curb Return Radii

The required curb return radii are defined in **Table 8-1** or **Table 8-2**, unless otherwise approved or required by the Local Entity Engineer.

# 7.4.6 Streetscape Design

For all street landscaping standards, including median and parkway sections within the Fort Collins (city limits only), see Appendix C, *City of Fort Collins Streetscape Design Standards and Guidelines.* 

# 7.5 MEDIANS

# 7.5.1 Medians

## A. General Requirements

General criteria for medians are specified on **Figures 7-1 through 7-13.** In Loveland (GMA and city limits) painted or raised medians are required on all Arterial Streets. In Fort Collins (GMA and city limits) raised medians are required on all 4-Lane and 6-Lane Arterial Streets. Other medians may be required by the Local Entity Engineer for specific circumstances to control traffic. Medians requested by Developers may be approved as long as additional rights-of-way are dedicated and all maintenance shall be done by viable private parties.

- 1. Refer to Construction Drawings 704, 705, and 801 for design and construction details on medians.
- 2. The minimum width of any raised median shall be 4 feet wide. See **Construction Drawing 801**.
- 3. Raised center medians shall have an 8 inch high curb measured from the pavement surface (Loveland City Limits and Loveland GMA only).

## **B.** Turn Lane and Access

The design of medians shall include the evaluation for needed turn lanes and accesses. For the minimum requirements of turn lanes, refer to **Chapter 8**, **Intersections**.

## C. Drainage

Landscaped medians shall be provided with drainage facilities to handle sprinkler runoff and nuisance flows. Sprinklers shall be designed to prevent spray onto the pavement surface. Refer to Local Entity requirements for specific median landscape design in **Appendix C**. A properly designed drain system shall be required.

# **D.** Curb and Gutter

If gutters are not needed to handle drainage referenced above, medians may be constructed with a curb glued to the pavement surface a barrier curb or with outfall curb and gutters.

## E. Nose

Use vehicle tracking templates to determine the position of the median nose so that vehicles do not track onto the median. Refer to **Construction Drawing703**.

The minimum radius for nose curbs shall be 2 feet to flowline. See **Construction Drawing801**.

## F. Paving

All non-landscaped areas of medians shall be paved with stamped concrete, brick pavers, concrete, or exposed aggregate concrete in accordance with streetscape standards of the Local Entity. Standard width medians shall be designed in accordance with streetscape standards for the Local Entity.

## **G.** Transitions

The ends of medians shall transition into turn lanes with a minimum radius of 100 feet. A change of directions must be accomplished with the use of radii. Angle points shall not be allowed.

# H. Objects

No permanent structures, including light poles, fire hydrants, trees, etc., shall be placed within 5 feet of the travel lane or in any location that would obstruct sight distance except for structures as approved in these Standards. If a median streetlight is placed within 5 feet of the travel lane, the light must be a breakaway model.

# 7.6 NON-CONNECTIVE STREET ALIGNMENTS

# 7.6.1 Cul-de-Sacs

Cul-de-sacs shall be used only where necessary.

## A. Permitted Locations

Cul-de-sacs are permitted only on Local Streets in conformance with Figures 7-19 and7-21. In Loveland (GMA and city limits) cul-de-sacs may conform to Figure 7-22L.

# B. Maximum Length

The cul-de-sac shall have a maximum length of 660 feet, (400 feet in Loveland (city limits only)). If commercial sites or residences install fire sprinkler systems, the Local Entity may increase this length to 1,000 feet, or to 1,320 in Fort Collins (city limits only) in accordance with Local Entity Fire Standards.

# C. Secondary Access in Loveland (GMA and City Limits)

Any cul-de-sac that does not meet the requirements of Section 7.6.1 B shall be provided with a secondary access road per Section 7.8.

## D. Minimum Radius

The cul-de-sac shall have a minimum flowline radius per Figures 7-21.

# E. Minimum Parking

A minimum of one parking space must be provided for each residence. All parking areas outside of the right-of-way shall have the appropriate easements and shall be maintained by private entities. Refer to **Chapter 19, Parking**.

# 7.6.2 Eyebrows

# A. Permitted Locations

Eyebrows shall be permitted only on Local Streets that intersect Local Streets in conformance with Figure 7-23.

# **B.** Spacing Requirements

The location of the Eyebrow shall be in conformance with spacing requirements in **Chapter 9, Access Requirements and Criteria**.

# C. Permitted Lengths

Eyebrows shall be a minimum of 25 feet in length and a maximum of 100 feet measured along the flowline.

# 7.6.3 Turns

When a roadway width is less than 36 feet wide and the centerline radius is less than requirements of **Table 7-3** or **Table 7-4**, requirements of Figure 7-24 shall be met for turns. No other widening (Knuckles) are permitted.

# 7.6.4 Dead-End Streets.

# A. Permanent Dead-End Streets

New permanent dead-end streets are prohibited.

# **B.** Temporary Dead-End Streets

Temporary dead-end streets will be permitted only on streets that have no direct access from adjoining property. Additionally, a temporary dead-end street shall be planned to extend into neighboring property during a later development phase or project. The road must be fully constructed to the property line, except in Loveland (GMA and city limits) where the length must exceed 150' before the temporary turnaround would be required).

1. <u>Signage</u>. Signage for temporary, dead-end Roadways shall be in accordance with **Chapter 14, Traffic Control Devices.** 

# C. Temporary Turnarounds

At locations where a street will be temporarily terminated with access provided from the street and the street is planned to be extended with future development, a temporary turnaround shall be constructed. The turnaround shall have a minimum

Page 7-18

radius of 50 feet to the edge of the completed dead-end street. Refer to **Figure 7-26** No curb and gutter is required on temporary turnarounds.

#### **D.** Temporary Turnaround Easements

All temporary turnarounds shall be constructed within an access Easement. The Easement may be vacated by the Local Entity when the Easement is no longer necessary. Application for vacation of the easement must be initiated and paid for by the Developer or property owner.

# 7.7 DRAINAGE SYSTEMS

## 7.7.1 Drainage

Drainage system design shall be in accordance with current Local Entity storm drainage requirements.

# 7.7.2 Grading in Right-of-way

#### A. Slopes

The maximum slopes for all areas within the Right of Way or outside of the right of way that can affect the public improvements, shall be 4:1 unless designed with retaining walls. Any slopes proposed to exceed 4:1 must be proven to be stable and must be approved by the Local Entity Engineer. In general, retaining walls are discouraged and not allowed within the right-of-way. Refer to **Chapter 11**, **Structures** for design requirements. The minimum slopes in non-roadway areas shall be 2 percent unless otherwise allowed by the Local Entity Engineer. All areas shall be seeded or stabilized in accordance with these Standards or the requirements of the Local Entity Storm Water Utility, whichever is more conservative.

## **B.** Off-site Fill Material

Any material from an off site location to be used in rights-of-way or areas within the influence area of the right-of-way must be tested and discussed within the Soils Investigation Studies. Refer to Chapter 5, Soils Investigation for specific requirements.

## 7.7.3 Subdrains

## A. Controlling Groundwater

Subdrains used for the purpose of controlling groundwater on private property may be constructed within public right-of-way if certain criteria are met. The system shall be private and must be maintained by viable private parties and approved with an Encroachment Permit if applicable. Refer to Chapter 12, Utility Locations, for allowable locations within the right-of-way. Refer to Chapter 5, Soils Investigations for information on design criteria.

## **B.** Protecting Right-of-way Improvements

Subdrains constructed for the purpose of protecting public right-of-way improvements may be installed only if other means are not possible. The Local Entity shall own and maintain these systems.

In Loveland (GMA and city limits) and Fort Collins (GMA only), all subdrain systems must be owned and maintained by a private party other than the Local Entity.)

# C. Design Criteria

- 1. All subdrains covered by these Standards shall be designed to meet the following criteria:
  - a. Positive Outfall: Demonstrate that subdrain has positive outfall for gravity drainage; prevent surcharging of subdrain.
  - b. Adequate Engineering: Demonstrate that the system has been designed in consideration of site-specific groundwater conditions, soil properties, topography, and layout of proposed development. Address maintenance aspects of recommended design.
  - c. Sanitary Sewer Kept Dry (minimize infiltration): Demonstrate that the subdrain system maintains adequate flow capacity under peak hydraulic loading rates to keep groundwater below the invert of the sanitary sewer.
  - d. No Offsite Transport: Show that the system will neither receive groundwater inflow from additional upstream developments, nor transfer collected groundwater to downstream developments.
  - e. Water Rights: The system shall be shown to create no injury to existing water rights or others on their property in the project vicinity.
  - f. One Year Monitoring After Construction: The system shall incorporate provisions to allow monitoring of groundwater levels to confirm that it is functioning as designed.
  - g. Design for Seasonal High Water: The system shall be designed in consideration of seasonal high groundwater levels anticipated at the project site.
  - h. Groundwater Barriers: The system shall be designed such that clay cutoff walls are provided at boundaries of the development to preclude hydraulic communication with offsite utility trenches either upstream or downstream.
  - i. Filter Fabric: The utility trench shall be lined with a filter fabric specifically selected in consideration of on-site soil conditions in order to minimize the invasion of fine soil particles into the bedding gravel.
  - j. Pipe Diameter: 8 inches minimum for mains; 3 inches minimum for laterals (pipe diameter shall be different from the sewer lateral).

# D. Subdrain Placement and Cleanouts

Construction Drawings 713.1F, 713.1L, 713.2F, and 713.2L show general requirements for subdrain placement, location of cleanouts and service.)

# 7.7.4 Sidewalk Culvert (Chases)

Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the roadway by use of a sidewalk culvert or other methods approved by the Local Entity Engineer.

A sidewalk culvert shall not be located within a curb ramp, curb cut, or driveway. Sidewalk culverts shall only be allowed in special situations, on a case-by-case basis, as determined by the Local Entity Engineer. Sidewalk chase sections shall be constructed in accordance with **Construction Drawing709**.

# 7.7.5 Crosspans

## A. Basic Requirements

Crosspans for passing storm drainage flow across roadways shall be constructed in accordance with the **Construction Drawings 708 and 710**. The pans shall be a minimum of 6 feet wide with 7/8-inch typical catch. Mid-block crosspans shall be a minimum of 12 feet wide with 1-3/4 inches typical depth. Greater widths may be required by the Local Entity Engineer.

## **B.** Dimensions and Depth

Crosspans shall be a minimum width of 6 feet and a 7/8-inch typical catch adjacent to residential streets. Crosspans adjacent to Collector streets shall be 8 feet wide with a typical depth of 1-1/8 inches and crosspans adjacent to an Arterial shall be 10 feet wide with a typical depth of 1-1/2 inches. Refer to **Construction Drawing 708**.

## C. Prohibited on Arterial and Collector Streets

No crosspans are allowed to cross Arterial streets. No crosspans are allowed to cross Collector streets in Fort Collins (GMA and city limits).

## D. Minimum Grade

Minimum grade on crosspans at flowline of pan shall be 0.5 percent.

## **E.** Crosspan Transitions

The following criteria shall be followed for crosspan approaches:

- 1. <u>Design Speeds</u>. Pavement transition from standard crown to crosspan shall be designed using the appropriate design speeds as given in **Table 7-3** and **Table 7-4**.
- 2. <u>Intersections</u>. Transitions from standard crown to crosspan at intersections shall be designed in accordance with **Figures 7-27 and 7-28**. Details shall be prepared to show the elevations in the locations shown on **Figures 7-27 and 7-28**.
- 3. <u>Pavement Material</u>. In asphalt paved streets, approaches to crosspans shall be constructed with full depth asphalt wedges per **Construction Drawing 710**.

# F. Monolithic Paving

If pavement is concrete, any drainage conveyance, such as crosspans, may be poured monolithically with the main line paving process.

# 7.7.6 Sidewalks, Curb and Gutter

## A. Sidewalks

- <u>Typical Cross-Sections</u>. Roadway typical sections that include sidewalks shall be as specified in this chapter. The typical cross-sections are summarized in Figures 7-1F through 7-13F and 7-1L through 7-11L and Construction Drawing 1601 and 1602.
- 2. <u>Other Sidewalk Requirements</u>. Refer to **Chapter 16**, **Pedestrian Facilities**, for specific sidewalk requirements.

# **B.** Curb and Gutter

**Tables 7-1 and 7-2 and Figures 7-1 through 7-13** or the type of curb and gutter to be used for the various street classifications.

- 1. <u>Drive-Over Curbs</u>. Drive-over combination curb, gutter, and walk is permitted as indicated on Tables 7-1 and 7-2 and as indicated in the referenced Figures, on Local Roadways only.
- 2. <u>Median Islands</u>. All median islands shall be designed with curb and gutter as shown in **Construction Drawing 703, 704 and 705**. For median island standards, see **Section 7.5**.
- 3. <u>Vertical Curb and Gutter (Type II)</u>. The vertical curb or curb and gutter section shall be in accordance with **Construction Drawing 701**. In Fort Collins (GMA and city limits), all new streets shall be constructed using vertical curb and gutter except for the Residential Local Street and Alley where Drive-Over curb and gutter may be used.

# 7.7.7 Inlets

Inlets located in a sidewalk shall be integrated with sidewalks. The inlet access shall be flush with the sidewalk surface. No manholes, inlets, or other storm sewer facilities are allowed within curb ramps. Refer to the appropriate Local Entity requirements for sizing of inlets. Inlets are not allowed in the curb return, but shall be located at or behind the tangent points of the curb returns.

# 7.7.8 Waterway Crossings

All waterway crossings beneath and/or within the public right-of-way shall be designed to minimize maintenance requirements. For irrigation structures, the minimization of silting within the structure must be addressed. The design shall maintain or increase the water velocity through the structure to minimize silting or provide other design elements to address this issue.

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# 7.7.9 Rural Roadside Ditches

Any rural or interim roadway sections developed without curbs (and with roadside drainage ditches) must complete the ditch construction with the installation of sod or other approved erosion control blanket within the ditch area. The profile grade of the ditch shall be maintained at a minimum slope of one (1) percent and a maximum slope of five (5) percent. The side slopes of the ditches outside of the Right of Way shall be a minimum of 4:1 and meet any specific criteria of the Local Entity Storm Water Utility. Flatter slopes may be considered when a paved invert is designed for the ditch bottom.

## A. Slope

The slope and capacity of any roadside ditches shall be maintained in any areas that driveways cross the ditch. Each site is required to provide a HDPE or concrete pipe, a minimum of fifteen (15) inches in diameter, calculated to meet capacity and strength requirements of the Storm Water Utility. The pipe shall be designed to have no less than twelve (12) inches of cover over the pipe. All portions of the driveway within the Right of Way shall be paved with concrete or asphalt.

# B. Maintenance

All driveway improvements within the right-of-way including piping, ditches, curb and gutter, and sidewalk are the responsibility of the adjoining property owner. The Local Entity will not provide maintenance of these items.

# 7.8 EMERGENCY ACCESS REQUIREMENTS

Any emergency access not on public streets shall be provided in accordance with the Emergency Access Section in the City of Fort Collins Land Use Code or in accordance with the requirements of the Loveland Fire Marshall.

# 7.8.1 Slope

The slope of the fire lanes shall be a minimum of 0.5 percent and a maximum of 8 percent.

# 7.8.2 Cross Slope

The Cross Slope of the fire lanes shall be minimum of 1.0 percent and a maximum of 4.0 percent.

# 7.8.3 Lane Width

The lane width shall be a minimum of 20 feet from the edge of the roadway to edge of the roadway and shall be in an access Easement. The access Easement shall have a minimum width of 20 feet. The lane widths may be required to be increased through horizontal curves to accommodate fire truck passage.

# 7.8.4 Vertical Clearance

There shall be a minimum of 13.5 feet of vertical clearance over the entire fire lane.

# 7.8.5 Barricade

The fire lane may have an approved barricade, but it must be approved by the Local Entity Fire Department.

# 7.8.6 Roadway Surface

The surface of the roadway must be a paved surface complying with Local Street pavement thickness requirements, unless approved otherwise by the Local Entity Engineer.

# 7.8.7 Maintenance

All access roadways shall be maintained and kept clear for emergency use at all times.

# 7.9 BUS STOPS

# 7.9.1 General

The following minimum design criteria for the construction of bus stops. The Local Entity Engineer may vary any of the following requirements as deemed appropriate for the site and its particular situation. The Designer shall propose and the Local Entity Engineer will approve the exact location of the bus stop in a proposed development. All bus bay locations shall be coordinated with the Local Entity Engineer.

# 7.9.2 Bus Lane Width

Bus bays should be at least 10 feet wide.

# 7.9.3 Bus Stops

All bus stop locations shall be constructed with concrete pavement in accordance with Chapter 22, Construction Specifications and Bus Stop Design Standards and Guildelines

## A. Approach Leg (Near-side) Minimum Criteria

Bus stops on the approach leg of an intersection (near-side) should be at least 55 feet back from the pedestrian crosswalk at the intersection or at least 50 feet back from the intersection curb return (point of curvature, P.C.), plus 50 feet long for a single bus. If on-street parking is present, an additional 50 feet minimum shall be provided behind the bus stop for the bus to transition to the stop. See Figure 5 of the Bus Stop Design Standards and Guidelines for more information.

## B. Departure Leg (Far-side) Minimum Criteria

Bus stops on the departure leg of an intersection (far-side) should provide at least a 50-foot long loading area for a single bus, measured at least 5 feet from the pedestrian crosswalk or measured from the intersection curb return (point of curvature, P.C.).. If on-street parking is present, an additional 50 feet minimum shall be provided behind the bus stop for the bus to transition back into traffic. See Figure 5 of the Bus Stop Design Standards and Guidelines for more information.

Page 7-24

# C. Mid-Block

Mid-block stops shall be designed with entrance and exit designed for the posted speed limit in accordance with the transition criteria in **Construction Drawing 711**. For example, impacted area for a single bus stop ranges from about 150 to 200 feet, yielding a minimum of a 400 to 600-foot block for application.

# 7.9.4 Bus Bays

All bus pullouts and bays shall be designed and constructed in accordance with the requirements in **Construction Drawing 711**.

# 7.9.5 Bus Shelters

For access and design guidelines for bus shelters, refer to Chapter 16, Pedestrian Facilities.

# 7.9.6 Bus Pullout Lanes

Bus pullouts shall be constructed with no less than 50 feet between an intersection curb return (point of curvature, P.C.) and the beginning of the lead in taper. Bus pullouts for higher speed limits shall be as shown in **Construction Drawing 711**.

# 7.10 IMPROVEMENT OF ANNEXED STREETS

For improvement of annexed streets in Fort Collins (city limits only), See Appendix "H".



LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE	
STREET STANDARDS	FIGURE	DATE: September, 2016	7–1F	

# FORT COLLINS ONLY



4 - LANE MODIFIED ARTERIAL STREET			
LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7- /













<u>BIKE LANES</u>: Bicyclists shall share the travel lanes with motor vehicles. Additional width may be required in the parking lanes to provide 14' wide bike/parking shared lanes within and leading to activity areas.

PARKING: Two lanes 10' wide.

PARKWAY: 6.5' (min.) width. Additional width optional.

SIDEWALK: 4.5' (min.) width. Additional width may be required within and leading to activity areas.

MEDIAN: Not required, except where necessary to control access and/or to provide pedestrian refuge. Additional roadway and right of way width may be required.

 $\underline{\mathsf{W}\mathsf{H}\mathsf{E}\mathsf{R}\mathsf{E}\;\mathsf{U}\mathsf{S}\mathsf{E}\mathsf{D}}$  . These specifications shall apply to streets used in industrial areas for local access and circulation.

DESIGN SPEED: 30 MPH

SPEED LIMIT: 25 MPH

ACCESS: Access will be limited. Points of access must be approved by the Local Entity.

CONTINUITY: Streets are limited in length to 1320 feet.

FENCES: Setback a minimum of 6.5' from the parkway edge of the sidewalk.

CURB AND GUTTER: Vertical curb and gutter.

(	INDUSTRIAL LOCAL STREET			
Γ	LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
	STREET STANDARDS	FIGURE	DATE: September, 2016	7-7F




$\left( \right)$	RES	IDENTIAL LO	CAL STREET	
	LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE: September, 2016	7-9F

# FORT COLLINS ONLY



ROADWAY WIDTH: 12' to 20'. (20' width required for commercial and industrial areas)

RIGHT OF WAY WIDTH: 12' to 20'. (20' width required for commercial and industrial areas)

PARKING: None. Parking must be provided on private property.

<u>WHERE USED</u>: An alley may be used to provide secondary vehicular access only to the rear of properties served by a street, if allowed by city code.

DESIGN SPEED: 15 MPH

SPEED LIMIT: 15 MPH.

DRIVEWAY CONNECTIONS TO ALLEYS: Driveway connections to alleys must be flared in accordance with Detail 1.

<u>ALLEY CONNECTIONS TO STREETS</u>: Where an alley intersects the right of way for a street 10' x 10' corner cuts shall be dedicated as R.O.W. for visibility as shown in Detail 2 below. These areas may be landscaped no higher than 12". No fences may encroach into this area.

CONTINUITY: Alleys are limited in length to 660 feet.

<u>GARAGE DOOR SET BACK:</u>  $\star$  Option 1: 8' for fences placed with a setback equal to 8' or more. Option 2: 20' feet minimum for fences placed less than 8' from the edge of the alley.

<u>FENCES</u>: Fences may be placed as close as 3' from the right-of-way line on private property when the garage door is set back at least 20' from the right-of-way. Minimum setback is 8' for garage door setback less than 20' from the right-of-way.

 $\star$  Building setbacks shall be in accordance with the Land Use Code.



DETAIL 1

Drivew	vay Flare
а	b
FT.	FT.
0	0
2'	6'
4'	8'
5'	8'
6'	8'
	Drivew a FT. 0 2' 4' 5' 6'



$\left( \right)$	ALLEY OPT	'ION (A) (Dra	ainage f	to Center	
	LARIMER COUNTY	DESIGN	REVISION	NO: 1	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE:	04/01/07	7–11F



RIGHT OF WAY WIDTH: 12' to 20'. (20' width required for commercial and industrial areas)

PARKING: None. Parking must be provided on private property.

<u>WHERE USED</u>: An alley may be used to provide secondary vehicular access only to the rear of properties served by a street, if allowed by city code.

DESIGN SPEED: 15 MPH

SPEED LIMIT: 15 MPH.

DRIVEWAY CONNECTIONS TO ALLEYS: Driveway connections to alleys must be flared in accordance with Detail 1.

<u>ALLEY CONNECTIONS TO STREETS</u>: Where an alley intersects the right of way for a street 10' x 10' corner cuts shall be dedicated as R.O.W. for visibility as shown in Detail 2 below. These areas may be landscaped no higher than 12". No fences may encroach into this area.

CONTINUITY: Alleys are limited in length to 660 feet.

GARAGE DOOR SET BACK:  $\star$  Option 1: 8' for fences placed with a setback equal to 8' or more. Option 2: 20' feet minimum for fences placed less than 8' from the edge of the alley.

<u>FENCES</u>: Fences may be placed as close as 3' from the right-of-way line on private property when the garage door is set back at least 20' from the right-of-way. Minimum setback is 8' for garage door setback less than 20' from the right-of-way.

Sidewalk

 $\star$  Building setbacks shall be in accordance with the Land Use Code.



$\left( \right)$	ALLEY OPTIC	ON (B) (Drai	nage to	One Si	de)
	LARIMER COUNTY	DESIGN	REVISION	NO: 1	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE:	04/01/07	7–12F

## FORT COLLINS ONLY



ROADWAY WIDTH: 28'.

RIGHT OF WAY WIDTH: 46' (min.)

BIKE LANES: Bicyclists share the travel lanes with motor vehicles.

PARKWAY: Both sides of the street.

PARKING: Both sides of street.

CURB AND GUTTER: Drive over or vertical curb and gutter.

WHERE USED: These specifications may be used for internal local streets of developments, with minimum lot sizes of one (1) acre or larger, and when the traffic volume, on the street is anticipated to be less than 300 vpd.

ACCESS: Access will be unlimited in accordance with these standards.

<u>CONTINUITY</u>: Streets are limited in length to 1,320 feet.

DESIGN SPEED: 25 MPH

SPEED LIMIT: 25 MPH

FENCES: Fences may be set on the right-of-way line as long as required sight distance is not obstructed.

GARAGE DOOR SETBACKS: 50'.

SIDEWALK: None.

$\bigcap$	RURAL	RESIDENTIAL	LOCAL	STREET	
	MER COUNTY	DESIGN	REVISION	NO:	FIGURE
STRE	ET STANDARDS	FIGURE	DATE:	09/11/00	7–13F



LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7-1L



ACCESS: No primary access to individual lots permitted. 1/2 mile spacing for signalized intersections.

CONTINUITY: Unlimited.

FENCES: Fences shall be placed outside of the landscaping buffer yard.

LANDSCAPING: Tree, Lawn, Median, and Buffer Area landscaping maintenance shall be the responsibility of the adjacent property owner, or HOA.

CURB AND GUTTER: Vertical curb and gutter.

4-1	LANE ARTERI	AL STREET	
LARIMER COUNTY	DESIGN	REVISION NO:	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7-2L



RIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
EET STANDARDS	FIGURE	DATE: September, 2016	7-3L

LARIMER

STREET S



ROADWAY WIDTH: 48' with parking. 38' without parking. 50' without parking but with left turn lane.

RIGHT OF WAY WIDTH: 80' (min.) plus 14' (min.) utility easement each side.

TRAVEL LANES: Two lanes, 12' wide.

BIKE LANES: Two lanes, 5' wide when adjacent to a parking or turn lane, 7' wide when adjacent to the curb.

PARKING: Optional. Two lanes, 7' wide, may be provided EXCEPT within 200' of intersections.

PARKWAY: 6' (min.) width.

<u>SIDEWALK</u>: 5' (min.) width, detached. Additional width may be required for higher pedestrian traffic in and leading to activity areas.

MEDIAN: None. Additional width would be required for development requested medians.

<u>WHERE USED</u>: These specifications shall apply as required by the Local Entity, when a Collector street is shown on the Master Street Plan or when the traffic volume on the street is anticipated to be in the range of 3,001 to 7,000 vehicles per day.

DESIGN SPEED: 40 MPH

POSTED SPEED: 35 MPH

<u>ACCESS</u>: 1 forward-direction access per lot (if access cannot be provided from a street of lower classification.

CONTINUITY: 2 miles

FENCES: Fences shall be placed outside of the landscaped buffer yard.

PARKWAY LANDSCAPING: Tree Lawn, Median, and Buffer Area landscaping shall be the responsibility of the adjacent property owner or HOA.

CURB AND GUTTER: Vertical.

<u>STRIPING</u>: The centerline and separate bike and parking lanes shall be marked on the pavement in conformance with the requirements of Chapter 14 Traffic Control Devices and **CONST. DWG. 1408L**.

$\left( \right)$	MAJOR COLLECT	OR/COMMERC	CIAL COLLECTOR ST	REET
	LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE: September, 2016	7-4L



TY	DESIGN	REVISION NO: 1	FIGURE
RDS	FIGURE	DATE: September, 2016	7-5L

LARIMER COUN URBAN AREA STREET STANDA



ROADWAY WIDTH: 34' wide (with parking).

RIGHT OF WAY WIDTH: 60' (min.) plus 28' (min.) utility easement.

LEFT TURN LANES: 11' wide at intersections where needed.

BIKE LANES: Share street.

PARKING: Two lanes wide shared with bikes. None provided at intersections.

PARKWAY: Not required. 6' (min.) width where used.

<u>SIDEWALK</u>: 5' (min.) width attached or detached. Additional width may be required within and leading to activity areas.

MEDIAN: None. Additional width required for development requesting medians.

<u>WHERE USED</u>: These specifications shall apply to streets used in commercial areas for local access and circulation, when the traffic volume on the street is anticipated to be in the range of 201 to 1,000 ADT.

DESIGN SPEED: 30 MPH

POSTED SPEED: 25 MPH

ACCESS: No limit.

CONTINUITY: Streets are limited in length to 660 feet.

FENCES: Setback a minimum of 2' from the edge of the sidewalk.

PARKWAY LANDSCAPING: Tree Lawn, Median, and Buffer Area landscaping shall be the responsibility of the adjacent property owner or HOA.

CURB AND GUTTER: Vertical, rollover, or driveover.

## COMMERCIAL/INDUSTRIAL LOCAL STREET

LARIMER COUNTY URBAN AREA STREET STANDARDS

DESIGN	
FIGURE	
IIGOIM	

DATE: September, 2016

**REVISION NO:** 

FIGURE 7-6L



ROADWAY WIDTH: 34' wide (with parking).

RIGHT OF WAY WIDTH: 50' (min.) plus 28' (min.) utility easement.

BIKE LANES: Share street.

PARKING: Two lanes 7' wide shared with bikes.

PARKWAY: Not required. 6' (min.) width where used.

<u>SIDEWALK</u>: 5' (min.) width attached or detached. Additional width may be required within and leading to activity areas.

MEDIAN: None. Additional width required for development requesting medians.

<u>WHERE USED</u>: These specifications shall apply to streets used in residential areas for local access and circulation, when the traffic volume on the street is anticipated to be in the range of 201 to 1,000 vpd.

DESIGN SPEED: 25 MPH

SPEED LIMIT: 25 MPH

ACCESS: No limit.

CONTINUITY: Streets are limited in length to 660 feet.

FENCES: Setback a minimum of 2' from the edge of the sidewalk.

PARKWAY LANDSCAPING: Tree, Lawn, Median, and Buffer Area landscaping shall be the responsibility of the adjacent property owner or HOA.

CURB AND GUTTER: Vertical, rollover, or driveover.

### RESIDENTIAL LOCAL STREET

LARIMER COUNTY URBAN AREA STREET STANDARDS

FIGURE
--------

DATE: September, 2016

**REVISION NO:** 

FIGURE 7-7L



ROADWAY WIDTH: 28' wide with parking on one side, 34' with parking on both sides.

RIGHT OF WAY WIDTH: 34' (min), 39' (min) w/sidewalk on both sides, 45' (min) w/parking & sidewalk on both sides.

SIDEWALK: 5' minimum, attached or detached, on 1 side or 2 sides within ROW.

BIKE LANES: Share street.

PARKING: One side for 28' roadway; both sides for 34' roadway.

PARKWAY: Optional, 6' min. width where used.

DESIGN SPEED: 20 MPH

SPEED LIMIT: 20 MPH

<u>CONTINUITY</u>: Streets are limited in length to 660 feet.

SIGNS: "No Parking" signs are required on one side of the street for restricted parking if roadway width is less than 34'.

	LANE		
LARIMER COUNTY	DESIGN	REVISION NO: 1	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7-8L



			•)
LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7-9L



ROADWAY WIDTH: 20'. May be reduced to 16' wide due to existing obstructions.

RIGHT OF WAY WIDTH: 20' wide plus 20' (min.) utility easement.

TRAVEL LANES: 20' wide (exclusive of gutter 1' shy distance to curb).

PARKING: None. Parking must be provided on private property.

WHERE USED: Secondary access only unless otherwise approved by the Local Entity Engineer. Traffic volume is anticipated to be less than 250 ADT.

DESIGN SPEED: N/A.

ACCESS: Access will be unlimited.

CONTINUITY: Streets are limited in length to 660 feet.

FENCES: Fences may be placed as close as 3' from the right of way line on private property.

DRIVEWAY CONNECTIONS TO ALLEYS: Driveway connections to alleys must be flared.

<u>ALLEY CONNECTIONS TO STREETS:</u> Where an alley intersects the right of way for a street, 10' x 10' corner cuts shall be dedicated R.O.W. for visibility as shown in Detail 1 below. These areas may be landscaped no higher than 24". No fences may encroach.

<u>GARAGE DOOR SETBACK:</u> Option 1: 8' for fences placed with a setback equal to 8' or more. Option 2: 20' minimum for fences placed less than 8' from the edge of the alley.



Alley	Driveway Flare		
Width	а	b	
FT.	FT.	FT.	
20	0	0	
18	2'	6'	
16	4'	8'	

$\left( \right)$	ALLEY OPTIO	ON (B) (DRAI	NAGE TO ONE SII	DE)
	LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE: September, 2016	7-10L



<u>WHERE USED</u>: These specifications may be used for estate type developments / gross density  $\leq$  2 dwelling units / acre or within separator or transition areas as recommended in other studies adopted by local entities.

DESIGN SPEED: See TABLE 7-4.

<u>SPEED LIMIT</u>: See **TABLE 7-4**.

GARAGE DOOR SETBACKS: 50' from edge of pavement.

SIDEWALK: None.

BIKE LANES: Bicyclists may use the 5' paved shoulder or share the roadway with motor vehicles.

GRAVEL SHOULDERS: Surface shall be covered with a minimum of 6" Class 5 or 6 Roadbase.

CONTINUITY: See **TABLE 7-2**.

DRAINAGE MAINTENANCE: The drainage ditches are the responsibility of the adjacent property owner or HOA.

RURAL ROAD			
LARIMER COUNTY	DESIGN	REVISION NO:	FIGURE
STREET STANDARDS	FIGURE	DATE: September, 2016	7-11L



LARIMER	COUNTY
URBAN	AREA
STREET ST	ANDARDS

DESIGN
FIGURE

#### REVISION NO: DATE: 09/11/00

FIGURE



(	CURVES PROVIDING	STOPPING DISTANCE	E FOR TURNIN	G ROADWAYS	
	LARIMER COUNTY	DESIGN	REVISION N	NO:	FIGURE
$\checkmark$	STREET STANDARDS	FIGURE	DATE: (	08/07/00	7-15.1



CONVES TROVIDING	STOLLING DISTANCE	S FOR TORN	ING NOADWAIS	
LARIMER COUNTY	DESIGN	REVISION	1 NO: 🔎	FIGURE
STREET STANDARDS	FIGURE	DATE:	08/07/00	7-15.2



URBAN AREA STREET STANDARDS

DESIGN
FIGURE

REVISION NO:DATE:09/11/00

FIGURE 7-16



	VERTICA	L CURVE LEN	IGTHS – CREST	
	LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
$\mathcal{L}$	STREET STANDARDS	FIGURE	DATE: 08/07/00	7-17



VERIIC.	AL CURVE L	ENGINS = SAG	
LARIMER COUNTY	DESIGN	<b>REVISION NO:</b>	FIGURE
STREET STANDARDS	FIGURE	DATE: 08/07/00	7-18



	LARIMER COUNTY URBAN AREA STREET STANDARDS	DESIGN FIGURE	REVISION	FIGURE
			DATE:	03/01/02





$\left( \right)$	STANDARD CUL-DE-SAC					
Į	LARIMER COUNTY	DESIGN	REVISION	NO:	1	FIGURE
$\mathcal{L}$	STREET STANDARDS	FIGURE	DATE:	03/01/	<b>'</b> 02	7-21





LARIME	R COUNTY
URBA	AN AREA
STREET	STANDARDS

REVISION NO: DATE: 11/16/00

FIGURE 7–23







LARIMER COUNTY	DESIGN FIGURE	REVISION	N NO:	1	FIGURE
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# **CHAPTER 8 – INTERSECTIONS**

#### 8.1 GENERAL

Intersections shall be designed to provide for the safety of motorists, pedestrians, and bicyclists. This chapter is based on criteria from the Institute of Transportation Engineers Traffic Engineering Handbook and AASHTO's A Policy on Geometric Design of Highways and Streets.

#### 8.1.1 Intersections as Conflict Locations

By their nature, intersections are conflict locations. Vehicles, pedestrians, and bicycles all cross paths. Each crossing is a conflict point. Intersections contain many conflict points.

#### A. Basic Intersection Design

The basic design of intersections includes the following objectives:

- 1. Minimize points of conflict;
- 2. Simplify areas of conflict;
- 3. Limit conflict frequency; and
- 4. Limit conflict severity.

These objectives can be achieved using the design elements presented below.

#### 8.2 INTERSECTION DESIGN CRITERIA

#### 8.2.1 Location of Intersections

For intersection location criteria, refer to **Chapter 9**, **Access Requirements and Criteria**, the current Master Street plan for each Local Entity and street layout criteria for the Local Entity.

#### 8.2.2 Lane Alignment

All lanes shall be in general alignment through each intersection, however a maximum 2foot shift is allowed across an intersection without a variance approval by the Local Entity Engineer..

#### 8.2.3 Angle of Intersection

New crossing roadways should intersect at 90 degrees whenever possible. In no case shall they intersect at less than 80 degrees or more than 100 degrees.

#### 8.2.4 Horizontal Alignment and Vertical Profile

#### A. Horizontal

The horizontal alignment of streets through an intersection shall be designed in conformance with **Tables 7-3 and 7-4**. Intersections may be placed on horizontal curves, provided that the tangent lengths given in **Tables 7-3 and 7-4** are provided on the minor street and the required sight distance is met.

#### **B.** Vertical

The street profile grade shall not exceed 4 percent on the approach to the intersection, as measured along the centerline of the street for a minimum distance equal to the tangent length for the street classification. The profile grade within the intersection streets shall not exceed 3 percent as shown on **Figure 8-17**.

#### C. Prevailing Street Grade

The grade of the street with the higher classification shall prevail at intersections. The lesser street shall adapt to the grade of the Major street. Grading of adjacent property and driveways shall adapt to the street grades. When roads are of equal classification, the Local Entity Engineer shall determine which street grade prevails.

#### 8.2.5 Exclusive Left Turn Lanes

Exclusive left turn lanes shall be provided on all arterial streets and other streets wherever left turn lanes are specified as needed by an access plan, required by these Standards or warranted and approved by the Local Entity Engineer. The Designer shall use information in the TIS to determine whether an exclusive left turn lane is warranted on non-arterial streets. To determine warrants, the following criteria shall be followed (modified) from the National Cooperative Highway Research Program Report 279 (NCHRP 279):

#### A. Warrants for Signalized Intersections

A separate left turn lane shall be required if one of the following criteria is met:

- 1. The left turn design volume is at least 20 percent of total approach volumes, or
- 2. The left turn design volume exceeds 100 vph in peak periods, or
- 3. The LOS criteria in **Chapter 4**, **Transportation Impact Studies**, are not satisfied without a separate left turn lane.

#### **B.** Warrants for Unsignalized Intersections

Left turn lanes may be required at approaches to intersections for which the combination of through, left, and opposing volumes exceeds warrants shown in **Figure 8-1.** The Local Entity Engineer will determine which peak hours to consider in this evaluation.

#### C. Design Criteria

Left turn lanes shall be designed to provide the following functions:

- 1. A means for safe deceleration outside the high speed through lane.
- 2. A storage length long enough for left turning vehicles so that signal phasing can be optimized and intersection delay minimized.
- 3. A means of separating movements at unsignalized intersections to reduce left turn impacts on other flows.

The design elements for a left turn lane are as shown in **Figure 8-11**. The elements are the approach taper, bay taper, lengths of lanes, width of lanes, and departure taper. For bay taper and approach taper lengths, see **Figure 8-2** and **Figure 8-3**. The required left turn lane widths shall be as specified in either **Table 7-1 or 7-2**.

#### 8.2.6 Exclusive Right Turn Lanes

Exclusive right turn lanes shall be provided at locations where they are specified as needed by an access plan, or where required by the applicable TIS, approved by the Local Entity Engineer.

#### A. Warrants for Right Turn Lanes

Figure 8-4 provides guidelines and warrants for whether a right turn lane shall be provided at intersections or accesses.

#### **B.** Design Criteria

Right turn lanes shall be designed to accomplish the following functions:

- 1. Provide a means of safe deceleration outside the high speed through lane.
- 2. Provide a separate storage area for right turns to assist in the optimization of traffic signal phasing.
- 3. Provide a means of separating right turn movements at stop controlled intersections.

The design elements, as shown in **Figure 8-9**, are the approach taper, bay taper, lengths of lanes, width of lanes, and departure taper. For approach taper lengths, see **Figure 8-5**.

#### C. Pedestrian Refuge

Where Pedestrian refuge is required, design it in accordance with Figure 8-19. If a right turn lane turns into an exclusive lane that continues, use Figure 8-18.

#### 8.2.7 Acceleration/Deceleration Lanes

For each high volume driveway and major intersection, acceleration/ deceleration lanes shall be considered. The criteria for the requirements are provided below. The specific designs for these lanes shall be in accordance with NCHRP 279 (1985 Edition) and this chapter.

#### A. Deceleration

Deceleration lane requirements are given in Sections 8.2.5 and 8.2.6.

#### **B.** Acceleration

Refer to NCHRP 279 (1985 Edition) for acceleration lane criteria. Fort Collins (GMA and city limits) does not generally want acceleration lanes.

#### 8.2.8 Design Vehicles

As a minimum, intersections shall be designed to accommodate the following AASHTO design vehicles for the specified turns. The minimum allowable intersection turning radii are as follows in accordance with the AASHTO A Policy on Geometric Design of Highways and Streets.

#### A. SU-30 (Single Unit Truck)

All SU-30 vehicles must be able to turn easily from one street to the next and remain in the correct lane for each roadway. This shall be required for all roadways and alleys.

#### B. B-40 (Bus)

All B-40 vehicles may use more than one traffic lane to complete the turn when turning from the correct lane without crossing into opposing traffic lanes and without tracking onto the curb at corners. This shall apply to all streets.

#### C. WB-50 (Large Semitrailer)

All WB-50 vehicles may use more than one traffic lane to complete the turn without tracking onto the curb at corners. In addition, the vehicle must make the turn in one forward maneuver not encroaching into opposing traffic lanes. This requirement shall apply to all Arterial/Arterial, Arterial/Collector, Arterial/Connector, Arterial/Local Commercial, Arterial/Local Industrial, Collector/Collector, and Collector intersections at Connectors, Local Commercial, and Industrial streets.

For all other intersections (including mini-roundabouts), the vehicles may use the entire paved surface of the street to negotiate the turn. The vehicle may have to back up to complete the turn.

#### D. WB-67 (Large Semitrailer).

All modern roundabouts and arterial intersections containing raised medians and channelizing islands shall be designed to accommodate a WB-67 vehicle.

#### E. Other Vehicles.

For special circumstances other design vehicles may be required by the Local Entity Engineer.

#### 8.2.9 Curb Returns

#### A. Curb Return Radii

The corner radii shall meet the following requirements in **Table 8-1** or **Table 8-2** unless otherwise approved or required by the Local Entity Engineer.

#### Table 8-1 Minimum Curb Return Radii -Loveland (GMA and City Limits)

	Local	Collector	Arterial						
Commercial Driveways, High Volume Driveway & Alley	15'	20'	20'						
Local	20'	20'	30'						
Collector	20'	25'	30'						
Arterial	30'	30'	35'						

#### Table 8-2 Minimum Curb Return Radii -Fort Collins (GMA and City Limits)

	Local	Collector	Arterial	
High Volume Driveway	15'	15'	20'	
Alley	5'	5'	5'	
Local	20'	20'	25'	
Collector	20'	20'	25'	
Arterial	25'	25'	25'	

For curb returns on a State Highway, **CDOT**'s curb radii requirements shall supersede these Standards.

#### **B.** Curb Return Grades

The minimum desirable grade for flowlines around the curb return should be 1 percent. The minimum allowable grade for flowlines around curb returns shall be 0.5 percent.

#### 8.2.10 Traffic Islands.

The following is a list of different types of traffic islands:

#### A. Corner Islands Separating Right Turns

Standard corner islands shall be used in 4- or 6-lane Arterial/Arterial intersections to channelize traffic where required to provide pedestrian refuge or where required by the Local Entity Engineer. The corner islands shall be designed as raised islands in accordance with Figures 8-18 or 8-19 for a right turn lane continuing to an exclusive lane or for a right turn lane stop condition, respectively. The striping shall be in accordance with the requirements of **Chapter 14**, **Traffic Control Devices**.

#### B. Median Islands Separating Opposing Traffic

Median islands are required at all Arterial/Arterial intersections. If raised medians are not required by these Standards, the median islands may be raised or painted. The length of the island shall include the appropriate approach taper, bay taper and length of lane required by the Standards, or supported by another approved resource standard. The design shall be in accordance with **Construction Drawing 801** and **Figure 8-11** and as follows:

- 1. <u>No Obstruction</u>. Medians must not obstruct the minimum left turn radius for the design vehicle(s).
- 2. <u>Drainage</u>. Landscaped medians shall include drainage facilities to handle sprinkler run-off and nuisance flows. When low maintenance landscaping is used in conjunction with trickle irrigation, drainage requirements may be waived and outfall curb and gutter should be used.

In Fort Collins (GMA and city limits), use barrier curb in accordance with **Construction Drawing 703**. Otherwise, inflow curb and storm drainage inlets and systems shall be provided to carry storm water.

- 3. <u>Gluedown Curb</u>. Gluedown curb is acceptable for medians when specifically approved by the Local Entity. In Loveland (GMA and city limits), the design must provide for 1 foot of clear distance between the face of the curb and the travel or left turn lane width.
- 4. <u>Median Islands Required</u>. Median islands are standard on all new 6-lane and 4lane Arterial streets. These islands shall be designed to provide pedestrian refuge. (See **Chapter 16**, **Pedestrian Facilities Design and Technical Criteria**, for design requirements.)

#### C. Median Islands on Minor Arterials, Collectors, or Local Streets

Raised medians may be placed in Minor Arterial, Collector, and all Local streets. If medians are included, they shall be placed in the public right-of-way, and they must meet the following Standards for design:

- 1. <u>No Obstruction</u>. The medians may not obstruct the design vehicle turns.
- 2. <u>Visibility</u>. The medians must be placed such that the required visibility in the intersection is not obstructed.
- 3. <u>Undiminished Use</u>. Medians must be placed so they do not diminish the intersection use.
- 4. <u>Alignment</u>. Lanes on one side of the intersection must align with the correct lanes on the opposite side of the intersection. Refer to **Section 8.2.2**.
- 5. <u>Median Maintenance</u>. These medians must be maintained by parties other than the Local Entity. The maintenance responsibility must be defined on the Final Development Plan, Plat or Development Agreement.
- 6. <u>Public Use</u>. The appropriate Local Entity may use these islands for roadway signing and may choose to remove the medians if it is deemed necessary by that Local Entity.
- 7. <u>Additional Right-of-way</u>. The Developer shall dedicate all additional right-ofway necessary to include these medians.
- 8. <u>Compliance with these Standards</u>. The median design must comply with all applicable median criteria in these Standards and the streetscape standards of the Local Entity.

#### **D.** Splitter Islands on Roundabouts

In modern roundabout designs, raised splitter islands shall be designed in accordance with Federal Highway Administration Roundabouts to direct traffic and provide pedestrian refuge.

#### 8.2.11 Traffic Signals, Striping and Signing

See Chapter 14, Traffic Control Devices.

#### 8.2.12 Access Ramps

#### See Chapter 16, Pedestrian Facilities Design and Technical Criteria.

#### 8.2.13 Right-of-way

#### A. Requirements

All intersection rights-of-way and utility easements shall be dedicated as shown in **Figure 8-12** to provide adequate right-of-way to include sidewalks, access ramps, and utilities. Additional right-of-way may be required at intersections to provide space for additional left or right turn lanes without reducing the widths of standard required facilities.

#### **B.** Roundabouts

In Loveland (GMA and city limits), on all Arterials and Major Collectors, additional right-of-way may be required at intersections in conformance with **Figure 8-16L** to accommodate the potential installation of a roundabout in the future.

#### 8.2.14 Intersection Sight Distance

Street intersections shall be designed so that adequate sight distance is provided along all streets. The required sight distance shall be determined by the design speed and grades of the street and the acceleration rate of an average vehicle as prescribed below.

#### A. Minimum Requirements

All designs must provide minimum safe stopping sight distance in accordance with **Chapter 7**, **Street Design and Technical Criteria**, and **AASHTO**. In addition, for all streets that intersect with Arterial and Collector streets, the sight distance must be large enough to allow a vehicle to enter the street and accelerate to the average running speed without interfering with the traffic flow on the Arterial or Collector street. The design sight distance values to be used are provided in **Figure 7-16**.

#### B. Landscaping and Hardscaping

No landscaping or hardscaping shall be permitted within a corner cut that will block the line of sight for pedestrian visibility, (not higher than 24 inches).

#### 8.2.15 Channelization

Channelization refers to physical or visual guides used to separate vehicles, bicycles and pedestrians into particular lanes.

#### A. Intent of Channelization

Channelization is intended to:

- 1. Prohibit undesirable or wrong way movements.
- 2. Define desirable vehicular paths.
- 3. Encourage safe vehicle speeds.
- 4. Separate points of conflict wherever possible.
- 5. Cause traffic streams to cross at right angles and merge at flat angles.
- 6. Facilitate high-priority traffic movements.
- 7. Facilitate traffic control scheme.
- 8. Remove decelerating, stopped, or slow vehicles from high-speed through-traffic streams.
- 9. Provide safe crossings for pedestrians/bicycles.
- 10. Provide safe refuge for pedestrians.

#### **B.** Specific Channelization Requirements

Channelization shall be required at locations where it is necessary for safety or to protect the operation of the major street. Examples include:

- 1. Providing raised medians in all Arterials where left turns are prohibited.
- 2. Providing exclusive turning lanes, with appropriate striping as shown in Figures 8-18 and 8-19.
- 3. Providing travel lanes, with widths as specified in the standard street cross sections. See Figures 7-1F through 7-13F or 7-1L through 7-11L.
- 4. Raised islands must be large enough to be visible to vehicle drivers. Therefore, no single island, including pedestrian paths and/or pedestrian refuge, shall be smaller than 100 square feet.

#### 8.2.16 Roadway Narrowing

Minor Collector or Local streets may be narrowed at intersections to provide more visibility for pedestrians. This shortens the distance necessary for pedestrians to cross the street. The narrowing shall not encroach into bike lanes or travel lanes. Narrowing may not be used on Major Collectors without any parking lanes, on any Arterials, or where the standard width is necessary. See **Chapter 18, Neighborhood Traffic Safety**, for design criteria.

#### 8.2.17 Roundabouts

#### 8.2.18 Roundabouts are considered a form of traffic control. Roundabouts shall be designed in accordance with the Roundabout Design Manual, included as Appendix I for reference only. Check with the Local Entity Engineer for the most current version of the Roundabout Design Manual.Bike Lanes at Intersections

See Chapter 17, Bicycle Facilities; Chapter 4, Transportation Impact Study; and Chapter 14, Traffic Control Devices.

#### 8.2.19 Pedestrian Requirements

See Chapter 14, Traffic Control Devices, concerning crosswalk requirements and Chapter 16, Pedestrian Facilities Design and Technical Criteria.

#### 8.2.20 Drainage

See Chapter 7, Street Design and Technical Criteria, concerning drainage.

#### 8.2.21 Pavement Requirements for Arterial/Arterial Intersections

All new and reconstructed Arterial/Arterial intersections are required to be designed and constructed with concrete pavement. The concrete paving shall extend on each approach leg to the beginning points of the bay tapers. When existing arterial/arterial intersections are expanded, the use of concrete pavement is only required where one or more complete lanes are added. Refer to **Chapter 10**, **Pavement Design and Report.** See CDOT M&S Standards for the typical concrete pavement joint locations.

#### 8.2.22 Intersection Lighting

See Chapter 15, Street Lighting, for street lighting requirements.

#### 8.2.23 Intersection Control

See Chapter 14, Traffic Control Devices, for intersection control.



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LARIMER COUNTY URBAN AREA STREET STANDARDS

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FIGURE 8-2

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# CHAPTER 9 – ACCESS REQUIREMENTS AND DESIGN CRITERIA

#### 9.1 GENERAL

Access may occur as one of two types: (1) access for land use (driveways) and (2) public streets (street intersections).

#### 9.1.1 Designing Placement of Accesses

#### A. Direct Access Restricted

Direct access to individual lots from Arterials is restricted. For City of Loveland (GMA and city limits) direct access to is restricted from Arterials and Collectors.

#### B. Avoiding Conflicts in Center Left Turn Lane

When establishing the placement of offset accesses (either driveways or intersections), ensure that traffic making left-hand turns into the accesses does not conflict or compete for the simultaneous use of a center left turn lane.

#### C. Separation Distances

The specific separation distances between accesses shall be as shown in **Table 7-3** or **Table 7-4**. Greater separation may be required to eliminate conflicts or overlaps of center left turn lanes as determined by TIS.

#### **D.** Access Control Plan

For a street controlled by an adopted Access Control Plan, the proposed access shall conform with the applicable Access Control Plan.

#### 9.1.2 Review and Approval

#### A. Review Procedure

- 1. Advice Available. To determine the extent of technical justification required for all access requests, consult with the Local Entity Engineering staff. It is recommended that this advice be sought prior to submitting any application.
- 2. Access Permits. All access permits shall be reviewed and approved through the Local Entity, in Fort Collins (GMA and city limits) and in Loveland (GMA only). Loveland (GMA and city limits) does not issue or require a separate access permit. The requirements of this chapter are covered in the City of Loveland's design review of the right-of-way permit.
- 3. Permit Required. A permit must be requested by the Developer and approved by the Local Entity prior to the construction or reconstruction of any access. See Chapter 6, Permits.
- 4. CDOT Approval for State Highway Access. The Colorado Department of Transportation shall review and approve all State Highway access.

#### **B.** Approval

Access is granted through Local Entity approval of the final plat, final construction plans, or final site plan. The number and location of access points shall conform to

the criteria outlined in this section, unless an exception is approved by the Local Entity Engineer.

#### C. Approval for Existing Developments (City of Loveland only)

Zoning determines how to obtain approval for access from existing developed property to Local Entity streets.

- 1. Planned Developments. For planned developments, new or altered access shall be obtained through the Administrative Amendment Process. This involves applying through the Planning Department to amend the property Final Development Plan. The application shall be accompanied by appropriate plans for the proposed access and technical justification, including justification for the extent of improvements proposed at the access point.
- 2. Conventionally Zoned Property. For conventionally zoned property, application for access can be made using the Local Entity's application form identified in Chapter 6, Permits. This application shall be accompanied by plans for the proposed access and technical justification for the access and associated public improvements.

#### 9.2 CRITERIA FOR ACCESS ONTO ROADWAYS

#### 9.2.1 State Highways

#### A. Access to State Highways

Access to state highways is governed by the State Highway Access Code, state highway access plans and these Standards. All access issues on state highways within the Larimer County Urban Area shall be submitted to the Colorado Department of Transportation and approved before access permits will be issued by CDOT. The proposed access points to a state highway shall be in accordance with **Tables 7-3 or 7-4**.

#### **B.** Access to Existing Frontage Roads

Proposed access to all frontage roads shall comply with the requirements of the Colorado Department of Transportation State Highway Access Code, any applicable access control plan and the requirements of these Standards. Refer to **Chapter 7**, **Street Design and Technical Criteria**. The proposed access points to a frontage road shall be in accordance with **Table 7-3** or **Table 7-4**.

#### 9.2.2 Freeways

All new freeway access in the Larimer County GMA shall meet the requirements of the Colorado Department of Transportation. All design issues must meet CDOT standards.

#### 9.2.3 4-Lane or 6-Lane Arterials (Master Planned)

#### A. Access Approval

Access approval must be obtained from the Local Entity for any private access constructed to a 4- or 6-lane Arterial street. This approval must be granted during the

Page 9-2
development review process (through plan approval) or by issuance of the Local Entity's right-of-way or access permit.

#### **B.** Conditions for Private Access

For any driveway or street access to a 4-lane or 6-lane Arterial, an Access Management Plan and a signal progression plan may be required by the Local Entity Engineer. Refer to **Chapter 4**, **Transportation Impact Studies**. Generally, no private direct access shall be allowed onto a 4- or 6-lane Arterial street. Private direct access may be permitted only when the property in question has no other reasonable access to the general street system and appropriate auxiliary turn lanes are provided. Access may be permitted when the alternative direct access to another roadway would cause unacceptable traffic operation and safety problems to the overall traffic flow of the general street system.

When private access must be provided, the following shall be considered:

- 1. Temporary Nature. Such access shall continue only until such time that some other reasonable access to a lower function category street is available and permitted. The Access Permit shall specify the future reasonable access location(s), if known, and what changes will be required under what circumstances.
- 2. Limitations. No more than one access shall be provided to an individual parcel or to contiguous parcels under the same ownership unless it can be shown that:
  - a. Allowing only one access conflicts with safety regulations (e.g., fire access), or
  - b. Additional access would significantly benefit safety and operation of the highway or street and is necessary to the safe and efficient use of the property.
- 3. Right Turns Only. An access shall be limited to right turns only (through signage and a raised median), unless
  - a. The access has the potential for signalization, in accordance with the general spacing requirements in Table 7-3 or Table 7-4,
  - b. Left turns would not create unreasonable congestion or safety problems and not lower the level of service, and
  - c. Alternatives to the left turns would not cause unacceptable traffic operation and safety problems to the general street system.
- 4. Access Management Plan. Private access must be included as part of the Access Management Plan if required by the Local Entity.
- 5. Offset from Opposite Streets. Intersections of streets with Arterial streets shall only align with streets intersecting on the opposite side of the Arterial street where a traffic signal or Roundabout will be permitted unless a raised median exists within the arterial roadway that restricts the access at the intersections to right-in and right-out turns only. All other intersections must be offset by the distances given in Tables 7-3 or 7-4.

#### C. Public Direct Access Requirements

Public direct access to a 4- or 6-lane Arterial, where left turns are to be permitted, must meet the signal spacing criteria and the Access Management Plan. Those that do not meet these requirements shall be limited to right turns only, unless they meet the requirements above. Local streets should not intersect 4- or 6-lane Arterials, except in Fort Collins (GMA and city limits), where local street intersections shall be spaced at a minimum of 460 feet. See **Table 7-3** for exceptions.

#### D. Spacing and Signalization Criteria

Full access to 4-lane or 6-lane Arterials shall be limited to one-half mile intervals, or one-quarter mile intervals in Fort Collins (city limits only), plus or minus approximately 200 feet, in order to achieve good speed, capacity, and optimal signal progression. However, to provide flexibility for both existing and future conditions, an approved engineering analysis of signal progression shall be made to properly locate any proposed access that may require signalization. The specifics of this analysis are detailed in **Chapter 4, Transportation Impact Studies.** 

# 9.2.4 2-Lane Arterials

# A. Approval for Private Access

Approval must be obtained from the Local Entity for any private access constructed onto a 2-lane Arterial. Generally, no private direct access shall be allowed onto a 2lane Arterial except where no alternative access is available. The Local Entity Engineer may permit private direct access onto a 2-lane Arterial under either of the following conditions:

- 1. No Signalization Potential. The access does not have the potential for signalization as per the requirements of Section 9.2.3 B above, or,
- 2. Does Not Interfere. The access does have the potential for signalization, (by meeting the signal spacing requirements for intersecting public streets stated below) and does not interfere with the location, planning, and operation of the general street system and access to nearby properties in accordance with the Access Management Plan.
- 3. Movements May be Limited. Left turns may be prohibited, allowing right turns only. If left turns are restricted, raised medians will be required to prevent the left turn movements.

# **B.** Public Direct Access Requirements

Public direct access to a 2-lane Arterial, where left turns are to be permitted, must meet the signal spacing criteria in **Table 7-3** or **Table 7-4**. Those that do not meet these requirements shall be limited to right turns only, unless they meet the requirements of **Section 9.2.3 B** above. No local streets should intersect 2-lane Arterials, except in Fort Collins(GMA and city limits), where local street intersections shall occur with a minimum spacing of 660 feet See **Table 7-3** for exceptions).

#### C. Spacing and Signalization Criteria

- 1. Limited Intervals. Non-signalized full access to 2-lane Arterials shall be limited to one-quarter mile intervals, plus or minus approximately 100 feet, in order to achieve good speed, capacity, and optimal signal progression. Signalized intersections shall still be spaced at one-half mile spacing.
- 2. Proper Locations. However, to provide flexibility for both existing and future conditions, an approved engineering analysis of signal progression shall be made to properly locate any proposed access that may require signalization. The specifics of this analysis are detailed in Chapter 4, Transportation Impact Studies.

# 9.2.5 Major and Minor Collectors

#### A. Private Access

Private access to Collectors shall be governed by the curb opening and driveway criteria in **Table 7-3** or **Table 7-4**. Single family residence access to Collectors is not permitted unless access to a lower function category street is not available. In Fort Collins (GMA and city limits), access to Minor Collectors should be shared access.

#### **B.** Intersections

Refer to **Tables 7-3** and **7-4**.

#### C. Offsets

Streets intersecting on opposite sides of a Collector Street shall be either directly across from each other or offset by the distances given in **Tables 7-3** and **7-4**.

# 9.2.6 Local Streets and Lanes

Private access to local streets shall be governed by the following curb opening and driveway criteria.

# A. Spacing

Public streets shall meet spacing requirements of Tables 7-3 and 7-4.

# **B.** Arrangement

Local streets shall be designed to divert traffic to Collector streets and provide for circulation and movement within the subdivision. In Fort Collins (GMA and city limits), new streets should be laid out so the streets interconnect with simple routes (not circuitous) and multiple routes provided for all locations in the development. In addition streets should be located to match Local Entity planning requirements.

# 9.2.7 Eyebrows

The spacing of eyebrows shall be consistent with the intersection spacing requirements given in **Tables 7-3** and **7-4**.

# 9.2.8 Alleys

The spacing of alleys shall be centered at half the distance between two intersections or not less than 150 feet from the nearest intersection.

# 9.3 BASIC PRINCIPLES FOR CURB OPENINGS AND DRIVEWAYS

#### 9.3.1 General

Curb openings for driveways require minimum dimensions in some instances and maximum dimensions in other instances. Appropriate design will provide good driveway access operation and at the same time minimize interference to street traffic. The dimensions established in these Design Standards are derived from studies of the largest vehicles authorized on streets and highways.

Driveways, which serve properties adjoining the right-of-way, shall be served access by the street through a curb cut. The portion of the driveway within the right-of way is called the driveway approach.

#### 9.3.2 Layout Criteria

The opening or driveway approach width shall be adequate to properly handle the anticipated traffic volume and character of traffic, as well as being within the limits specified for the type of property development. The controls established for curb openings and driveways shall apply to existing streets as well as new streets that may be developed in the future.

#### A. High Volume Access

- 1. Radial Access. A driveway shall have a radial access opening in accordance with Construction Drawings 707.1 or 707.2 (as applicable) and Tables 8-1 and 8-2 (as applicable) whenever any of the following conditions occur:
  - a. Access onto an arterial street
  - b. The driveway is for an adjoining commercial land use
- 2. c. The driveway has a volume of 350 or more trip ends per day and enters directly onto a Collector, Commercial Local, or Industrial streetMaximum Width. High volume driveways shall have a maximum width of 36 feet.
- 3. Median. If it is necessary to increase the maximum width, a median (minimum width of 6 feet) shall be provided to divide the inbound from the outbound traffic.
- 4. Turn Lanes. Additionally, the need for turn lanes will be evaluated in accordance with Chapter 4, Transportation Impact Studies, requirements and in accordance with the requirements of Chapter 8, Intersections.

#### **B.** Low Volume Driveways

C. Any driveways not determined to be built with a radial access opening in accordance with the requirements set forth in 9.3.2.A, shall be designed and constructed as a standard driveway in accordance with Construction Drawings 706.1 or 706.2 (as applicable).Multi-Family Dwelling Unit Driveways

Multi-Family dwelling unit driveways (3 or more units) are acceptable with a minimum width of 24 feet. Driveways that serve 12 units or more shall have a minimum width of 28 feet (this width may be reduced to 24 feet on low traffic volume streets) and a maximum width of 36 feet.

# 9.3.3 Sight Distance - Driveways

#### A. Adequate Intersection Sight Distance

To the extent possible, all openings for driveways shall be located at the point of adequate sight distance along the street. Accesses to commercial, office and multifamily residential establishments shall have sufficient space reasonably clear of any obstructions to provide drivers entering the property sufficient sight distance for proper and safe movements.

#### **B.** Profile

The profile of a driveway approach and the grading of the adjacent area shall be such that when a vehicle is located on the driveway outside the traveled portion of the street the driver can see a sufficient distance in both directions to enter the street without creating a hazardous traffic situation.

# 9.3.4 Adjustments for Existing Structures

Any adjustments made to utility poles, street light standards, fire hydrants, catch basins or inlets, traffic signs and signals, or other public improvements or installations required for the curb openings or driveways shall be accomplished without cost to the Local Entity.

# 9.3.5 Entrance-Only and Exit-Only Approaches

Driveway approaches, where the driveway is to serve as an entrance only or as an exit only, shall be appropriately signed by, and at the expense of, the property owner. The property owner shall provide means to ensure that motorists will use the driveway as only an entrance or an exit only.

# 9.3.6 Access to Roadways with No Curb and Gutter

Private drive access to Local, Collector, or Arterial roadways that have no curb and/or gutter improvements shall be constructed to meet the following requirements:

#### A. Surface Requirements

The driveway shall extend from right-of-way line to edge of existing driving surface and shall be constructed with a minimum of 3.5 inches of asphalt or concrete in accordance with **Construction Drawing 901**.

#### B. Right-of-way

New driveway accesses from private property to existing pavement shall be paved within the right-of-way. On Local rural roads HBP or concrete pavement shall be installed from the right-of-way line to the edge of the traveled roadway. The width of the driveway within the right-of-way shall be 12 to 22 feet.

#### C. Culvert

A culvert shall be installed at the established roadside ditch flowline elevation beneath the private drive access in accordance with the requirements of **Construction Drawing 901** and the culvert diameter shall be specified by the approved storm drainage report or in absence of the report by the Local Entity. A culvert shall be installed in the flowline of the borrow ditch of a size necessary for the design storm

#### Chapter 9 – ACCESS REQUIREMENTS AND DESIGN CRITERIA Section 9.3 Basic Principles for Curb Openings and Driveways

flow (15 inch minimum diameter). The pipe shall have flared end sections in accordance with **Construction Drawing 901**. The minimum cover over the culvert should be 1 foot. Additional cover may be required for heavy vehicles. Refer to **Chapter 7**, **Street Design and Technical Criteria**, for the improvement requirements to roadside ditches.

#### D. Sketch Plan

A drawing of the proposed driveway installation showing all dimensions shall be submitted with the right-of-way or Access permit application. Refer to **Construction Drawing 901** for driveway requirements.

#### 9.3.7 Residential Approaches

All driveway approaches shall comply with **Construction Drawings 706.1**, **706.2** or **707.1** or 707.2 and the following:

#### A. Width

Residential driveway approaches shall have a minimum width of 12 feet and a maximum width of 24 feet.

#### **B.** Driveway Frontage

No more than 50 percent of the street frontage of a lot shall be occupied with driveways except for cul-de-sacs and flag lots.

#### C. Adjacent Parking

Parking immediately adjacent to driveways shall meet the parking setback requirements. Refer to Chapter 19, Parking.

#### **D.** Off-Street Driveway Parking

Off-street parking provided off or along driveways shall meet parking setback requirements in accordance with Figure 19-6.

#### E. Continuous Sidewalks

All concrete sidewalks shall be designed with a uniform, continuous profile grade at driveway crossings. The maximum Cross Slope of <sup>1</sup>/<sub>4</sub> inch per foot shall be maintained where the sidewalk crosses the driveway. Refer to **Construction Drawing 1601**.

#### F. Accessibility Alternatives

Pedestrian accessible driveways may be required in lieu of mid-block access ramps for residential areas. In those cases, the slope of the driveways shall be 1:12 or less. This access shall be provided at approximately 300-foot intervals on both sides of the street. The lot line locations shall be designated on the Construction Plans.

#### G. Three-Car Garage Driveway Width

Driveways serving 3-car garages shall have a maximum drive approach width of 30 feet unless otherwise approved.

#### H. Garage Door Location

Garage doors entering onto public streets shall be set back such that 20 feet of space is provided for a vehicle to park without blocking the sidewalk or encroaching into the driveway approach. Garage doors onto alleys shall be set back in accordance with Figures 7-9L, 7-10L, 7-11F or Figure 7-12F as applicable.

# 9.3.8 Commercial Approaches

#### A. Width

No single opening shall exceed 36 feet in width.

# **B.** Driveway Footage

The total length of curb opening on a street for access to a commercial property shall not exceed 40 percent of the property frontage.

# 9.3.9 Maintenance Responsibility

Maintenance of the access and drainage improvements within the right-of-way described in **Section 9.3.6** of this chapter shall be the responsibility of the adjacent property owner or other designated private entity, including all improvements to driveways within right-of-way, including sidewalk, curb and gutter and parkway.

# 9.4 GENERAL REQUIREMENTS

# 9.4.1 Number of Openings

# A. Single Family Residential

In general, each Single Family residential property should be limited to one access point. Multiple accesses may be provided as long as spacing, clearance, and percentage of lot frontage requirements are satisfied.

# B. Multi-Family Residential

Access shall be determined by information provided by the Owner/Developer as specified in **Chapter 4**, **Transportation Impact Studies** and by comments generated during the review and acceptance of that study.

# C. Commercial

In general, commercial property having less than 150 feet of frontage and located mid-block should be limited to one access point to the street. An exception to this may be where a building is constructed in the middle of a lot and parking is provided for on each side of the building.

# **D.** Industrial

Access shall be determined on a case-by-case basis. The Local Entity shall consider good traffic engineering practice and the information provided by the applicant (specified in **Chapter 4, Transportation Impact Studies**) accompanying their submittal.

# 9.4.2 Entrance Angle

In general, the entrance angle for all driveway approaches and intersections shall be as near  $90^{\circ}$  to the centerline of the street as possible. The minimum angle that will be permitted is  $90^{\circ}$  plus or minus  $10^{\circ}$  for a minimum of 25 feet measured perpendicular to the street and measuring from the curb or edge of pavement toward the private property served.

# 9.4.3 Minimum Space Between Openings

The minimum spacing between curb openings shall be the footage measured at the curb line. This spacing will apply to the distance between drives serving adjoining properties. This does not apply to residential projects using mountable curb, gutter, and sidewalks. Refer to **Table 7-3** or **Table 7-4**.

# 9.4.4 Slope

Driveways within the walk and parkway area shall slope toward the street. The driveway profile grade within 20 feet of flowline shall not exceed 8 percent unless otherwise approved by the Local Entity Engineer.

# 9.4.5 Intersection with Street

Driveways should intersect streets at right angles and shall in no case intersect at less than 80 degrees.

# 9.4.6 Pavement

# A. General

All areas within the public right-of-way used for vehicular traffic shall be paved with Portland cement concrete (PCC) from the edge of pavement to the edge of right-of-way. PCC may only be required to extend to the back of sidewalk if approved by the Local Entity Engineer.

# **B.** Loveland (City Limits Only)

In Loveland (city limits only) all driveway and parking areas used by vehicular traffic shall be paved with PCC or HMA. Outdoor storage areas subject to infrequent vehicular traffic may be surfaced with a dust free material approved by the Local Entity Engineer.

# 9.4.7 Shared Access

Whenever possible and feasible, shared entrances should be provided to serve two adjacent properties. Recorded, private access easements are required for all shared accesses.

# 9.4.8 Access Approaches

Access approaches shall not be approved for parking or loading areas that require backing maneuvers within the right-of-way except on Local Residential streets. All offstreet parking areas on Collector and Arterial streets must include on-site maneuvering

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areas and aisles to permit user vehicles to enter and exit the site in forward drive. Refer to **Chapter 19, Parking**, for general parking information.

# 9.4.9 Abandoned Access

If a parcel of land with direct access has been in a state of non-use for more than one year, re-commencement of access use shall be considered a change in use. If the use of the access exceeds the design limitations of the access or does not conform with the present code, a new approval may be required through the development plan review process, access management plan, or the Local Entity's work in right-of-way permit.

# 9.4.10 Change in Use

If the use of an existing access to right-of-way changes, or there is a change in the use of the property, the change in access use must be approved through the development review process, access management plan, or the Local Entity work in right-of-way or access permit. Change in access or property use may include, but is not limited to, change in the amount or type of traffic (20 percent or 25 vph, whichever is less), structural modifications, remodeling, change in type of business, expansion in existing business, change in zoning, change in property division creating new parcels, etc. In Loveland (city limits only), refer to the Site Development Performance Standards and Guidelines for the percent change.

# 9.4.11 Drainage

#### A. Drainage at Curb Cuts

Where curb cuts are allowed, concentrated storm water runoff from property adjoining the right-of-way shall not be discharged across the sidewalk. These flows must be directed elsewhere or directed to a sidewalk chase where storm water may pass under a sidewalk section.

# **B.** Sheet Flow Drainage

Sheet flow drainage is allowed where it does not interfere with the pedestrian use of the sidewalk. (In Fort Collins) A maximum area of 750 square feet behind the sidewalk may sheet flow over the sidewalk.

# 9.4.12 Minimum Off-Street Parking Set Back Distance

Refer to Chapter 19, Parking, and Figure 19-6.

# 9.5 CONTROL DIMENSIONS

To accomplish the objectives of the basic principles stated earlier, certain control dimensions are necessary. There are many variables that affect these control dimensions. Some of the variables are as follows: type of street classification, type of private property development, volume and type of traffic, and width of right-of-way.

# 9.5.1 Width of Curb Opening (W)

The total width of curb opening for properties shall be in conformance with **Construction Drawings 706 or 707.** 

# 9.5.2 Edge Clearance

Refer to **Table 7-3** or **Table 7-4**. Note that shared access with adjoining property is encouraged. Shared access shall be the only justification for reducing the minimum edge clearance dimension.

#### 9.5.3 Corner Clearance

It is important to locate driveways away from major intersections. This constraint is as much for the ability to enter and leave the property as for the benefit of intersection safety and operations. Exiting a driveway during peak-hour conditions at traffic signals is difficult where the queue of standing or slow-moving vehicles never allows a sufficient gap for entry from the driveway. Corner clearances shall be as specified in **Table 7-3** or **Table 7-4**.

#### 9.6 UNPERMITTED ACCESS

Any access, driveway, or curb-cut which is constructed within public right-of-way without a right-of-way or access permit issued by the Local Entity shall be subject to removal. Failure to remove the unpermitted access may result in the removal of said access by the Local Entity. The cost for removal shall be charged to the property owner from which the access originates.

#### 9.7 REMOVAL

Any curb opening or driveway that has been abandoned shall be removed and restored by the property owner except where such abandonment has been made at the request of, or for the convenience of, the Local Entity.

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This chapter does not contain figures.

# CHAPTER 10 – PAVEMENT DESIGN AND REPORT

# 10.1 GENERAL

The purpose of this chapter is to present the Street Structural Design Criteria required for use on all streets in the Larimer County GMA. These criteria shall be used in conjunction with **Chapter 7**, **Street Design and Technical Criteria**.

General Soils Investigations and Report requirements are outlined in Chapter 5, Soils Investigations and Report. Chapter 5 defines requirements for soil testing and backfill requirements for all cut and fill areas within the right-of-way or public easements. The Final Pavement Design Report shall include follow-up testing for subgrade soil expansion, subsurface water, and R-value, in accordance with Table 10-2.

# 10.1.1 Existing Streets

For existing streets the Local Entity Engineer may require deflection tests or other testing of the existing pavement and base structure to determine if an overlay is feasible, or if reconstruction is necessary.

# 10.1.2 AASHTO Design

The design criteria and procedures presented follow American Association of State Highway and Transportation Officials (AASHTO) 1993 Guide for the Design of Pavement Structures. Mechanistic design procedures may be substituted in the City of Loveland. The designer shall review the M.E. design criteria prior to submitting the final pavement design.

# 10.1.3 Pavement Type

Streets are to be constructed of either asphaltic concrete pavement or Portland cement concrete, base course material, and subbase material (where required), placed on compacted subgrade. In Loveland the subgrade shall have a minimum one-foot layer of R=20 material. Refer to Chapter 22, Construction Specifications, for subgrade, subbase, and base course information. All new and reconstructed Arterial/Arterial intersections shall be constructed in Portland cement concrete pavement, in accordance with Chapter 8, Intersections. Exceptions to the Portland cement concrete pavement requirement may be granted for interim conditions described in Chapter 8, in the subsection Pavement Requirements for Arterial/Arterial Intersections.

# 10.1.4 Treated Subgrade

The use of treated subgrade, treated base, and/or full depth asphalt pavement may be acceptable when designed and submitted by the designer, and approved by the Local Entity Engineer in accordance with these standards. The local entities for projects in Fort Collins (GMA and city limits) and Loveland (GMA only) generally will not approve full-depth asphalt pavement.

For treated subgrade, refer to **Chapter 23**, **Street Inspection and Testing Procedures**. For full depth asphalt refer to **Section 10.4.2 B**. The subgrade must be within 6 inches of final grade prior to any soil sampling and testing.

# 10.1.5 Arterial and Collector Level Intersections

The pavement thickness design for arterial and collector level intersections shall be the combined 20-year design for both directions for the shared use areas. A separate design analysis is required.

# 10.1.6 Roundabouts

The pavement thickness design for the circulatory roadway shall be based on the sum of the 20 year design volumes from all legs. A separate design analysis is required. Refer to **Section 8.2.17** for Roundabout design requirements.

# 10.1.7 Approval

A preliminary pavement design may be submitted with final construction plans. The Local Entity Engineer shall review the Final Pavement Design Report within two weeks of the submittal. The Local Entity Engineer's approval is required prior to subgrade treatment, placement of base or pavement (including curb and gutter) construction.

# 10.1.8 New Pavement Design

A new, revised Pavement Design investigation and report shall be required if the following conditions occur:

# A. Phases

If a street is to be built in phases, (i.e., the center two lanes are built first, then at some later date more lanes are added), and it has been at least two years since the original design was completed.

# **B. Imported Fill Material**

If any new fill material that does not match the properties of the subgrade soil is imported, the Local Entity may require a new pavement design report or additional testing to verify the acceptability of this material for roadway fill.

# 10.2 FINAL PAVEMENT DESIGN – SOIL INVESTIGATION REQUIREMENTS

# 10.2.1 Timing of Soil Borings

Soil borings shall be taken in the existing or proposed street right-of-way. Subgrade samples shall be taken upon the material that will be subgrade after the installation of the sanitary sewer, waterline, other utilities, on which the final insitu subgrade strength characteristics may be affected by their installation. The subgrade shall be at or near its

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final elevation, generally within 6 inches or final subgrade elevation. Any required fill material shall be placed to the subgrade elevation prior to sampling.

	20-Yea Tr Infor	r Design affic mation	Sei	rviceab idex (p	oility si)	Relia- bility	Minimum Asphalt for Composite Section	Default Agregate Base Course Section	Default Full Depth Asphalt Pavement Thickness inches <sup>2</sup>	
ROAD			Si	St	D		Layer, inches	Layer, inches	Layer, inches	Min. Struct.
CLASSIFICATION	EDLA <sup>3</sup>	ESAL	Init.	Final	psi	(%)	HMA	ABC	Min.	No.⁴
LOCAL										
Resid. two lane	5	36,500	4.5	2.0	2.5	75	4.0	6.0	6.0	2.45
Resid. Cul-de-sac	10	73,000	4.5	2.0	2.5	80	5.4	6.0	6.5	2.82
and single lane <sup>-</sup> Indust./commercial	50	365,000	4.5	2.3	2.2	75	5.5	11.0	8.5	3.60
<u>COLLECTOR</u> Minor Major Indust./commercial	25 50 100	182,500 365,000 730,000	4.5 4.5 4.5	2.3 2.3 2.3	2.2 2.2 2.2	75 85 85	5.5 6.5 7.0	7.0 9.0 11.0	7.5 8.5 10.0	3.20 3.82 4.30
<u>ARTERIAL</u> Two lane Four lane Six lane	100 200 300	730,000 1,460,000 2,190,000	4.5 4.5 4.5	2.5 2.5 2.5	2.0 2.0 2.0	90 90 90	7.5 8.0 8.5	11.5 15.0 17.0	NA NA NA	4.51 4.90 5.25

Table 10-1Flexible Pavement Design Criteria

NOTES:

Wearing surface course shall be Grading S or SX for residential roadway classification and Grading S for collectors, arterials, and all industrial/commercial roadways.

<sup>2</sup> Full depth pavement may be used only on Local / Residential Class roads with written approval of the Local Entity Engineer.

<sup>3</sup> EDLA shall be calculated based on projected traffic uses. Minimum EDLA values are as given for the design lane. The Engineer may require greater EDLA values if warranted. City of Fort Collins will provide all EDLA numbers for City of Fort Collins projects. The EDLA for a reundabaut abalt wall the sumultative EDLA for each extra lag. EDLA for a targit/callecter interactions about the sumultative EDLA for each extra lag.

for a roundabout shall include the cumulative EDLA for each entry leg. EDLA for arterial/collector intersections shall be two-way traffic. <sup>4</sup> Minimum structural numbers are based on subgrade R-value = 5 and CDOT calculations ; M<sub>R</sub> = 3,025 and Std. Deviation = 0.44 CDOT Design methods shall be used for resilient modulus calculations for all roads

<sup>5</sup> Single lane refers to a paved surface less than 20 feet wide, including residential alleys.

<sup>6</sup> Min/max lift thicknesses: Grade SX – 1 1/2"/2 1/2", Grade S - 2"/3.5", Grade SG - 3"/5" (2" Minimum surface wearing course) In

Loveland, Grade SG may only be used with a variance approval.

<sup>7</sup> The minimum HMA section for Composite pavement s shall be 4-inches for Local, 5-inches for Collectors, and 6-inches for Arterials.

# 10.2.2 Frequency of Testing

A minimum of one boring shall be obtained for any roadway segment. A second boring shall be required in the trench of any installed utilities. The distance between borings shall not exceed 500 feet, two borings per location where utility trenches exist (one boring in the trench and one in compacted subgrade). Multiple samples shall be taken

alternately among lanes and shall be evenly spaced. The Local Entity Engineer may require more frequent testing.

# 10.2.3 Depth of Borings

#### A. In Utility Trenches

In utility trenches, samples shall be taken to a minimum depth of 5 feet below the proposed subgrade elevation.

#### **B.** Outside of Trenches

Outside of trenches, samples shall be taken to a minimum depth of 10 feet below the proposed subgrade elevation.

#### C. Extra Depth

Borings shall extend deeper if bedrock or high groundwater are design concerns.

# 10.3 TESTING

The following tests, **Table 10-2**, are required for the Final Pavement Design testing.

Test	Final Pavement Design Report			
Visual	Х			
Liquid Limit	X			
Plastic Limit	X			
Moisture	X			
Percent Passing 200	X			
Gradation (Granular Soils)	X			
AASHTO or USC Classification	X			
Subgrade Support R-Value	X			
Swell	Mitigation and Detailed Analysis			
Percentage of Soluble Sulfates	X			
Standard Penetration Test	Х			
Groundwater	X			
Bedrock Level	X			

Table 10-2 Required Tests

# **10.3.1 Classification Testing**

Soils shall be classified visually and tested to determine the properties listed in **Chapter 5**, **Soils Investigations and Report**. Sands and gravel samples shall be analyzed for gradation where needed to comply with classification requirements.

# 10.3.2 Subgrade Support Testing

Individual subgrade or composite samples shall be tested for subgrade support value. The Subgrade Soils Investigation report shall clearly state whether or not the subgrade soil is capable of supporting the proposed construction and design traffic loads. Recommendation for subgrade stabilization, if required, shall also be provided. The Final Pavement Report shall contain specific mitigation. The following subgrade tests shall be conducted:

#### A. Hveem Stabilometer

The subgrade support value shall be determined using Hveem Stabilometer (R-Value). The design R-value shall be for 300 psi (2070 kPa) exudation pressure. Reported data shall include the following:

- 1. Test procedure reference.
- 2. Dry density and moisture content for each sample.
- 3. Expansion pressure for each sample.
- 4. Exudation Pressure. Corrected R-value curve showing the 300 psi (2070 kPa) design R-value.

#### **B.** Swell Tests

Swell tests shall be conducted for samples with probable expansion (volume change estimate) greater than 2 percent based on actual test results. **Table 10-3** provides a guideline for expansion potential. Surcharge pressure shall be 150 psf, or as specified by the Local Entity Engineer. Refer to **Section 5.7** for mitigation requirements.

1. Minimum number of samples. At least two samples shall be required per soils report, with one test sample within trench backfill and one outside of trench backfill. Thereafter continue with one swell test every fourth sample unless waived by the Local Entity Engineer.

% Passing No. 200 Sieve	Liquid Limit (%)	Standard Penetration Resistance (Blows/Ft)	Volume Change Estimate (% of Total)	Expansion Classification
>95	>60	>30	>10	Very High
60–95	40–60	20–30	3–10	High
30–60	30–40	10–20	1–5	Medium
<30	<30	<10	<1	Low

Table 10-3Expansion Potential of Subgrade Soils

# **10.4 PAVEMENT THICKNESS DESIGN CRITERIA**

Pavement design procedures in this section provide for a 20-year service life of pavement when normal maintenance is provided to keep the roadway surface in an acceptable condition.

#### 10.4.1 Design Factors

#### A. Equivalent Daily Load Applications (EDLA)

Equivalent Daily Load Applications (EDLA) and Equivalent Single Axle Loads (ESAL) units are based on 18 kip (80 kN) axle loading on each design lane. All data and design procedures in this section use EDLA or ESAL units for pavement loading repetitions. Minimum EDLA and ESAL criteria for each roadway classification are given in **Table 10-1**. The values shall be increased for roadways with a traffic study showing higher traffic numbers. In Fort Collins (city limits only), the City will provide all EDLA (ESAL) numbers.

#### **B.** Design Serviceability

The Serviceability Index to be used for all Local Entity Roadways dedicated for public use is given in **Table 10-1**.

#### C. Minimum Pavement Section

**Table 10-1** provides the default acceptable pavement sections for each roadway classification based on assumed subgrade support and traffic values. These pavement thicknesses may be used for preliminary planning purposes and cost estimates. All pavement thickness designs must be based on actual subgrade support test results (refer to Chapter 5, Soils Investigations and Report) and traffic projections (refer to Chapter 4, Transportation Impact Study) for the specific project. In specifying layer thickness, the designer shall consider how the pavement section will be physically constructed (e.g. Specify how to construct 2' of treated subgrade or the number of lifts and the grade for asphalt in a 6-inch asphalt section .)

#### **D.** Flexible Pavement Strength Coefficients

**Table 10-4** contains the standard design coefficient for various pavement materials. Nonstandard design coefficients may be used, only if approved in advance by the Local Entity's Engineer. In addition, design values must be verified by pre-design mix test data and supported by daily construction tests (refer to Chapter 23, Street Inspection and Testing Procedures).

# E. Portland Cement Concrete Working Stress (f<sup>t</sup>)

The working stress ( $f^{t}$ ) to be used in the design shall be 75 percent of that provided by third-point beam loading, which shall have a minimum laboratory 28-day strength of 600 psi based on actual tests of materials to be used.

# 10.4.2 Special Considerations

#### A. Staged Construction

This is an alternative for the Developer to provide a minimum thickness pavement during construction, and after repairs, construct the final lift of asphalt, providing for a new finished pavement surface. Minimum asphalt and aggregate base course thicknesses are given in alternate composite sections using Grade SG hot mix asphalt (HMA) may be submitted for approval with a minimum wearing course thickness of 2.0 inches. If the full pavement section is not to be placed immediately, a pavement design for staged construction may be required by the Local Entity Engineer. The staged construction design must include asphalt thickness for each proposed stage. Calculations, traffic numbers, and construction truck traffic numbers supporting the staged design must also be submitted. For staged construction, accommodations must be provided for the paved surface to drain with no water left standing on the pavement.

1. <u>Overlay at End of Warranty Period.</u> After the end of the two-year warranty period, (and after all Punch list repairs have been made), the Contractor shall pave a 1-<sup>1</sup>/<sub>2</sub> " SX overlay.

The report shall instruct the Contractor to pave  $\frac{1}{2}$  inch less than required pavement section at initial construction, leaving the finish asphalt  $\frac{1}{2}$  inch below the design crown elevation. After two years, (and after all warranty repairs have been made), the Contractor shall perform a tapered milling (0 to 1-inch depth) of the outside 4 feet of pavement along the gutters prior to placing the  $1-\frac{1}{2}$  inch SX overlay. This shall be accomplished before the Local Entity accepts the streets for full-term maintenance.

2. <u>Manhole and Valve Settings</u>. All manholes and valve boxes shall be set at grade for the interim paving surface. Manholes and valve boxes must be adjusted to final grade prior to placement of the final overlay. Riser rings shall not be used.

# **B.** Full Depth Sections

- Loveland (city limits only). Full depth asphalt pavement sections will be considered on a case by case basis where depth of bedrock, drainage, and soil conditions are compatible with full-depth asphalt. Refer to Chapter 22, Construction Specifications, for minimum and maximum lift requirements. When permitted by the Local Entity Engineer, full depth asphalt pavements shall consist of one or more layers of Grade S HMA topped with one or more layers of Grade S or SX HMA placed directly on a stabilized subgrade.
- 2. <u>Fort Collins (city limits only)</u>. Full depth asphalt pavement sections are generally not allowed.

# C. Rehabilitating Existing Asphalt Streets

Prior to overlaying existing asphalt, the Local Entity Engineer may accept nondestructive testing to determine the amount of overlay necessary to bring the street to current standards. The method of nondestructive testing and the data obtained must be in a form compatible with the pavement management system for the Local Entity. All "pot-holes," utility trench settlement, cracking, and any similar imperfections shall be repaired to the Local Entity Engineer's satisfaction prior to overlaying. Refer to **Chapter 25, Reconstruction and Repair,** for specific requirements.

#### **D.** Special Requirements

The Local Entity Engineer may require full depth asphalt or Portland cement concrete or chemically treated base or subgrade in locations where traffic, utilities, type of construction, subsurface drainage, or time of construction would make asphalt on aggregate base impractical.

#### **10.4.3** Pavement Structure Components

The Pavement Structure Components shall be a combination of one or more of the following courses placed on a subgrade to support the traffic load and distribute it to the roadbed. However, the pavement section must be composite in nature.

#### A. Subbase

The layer(s) of specified or selected material of designed thickness placed on a subgrade to support a base course, surface course, or both.

#### **B.** Base Course

The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support a surface course.

#### C. Surface Course

One or more layers of a pavement structure designed to accommodate the traffic load; the top layer of which resists skidding, traffic abrasion and the disintegrating effects of climate. For asphalt pavement the top layer is sometimes called "Wearing Course."

#### **10.5 PAVEMENT DESIGN PROCEDURES**

#### 10.5.1 Flexible Pavement Design

#### A. General

Flexible pavements are those pavements that have sufficiently low bending resistance to maintain continuous contact with the underlying structure, yet have sufficient stability to support a given traffic loading condition. An example is asphaltic concrete pavement.

#### **B.** Procedure

Computer generated printouts and/or other design calculations must be included with the design submittal. The following procedure should be used in determining the structural number and thickness of the pavement being designed:

1. Confirm the roadway classification and corresponding EDLA. The predicted volumes in the traffic impact study must be used whenever they exceed the minimum EDLA values given in **Table 10-1**.

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- 2. Determine the serviceability index (SI) and reliability for the roadway classification (Table 10-1).
- 3. Convert the R-value to a Resilient Modulus for each soil subgrade type identified in the exploration using the **CDOT equations 2.1 and 2.2** as detailed in Section 2.5 of the CDOT 2007 Pavement Design Manual.
- 4. Determine the required structural numbers using **AASHTO** pavement design software or nomographs from **AASHTO** along with soil support test results and EDLA values previously determined. If used, copies of the nomograph determinations must be included with the design submittal.
- 5. Once the required structural number (SN) has been determined, the design thickness of the pavement structure can also be determined by the software that uses the general equation:

 $SN = A1D1M1 + A2D2M2 + A3D3M3 + \dots$ 

Where:

A1 = Hot Mix Asphalt (HMA) Strength Coefficients

A2, A3, ... = Strength Coefficients of Additional Pavement Components

The strength coefficients for various components of the pavement structure are given in **Table 10-4**.

- D1 = Thickness of Hot Mix Asphalt (HMA)
- D2, D3, ... = Thickness of Additional Pavement Component Sections
- M1, M2, ... = Drainage Coefficient

Total HMA thickness selected shall not be less than the minimum specified in **Table 10-1**, and the aggregate base course thickness selected shall not exceed 2.0 times the total HMA thickness selected.

- 6. The standard deviation for design of asphalt pavements shall be 0.44.
- 7. The design must reference any mitigation measures required when the subgrade contains swelling soils. Refer to **Chapter 5**, **Soils Investigations and Report**. Design reports recommending permeable layers in the pavement system must present the measures to be used to ensure adequate drainage of such layers and to maintain separation of the layers from the swelling soils.

Pavement Structure Component	Design Strength Coefficients	Limiting Test
Conventional Materials	(Per Inch of Material) <sup>3</sup>	Criteria
Plant Mix Seal Coat	0.25	
Hot Bituminous Pavement	0.44	R 90+
Existing Bituminous Pavement	0.24	See Note 1
Aggregate Base Course	0.11	R>72
Existing Aggregate Base Course	0.10	R>69
Granular Subbase Course	0.07	R>50
Recycled Asphalt/Concrete	0.07	R>50
Pavement Subbase Course		
Chemically Treated Subgrades <sup>2</sup> (or Approved Substitute)		Compressive Strength of Field Specimen
Cement Treated Subgrade	0.23	7 day, 650–1000 psi
Fly Ash Treated Subgrade	0.10	7 day, 150 psi @ 70°±
Lime Treated Subgrade	0.14	7 day, 160 psi, PI <6
Kiln Dust Treated Subgrade	0.10	7 day, 150 psi, PI <6

# Table 10-4Pavement Strength Coefficients

NOTES:

1. Greater strength coefficient may be considered if derived from deflection data collected on the existing street in compliance with procedures outlined in the Asphalt Institute Manual MS-17.

2. Strength coefficient is only acceptable if material is properly mixed and field tests correlate with laboratory results. Strength Coefficient shall be reduced by 50 percent if field test correlations are not performed.

3. The credited thickness of chemically treated subgrade shall be 2-inches less than the maximum specified tilling depth (e.g. 12-inches of fly ash stabilization will get a 10-inch strength credit. Chemical soil stabilization shall not proceed between October 31 and April 1 without the Local Entity Engineer's approval, due to freeze thaw issues with frozen subgrade. Minimum tilling depth shall be 12-inches to meet subgrade scarifying requirements.

# 10.5.2 Rigid Pavement Design

#### A. General

Rigid pavements are those that possess a high bending resistance and distribute loads over a large area of foundation soil. Examples include Portland cement concrete pavement or Portland cement concrete surfaced with asphalt.

#### **B.** Procedure

Computer generated printouts and/or other design calculations must be included with the design submittal.

The design of rigid pavements is a function of structural quality of the subgrade soil (R-value), traffic (EDLA), and the strength of the concrete (working stress). In comparison to the strength of the concrete slab, the structural contributions of underlying layers to the capacity of the pavement are relatively insignificant. Therefore, the use of thick bases or subbases under concrete pavement to achieve greater structural capacity is considered to be uneconomical and is not recommended. However, street sections with landscape medians may require a drainage layer section to provide positive drainage from the median to an acceptable outlet. In all cases,

subgrade shall be stable as determined by proof-rolling requirements outlined in **Chapter 22, Construction Specifications**, concerning final proof-rolling.

The following procedure should be used in determining the structural number and thickness of the pavement being designed:

- 1. Confirm roadway classification and corresponding EDLA. The predicted volumes in the traffic impact study must be used whenever they exceed the minimum EDLA values given **Table 10-1**.
- 2. Determine the serviceability index of the roadway classification from Table 10-1.
- 3. The reliability factor for design of all concrete pavements shall be 90 percent.
- 4. The working stress of the concrete is to be obtained from laboratory tests. For preliminary design see Section 10.4.1 E.
- 5. The standard deviation for design of concrete pavements shall be between 0.30 and 0.40.
- 6. Determine the structural numbers using **AASHTO** pavement design software. Nomographs of the **AASHTO** parameters may be used instead. If used, copies of the nomograph determinations must be included with the design submittal.
- 7. Determine the slab thickness. A minimum thickness of 6 inches must be provided.
- 8. Refer to Section 10.3. Design must reference any mitigation measures required when the subgrade contains sulfates.

#### C. Joint Design

The construction plans for rigid pavement areas shall include a joint pattern layout for each street or alley. All joints and joint filling in rigid pavement shall be designed and detailed in accordance with the current Colorado Department of Transportation Standard Plans (M&S Standards).

#### **10.6 PAVEMENT DESIGN REPORT**

The pavement design report shall be prepared by or under the supervision of and signed and stamped by a Professional Engineer registered in the State of Colorado. The report shall make a recommendation for a typical pavement structural section based on known site soil conditions and the valid traffic impact study (refer to **Chapter 4**, **Transportation Impact Study**).

#### 10.6.1 Required Information for Pavement Design Report

#### A. List of Required Info

- 1. Vicinity map to locate the investigated area.
- 2. Scaled drawings showing the location of final borings.
- 3. Final Plat with street names.

- 4. Scaled drawings showing the estimated extent of subgrade soil types and EDLA for each street classification.
- 5. Pavement design alternatives for each street classification.
- 6. Tabular listing of sample designation, sample depth, Group Number, liquid limit, plasticity index, percent passing the No. 200 sieve, **AASHTO** Classification, Group Index and soil description. Refer to **Chapter 5**, **Soils Investigations and Report**.
- 7. R-value test results of each soil type used in the design. Refer to Chapter 5, Soils Investigations and Report.
- 8. Swell/consolidation tests. Refer to Chapter 5, Soils Investigations and Report.
- 9. Identification of any samples that were consolidated to create composite samples for testing purposes. Refer to **Chapter 5**, **Soils Investigations and Report**.
- 10. Borrow source identification.
- 11. Pavement design computer printouts or nomographs properly drawn to show Soil Support EDLA SN. Refer to Sections 10.4.1 A and 10.5.1 B and Table 10-1.
- 12. Design calculations for all phases of soil report.
- 13. Design coefficient used for asphalt, base course, etc. Refer to Table 10-4.
- 14. Mix design test results as discussed in Chapter 23, Street Inspection and Testing Procedures, where chemical stabilization has been approved by the Local Entity Engineer.
- 15. A discussion of potential subgrade soil problems including, but not limited to:
  - a. Heave or settlement prone soils.
  - b. Frost susceptible soils.
  - c. Ground water.
  - d. Drainage considerations (surface and subsurface).
  - e. Cold weather construction (if appropriate).
  - f. Soluble sulfates in subgrade.
  - g. Other factors or properties that could affect the design or performance of the pavement system.
- 16. Recommendations to alleviate or mitigate the impact of problems discussed in the previous paragraph. Also refer to **Chapter 5**, **Soils Investigations and Report**.
- 17. Professional Engineer Stamp

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# CHAPTER 11 – STRUCTURES

# 11.1 GENERAL

This chapter provides design guidelines for structures in public rights-of-way for new streets. All designs shall be stamped by a registered PE proficient in structural engineering.

# 11.1.1 Design Standards

Designs of structures shall conform to these Standards and supplemented by the following documents

# A. List of Structural Standards to be Followed

- 1. AASHTO, Standard Specifications for Highway Bridges, latest edition.
- 2. AASHTO, LRFD Bridge Design Specifications, latest edition.
- 3. AASHTO, LRFD Bridge Construction Specifications, latest edition.
- 4. AASHTO, A policy on Geometric Design of Highways and Streets, 1990 edition.
- 5. AASHTO, Roadside Design Guide, latest edition.
- 6. CDOT, Bridge Manual, Volumes I and II, latest editions.
- 7. CDOT, Standard Specifications for Road and Bridge Construction, latest edition.
- 8. CDOT, M&S Standards, latest edition.

# 11.1.2 Borings and Soils Tests

Appropriate borings and soils tests shall be conducted as outlined in Chapter 5, Soils Investigations.

# 11.1.3 Design Approaches

Recognized design approaches for structures in this chapter are as follows:

#### A. Working Stress Design (WSD)

WSD establishes allowable stresses as a fraction or percentage of a given material's load-carrying capacity. Calculated design stresses must not exceed those allowable stresses.

#### **B.** Load Factor Design (LFD)

LFD adjusts WSD to reflect various loads such as vehicular and wind forces. This design philosophy employs a limited use of load variability.

#### C. Load and Resistance Factor Design (LRFD)

LRFD enlists both load and resistance factors, derived from the theory of reliability, statistical knowledge of loads, and structural performance. This design philosophy employs explicit use of load variability.

#### **D. AASHTO Approaches**

Either of the following **AASHTO** standards may be used to design structures in this chapter unless otherwise specified:

- 1. AASHTO's Standard Specifications for Highway Bridges uses the WSD and LFD design philosophies.
- 2. AASHTO's LRFD Bridge Design and Construction Specifications uses the LRFD design philosophy.

# **11.1.4 Deflection Control**

Designs of all three-sided concrete structures in this chapter must include deflection control.

# 11.2 BRIDGES

# 11.2.1 General

Bridges shall be considered structures with the span between supports greater than 20 feet.

Design Life. All bridges shall have a minimum design life of 50 years.

# 11.2.2 Sufficiency Rating

The design of all major structures (span 20 feet) shall be rated for structural sufficiency prior to approval of the Local Entity of the public improvement plans. The design shall be in compliance with Federal Bridge Rating Guidelines for new bridges. Refer to **Chapter 23, Street Inspection and Testing Procedures,** for further information regarding inspection and rating.

# 11.2.3 Definition and Types of Bridges

Bridges can be designed to carry various load combinations. This section covers both vehicular and pedestrian/bicycle bridges.

#### A. Basic Construction Parameters

Bridges shall be constructed of reinforced concrete or, where conditions prevent the use of reinforced concrete, steel. Bridge construction of timber is prohibited unless specifically allowed by the Local Entity Engineer.

# **B.** Span Construction Types

Typical span types and approximate span limitations are shown in Table 11-1.

Bridge Span Types				
Span Type	Approximate Limitations			
Reinforced Concrete Slab	< 40 feet			
Prestressed Concrete Slab	< 50 feet			
Prestressed Concrete Double Tee	< 120 feet			
Girders				
Prestressed Concrete Box Girders	< 140 feet			
Prestressed Concrete B-T Girders (Bulb	< 160 feet			
Tee)				
Rolled Beams	< 100 feet; with cover plate up			
	to 120 feet			
Plate Girders	< 70 feet			
Trusses	> 140 feet			

#### Table 11-1 Bridge Span Types

# 11.2.4 Vehicular Bridges

Vehicular bridges shall be designed to carry pedestrians and bicycles as well as vehicles. Any bridges with a clear deck width greater than 20 feet shall be treated as a vehicular bridge.

# A. Illumination

Refer to Chapter 15, Street Lighting, for bridge illumination requirements.

# **B.** Design Loads

- 1. <u>Recreational Trails</u>. The minimum design vehicular loading for new bridges used for recreational trails shall accommodate maintenance traffic. The minimum design loading shall be H-15.
- 2. <u>Vehicular Bridges</u>. All vehicular bridges shall be designed for vehicular loadings of HS-25 or higher.
- 3. <u>Pedestrian Load</u>. A pedestrian load of 85 psf shall be applied to all sidewalks wider than 2 feet, in combination with vehicular design live load. Sidewalks in this case include wide curbs or other structures that may be used by pedestrians.

# C. Design Details

See the standards mentioned in **Section 11.1.3**, concerning design Approaches, for further use of design methods.

1. <u>Deflection</u>. Maximum deflection on a vehicular bridge shall be as follows:

 $D_{max} = S/1000$ 

where D = Deflection, feet

```
S = Span, feet
```

2. <u>Minimum Thickness of Metal</u>. Closed structural tubular members shall have a thickness of at least 5/16 inch.

# D. Clear Width

The clear width for new bridges on all streets with curbed approaches shall meet or exceed the curb-to-curb width of the roadway approaches. For streets with shoulders and no curbs, the clear roadway width should be the same as the approach roadway width.

# E. Sidewalks

Requirements for sidewalks on bridges are as follows:

- 1. <u>General</u>. Sidewalks conforming to the street cross sections shall be provided on both sides of a bridge.
- 2. <u>Width of Parkways</u>. Parkways are not required on the bridge structure in Loveland (GMA and city limits).
- 3. <u>Extending Approaches</u>. Sidewalks on the approaches shall extend across all bridges.
- 4. <u>Width Criteria</u>. Refer to sidewalk and bike path width criteria in Chapter 16, Pedestrian Facilities, and Chapter 17, Bicycle Facilities.
- 5. <u>Exceptions</u>. Sidewalks and/or bike lanes may be omitted from a bridge when separate bike/pedestrian bridges exist and when approved by the Engineer.

# F. Median Barriers

Median barriers shall not be used in an urban setting with design speeds less than 45 mph.

# 11.2.5 Pedestrian/Bicycle Bridges (P/B Bridges)

P/B bridges are designed to carry primarily pedestrian and/or bicycle traffic as well as the occasional maintenance or service vehicle. This type of bridge will not carry a vehicular roadway.

# A. Design Approach

P/B bridges shall be designed with the LFD method as provided by **AASHTO Standard Specifications for Highway Bridges**.

# **B.** Design Loads

1. <u>Vehicular</u>. The minimum design vehicular loading for a P/B bridge follows the Htruck configuration loading. Specific H-truck loading depends upon clear deck width as follows:

#### Chapter 11 – Structures Section 11.2 Bridges

Table 11-2 H-Truck Loading		
P/B Bridge Width	H-Truck Loading	
6 – 10 feet	H-5 truck configuration (10,000 lb)	
> 10 feet	H-10 truck configuration (20,000 lb)	
< 6 feet	Not wide enough for any vehicles	

- 2. <u>Pedestrian</u>. Do not design for a combination of pedestrian and vehicular loads. Design live loads shall be as follows:
  - a. <u>Main Member</u>. The design pedestrian live load for the Main Member shall be 85 psf, with the following exception: if the deck influence area, A1, is greater than 400 square feet, a reduction may be made per the following equation:

Pedestrian live load = 85(0.25 + (15/square root of A1)) psf.

At no time shall the pedestrian live load be less than 65 psf.

- b. <u>Secondary Member</u>. The design live load for the Secondary Member shall be 85 psf.
- c. <u>Deck Loading for Horses or Snowmobiles</u>. Use a concentrated load of P = 1000 lb when horse or snowmobile traffic is present.

#### C. Wind

- 1. <u>Wind Design Factors</u>. Wind load is a horizontal load. There is no required combination of wind on live loads (pedestrian or vehicular). For wind overturning force see Section 3.15.3 of **AASHTO Standard Specifications for Highway Bridges**.
- 2. <u>Specific Load Criteria</u>. The design wind load applied to the vertical area of P/B bridge members shall be as follows:

Table 11-3

Design Wind Load			
Member Type	Design Wind Load		
Truss and Arches	75 psf		
Girders and Beams	50 psf		
Open Truss	35 psf		

#### **D.** Design Details

1. <u>Deflection</u>. Maximum deflection on a P/B bridge shall be as follows:

 $D_{max} = S/1000$ 

where D = Deflection, feet

S = Span, feet

2. <u>Vibrations</u>. Design frequencies shall be as follows:

- a. <u>P/B Bridge Without Live Load</u>. When the P/B bridge has no vehicular or pedestrian traffic, the frequency shall be greater than 3 Hz to avoid the first harmonic.
- b. <u>P/B Bridge With Live Load</u>. When the P/B bridge has a live load, (e.g., running and jumping), the frequency shall be greater than 5 Hz to avoid the second harmonic.
- 3. <u>Allowable Fatigue Stress</u>. Fatigue provisions are not required for pedestrian live load stresses where heavy pedestrian loads are infrequent. Fatigue provisions shall be included for wind loads.
- 4. <u>Minimum Thickness of Metal</u>. Closed structural tubular members shall have a thickness of at least 1/4 inch.
- 5. <u>Half Through Truss Spans</u>. Half through truss spans shall be designed per **AASHTO Guide Specifications, For Design of Pedestrian Bridges**, **1997**.

# 11.3 RAILINGS

#### 11.3.1 General

#### A. Purpose

Railings offer protection to pedestrians, bicyclists, and motorists. They can be designed to retain and redirect vehicles upon impact or to prevent rollover with high center of gravity vehicles. Railings provide a transition from a roadway or pedestrian/bicycle way to a bridge.

#### **B.** Using Rigid Railings

Railing systems can be rigid, or they can allow deflection to reduce penetration. Highway structures normally warrant the use of a rigid railing.

#### C. Compliance with Standard Drawings

This section provides criteria for roadside/bridge, pedestrian, bicycle, and combination barriers. Railings shall comply with **Figure 11-8**.

#### 11.3.2 Traffic Railing

A traffic railing is used for roadway traffic when there is a hazard within the clear zone. It is also used to separate the travel lane from an attached sidewalk in cases where there is no bike lane and the posted speed is greater than or equal to 40 mph. Two types of traffic railing are the bridge railing and the roadside barrier.

#### A. Bridge Railing

Bridge railings must handle vehicles on the bridge under impact conditions. Vehicles and impact conditions are specified in the design. The railing systems listed are used on bridge structures and appear in ascending order of strength or rigidity.

- 1. <u>Fort Collins (GMA and city limits)</u>. All bridge railings for Fort Collins (GMA and city limits) shall conform to **Figure 11-8**.
- 2. <u>Loveland (GMA and city limits)</u>. Bridge railing options for Loveland (GMA and city limits) are given in the referenced construction drawings below.
- 3. Types of Railings (Crash-Tested).
  - a. <u>Oklahoma Modified TR-1 Bridge Railing</u>. This rigid concrete post and beam system reduces snow accumulation to the bridge deck. See **Construction Drawing 1102L**.
  - b. <u>BR1 Type C Aluminum Bridge Railing.</u> This metal railing/concrete parapet system has significant strength. It can redirect cars and vans but is not adequate to prevent rollover with high center of gravity vehicles. See **Construction Drawing 1107**.
  - c. <u>Safety-Shaped Concrete Bridge Railing</u>. This common bridge railing can redirect heavy trucks and buses. See **Construction Drawing 1103L**.
  - d. <u>Nevada Concrete Safety Shape (With Steel Rail)</u>. This railing is a raised height system that can contain and redirect a 18,000 kg bus. See **Construction Drawing 1104L**.
  - e. <u>Texas Type HT (Heavy Truck)</u>. This railing can contain and redirect heavy vehicles. See **Construction Drawing 1105L**.
  - f. <u>Texas Type TT (Tank Truck)</u>. This extremely strong barrier railing can contain and redirect heavy vehicles. It is very heavily reinforced and rarely used. See **Construction Drawing 1106L**.
- 4. <u>Using Other Types of Railing</u>. Other railing may be proposed for review and approval by the Local Entity. Structural calculations or crash test results need to be submitted with such proposals.
- 5. <u>Transitions</u>. Transitions shall be provided when a semi-rigid roadside guard rail meets a rigid bridge railing.
  - a. <u>Gradual Stiffening</u>. The transition shall provide a gradual stiffening of the approach by adjusting the post spacing or rail strength or by transitioning to a different, stiffer barrier.
  - b. <u>Flexible Bridge Railings</u>. Transitions may not be necessary when bridge railings have some flexibility. Any design without a transition shall satisfy **AASHTO** criteria referenced in **Section 11.1.1**.
  - c. <u>Alternatives in Congested Areas</u>. In urban areas or where city streets and/or sidewalks prevent installation of approach guardrail transitions, one or more of the following alternatives shall be followed:

- 1) Extend the guard rail or bridge rail in a manner that prevents encroachment of a vehicle onto any roadway system below the bridge. A tapered end section parallel to the roadway may be an option.
- 2) Provide a barrier curb.
- 3) Restrict speed. See Chapter 14, Traffic Signals, Signs, and Striping, for regulatory signs. Engineer approval is required for this option.
- 4) Provide a recovery area.
- 6. <u>Placement and Lateral Clearance</u>. The rail system shall be placed 2 feet beyond the useable shoulder.

#### **B.** Roadside Barrier

A roadside barrier railing shields motorists from natural or manmade obstacles located along either side of a traveled way. Barriers are required only when the warrants, contained in the AASHTO Roadside Design Guide, are met.

1. <u>Common Roadside Barriers</u>. Roadside barriers are flexible, semi-rigid, or rigid. The following are some of the most widely used roadside barriers listed in order of increasing capabilities to contain and redirect large vehicles:

Roadside Barriers		
Category	Type of Barrier	Reference Drawing
Semi-Rigid Systems	Blocked-Out W-Beam (Strong Post)	Refer to M & S Standards
	Blocked-Out Thrie Beam (Strong Post)	Refer to M & S Standards
	Modified Thrie- Beam	Refer to M & S Standards
Rigid	Concrete Safety Shape	Refer to M & S Standards
Systems	Stone Masonry Wall	Refer to M & S Standards

Table 11-4 Roadside Barriers

- 2. <u>Transitions</u>. Refer to Section 11.3.2 A.5. In the case of roadside barriers, the gradual stiffening will decrease from bridge or structure to roadway.
- 3. <u>Placement and Lateral Clearance</u>. Placement of roadside barriers shall relate to lateral offset, terrain effects, flare rate, and length of need.
  - a. <u>Lateral Offset from the Edge-of-Traveled Way</u>. Roadside barriers shall be placed as far from the traveled way as conditions allow. The "shy line offset" is defined as the distance from the edge of the traveled way beyond which a roadside object will not be perceived as an obstacle. A roadside barrier should not be placed beyond the shy line offset given in **Table 11-5**. The offset is calculated as a function of design speed, especially for short, isolated installations. For long, continuous runs of railing, this offset distance is not as critical.
| ouggested ony Line Onset (Ls) values |                                       |  |
|--------------------------------------|---------------------------------------|--|
| Design Speed<br>(Km/H)               | Shy Line Offset<br>L <sub>s</sub> (m) |  |
| 80                                   | 12                                    |  |
| 75                                   | 10.5                                  |  |
| 70                                   | 9.2                                   |  |
| 65                                   | 8                                     |  |
| 55                                   | 7.2                                   |  |
| 50                                   | 6.5                                   |  |
| 45                                   | 5.5                                   |  |
| 40                                   | 4.6                                   |  |
| 30                                   | 3.6                                   |  |

# Table 11-5 Suggested Shy Line Offset (L<sub>s</sub>) Values

- b. <u>Deflection Distance</u>. A barrier's deflection distance on impact is a critical factor in its placement. If a rail is installed along the face of an exposed pier, abutment, or wall, sufficient clearance shall be provided to allow dynamic lateral deflection. This will enable the rail to cushion and deflect an errant vehicle. See **Figure 11-1** for this barrier-to-obstruction distance.
- c. <u>Terrain Effect</u>. Most roadside barriers are designed and tested on level terrain. Caution must be taken when slopes are as steep as 1:6. **Figure 11-2** shows recommended barrier location on a 1:6 slope.
- d. <u>Length of Need</u>. See **AASHTO Roadside Design Guide** for length of need requirements.

# 11.3.3 Pedestrian Railing

A pedestrian railing shall be used at all locations where pedestrians are adjacent to a 2:1 or steeper drop-off equal to or greater than 30 inches high.

# A. Placement

The railing shall be placed on the outer edge of the sidewalk when pedestrian traffic is separated from vehicular traffic by a traffic railing. Pedestrian railing height shall be a minimum of 42 inches, measured from the walkway surface.

# **B.** Construction Materials

A pedestrian railing shall be constructed of one of the following materials:

- 1. Metal fabric.
- 2. Chain link (vinyl clad only).
- 3. Metal rails only or metal rails placed above a concrete parapet.

# C. Design Loads

See **Figure 11-3** for loading diagram.

- 1. <u>Metal Rail Design</u>. The design live loading shall be w = 0.050 KLF, both transversely and vertically, acting simultaneously on each longitudinal element. A concentrated load of 0.20 KIPS, acting on the top rail, and simultaneous with the design live loading can be considered at any point and in any direction.
- 2. <u>Chain Link/Metal Fabric Design</u>. The design live load shall be 0.015 KSF acting normal to the entire surface.

# 11.3.4 Bicycle Railing

A bicycle railing shall be used wherever bicycle lanes are adjacent to the edge of a bridge or hazard. The railing shall be warranted when the street has designated bike lanes.

### A. Placement

The bicycle railing shall be placed on the outer edge of the bike lane. Bicycle railing height shall be a minimum of 54 inches, measured from the riding surface.

### **B.** Construction Materials

A bicycle railing shall be constructed of metal rails only, metal rails above a concrete parapet, chain link, or metal fabric.

### C. Design Loads

See Figure 11-4 for loading diagram. Design loads are the same as for pedestrian railing in Section 11.3.3 C.

### 11.3.5 Combination Pedestrian, Vehicle and/or Bicycle Traffic Barrier

### A. Conditions for Use

The combination barrier shall be provided whenever a raised curb and an attached sidewalk exist adjacent to a roadway.

### **B.** Placement

The combination barrier shall be installed adjacent to the roadway with either a pedestrian or bicycle railing, as appropriate. If the sidewalk width is 6 feet or greater, the railing height shall be a minimum of 54 inches, measured from the riding surface. The combination barrier shall be placed on the outboard side. See **Figure 11-5**.

# 11.4 RETAINING WALLS AND ABUTMENTS

### 11.4.1 General

### A. Description

Retaining wall and abutments retain earth with lateral support or at the end of a bridge span, respectively. The design of these structures depends upon: type, function, and anticipated service life of retaining wall, earth pressure exerted on the

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wall by the retained backfill, geometry, strength and derformability of the ground, groundwater, and welling pressure in clay backfills.

Four types of retaining wall systems are discussed in this section: conventional retaining walls and abutments, anchored walls, mechanically stabilized earth walls, and prefabricated modular walls.

### **B.** Backfill Materials

The backfill materials used shall be granular and free-draining.

### C. Drainage

Drainage shall be provided to reduce hydrostatic pressure behind the wall.

### D. Design Life

All retaining walls shall have a minimum design life of 50 years.

# 11.4.2 Conventional Retaining Walls and Abutments

Conventional retaining walls and abutments are proportioned to provide stability against bearing capacity failure, overturning, and sliding.

### A. Avoid Placement in Right-of-way

Retaining walls are discouraged within the public right-of-way. They will be allowed only when necessary to support public improvements and when approved by the Engineer.

# **B.** Requirements When Beyond Right-of-way

Retaining walls needed to support private improvements shall not be located in the public right-of-way. However, if the failure of a related retaining wall could threaten any improvements or safety within the right-of-way, the Local Entity shall require it to be designed to the Local Entity's standards.

# C. Loading

Design of conventional retaining walls and abutments shall satisfy the following loading factors:

- 1. Lateral earth and water pressures, including any live and dead load surcharges.
- 2. The weight of the wall.
- 3. Temperature and shrinkage effects.
- 4. Seismic loads.

## 11.4.3 Anchored Walls

Anchored walls provide additional lateral resistance with the use of anchors. Their design is based on the suitability of the subsurface soil and rock conditions.

### A. Loading

Design of anchored walls shall satisfy items 1, 2, and 4, in Section 11.4.2 C above.

# 11.4.4 Mechanically Stabilized Earth Walls (MSEW)

Mechanically Stabilized Earth Walls (MSEW) are flexible composites of granular soil and tensile inclusions that behave as earth embankments with vertical or nearly vertical faces. MSEW are proportioned to provide stability against overturning and sliding. Bearing pressure generally governs design.

### A. Loading

Design of MSEWs shall satisfy items 1, 2, and 4, in Section 11.4.2 C above.

### **B.** Application for MSEW

An MSEW should be used where substantial total and differential settlement is expected. This type of wall may also be used where conventional gravity, cantilever, or counterforted concrete retaining walls are considered.

### C. Unacceptable Uses of MSEW

An MSEW shall not be used in any of the following conditions:

- 1. Where utilities other than highway drainage are to be constructed within the reinforced zone.
- 2. Where floodplain erosion or scour may undermine the reinforced fill zone or any supporting footing.
- 3. Where surface or groundwater contaminated by acid mine drainage or other industrial pollutants is present.

# 11.4.5 Prefabricated Modular Walls

Prefabricated modular walls employ soil-filled interlocking modules to resist earth pressures. Stability of modular walls depends upon the weight and strength of the fill soil. Each module level shall be investigated for sliding and overturning.

# A. Loading

- 1. Design of prefabricated modular walls shall satisfy items 1, 2, and 4, in Section 11.4.2 C above.
- 2. Earth pressure shall be computed on a plane surface where modules form an irregular, stepped surface.

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3. Ka, used to compute lateral thrust, shall be computed based on the friction angle of the backfill behind the modules.

### **B.** Application for Prefabricated Modular Wall

A prefabricated modular wall may be used where conventional gravity, cantilever, or counterforted concrete retaining walls are considered.

# C. Unacceptable Uses of Prefabricated Modular Wall

A prefabricated modular wall shall not be used in any of the following conditions:

- 1. On curves with radius less than 800 feet, unless the chord can be substituted with a series of chords.
- 2. Where groundwater or surface runoff is contaminated with acid.

# 11.4.6 Placement of Walls

### A. Relationship to Shoulder

Full or partial height walls shall not be located closer than the outer edge of shoulder.

# B. Retaining Wall at Roadway Level

When the top of the retaining wall is at the level of a roadway, the face of the parapet wall or rail shall be at least 4 feet from the edge of the traveled way.

# 11.5 BURIED STRUCTURES

A buried structure is a feature constructed by embankment or trench methods. Buried structures may be constructed of precast or cast-in-place concrete, aluminum, steel, or thermoplastic materials. This section covers typical buried structures in the **AASHTO** bridge standards manuals referenced in **Section 11.1.1**.

# 11.5.1 Design Life.

The design life for buried structures shall be a minimum of 100 years.

# 11.5.2 Design Loads

# A. Non-Vehicular Loads

- 1. <u>Load Factors</u>. Buried structures shall be designed for force effects resulting from horizontal and vertical earth pressure, pavement load, live load and vehicular dynamic load.
- 2. <u>Other Load Factors</u>. When relevant for site or construction conditions, earth and live load surcharges and downdrag loads shall also be evaluated.
- 3. <u>Water Buoyancy Loads</u>. Water buoyancy loads shall be analyzed for buried structures with inverts below the water table.

### **B.** Vehicular Loads

1. <u>Wheel Loads</u>. Where depth of fill is greater than 2 feet, wheel loads may be considered uniformly distributed over a rectangular area equal to the dimensions of the tire contact area.

For depth of fill 2 feet or less, wheel loads shall be increased by 1.15 times the depth of fill in select granular backfill, and by 1.0 times the depth of the fill in all other cases.

- 2. <u>Recreational Trails</u>. The minimum design vehicular loading for buried structures supporting recreational trails shall accommodate maintenance traffic. The minimum design loading shall be H-15.
- 3. <u>All Other Traffic</u>. Buried structures below traffic other than recreational traffic shall be designed for vehicular loadings of HS-20 or higher.
- 4. <u>Sidewalks</u>. A pedestrian load of 85 psf shall be applied to all sidewalks, where warranted for location above buried structures, wider than 2 feet and considered simultaneously with vehicular design live load.

### C. Tolerable Movement

The function and type of structure, anticipated service life, and consequences of unacceptable movement shall dictate the tolerable movement criteria for a buried structure.

### **D.** Embankment Installation

The soil envelope shall be wide enough to ensure lateral restraint for the buried structure. In no case shall the width of the soil envelope on each side of the buried structure be less than the values specified in Table 11-6.

Table 11-6

Minimum Wi	dth of Soil Envelopes
Diameter, S (Inches)	Minimum Envelope Width (Feet)
<24	S/12
24–144	2.0
>144	5.0

# E. Minimum Soil Cover

The depth of cover of a well compacted granular sub-base, taken from the top of rigid pavement or the bottom of flexible pavement shall be no less than the values specified in **Table 11-7 and Table 11-8**.

Table 11-7
Minimum Soil Cover for Buried Structures

Туре	Condition	Minimum Cover
Structural Plate Pipe Structures		S/8 <u>&gt;</u> 12.0 inches
Long Span Structural Plate Pipe Structures		Refer to Table 11-8
Structural Plate Box Structures		1.4 to 5.0 ft.
Reinforced Concrete Pipe	Unpaved areas and under flexible pavement	B <sub>c</sub> /8 or B' <sub>c</sub> /8, (whichever is greater) ≥ 12.0 inches
	Compacted granular fill under rigid pavement	9.0 inches
Thermoplastic Pipe		$ID/8 \ge 12.0$ inches

Notes for Table 11-7:

S = diameter of pipe (inches)

 $B_c$  = outside diameter or width of the structure (feet)

B'<sub>c</sub> = out-to-out vertical rise to pipe (feet)

ID = inside diameter (inches)

	n Burice	Longo	pull I lut		luotares	
Minimum Cover, Feet						
Top Radius, ft:	≥15.0	≥15.0 15 - 17 17 - 20 20 - 23 23 - 25				
Steel Thickness Without						
Ribs, inches						
.111	2.5	-	-	-	-	
.140	2.5	3.0	-	-	-	
.170	2.5	3.0	3.0	-	-	
.188	2.5	3.0	3.0	-	-	
.218	2.0	2.5	2.5	3.0	-	
.249	2.0	2.0	2.5	3.0	4.0	
.280	2.0	2.0	2.5	3.0	4.0	

Table 11-8Minimum Soil Cover for Buried Long Span Plate Pipe Structures

### F. Minimum Pipe Spacing

Multiple lines of pipe shall be spaced far enough apart to permit proper placement and compaction of backfill below the haunch and between structures. Minimum spacing shall not be less than that shown in **Table 11-9**. The utility companies may have other spacing requirements that will use spacing greater than these requirements.

Type of Structure	Minimum Distance Between Pipes (Ft)
Round Pipes Diameter, D (ft)	
≤ 2.0	1.0
2.0 - 6.0	D/2
≥ 6.0	3.0
Pipe Arches Span, S (ft)	
≤ 3.0	1.0
3.0 - 9.0	S/3
9.0 - 16.0	3.0
Arches Span, S (ft)	
All Spans	2.0

# Table 11-9 Minimum Pipe Spacing

### 11.5.3 Structural Plate Box Structures

Structural plate box culverts are composite reinforced rib plate structures rectangular in shape. These structures are relatively flat on top and require a large flexural capacity. Structural plate box culverts are also called metal box culverts.

### A. Design

The shallow covers and extreme shapes of box culverts require special design procedures. Flexural requirements of metal box culverts govern the choice of section in all cases.

#### **B.** Geometric Requirements

See **Figure 11-6** and **Table 11-10** for geometric requirements for structural plate box structures.

Parameter	Required Range
Span, S	8'-9" to 25'-5"
Rise, R	2'-6" to 10'-6"
Radius of crown, rc	< 24'-9 1/2"
Radius of haunch, rh	> 2'-6"
Haunch radius included angle, $\Delta$	50 to 70 degrees
Length of leg, D	4-3/4" to 71"
(measured to the bottom of the plate)	
Minimum length of rib of leg, L	19"; D - 3"; or within 3" of top or footing
	(which ever is lowest)

 Table 11-10

 Geometric Requirements For Structural Plate Boxes

#### C. Embankment Installation

The combined width of the soil envelope and embankment beyond shall be adequate to support all the loads on the culvert.

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### **D.** Live Loads

Live load distribution for culvert tops may be based on provisions for deck slabs spanning parallel to traffic.

## E. Maximum Soil Cover

Maximum soil cover for structural plate box structures shall be limited to a depth of cover of 5 feet.

## F. Concrete Relieving Slabs

Concrete relieving slabs may be used to reduce flexural moments in box culverts. The length of the concrete relieving slab shall project at least 1 foot beyond the haunch on each side of the culvert.

# 11.5.4 Reinforced Concrete Pipe

This section covers buried precast reinforced concrete pipes of circular, elliptical, and arch shapes.

### A. Design

Buried reinforced concrete pipes shall be designed to resist structural failure due to flexure, thrust, shear, and radial tension. The dimensions of the pipe sections shall be determined with either the direct or indirect design method as outlined in the **AASHTO** standards referenced in **Section 11.1.1**.

### **B.** Trench and Embankment Installations

Both trench and embankment installations shall be designed for embankment (positive projecting) loads and pressure distribution. The earth pressure distribution shall be the Hedger pressure distribution as shown in **Figure 11-7** and

Table 11-11.

_			<u> </u>	
		Installat	ion Type	
Coefficient	1	2	3	4
VAF	1.35	1.4	1.4	1.45
HAF	0.45	0.4	0.37	0.3
A1	0.62	.85	1.05	1.45
A2	0.73	0.55	0.35	0.0
A3	1.35	1.4	1.4	1.45
A4	0.19	0.15	0.1	0.0
A5	0.08	0.08	0.1	0.11
A6	0.18	0.17	0.17	0.19
а	1.4	1.45	1.45	1.45
b	0.4	0.4	0.36	0.3
С	0.18	0.19	0.2	0.25
e	0.08	0.1	0.12	0.0
f	0.05	0.05	0.05	_
u	0.8	0.82	0.85	0.9
V	0.8	0.7	0.6	_

Table 11-11Coefficients for Use with Figure 11-7

### C. Live Loads

For standard installations, the live load on the pipe shall be assumed to have a uniform vertical distribution across the top of the pipe and the same distribution across the bottom of the pipe as shown in **Figure 11-7**.

# 11.5.5 Reinforced Concrete Cast-in-Place, Precast Box Culverts, and Reinforced Cast-in-Place Arches

This section covers cast-in-place and precast reinforced concrete box culverts and cast-in-place reinforced concrete arches.

### A. Trench and Embankment Installations

Installations of trenches or embankments shall be constructed according to requirements in Chapter 5, Soils Investigations and Report, and Chapter 22, Construction Specifications.

#### **B.** Other Installations

Other installation methods (such as partial positive projection, 0.0 projection, negative projection, induced trench, and jacked installations) may be used to reduce the loads on a culvert.

### C. Live Loads

- 1. <u>Vehicular</u>. All vehicular box culverts shall be designed for vehicular loadings of HS-20 or higher.
- 2. <u>Less Than 2 Feet of Soil Cover</u>. Distribution of wheel loads and concentrated loads for culverts with less than 2 feet of cover shall be as specified for slab-type

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superstructures. Minimum cover shall be as required in Chapter 12, Utility Locations.

- 3. <u>When Live Load Effects Can Be Ignored</u>. For single-span culverts, the effects of live load may be neglected where the depth of fill is more than 8 feet and exceeds the span length. For multiple span culverts, the effects of live load may be neglected when depth of fill exceeds the distance between faces of end walls.
- 4. <u>No Soil Cover</u>. If soil cover is not provided, the top of reinforced concrete box structures shall be designed for direct application of vehicular and pedestrian loads.

# **D.** Crack Width Control

Steel reinforcement shall be well distributed over the zone of maximum concrete tension to control flexural cracking.

# 11.5.6 Thermoplastic Pipe

This section covers buried thermoplastic pipe with solid, corrugated, or profile wall and constructed of High Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC).

# A. Design

Buried thermoplastic pipes under roadways and driveways shall be designed to resist structural failure due to thrust and buckling. Investigation of buckling shall be based on the 100-year value for modulus of elasticity.

# **B.** Localized Distortion

Maximum localized distortion of installed plastic pipe shall be based on the service requirements outlined by **AASHTO** standards referenced in **Section 11.1.1** and overall stability of the installation.

# C. Temporary Roadways

The design requirements for thermoplastic pipe may be relaxed for temporary roadways or special conditions as approved by the Local Entity Engineer.

# 11.5.7 Precast Reinforced Concrete Three-sided Structures

This section covers three-sided precast reinforced concrete structures supported on a concrete footing foundation.

# A. Design

Design of three-sided structures shall be based on a pinned connection at the footing and shall take into account anticipated footing movement. Each precast three-sided structure shall be analyzed independently with no shear or stress transfer assumed between sections.

### **B.** Geometric Requirements

The shape of precast three-sided structures, as specified by the manufacturer, may vary in span, rise, wall thickness, haunch dimensions, and curvature. Wall thickness shall be a minimum of 8.0 inches for spans under 24 feet and 10 inches for spans 24 feet and longer.

### C. Shear Key

Flat top structures with shallow cover may experience differential deflection of adjacent units; therefore, shear keys shall be provided in the top surface.

### **D.** Minimum Reinforcement

The flexural reinforcement in the direction of span shall provide a ratio of reinforcement/gross concrete area  $\geq 0.002$ . This minimum reinforcement shall be provided at all cross-sections subject to flexural tension, at the inside face of walls, and in each direction at the top of slabs of three-sided sections with less than 2.0 feet of fill.

### **E. Deflection Control**

Deflection criteria shall be addressed in the design of all precast reinforced concrete three-sided structures.



LARIMER	COUNTY	
URBAN	AREA	
STREET ST	<b>FANDARDS</b>	

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DATE:

DESIGN FIGURE FIGURE 11 - 1



LARIMER COUNTY	DESIGN FIGURE	REVISION NO:	FIGURE
STREET STANDARDS		DATE: 08/07/00	11-2





LARIMER COUNTY	DESIGN	REVISIO	N NO:	FIGURE
STREET STANDARDS	FIGURE	DATE:	08/07/00	11-4





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DESIGN FIGURE FIGURE



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# CHAPTER 12 – INSTALLATION OF UTILITIES AND OTHER SYSTEMS

## 12.1 GENERAL

This chapter sets forth the criteria and location requirements for all utilities, such as: water, sewer, storm sewer, subdrains, power (electric and natural gas), phone, CATV, traffic signals and mailboxes, within the right-of-way and/or public utility easements. The appropriate utility and the Local Entity's utility department shall determine all final alignments of utilities.

### 12.2 DESIGN STANDARDS

### 12.2.1 General Requirements

Standard plan requirements and layout requirements are discussed in Chapter 3, Information Requirements for Construction Plans. Refer to Figure 12-1 for general utility requirements.

### 12.2.2 Minimum Depth

All utilities shall be located at least 2 feet below the scarified subgrade elevation, unless specifically approved to be less by the Local Entity Engineer. Greater depth of cover may be specified by the Local Entity Engineer.

### 12.2.3 Access Covers

#### A. Clearance

All manhole lids, utility access covers, and range box access covers shall be flush with the roadway finished surface or depressed no more than 1/2 inch below the finished surface. If located in concrete, all access covers shall be set flush with surrounding concrete. Refer to **Construction Drawing 1201**.

#### **B.** Wheel Path

Manholes or valves shall not be designed or constructed in the Wheel Path of the travel lane or at any location within a bike lane.

### C. Access Cover Location

### 12.2.4 Manhole, water valve or other utility access covers and lids shall not be located in the flowline of curbs or crosspans. Manholes and water valve covers shall be located more than 4 feet away from the curb or crosspan.Trees and Large Shrubs Prohibited Over or Near Utilities

### A. Buried Utilities

Trees, berms or large shrubs shall not be placed over buried utilities. Additional horizontal clearances from the trunk of any tree or shrub to any buried utility may be required by the Local Entity's utility department.

### **B.** Overhead Utilities

Trees should not be planted under overhead power lines when mature growth of the tree would come within 10 feet of the power lines.

# 12.2.5 Use of PVC Sleeves by Franchised and Private Utilities

### A. General

It is the intent of these standards to reduce the amount of open cuts in the roadway. Therefore, franchised and private utility companies shall install all utilities within a non-corrosive sleeve equivalent to Schedule 40 PVC or other sleeves encased in concrete, slurry or flow-fill material, across all public streets to accommodate future repairs without street cuts. PVC sleeves shall conform to **Construction Drawing 1202**.

### **B.** Exceptions

Steel gas line street crossings will not require sleeves.

# C. Depth

Sleeves shall be installed at a minimum depth of 36 inches from the top of the pipe to the top of pavement or 24 inches from the top of pipe to the top of subgrade, whichever is greater.

### **D.** Location

Sleeves shall be located within 15 feet of the parallel gutter flowline of the existing street and shall be coordinated with other utilities. All sleeve locations shall be marked according to **Chapter 22, Construction Specifications**. Sleeves shall be separated for existing buried utilities in accordance with the utility owner requirements. Ten feet of separation is typically preferred.

### E. Street Cuts

Utility crossings of existing streets shall be performed in accordance with **Chapter 25, Reconstruction and Repair**.

## 12.2.6 Use of PVC Sleeves for Potential Signalized Intersections

A. Depth

Refer to Section 12.2.5 C.

### **B.** Location

Refer to Section 12.2.5 D.

### C. Extra PVC Sleeves

Extra PVC sleeves may be required on Collector or Arterial intersections for future traffic signalization.

# 12.3 LOCATION CRITERIA

Refer to Figure 12-1 for general notes about Utility locations within street rights-of-way.

# 12.3.1 Utilities

### A. General

The utility locations discussed below are required for new development and preferred in the case of existing streets/established developments.

## B. Water

- 1. <u>Water Mains</u>. Water mains should be located on the north and east sides of streets approximately 7 feet south or west of the north or east gutter flowline. Water mains shall be separated by a minimum of 10 feet horizontally from sanitary sewer and storm sewer facilities.
- 2. <u>Fire Hydrants</u>. Fire hydrants shall be located 2 feet minimum from curb and gutter flowline or 2 feet minimum from back edge of a sidewalk or 10 feet minimum from edge of pavement if no curb is present. In addition, the water line shall be located such that the valves will not be in the wheel path of the street lane.
- 3. <u>Requirements</u>. The vertical depth of the water lines shall meet the requirements of the Local Entity's utility department.

# C. Sanitary Sewer

- 1. <u>Location</u>. Sanitary sewer should be on the centerline of the right-of-way unless a median is present. If a median is present, the sanitary sewer line shall be located 6 feet west or south of the median. The sanitary sewer shall be located such that the manhole locations are not within the wheel path of the street lane.
- 2. <u>Requirements</u>. The vertical depth of the sanitary sewer lines shall meet the requirements of the sanitary sewer standards of the Local Entity.

### **D.** Storm Sewer

- 1. <u>Location</u>. The storm sewer shall be placed so the manhole locations are not within the wheel path of the street lane.
- 2. <u>Requirements</u>. The storm sewer lines shall meet the requirements of the storm sewer standards of the Local Entity.

### E. Natural Gas

- 1. <u>Location</u>. Gas mains shall be located either within the right-of-way or in an adjacent easement on the south and west sides of the street.
- 2. <u>Double Mains</u>. For double mains (a main on each side of the street), the requirement of north and east/south and west may be waived by the Local Entity Engineer. Double mains are recommended.

### F. Power and Street Lighting

- 1. <u>Location</u>. Generally, power and street lighting lines shall be located on both sides of the street either within the right-of-way or in an adjacent easement.
- 2. <u>Double Mains</u>. Double mains are common and acceptable.

### 12.3.2 Other Systems

### A. Cable TV/Telephone

Cable TV and telephone lines generally serve properties from the back. For mains along the street front the utility shall coordinate the location in the right-of-way or easements with the Local Entity Engineer. All pedestal boxes located in the right-of-way between the curb and the sidewalk shall be installed below ground.

#### **B.** Mailboxes

Mailbox clusters must be installed a minimum of 2 feet from back of walk and not cause any sight obstruction. Mailboxes must not pose a fixed object hazard for vehicles and pedestrians.

### C. Poles

- 1. <u>Location</u>. Poles, signs, and any other above ground streetscape (except regulatory signs) should be located within 5 feet of the right-of-way line or 10 feet from the travel lane (flowline), whichever is most restrictive.
- 2. <u>Clearance</u>. Light poles shall be placed no closer to the roadway than 2 feet behind a vertical curb line and no closer than 2 feet to any sidewalk.
- 3. <u>Pole Requirements</u>. The Local Entity Engineer may require breakaway poles on public right-of-way where speed limit is 40 m.p.h. or higher. Refer to **CDOT Roadway Design Manual, Section 1002.6, Specifications**.

- 4. <u>Engineer Approval</u>. All poles within the public right-of-way must be accepted by the Local Entity Engineer prior to the permit application for installation.
- 5. <u>Other Requirements</u>. All signs and heights shall meet the requirements of **Chapter 14, Traffic Signals, Signs, and Striping**.

### **D.** Subdrains

Subdrain main lines may be permitted within the public right-of-way. The Developer shall be required to provide additional information and soils investigation, as discussed in Chapter 5, Soils Investigations and Report. In addition, subdrains shall be designed in accordance with the requirements in Chapter 7, Street Design and Technical Criteria. If the soils investigation shows that subdrains are required for private property foundations, these lines may be designed to be installed within the public right-of-way only if all requirements of these Standards are met.

- 1. <u>Private Property.</u> Subdrains built within the right-of-way for private drainage shall be private improvements and shall have provisions for viable maintenance by the local homeowners association or other private entities. The Local Entity may require the private entity to abandon or relocate such subdrains.
- 2. <u>Public Property.</u> A subdrain is public if it is used to drain public improvements, such as the street/pavement section.
- 3. <u>Requirements.</u> The subdrain design shall meet or exceed these minimum requirements:
  - a. <u>Depth.</u> Top of pipe shall be at least 36 inches below pavement surface.
  - b. <u>Outlet.</u> All subdrains shall outlet to a detention pond, inlet, or other approved location. Each outlet shall have a device to prohibit backflow into outlet pipe.
  - c. <u>In Loveland</u>. Perforated subdrains for private improvements shall <u>not</u> be allowed within any public right-of-way or easement.
- 4. <u>Professional Engineer</u>. Subdrains must be designed by a Professional Engineer and are subject to approval of the Local Entity Engineer.

# 12.3.3 Utility Crossings with Bridge Structures

Sleeves may be required within the bridge structures to provide for electrical, gas, telephone, and cable crossings. The Local Entity Engineer may require additional sleeves to be designed with the bridge structure for sewer, water, or other utilities.



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# CHAPTER 13 – STREET NAMING AND ADDRESSING

# 13.1 GENERAL

This chapter describes the criteria used to name new streets and assign addresses to properties along those streets. Street names and addresses should be easy to locate. It is important that street names not be duplicated nor sound similar to any other street. Addresses must be consistent to provide easy location of all properties. Street layout is an important factor for being able to assign addresses that carry on in a general logical sequence. For the health, safety and welfare of the public, people must be able to describe their location for emergency services, and responding emergency personnel must easily find the location.

# 13.2 STREET NAMING

Since the 911 emergency dispatch system operated by the Larimer Emergency Telephone Authority (LETA) is a countywide system, all Local Entities within the Larimer County coordinate on their selection of street names to ensure that there are no duplicate street names county wide. This is a need for the rapid and efficient dispatch of emergency services. Each Local Entity participates in a web site based Street Name Inventory System coordinated by Larimer County.

# 13.2.1 Name Selection System

The system may be accessed by anyone to check on street names. A proposed street name may be entered for testing to determine whether the name is acceptable. The system will indicate names already in use and show names the sound too similar. The web site address for the system is <u>www.larimer.org/streets/index.htm</u>. Only the Local Entities assigning addresses may enter street names for reservation in the system. Street names are reserved as proposed at the time a plat is submitted for development review. Upon approval of the plat, the proposed street names will be transferred to the "existing" list. In some cases, Local Entities have reserved specific names for their future use.

# 13.2.2 Street Naming Criteria

When assigning names to streets, follow the street naming criteria in **Table 13-1** titled "Rules of the Street." This list appears on the Name Selection System web site, <u>http://www.larimer.org/streets/rules.htm</u>.

In Loveland (city limits only), refer to Title 12, Section 12.08 of the Loveland Municipal Code for the street naming policy.

### 13.2.3 Major Street Names

In Fort Collins (city limits only) all arterial and collector street names shall be selected from a City Council approved list of reserved names. The names relate to the history of Fort Collins. The list is available in the Current Planning Department office.

In Loveland (city limits only), refer to Title 12, Section 12.08 of the Loveland Municipal Code for the street naming policy.

# Table 13-1 "Rules of the Streets"

	Standardization of road naming criteria
1. 2. 3.	Use only accepted suffixes Homonyms for road names are not acceptable. Road names should be unique and not repeated in the County from this point forward, with the exception of continuation of existing streets.
4.	Each Municipality and the County may develop a list of acceptable or recommended names for use in its jurisdiction. If there are duplications on such lists, and another Municipality or the County utilized the name, the name will be removed from the acceptable or recommended lists in the other jurisdictions.
5.	Within the Growth Management Area around each Municipality, roads will be named using city/town names, not County road numbers. Outside of the GMA Boundary, County road numbers will be used. Street names, rather than County road numbers, will be used for internal roads in County subdivisions and 35 acre developments.
6.	In the unincorporated area any road that serves as an access to multiple properties must be named. Multiple properties accessing of a single point from a County road may not use the single access point as a common address.
7.	Continuous roads should have continuous names (with the exception of circle roads). Names should not change except at the Growth Management Area boundary, however, names are not required to change at the Growth Management Area boundary.
8. 9.	Recommend that road names must be simple to pronounce, in the opinion of the review jurisdiction. Cardinal directions cannot be used in the name. Directions are used only to designate the portion of an existing road. (not acceptable - North Road, East Fort Road, Northstar Drive.)
10. 11.	No curse words or derogatory terms shall be used for road names. These are meant to be minimum standards for each Municipality and the County. The main objective is to provide clear street names for citizens and for emergency dispatch and to minimize the possibility of emergency personnel being unable to find a location. Nothing in this Agreement is intended to limit any Municipality or the County from developing more extensive street naming guidelines.
12. 13. 14. 15.	Numerical addressing will not change from the current process. All names shall be of the commonly acceptable spelling, according to a standard dictionary. Street names cannot contain any punctuation or special characters. Only alphabetical symbols A through Z, and numbers 0 through 9 and blank spaces may be used in street names. Anytime that a street makes a directional change of approximately ninety degrees, the street name shall change. A directional change of approximately ninety degrees shall mean a horizontal curve where a reduction in the design speed is required (i.e. a sharp turn vs. a sweeping curve).
16.	Existing street names shall continue across intersections and roundabouts.

### 13.2.4 Suffixes

Street suffixes, such as Court, Avenue, etc., which are used to complete the street name, shall conform to the requirements shown in **Table 13-2** titled "Approved Street Suffixes." This list appears on the Name Selection System web site.

### 13.3 STREET ADDRESSING

The purpose of addressing is to provide a means to locate all properties within the Local Entity. The intent of each Local Entity is to assign addresses with an orderly system, which is consistent, predictable and understandable for everyone.

# 13.3.1 Address Assignment

All addresses shall be assigned by the Local Entity. Addresses shall be assigned at the time, or shortly thereafter, the approved plat or deed is filed with the Larimer County Clerk and Recorder. The record of addresses is kept and maintained by each Local Entity for its own jurisdiction.

# 13.3.2 Address Changes

The Local Entity must approve any change in a property address. Any changes must conform to the addressing convention used by the Local Entity.

# Table 13-2Approved Street Suffixes

The following table lists the only suffixes that can be used for <b>new</b> street				
	names.			
Suffix	Abbreviation	Description		
Avenue	AVE	A roadway or thoroughfare that is continuous and not limited to a single subdivision.		
Boulevard	BLVD	Street with a landscaped median dividing the roadway.		
Court	СТ	Permanently dead-end street or terminating in a cul-de- sac, not longer than 660 feet in length.		
Drive	DR	A curvilinear street.		
Lane	LN	Minor street within a subdivision.		
Parkway	PKWY	A thoroughfare designated as a collector or arterial, with a median reflecting the parkway character implied in the name.		
Place	PL	Permanently dead-end street, terminating in a cul-de- sac, or short through street, not longer than 660 feet in length.		
Road	RD	A designated thoroughfare.		
Street	ST	The common or default suffix.		
Way	WAY	A curvilinear street.		

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# CHAPTER 14 – TRAFFIC CONTROL DEVICES

# 14.1 GENERAL

This chapter describes general signal, signing, and striping design requirements for use in the Local Entity. All design and construction of signals, signing, and striping shall be in conformance with this chapter and the latest revision of the MUTCD. For Fort Collins (city limits only) also refer to Appendix "F", *City of Fort Collins Traffic Operations Manual*.

# 14.2 DESIGN REQUIREMENTS

### 14.2.1 Traffic Signal Design Requirements

The design of traffic signals shall be performed by the Local Entity or a qualified Traffic Engineer approved by the Local Entity. The Local Entity may charge the cost of design and construction to the Developer when the work is completed by the Local Entity.

For CDOT highways, the design will follow the current version of **Colorado Department of Transportation Standards** for a standard mast arm type traffic signal installation. For city streets not on the state highway system the design will follow the 1994 version of **Colorado Department of Transportation Standards** for a standard mast arm type traffic signal installation, with the changes below in Loveland or Fort Collins (GMA and city limits):

### A. Special Requirements for Loveland (GMA and City Limits)

- 1. Galvanized and painted mast arm/signal poles, luminaire arms, and extensions shall be painted with Standard Valmont Color Medium Brown.
- 2. Street light luminaire extensions (galvanized and powder coated) shall be ordered on all poles. A 35-foot luminaire mounting height and a 15-foot luminaire arm (galvanized and painted) shall be used to mount a 250 or 400 Watt HPS streetlight fixture (or approved equal). Streetlight fixtures are to be obtained from the City of Loveland's warehouse at no cost to the project or the traffic division. The luminaire arm shall be rotated 10 degrees in front of the mast arm (-10 degrees).
- 3. The signal cabinet shall be a SafeTran Model #333SD (or approved equal) wired for a full 8 phase with overlaps operation with Signal Sense SSDC 1500 UPS (or approved equal) with three (3) 79 Amp backup batteries.

Signal Controller shall be a Naztec 970 traffic signal controller (or approved equal) with the latest version of software.

4. A Fiber optics switch is provided in each signal cabinet and at other locations as needed. A Rugged Com RS 900GP 12 port multilink patch panel part number FWM-1X-SP-BK (or approved equal) is also required.
- 5. Opticom fire preemption system complete with Global 721 detectors (or approved equal), wiring, and Global 752 card (or approved equal) in the cabinet (3M system) is required.
- 6. Attachment height for mast arms to signal pole shall be at 19 feet unless located on CDOT highways where the latest **CDOT** specifications (20' attachment height) shall be required.
- 7. A Panasonic pan-tilt-zoom (PTZ) camera model WV-SW396 (or approved equal) shall be required at each signalized intersection. The camera shall include all wiring including an unspliced latest CAT cable from camera to controller cabinet.
- 8. Black, 12"-12" polycarbonate signal head cap visors with 5" black back plates shall be mounted using skybrackets (or approved equal) over the center of each lane. Side of pole mounted 12"-12"-12" are for the far side right, which will cover any dedicated right turn lanes. Use of far side left 12"-12"-12" or 12"-12"-12"'-12"' heads with cut away visors are determined on an intersection by intersection basis but will be used in most cases on State Highways and/or arterials with significant large truck traffic. Section heads shall not be doghouse style unless otherwise approved Local Entity.
- 9. Black 16-inch poly LED countdown pedestrian heads and a clamshell/banding mounting system are required with black Polara Bulldog ADA pedestrian buttons (or approved equal) for all standard pedestrian movements.
- 10. Two 3-inch conduits and one 2" conduit (Schedule 80 PVC minimum) will be used for wiring between the signal bases and the cabinet. For vehicle loops, use a 2-inch conduit from the water valve pull boxes to the nearest pull box.
- 11. Traffic signal pull boxes shall be polymer concrete with traffic logo on the lid. There are 4 standard sizes depending on the application: 13" x 24"x 12", 17" x 30" x 12", 24" x 36" x 18", and 36" x 48" x 18". Split lid for fiber optics. See Figure 14-4 for pull box specifications.
- 12. Pedestrian buttons shall be the black Polara bulldog type (or approved equal) with audio alert, LED light, and sign housing/back plate that shall be a 5" x 7" man/arrow white on black.
- 13. See Figure 14-3A for example traffic signal layout and Figure 14-3B for Traffic Signal General Notes.

#### B. Special Requirements for Fort Collins (GMA and City Limits)

- 1. Galvanized and painted mast arm/signal poles, luminaire arms, and extensions painted with Standard Retardo Brown or Forest Green shall be used.
- 2. Street light luminaire extensions (galvanized and painted) shall be ordered on all poles. A 30-foot luminaire mounting height and a *IS-foot* luminaire arm (galvanized and painted) shall be used to mount a 250 Watt HPS streetlight fixture. Streetlight fixtures are to be purchased from the City of Fort Collins warehouse.

- 3. 2070-L Controller and Cabinet Model #332 wired for a full 8 phase with overlaps operation with the latest version of city approved firmware is required.
- 4. City standard spread spectrum radio with antenna and complete wiring, including modem card in the controller, is required.
- 5. Opticom fire preemption system complete with detectors, wiring, and card in the cabinet(3M system) is required.
- 6. Attachment height for mast arm to pole shall be at 19 feet instead of CDOT standard 20 feet.
- 7. Micro loops complete with wiring and detector cards for counting traffic on all approach lanes shall be used.
- 8. Yellow, 12"-12"-12" aluminum signal heads with 4" black back plates shall be mounted using astrobrackets over the center of each lane. Side of pole mounted 12"-12"-12" are for the far side right, which will cover any dedicated right turn lanes. Use of far side left 12"-12"-12" heads are determined on an intersection by intersection basis but will be used in most cases on State Highways or Arterials with significant large truck traffic.
- 9. Black 16-inch LED pedestrian heads (hand/man) with visors and a clamshell/banding mounting system are required with ADA pedestrian buttons for all standard pedestrian movements.
- 10. Two 3-inch conduits (Schedule 40 PVC minimum) will be used for wiring between the signal bases and the cabinet. For vehicle loops, use a 2-inch conduit from the water valve pull boxes to the nearest pull box.
- 11. Pedestrian buttons shall be the bulldog type with audio alert, LED light, and sign housing/back plate.
- 12. The City of Fort Collins operates its own communications network for the traffic management system, and as such, any new traffic signal installation shall include the design and expansion of that communications network from an approved existing access point to the new signal. The design and expansion of the communications network shall be per the traffic operations specifications current at that time.
- 13. The traffic signal system communication network utilizes 48 strand single-mode fiber optic cable, per traffic operations specifications. The fiber shall be undergrounded in 2" HDPE schedule 40, SDR 11, or heavier conduit, with 24" x 36" or larger pull boxes placed every 1000 feet. A 100 foot coil of fiber cable shall be stored in all pull boxes, with exceptions approved by the traffic operations department.
- 14. All design work of the cable installation and selection of the communications electronic equipment shall be approved by the Traffic Engineer prior to acquisition and installation. Upon completion of the cable installation, final asbuilts shall be submitted for review and approval.

#### 14.3 TRAFFIC SIGNING

#### 14.3.1 General

#### A. Type and Location of Signs

The Local Entity Engineer shall make the final determination regarding the type and location of signage controls within the right-of-way. These controls shall include traffic control signs, street name signs, delineators, and permanent barricades.

#### **B.** Design, Installation, and Maintenance

Because the Local Entity will maintain the permanent traffic control devices on public rights-of-way, all traffic control devices shall be fabricated and installed in accordance with **Chapter 22**, **Construction Specifications**. All design shall be in accordance with this chapter and the latest revision of the MUTCD, and in Fort Collins (GMA and city limits) refer to Appendix F, City of Fort Collins Traffic Operations Manual.

#### C. New Roadway

Permanent signage, unless otherwise approved by the Local Entity Engineer, shall be completely in place before any new Roadway is opened to the public.

#### **D.** Other Standards

These Standards are to be used in conjunction with other applicable Local Entity Regulations.

#### E. Sign Posts, Supports, and Mountings

For Fort Collins (GMA and city limits) also refer to Appendix F, City of Fort Collins Traffic Operations Manual. Sign posts and their foundations and sign mountings shall be constructed to hold signs in a proper and permanent position, to resist swaying in the wind or displacement by vandalism.

- 1. <u>Sign Post</u>. The post shall be constructed in two sections:
  - a. <u>Anchor (Stub)</u>. A 2-1/4-inch 12-gauge galvanized steel square stub section with holes, three (3) feet long, is driven into the ground 30 to 33 inches with 3 to 6 inches remaining above the final grade. The sign post system's material specification is Telspar 22F12A 03PG, 2-1/4-inch x 3 feet anchor post with holes, or perforated.
  - b. <u>Sign Post</u>. A 2-inch square galvanized steel post section with holes is inserted into the stub and bolted. The material specification is Telspar 20F12P-10PG, 2-inch square 12-gauge 10-foot post with holes. Posts shall be installed 6 to 8 inches into the anchor (stub), which has 3 to 6 inches sticking out above the final grade.

- 2. <u>Post Bolts</u>. Two 2-1/2-inch long, 3/8-inch hex head bolts are used to attach sign posts to sign anchor (stubs). These bolts shall be installed in adjacent holes at the top of the anchor (stub), at 90 degrees to one another.
- 3. <u>Sign Bolts</u>. Signs shall be mounted to the post with a minimum of one drive rivet (TL3806 EG) and nylon washer (against sign face) at the top of sign. The bottom of the sign shall be attached with one 5/16" hex bolt, one metal washer and one nylon washer against sign face. The bolt or rivet system is used to fasten signs to the Telspar post.
- 4. <u>Other Sign Mounts</u>. Streetlights and approved utility poles, when located appropriately, may be used for signs such as warning, parking, and speed limit signs. Streetlight locations should be checked for potential sign installation during the design process and shown on the sign plan sheets. Refer to **Section 14.4.3 B**.
- <u>Breakaway Post System</u>. Posts must be of appropriate length to comply with MUTCD specifications for the location, must conform to the Local Entity's Specifications, and must meet the Federal breakaway standards. See Construction Drawing 1414 for Cantilever arm brackets for street name signs mounted on light or signal posts.

#### F. Sign Reflectivity

All traffic control signs must be fabricated with reflective materials All reflective materials to be a minimum of diamond grade, except parking and street name signs shall be a minimum of high intensity material or greater. per Section 14.3.3. All signs or traffic control devices must have a 7-year materials warranty. No silk screened signs will be permitted.

For Fort Collins (GMA and city limits) also refer to Appendix F, City of Fort Collins Traffic Operations Manual.

#### G. Backing Plates

Aluminum blanks of .080 gauge are standard, except for signs larger than  $36 \times 36$  inches, which shall be .100 or .125 gauge aluminum.

#### 14.3.2 Intersections

#### A. Street Name Sign

- 1. <u>General</u>. All street name signs must conform to these standards, See **Construction Drawing 1411**. If the intersection has a traffic signal, street name signs will be designated as part of the signal.
- 2. <u>Minor Intersection</u>. Eight-inch plates shall be used at all minor intersections; lengths will vary to fit street names. Also see street name sign drawing #1411.
- 3. <u>Major Intersection</u>. 10" plates shall be used at all major intersections, which include the intersections with Collector and Arterial Roadways. In Loveland

(GMA and city limits), street name signs placed on mast arms at signalized intersections shall use 18" plates with 14" letters.

- 4. <u>Sign Assembly</u>. There shall be two plates for each road, with a minimum of four plates per street sign assembly. In Loveland (city limits only), street name signs shall be mounted directly to the sign post with two drive rivets per sign and nylon washers against sign face. Typical installation shall include four street name signs, two for each direction. For signs with lengths of 18" 30" use .080 gage blank thickness; for signs 36" 48" us .100 gage blank thickness.
- 5. Sign Face.
  - a. <u>Letter Size</u>. Refer to the following table and **Construction Drawing 1411** for letter size specifications.

Type of Mounting	Letter Size	Height of Sign Blank
Local/Local	6"	8", Lengths may vary
Metro Overhead	14"	18", Lengths may vary

- b. <u>Color</u>. Letters and numbers are to be white on a green background face. Private streets shall use green letters on a white background face. The colors shall not fade when exposed to an accelerated test of ultraviolet light equivalent to 5 years of outdoor exposure. No silk screened signs are permitted. Minimum of high intensity materials shall be used for local signs and diamond grade for metro overhead signs.
- c. <u>Block Numbers and Arrows</u>. All signs shall include block numbers plus arrow pointing toward the higher block number, except on one way streets. Arrows shall meet MUTCD standards as illustrated in the Standard Highway Sign Handbook.
- d. <u>Border</u>. There shall be no borders on street name signs (except for Metro District signs).
- 6. <u>Street Name</u>. Street names and 100-block (where applicable) designations should be obtained from the approved plat. Internally illuminated signs are not permitted in Loveland (GMA and city limits).
- 7. <u>Change of Name or Numbers</u>. At the point where a street changes names/numbers from one section to the next, the change shall be designated with a street name assembly by using standard names, numbers, and directional arrows to indicate change. This will be accomplished using an 18" double height street name plate. This change and shall look like a standard street name sign, separated horizontally with a vertical white line in the middle of the sign.
- 8. <u>No Outlet Signs</u>. On any cul-de-sac, temporary dead-end street, or any other streets with only one access point a "No Outlet" sign is required. The "No Outlet" signs may be placed under the street name signs. In Loveland (GMA and city limits), signs shall be 30" x 8".

#### **B.** Stop Signs

- 1. Location of all stop signs shall be determined and discussed in the TIS.
- 2. Stop signs will be placed in accordance with the TIS, approved construction plans, and the MUTCD. In general, stop signs should be placed at point of curvature (PC) and behind attached sidewalk.

#### C. Warning Signs

Intersection warning signs may be required on 4- or 6-lane Arterial Roadways in advance of major intersections. An advisory plaque identifying the name of the intersecting side street shall be placed beneath the advance intersection warning sign. Placement of these signs shall be per MUTCD standards.

# 14.3.3 Traffic Control Signs

#### A. Design and Size

Sign specifications and diagrams are detailed in the latest revision of the Federal "Standard Highways Sign," latest version. This publication is available from the U.S. Department of Transportation, Federal Highway Administration. Acceptable sign sizes are listed in the standard column of the table printed with each diagram. Expressway and construction warning signs shall be a minimum 36" x 36".

#### B. Mounting

Signs should be mounted on existing streetlight and power poles, with new posts being used only if necessary. **Streetlight locations should be checked for potential sign installation during the design process and shown on the signing and striping plan sheets.** 3/4" stainless steel banding shall be used to mount signs to fiberglass and steel poles. Installation of signs on wood poles can be achieved by using 3/8" x 2-1/2 inch lag bolts.

#### C. Regulatory

- 1. <u>Reflectivity</u>. All regulatory signs, except parking, shall be Diamond grade reflectivity or greater. This includes the red series and black on white signs. For Fort Collins (GMA and city limits), Micro prismatic sheeting or greater is required, except for parking signs.
- 2. <u>Sheeting Material</u>. All signs shall be fabricated with sheeting material, including letters. **No silk-screened signs will be permitted.** For Fort Collins (GMA and city limits), silk screening is acceptable but must be guaranteed for at least seven years.
- 3. <u>Stop Sign</u>. Stop sign sizing shall conform to the MUTCD. However, stop signs shall also not be less than 30" x 30" in size and consist of diamond grade sheeting or greater.

- 4. <u>Yield Sign</u>. For roundabouts or minor intersections only, a 36"x36"x36" yield sign may be used in lieu of a stop sign, at the discretion of the Local Entity according to MUTCD.
- 5. <u>Speed Limit Sign</u>. All Collectors and Arterials should have speed limit signs at a minimum  $\frac{1}{2}$  -mile intervals. All subdivisions shall have a speed limit sign at each entrance.
- 6. <u>Parking/No Parking Sign</u>. Designated parking and "no parking" zones shall be signed in accordance with MUTCD. No silk screened signs are permitted. For Fort Collins (GMA and city limits), silk screening is acceptable but must be guaranteed for at least seven years.

#### **D.** Warning

- 1. <u>Reflectivity Requirements</u>. All school crossing signs and those with, and W16-7P arrow signs shall be made with diamond grade fluorescent yellow/green sheeting.
- <u>"No Outlet" Sign</u>. On dead end streets, cul-de-sacs, and temporary dead end streets, a "No Outlet" sign will be required and mounted with standard mounting system under the street name sign. The sign shall be an MUTCD #W14-1p, 30 x 6-inch minimum size (30" x 8" minimum in Loveland [city limits only]) black on yellow warning sign. A separate 30" x 30" No Outlet sign may also be required in specific locations.
- 3. "Road Closed" Sign and Barricades.
  - a. <u>Temporary Dead End</u>. All temporary dead-end streets shall have a Type III barricade with appropriate advance warning sign(s) and as shown in **Construction Drawing 1413.** A temporary dead-end street is anticipated to be a dead end for less than a year. Type III Barricades shall have a "Road Closed" (R11-2, 48 x 30 inches) sign mounted on both sides of the barricade.
  - b. Long-Term Dead End. All dead-end streets anticipated to be a dead end for more than a year must use long-term barricades. The barricade shall consist of a split rail fence with round vertical and horizontal members, pressure treated, with two horizontal rails and a centerline of 10 to 12 feet for vertical members. Delineators shall be installed on the vertical members with a minimum of 2 per member. The "Road Closed" sign shall be mounted directly on the fence. For Fort Collins (GMA and city limits), Type III barricades or OM4-2 object markers may be mounted on telspar posts and anchors shall meet MUTCD standards.
- 4. <u>Crosswalk Sign</u>. Crosswalks shall be signed where adjacent to a school and on an established school pedestrian route. There are usually a minimum of 4 signs per crosswalk. The color and installation shall be completed according to MUTCD. The color shall be fluorescent yellow green.

#### E. Guide

- 1. <u>Reflectivity Requirements</u>. The guide signs shall have high intensity sheeting. In Fort Collins (GMA and city limits), the guide signs shall have Micro prismatic sheeting or greater.
- 2. <u>Bikeway Signs in Loveland (GMA and city limits)</u>. Bicycle signs for bike lanes shall be provided. If the approved design allows no parking along bike lanes located adjacent to the curb, standard symbol signs for "No Parking" shall be used (MUTCD #R7-9a, 12 x 18 inches). Appropriate right, left, or double arrows shall appear on the bottom portion of the standard sign. Refer to Construction Drawing 1402. Other signs for the beginning and ending points of bike lanes shall be used according to the MUTCD and AASHTO\_Guide for Development of Bicycle Facilities and as shown on the signing and striping plans or required by the Local Entity Engineer.

In Fort Collins (GMA and city limits), bikeway signs will be furnished by the City of Fort Collins Traffic Operations, and shall be billed to the contractor installing the signs.

### 14.3.4 Roundabouts

#### A. Modern Roundabouts

See Roundabout Design Guidelines Appendix I

# B. Mini Roundabouts

See Roundabout Design Guidelines Appendix I

# 14.4 PAVEMENT MARKING AND STRIPING

# 14.4.1 General

# A. Type and Location of Striping and Markings

The Local Entity Traffic Engineer shall make the final determination in regards to the type and location of pavement striping and marking within the right-of-way during the review of the project signing and striping plans.

# B. Design, Installation, and Maintenance

The Local Entity maintains the permanent pavement striping and marking on public rights-of-way after completion of the warranty period. All such devices shall be specified and installed in accordance with these Standards; all designs shall be in accordance with these Standards and the latest revision of the MUTCD and Colorado supplement. Refer to Chapter 22, Construction Specifications, for materials and installation.

#### C. New Roadway

Permanent striping and marking, unless otherwise approved by the Local Entity Engineer, shall be completely in place before any new Roadway is opened to the public. New striping on new roadways, overlays, and chip seals, etc. will require two full applications of paint in Loveland (GMA and city limits) and Fort Collins (GMA and city limits).

#### 14.4.2 Pavement Markings (Symbols, Arrows, "ONLY"s)

#### A. General

The Local Entity (except Fort Collins City Limits) must use preformed thermoplastic on all pavement markings such as arrows, "onlys," crosswalks, railroad crossings, school crossings, stop bars, and bike symbols.

For Fort Collins (GMA and city limits), pavement markings (symbols, arrows, "ONLY"s, crosswalks, stop bars, yield lines, word messages, bike symbols, etc.) shall be painted with epoxy paint.

#### **B.** Preformed Thermoplastic Pavement Marking Specifications

The prefabricated markings described shall be 125 mils (90 mils for bike symbols) in thickness and consist of white or yellow pigmented plastic film with imbedded reflective glass spheres, uniformly distributed throughout their entire cross-sectional area. It shall be possible to affix the markings to bituminous or Portland cement concrete pavements by a two part epoxy adhesive and shall have a black contrasting border as shown in Appendix L (Loveland Thermoplastic Standards). Prefabricated legends and symbols shall conform to the applicable shapes and sizes as outlined in the MUTCD. All concrete curing compound shall be removed before installing thermoplastic in specific marking locations as approved by the Local Entity Engineer.

#### C. Crosswalks

- 1. <u>General</u>. Crosswalks shall be used at all signalized intersections, approved crossings, school routes, adjacent to schools, and as otherwise directed. Refer to **Appendix C** for maps of Local Entity designated school routes.
- 2. <u>Standard Crosswalk</u>. White 9-feet long, except 12-feet long in Fort Collins (GMA and city limits) x 18-inch wide "Continental" or "Denver" style bars shall be used for all crosswalks.

For Fort Collins (GMA and city limits), pavement markings (symbols, arrows, "ONLY"s, crosswalks, stop bars, yield lines, word messages, bike symbols, etc.) shall be painted with epoxy paint.

#### **D.** Stop Bars

All stop bars shall be white and a minimum of 18 inches wide. Stop bars are required at signalized locations where the speed limit is 35 mph or higher and other locations specified by the Local Entity Engineer.

1. <u>Fort Collins (GMA and city limits)</u>. Locations where stop bars are required shall be specified by the Local Entity Engineer.

#### E. Symbols

Preformed thermoplastic pavement marking standard material is available from Flint Trading Co. and shall be a minimum of 125 mils thick or approved equal. This material shall be used for all arrows, "onlys," bike symbols (90 mils), railroad crossing symbols, etc.

# F. For Fort Collins (GMA and city limits), pavement markings (symbols, arrows, "ONLY"s, crosswalks, stop bars, yield lines, word messages, bike symbols, etc.) shall be painted with epoxy paint.Bikeways

The purpose of the placement of bicycle markings on the roadway is to reinforce the specified use of this designated area (Bike Lane/Bike Routes) and to supplement any regulatory signs. Bicycle markings are to be used on Collector and Arterial Roadways with designated Bike Lanes. Bicycle markings are to be re-installed in the same location on Roadways that have been under construction for routine street maintenance or rehabilitation.

For Fort Collins (GMA and city limits), pavement markings (symbols, arrows, "ONLY"s, crosswalks, stop bars, yield lines, word messages, bike symbols, etc.) shall be painted with epoxy paint.

#### G. Roundabouts

- 1. <u>Yield Line</u>. The roundabout shall require an 18" material yield line (18" material 36" long with 36" gaps) at the point of entry into the circulatory roadway unless otherwise approved by the Local entity Engineer.
- 2. <u>Crosswalk</u>. Generally, crosswalks do not need special markings on each approach leg at a roundabout. Refer to **Figures 8-13 and 8-14 or Section 14.4.2 C.2**.
- 3. <u>All linear lines (yield, center, edge, crosswalks, & lane lines) in concrete shall be inlayed thermoplastic</u>. The inlay process shall be per CDOT Specification Section 627.08.

#### 14.4.3 Striping

#### A. General

- 1. <u>Typical</u>. Typical striping widths for lane lines are 4 inches, unless otherwise noted. Double yellow centerline must have a 4-inch gap between stripes according to MUTCD.
- 2. <u>Pavement</u>. Two coats latex paint (highway type high-solids fast-dry) shall be used for asphalt and concrete pavement striping.

- 3. <u>Layout</u>. All striping on sealcoats shall require a layout line. Prior to striping, tabs are required for sealcoats (prior to the sealcoat process). All other conditions require spot taping at an interval of 25 ft or closer.
- 4. <u>Retro</u>-reflectivity. The 2 coats of paint shall be applied with beads for each coat. The application rate for beads shall be 6.5 pounds per gallon. The beads shall be type 2, non-floating, water resistant.

#### **B.** Broken Line

All broken lines shall be 4-inch wide or 8 inches using a 6 foot cycle (2' paint or therm, 4' gap).

#### C. Turn Bay Line

All turn bay lines shall be created with a minimum 8-inch wide line. However, if a turn bay occurs on a horizontal curve, the bay taper from the start of the double wide 8" shall be marked with short 8-inch wide dotted lines (2' long with 4' gap).

#### **D.** Centerline

All centerline striping shall be double yellow, each a minimum of 4 inches wide, with a 4-inch minimum gap between the two.

#### E. Parking Stalls and Angle Parking

All striping for parking shall be white and 4 inches wide. All edge lines of parking areas shall also be white and a minimum of 4 inches wide.

#### F. Bikeway

A 4-inch minimum wide white stripe shall be used for Bike Lanes.

#### 14.4.4 Temporary Striping

All temporary striping shall conform to "Standard Specifications for Road and Bridge Construction," published by **CDOT**, the latest revision except as herein amended. When approved, temporary striping shall be required prior to the opening of a Roadway for travel where pavement and/or permanent striping cannot be completed due to weather and/or time constraints. Refer to **Section 14.4.1** C if not approved.

#### A. Specifications

Temporary striping shall be the same color and width as for permanent striping. Temporary striping shall consist of tabs or 4 x 4-inch (min.) tape, depending on the pavement surface, spaced at 25-foot intervals. Refer to **Chapter 22, Construction Specifications,** for additional detail regarding temporary striping.

#### **B.** Time Duration Limit

Temporary striping is permitted on Collectors for no more than 7 days.

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#### C. Extensions

Extensions must be requested in writing if weather does not allow installation of permanent striping. For Fort Collins (GMA and city limits), also refer to Appendix F, City of Fort Collins Traffic Operations Manual.

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Figure 15-1 Street Light Placement at Intersections

# CHAPTER 15 – STREET LIGHTING

#### 15.1 GENERAL

The Developer shall coordinate all aspects of design and installation of new or upgraded street lighting.

#### 15.1.1 Fort Collins (City Limits Only) Street Lighting

All street lighting of public streets in the City of Fort Collins will be designed and installed by the City in accordance with these Standards for lighting. Exceptions to reduce lighting requirements may be approved by the Local Entity Engineer for parts of developments bordering rural areas.

#### 15.1.2 Loveland (City Limits Only) Street Lighting

All street lighting of public streets in the City of Loveland will be designed by the City in accordance with these Standards. The City will be responsible for all costs involving the material and installation of street lights on arterial and major collector streets. On all other streets, the Developer will be responsible for all costs involving the design, material, and installation of street lights.

The street lighting design shall be commenced by the City of Loveland only after the developer has provided to the City a \$300 electrical design deposit, along with electronic files of the overall utility design sheet(s) and the street plan design sheet(s). These items must be submitted to the City prior to the submittal of any land use application that requires the submittal of preliminary Public Improvement Construction Plans. Upon completion of the street lighting design by the City, the design engineer shall show the locations of all proposed street lights in the final Public Improvements Construction Plans as described in the checklist contained in **Appendix E**.

#### 15.1.3 Underground Service

Street lighting shall be installed with underground electric service on all newly developed dedicated public streets in the City. Curb returns shall be installed after the installation of the electrical system, including underground vaults.

The Developer is responsible for coordinating with the appropriate utility company all aspects of design and installation.

#### 15.2 PURPOSE

The purpose of streetlight installations shall be to illuminate the public traveled ways to a level that provides for the safe passage of public traffic, both vehicle and pedestrian.

#### 15.2.1 Residential Areas

All lighting in residential areas shall be installed to minimize light shining on or negatively affecting the neighboring residents.

#### 15.2.2 Guidelines

Uniform lighting will be used on new roadway projects involving Arterial and Collector streets. The guidelines shall be the IES Lighting Handbook, Fifth Edition, and the Design Manual of the Colorado Division of Highways, most recent edition and supplemental revisions or guidelines approved by the Local Entity. All fixtures, poles, and designs will be reviewed and approved by the power provider.

#### 15.2.3 Layout Criteria

#### A. Mounting Height.

Streetlight mounting height shall not exceed 20 feet in residential areas. In areas other than residential, the mounting height shall not exceed 40 feet.

#### **B.** Signalized Intersections.

Signalized intersections will be lighted using combined streetlights and mast arms. Mounting of signals will be perpendicular to the flowline.

#### C. Railroad Crossing Lighting.

Railroad crossing lighting will conform to the Railroad-Highway Grade Crossing Handbook (FHWA).

#### **D.** Lighting in Undercrossings.

All bridge underpasses, where vehicles, pedestrians, bicyclists, or equestrians may be present, shall require lighting.

#### E. Attached Sidewalks.

Install street lighting behind sidewalks where sidewalks attached to the curb are used.

#### F. Detached Sidewalks.

For sidewalks detached from the curb, install street lighting with a minimum of 2 feet clearance from back of curb to roadway side of support pole and 2 feet clear from all walks (1 foot on Local Streets).

#### G. Drawings.

Except within the Local Entity power service territories, drawings for installations will be prepared by the Developer with assistance from the power provider and approved by the Local Entity Engineer prior to installation. In new subdivisions, a street lighting plan will be required prior to approval of the subdivision.

#### H. Permission for Alternate Designs.

Alternate designs for fixtures, if approved by the Local Entity Engineer, may be used if installed in more than 20 locations.

#### I. Fire Hydrant Conflicts.

When locating proposed lighting, avoid possible conflicts with fire hydrants.

### J. Roundabout Lighting.

Lighting columns should be arranged around the perimeter of the roundabout in a simple ring, with the lights equidistant from the center and from each other. Lighting should extend at least 197 feet back along each approach road. Mounting height should be uniform throughout the intersection and not less than on any approach road. Minimum horizontal illuminance at the curblines should be as given in **Table 15-1**. The minimum illuminance required should not be less than the highest level of lighting for any of the approach roads.

# 15.3 LIGHTING SYSTEMS DESCRIPTIONS

These lighting standards apply to all new street lighting systems.

# 15.3.1 Refractor Style Cobra

The refractor style cobra with a Type-3 semi-cutoff distribution pattern mounted on poles shall be the standard construction for Collector and Arterial streets.

# 15.3.2 Acorn-Style Fixture – Loveland (City Limits Only)

An acorn-style fixture with a Type-3 distribution mounted on poles shall be used on Local streets.

# 15.3.3 Old English Fixture – Fort Collins (City Limits Only)

An Old English-style fixture with a Type-3 distribution mounted on poles shall be used on Local streets.

# 15.3.4 Light Types and Location of Use

Specific light types (HPS, Mercury, etc.) shall be installed according to Local Entity requirements. Refer to **Table 15-2** and **Table 15-3**. Poles or luminaries, that are equivalent to those described below, may be approved by the Local Entity's appropriate representative.

Street Classification	Area Classification	Average Maintained Illuminance Values	Illuminance Uniformity Ratio (Average to Minimum)	
Arterial	Commercial	17 lx (1.7fc)	3 to 1	
	Intermediate	13 lx (1.3 fc)		
	Residential	9 lx (0.9 fc)		
Collector	Commercial	12 lx (1.2 fc)	4 to 1	
	Intermediate	9 lx (0.9 fc)		
	Residential	6 lx (0.6 fc)		
Local	Commercial	9 lx (0.9 fc)	6 to 1	
	Intermediate	7 lx (0.7 fc)		
	Residential	4 lx (0.4 fc)		
Area Classification Defini	tions:			
Commercial:	A business area of a municipality where ordinarily there are many pedestrians during night hours. This definition applies to densely developed business areas outside, as well as within the central part of a municipality. The area contains land use which attracts a relatively heavy volume of night time vehicular and/or pedestrian traffic on a frequent basis.			
Intermediate:	Those areas of a municipality often with moderately heavy night time pedestrian activity such as in blocks having libraries, community recreation centers, large apartment buildings, industrial buildings, or neighborhood retail stores.			
Residential:	A residential development, or a mixture of residential and small commercial establishments, with few pedestrians at night.			
Note:	Values in table assume typical asphalt roadway surface (pavement classification R2 or R3). Consult the IES document for other pavement surfaces.			
Source:	Illuminating Engineering	Society RP-8 (8).		

Table 15-1Recommended Street Illumination Levels

# Table 15-2Loveland (City Limits Only) Street Light Requirements

Street Classification	Lighting System
6-lane Arterial	400-W cobra, semi-cutoff style, fiberglass pole, 38-foot mounting height
2 and 4-lane Arterial	250-W cobra, semi-cutoff style, fiberglass pole, 32-foot mounting height
Major Collector	150-W cobra, semi-cutoff style, fiberglass pole, 27-foot mounting height
Minor Collector	70-W acrylic acorn, fiberglass pole, 15-foot mounting height
Local/Lane	70-W acrylic acorn, fiberglass pole, 15-foot mounting height

Table 15-3					
Fort Collins (City Limits Only)	Street Lighting Requirements				

Roadway Classification	Wattage (HPS)	Spacing (Feet)	Foot- Candles	Uniformity Ratio		
Residential						
Local	70	See Note 1	0.2	N/A		
Collector	150	290	0.4	5:1		
Arterial	150	190	0.5	4:1		
Intermediate						
Local	150	275	0.4	5:1		
Collector	150	175	0.6	3:1		
Arterial	250	125	1	4:1		
Commercial						
Local	150	175	0.5	4:1		
Collector	250	190	1.3	3:1		
Arterial (NOT College Avenue	250	125	1	4:1		
Arterial (College Ave N of Harmony Rd)	400	118 <sup>2</sup>	3.5	2:1		
Arterial (College Ave S of Harmony Rd)	250	118 <sup>2</sup>	1.9	2:1		

Where possible, streetlights shall be staggered on alternate sides of the roadway. However, for "T" intersections, the light should be located on either corner of the intersection of the street that ends.

Notes:

1. Local residential streets shall have one light at each intersection. If the intersection lights would exceed 320 feet apart on a straight street, mid-block lights shall be added so lights do not exceed 320 feet spacing. If the street has a curve, judgment shall be used to reduce the spacing to less than 320 feet.

2. College Avenue street lighting shall be either twin lights on median mounted standards, or placed on EACH side of the street spaced at 118 feet (not staggered). Exception: College Avenue between LaPorte Avenue and Magnolia shall have specially designed 1000-W metal halide lighting on 100 ft. standards.

#### 15.4 SPACING

This chapter is restricted to lighting on public streets and rights-of-way. The Designer shall design the spacing of all street lighting according to **Table 15-4**.

-			
Classification	Luminaries	Spacing	Layout
Major Arterial	400-W Cobra	120-150 feet	Staggered layout
Minor Arterial	250-W Cobra	150-175 feet	Staggered layout
Major Collector	150-W Cobra	150 feet	Staggered layout
Minor Collector	70-W Acorn	160-200 feet	Staggered layout
Local/Lane	70-W Acorn	160-200 feet	Staggered layout

Table 15-4Loveland (City Limits Only) Street Lighting Spacing

#### **15.5 POSITIONING AT INTERSECTIONS**

In general, the nighttime visibility of a pedestrian or hazardous object within an intersection is enhanced by increased contrast between the object and the surrounding street area. The optimum contrast (and hence safety) is achieved when the street lights are situated to silhouette (or backlight) objects in the intersection. Therefore, street lights at intersections are required to be placed on the downstream side of the intersecting street, as viewed by a motorist approaching the intersection in the lane directly beneath the luminaries. See **Figure 15-1**. The positioning of light standards at intersecting streets shall be as noted in **Table 15-5**.

Major Collectors/Arterials	4 lights, one on each corner		
Arterials/Arterials	4 lights, one on each corner		
Collector/Collector	2 lights, one on opposite corners		
Local/Collector	2 lights, one on opposite corners		
Local/Local	1 light on one corner		
End of Cul-de-sac	1 light		

# Table 15-5Intersection Light Locations

#### 15.6 LIGHT POLE OFFSET DISTANCES

Distance behind back of walk for local streets shall be at least 1 foot, and must be within easements or right-of-way on Local residential streets. For Major Collectors and Arterials, the light must be offset at least 2 feet from the back of curb and provide a clearance space between the light pole and edge of walk that equals or exceeds the required sidewalk width.

#### 15.7 STREET LIGHTING IN MEDIANS

Street trees (full shade) shall not be placed within 40 feet of a street light. Ornamental trees shall be no closer than 15 feet to any street light.

#### 15.8 COLLEGE AVENUE – SPECIAL CONDITION

The following specifications apply only to College Avenue in Fort Collins (city limits only).

#### 15.8.1 LaPorte to Magnolia

From LaPorte Avenue to Magnolia Street, College Avenue shall be lighted with a minimum of four 1000-watt metal halide luminaires at each intersection. Between intersections, there shall be one 1000-watt metal halide luminaire at 100-foot staggered spacing or equivalent, as determined by the Light and Power Utility.

#### 15.8.2 Other College Avenue Blocks

The remainder of College Avenue shall have a minimum of four 400-watt H.P.S. luminaires at each intersection and twin 400-watt H.P.S. luminaires spaced at approximately 118-feet or as determined by the Light and Power Utility.

#### 15.9 INSTALLATION SEQUENCE

Underground electrical installation shall not begin until after curb and sidewalk is installed, unless other arrangements have been made with the appropriate light and power department for each Local Entity. Curb returns shall not be installed on any street until after electrical installation, to facilitate the installation of underground vaults and other facilities.

# 15.9.1 Fort Collins (City Limits Only)

In Fort Collins (city limits only), refer to the City of Fort Collins Light and Power Utility's pamphlet entitled "Electric Construction Policies, Practices and Procedures."



LARIMER COUNTY URBAN AREA STREET STANDARDS DESIGN FIGURE DATE: 10/25/00

FIGURE

# CHAPTER 16 – PEDESTRIAN FACILITIES DESIGN AND TECHNICAL CRITERIA

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# CHAPTER 16 – PEDESTRIAN FACILITIES DESIGN AND TECHNICAL CRITERIA

#### 16.1 GENERAL

This chapter sets forth the minimum criteria to be used in the design of all sidewalks, access ramps, and other pedestrian facilities within the right-of-way, or other public easements.

#### 16.1.1 AASHTO Reference

Within this chapter, AASHTO's **"A Policy on Geometric Design of Highways and Streets"**, as published by the American Association of State Highway and Transportation Officials, was used as a reference. It is also commonly called the **AASHTO "Green Book."** 

#### 16.1.2 ADA Requirements

All pedestrian facilities shall be designed in accordance with American Disabilities Act (ADA) regulations and the requirements of these Standards; whichever is safer for pedestrians.

#### 16.2 SIDEWALKS

#### 16.2.1 General Layout and Design Criteria

#### A. Sidewalk Widths

Minimum sidewalk widths for the various street classifications shall be as specified in **Table 7-1** or **7-2** and on **Figures 7-1F** through **7-13F** and **Figures 7-1L** through **7-11L**.

The Local Entity Engineer may require additional width for activity areas and routes leading to and from these areas. The final sidewalk width shall be determined through additional study of higher pedestrian traffic areas.

B. Sidewalk Crossings of Driveways and Alleys

All sidewalks that cross driveways and alleys shall be designed in accordance with **Construction Drawing 1601**.

C. Sidewalk Both Sides of Street

All street designs shall include sidewalks on both sides of the street. Rural roads or qualified affordable housing projects in Loveland (GMA and city limits) are the only exceptions (see Section 16.2.1 J).

#### D. In-Fill Sidewalk, Curb, and Gutter

In all existing areas previously developed, sidewalks, curbs, and gutters may be required to match existing conditions or Standards, as determined by the Local Entity Engineer.

- 1. <u>Sidewalk Upgrades Required in Loveland (GMA and city limits).</u> When redevelopment is proposed on in-fill parcels, the redevelopment plans shall show the location of all existing and proposed sidewalk improvements. The installation of sidewalks is required where no sidewalk exists (except in Industrial areas as described in **Section 16.2.1.N**). Widening of the existing sidewalks should occur whenever the addition of 2' or more is needed to comply with **Section 16.2.1.A** and proposed redevelopment of the site will cause an increase in the number of pedestrian trips on the sidewalk. In Loveland (GMA and city limits), the upgrading of sidewalk adjacent to redeveloped sites may be postponed up to three years when the existing sidewalk is in good repair and a satisfactory financial guarantee has been provided to the Local Entity.
- 2. <u>Sidewalk Upgrades Not Required in Loveland (GMA and city limits)</u>. When redevelopment is proposed that is not expected to cause an increase in the number of pedestrian trips on the sidewalk, no sidewalk widening is required. In such situations, the redevelopment plans shall still identify and preserve a sidewalk corridor that will accommodate the future widening of the sidewalk in full compliance with these standards for such time that the sidewalk widening is deemed necessary.

#### E. Sidewalk Widening

When a sidewalk must be widened, the widening shall only be allowed for an increased width of 4 feet or more. If the added width needed is less than 4 feet, the existing walk shall be removed and reconstructed to the new required width.

#### F. Storm Water Runoff at Curb Cuts

Drainage shall meet the requirements specified in Chapter 7, in the section/subsection titled Drainage Systems/Sidewalk Culvert (Chases).

#### **G.** Concrete Thickness

All detached sidewalks less than 8 feet in width and not within driveways shall be a minimum of 4-inch thick concrete. All detached sidewalks 8 feet and greater in width shall be 6 inches thick. All sidewalks within a driveway shall be a minimum of 6 inches thick. All attached sidewalks shall be a minimum of 6 inches thick. Sidewalks shall be a minimum of 8 inches thick where crossed by commercial traffic. See **Construction Drawing 1601**.

#### H. Slope

1. <u>Cross Slope</u>. Maximum cross slope for sidewalks shall be 1/4 inch per foot (1:48).

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- 2. <u>Longitudinal Slope</u>. Longitudinal slope of attached sidewalks shall be consistent with the street slopes.
- 3. <u>ADA Requirements for Steeper Slopes</u>. Sidewalks detached from the curb, with greater than 5 percent longitudinal slope, shall be constructed to meet ADA requirements.

#### I. Pedestrian Underpasses and Overpasses

On major Collectors and Arterials, where required by the Local Entity Engineer, underpass or overpass (grade separated) pedestrian crossings shall be provided for regional/neighborhood paths and trails. These pedestrian crossings shall be coordinated with the appropriate department.

#### J. Rural Roads

Rural road sections shall provide sufficient shoulder width for pedestrian travel. Refer to **Table 7-1** or **7-2** for rural road widths.

#### K. Horizontal/Vertical Curves

Horizontal/vertical curves on all sidewalks shall follow the design criteria for bikeways. Refer to **Chapter 17, Bicycle Facilities**.

#### L. Vertical Clearance

Sidewalk vertical clearance shall be 8 feet in accordance with Figure 16-1.

#### **M. Horizontal Clearance**

Sidewalk horizontal clearance shall be in accordance with **Figure 16-1**.

#### N. Off-Site Connections

The Local Entity Engineer may require off-site sidewalk extensions to provide pedestrian connectivity to destinations within <sup>1</sup>/<sub>4</sub> mile of the project as identified in the Transportation Impact Study. Additional offsite sidewalk construction extending greater than <sup>1</sup>/<sub>4</sub> mile from the project may also be required in some circumstances such as when the project is within a school walking area boundary.

Industrial Area Sidewalks in Loveland (GMA and city limits) the installation of sidewalks along public streets in industrial zoned areas may be postponed when primarily industrial types of uses (i.e. NOT retail or office uses) are proposed. When sidewalks are not installed with new industrial development, they must still be designed, located, and noted on the plans in accordance with these standards. They should be noted as future potential sidewalk locations with indication that the Local Entity Engineer reserves the right to require installation of sidewalks by the property owner in accordance with Title 12 of the Loveland Municipal Code at such time as they may be deemed necessary.

### 16.3 ACCESS RAMPS

#### 16.3.1 Ramp Requirements

Access ramps shall be installed at all intersections and at certain mid-block locations for all new construction or reconstruction of curb and sidewalk, as follows:

#### A. Locations

- 1. <u>4-Way Intersections</u>. Access ramps shall be included at all intersection corners. Access ramps shall be constructed in accordance with **Construction Drawings 1603 through 1607**.
- 2. <u>"T"-Intersections</u>. All "T" intersections shall have a minimum of 3 access ramps as shown in **Figure 16-2**.
- 3. <u>Local Streets/Mid-Block</u>. Local streets longer than 600 feet will require additional accesses, which should be spaced approximately 300 feet apart. Driveways or mid-block ramps may be used for these access points. If mid-block ramps are used, pavement markings and signing in accordance with **Chapter 14, Traffic Signals, signing and Striping**, shall be provided.
- 4. <u>Cul-de-Sacs</u>. Either an access ramp or a driveway that meets access ramp requirements shall be provided in all cul-de-sacs. If a public walkway or bikeway intersects the street, a ramp shall be provided to connect the walkway or bikeway to the street. The ramp must line up with the walkway.
- 5. <u>Detached Sidewalks</u>. Where sidewalks are detached from the curb, directional ramps should be used in accordance with **Construction Drawing 1606**. On arterial streets with detached sidewalks and corner radii greater than or equal to 35 feet, directional ramps shall be installed in accordance with **Construction Drawing 1604**.

#### 16.3.2 Use of Standard Details

Project drawings shall call out the specific Construction Drawing from these Standards to be used in construction for each access ramp.

# 16.4 UNDERWALK DRAINS (CHASES)

Underwalk drains shall not interfere with the pedestrian's use of the sidewalk. The chase plate shall be flush with the sidewalk surface and be securely fastened as specified. See **Construction Drawing 709**. Underwalk drains shall not be located within an access ramp, curb cut, or driveway.

# 16.5 CURB RETURNS

In certain cases, to be determined by the Local Entity Engineer, the Local Entity may require the radius of the curb return to be reduced from the values given in **Tables 8-2** and **8-3**, to reduce pedestrian travel time and distance. The curb return radius shall not be less than 20 feet.

#### **16.6 PEDESTRIAN CROSSINGS**

All crosswalks shall be marked in accordance with **Chapter 14, Traffic Control Devices.** Crosswalks will be required at all signalized intersections, school areas, and high pedestrian areas as designated by the Local Entity Engineer.

#### 16.6.1 Enhanced Crosswalks.

In Fort Collins (GMA and city limits), Enhanced Crosswalks may be required by the Local Entity, and at a minimum, they shall be used at mid-block crossings in neighborhoods, activity centers, trail or path crossings, school crossings and at signalized Arterial-Collector and Arterial-Arterial intersections.

Enhanced crosswalks shall be constructed of Portland Cement concrete. Stamped-colored asphalt pavement is not acceptable. Larimer County will not maintain enhanced crosswalks.

#### 16.6.2 Cross Slope

Sidewalk cross slope shall be maintained at 2% across driveways

#### 16.6.3 Crosspans

Crosswalks shall not be located in crosspans.

#### 16.6.4 Maximum Crosswalk Length Fort Collins (GMA and City Limits)

In Fort Collins (GMA and city limits), the maximum length for any crosswalk shall be 56 feet. Any street crossing longer than 56 feet shall be provided with pedestrian refuge such that the longest length of any crosswalk segment shall be 56 feet. See **Section 16.8**.

#### 16.7 TRAFFIC SIGNALS

All pedestrian traffic signals shall be in accordance with Chapter 14, Traffic Control Devices.

#### **16.8 PEDESTRIAN REFUGE AREAS**

For Arterials with raised medians and on splitter islands for roundabouts, a pedestrian refuge area shall be created in the median to increase pedestrian safety. See **Figure 8-18 and Figure 8-19 and Construction Drawings 801 and 802**. The vehicle turning radii must be taken into account with the specific design of islands. Fort Collins (city limits only) requires delineation of the pedestrian crossing by using a different surface material or texture in the roadway. This guides the sight-impaired to the refuge area.

# 16.9 MULTI-USE PATHS

Where a single, multi-use path is used to serve both pedestrians and bicyclists, the minimum path width shall be 10 feet.

#### 16.10 PEDESTRIAN MINIMUM CLEAR PATH

The minimum clear path around utility structures, street furniture and other encroachments shall be greater or equal to the sidewalk widths listed in **Tables 7-1** and **7-2** for the applicable street classification. For any private improvements within the right-of-way, the Designer will be required to obtain an encroachment (Revocable) permit from the Local Entity. Refer to **Chapter 6, Permits**.

#### 16.11 BUS SHELTERS

#### 16.11.1 Location

The location of a bus shelter shall be determined by the Local Entity Transit Provider.

#### 16.11.2 Visibility

Bus shelters shall have maximum transparency, and be highly visible from the surrounding area to assure the users' safety. The shelter may not be located within sight distance triangles as specified in **Chapter 8, Intersections.** 

#### 16.11.3 Minimum Size and Capacity

#### A. Opening Size

Openings shall be at least 36 inches wide and shall meet the requirements of ADA.

#### **B.** Capacity and Size

Capacity shall be based on maximum passenger accumulation at the stop. The shelter size shall be based on approximately 5 square feet per person.

#### C. Placement

Shelters shall not obstruct pedestrian flow or motorist's sight distance. The minimum pedestrian clear path width given in **Section 16.10** shall be maintained at bus shelters.

#### 16.11.4 Pad Requirements

#### A. Under Shelters

The design shall include a 6-inch thick concrete pad under all bus shelters. The pad shall extend at least 6 inches past each edge of the shelter.

#### **B.** Passenger Loading Area

Any shelters next to detached sidewalks shall include a minimum 15-foot wide concrete area between the sidewalk and the curb for passenger loading and unloading. Fort Collins requirements for pad sizes are incorporated in their Bus Stop Design Standards and Guidelines.

#### 16.11.5 Relocation of Shelters

The Local Entity Engineer may require a shelter to be relocated or removed in the future to accommodate other needs within the street right-of-way.

#### 16.11.6 Bicycle Racks and Trash Containers

All shelters are required to provide one trash container and one bicycle rack. The bicycle racks shall be in accordance with **Chapter 17, Bicycle Facilities**.

#### 16.11.7 Shelters on State Highways

Approval for installations of all bus shelters proposed in state highway rights-of-way shall be obtained from CDOT prior to any construction of the shelters.

#### 16.11.8 Sidewalk Connections

A sidewalk connection shall be provided between the bus shelter and the existing sidewalk or nearby pedestrian destinations. The minimum width shall be as required in **Section 16.2.1.** 



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# CHAPTER 17 – BICYCLE FACILITIES DESIGN AND TECHNICAL CRITERIA

#### 17.1 GENERAL

This chapter sets forth the minimum criteria to be used in the design of all bike lanes, bike paths, or other bicycles facilities within the Local Entity's rights-of-way or easements.

#### 17.1.1 AASHTO Basis

In this chapter, the **AASHTO "Guide for the Development of Bicycle Facilities"** as published by the American Association of State Highway and Transportation Officials was used as a reference.

#### 17.1.2 Bicycle Master Plan

This subsection was developed based on the **Master Plans** for each Local Entity. All projects shall optimize bicycle travel within the GMA by providing bicycle facilities in all new developments in accordance with the Local Entity's **Master Plan**.

#### 17.1.3 Permitted Bicycle Travel Areas

On public streets, bicycle travel should use designated bike lanes whenever possible. Bicyclists may share vehicular travel lanes in cases where no designated bike lanes are provided, except in certain cases where bicycle travel may be prohibited.

#### 17.1.4 Requirement for Other Accesses

Off-site improvements may be required to provide citizens with access to schools, and local commercial and other community facilities.

#### 17.1.5 ADA Requirements

All designs for off-street bicycle paths are considered multi-use paths and shall conform to ADA requirements.

#### 17.1.6 Use of Drainage System and Open Space

The bike path and pathway system may use the drainage and open space system in accordance with the Local Entity's utility standards.

#### 17.1.7 Access Easements

Where bike paths cross private land or coincide with private access facilities, the Developer shall provide a public access easement. This will ensure that bike paths or other access facilities become part of the overall Local Entity bike path plan.
## 17.1.8 Maintenance Responsibility

Maintenance and operation responsibility for new bike paths will be determined during the site/subdivision plan approval process. Public access/bike path easements shall be conveyed to the Local Entity. The easement width shall be clearly indicated on the site plan or construction plans.

# 17.1.9 Appurtenances Not Allowed

Manholes, utility poles or other appurtenances or obstructions, should not be located in bike lanes or bike paths.

# 17.2 ON-STREET BIKE LANES DESIGN REQUIREMENTS

# 17.2.1 On-Street Bike Routes

Specific streets are designated in the **Master Plans** as on-street bicycle routes. These routes are on streets with lower traffic volumes and speeds, wide outside lanes, and minimal stop signs, stop lights, curb cuts, driveways, and interference with turning traffic. Streets designated as on-street bicycle routes shall be designed with additional width for bike lanes. Some streets within new developments or re-developments must also contain additional roadway width for bike lanes, in accordance with **Figures 7-1F** through **7-13F** and **7-1L** through **7-11L**.

# 17.2.2 Width and Cross Sections

The bike lane shall be designed with widths shown in standard street classification sections. Bicycle lanes on one-way streets shall be on the right side of the street, unless otherwise specified by the Local Entity. Refer to **Chapter 7**, **Street Design and Technical Criteria**, for the standard cross section requirements. Bike lane width shall not be less than 5 feet.

# 17.2.3 Signage and Striping

All designated bike lanes shall be signed and striped, as required by MUTCD and as required in **Chapter 14**, **Traffic Control Devices**.

# 17.2.4 Actuation Loop

Separate actuation loops are required in bike lanes at signalized intersections. Quadra pole-type loops are required. Loop installation shall be similar to that in Sections 22.5.8 C5 and 22.5.9, E6, HBP-Superpave and HBP – Marshall Method.

#### 17.2.5 Rural Roads

In rural road sections, the paved roads shall include not less than a 5-foot paved shoulder, and not less than a 6-foot paved shoulder in Fort Collins (city limits only), for bicycle travel.

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# 17.2.6 Bike Lanes at Intersections

At the intersections where a separate right turn lane exists and is striped, the bicycle lane shall transition and be placed between the through lane and the right turn lane. The bike lane width shall remain the same as the approaching bike lane.

# 17.3 OFF-STREET BICYCLE PATHS DESIGN REQUIREMENTS

The Applicant should refer to the Local Entity's parks and recreation department for the recreation trail design requirements.

# 17.3.1 Bike Path Location

#### A. Location Criteria

Bike path locations shall be based on safety, circulation, and access considerations.

#### **B.** Easements

Where needed, a 10 to 20-foot minimum easement width shall be procured for a 10-foot wide bike path, in accordance with **Figure 7-14**.

# 17.3.2 Trees, Vegetation, and Other Obstacles

#### A. Preserving Trees

Where possible, bike paths shall be routed to minimize the loss of trees and disruption of natural environmental conditions.

#### **B.** Distance from Obstacles

A minimum of 2 feet is required between the bike path edge and any vertical obstructions such as trees, utility poles, signs, fences, or other obstacles. Greater separation may be required by the Local Entity where grades exceed 4 percent.

#### C. Clearing of Vegetation

Regardless of bike path surface, all vegetative material within 4 feet of the bike path shall be removed prior to bike path construction. This requirement shall be specified by the Designer and included on the approved plans. See **Figure 17-1**.

#### **D.** Overhead Clearance

All bike paths shall have a minimum of 10 feet clear vertical distance above the path. See **Figure 17-1**.

#### 17.3.3 Cross Section

Typical cross-sections shall be provided for all critical points (i.e. change in grade, direction) along the length of the bike path. See **Figure 17-1** 

# 17.3.4 Grade

# A. Profile

A profile of the proposed bike path construction shall be included in the construction plans or site plan. If the bike path profile is not consistent with the roadway profile, provide a separate profile for the bike path.

# B. Minimum and Maximum Grade

Minimum grade shall be 0.60 percent except in sag curves where proper drainage is provided by cross slope. The minimum grade shall be waived if cross slope is 2 percent and good drainage is provided off the side and is unobstructed. Maximum grade shall be 5 percent or as allowed by ADA.

# 17.3.5 Design Speed

# A. Paved Surfaces

For paved surfaces a minimum design speed of 20 mph shall be used. Where grades exceed 4 percent, a design speed of 30 mph shall be used.

# **B.** Unpaved Surfaces

For unpaved surfaces, a minimum design speed of 10 mph shall be used. Where grades exceed 4 percent, a design speed of 20 mph shall be used.

# 17.3.6 Horizontal Alignment

#### A. Minimum Radius of Curvature

The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate of the bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle.

#### **B.** Formula for Radius Calculation

The minimum design radius of curvature shall be based upon the following formula:

$$R=\frac{V^2}{15(e+f)}$$

where:

R = Minimum radius of curvature (ft)

V = Design speed (mph)

- e = Rate of superelevation
- f = Coefficient of friction

# C. Rate of Superelevation

Bicycle path superelevation rate shall be a minimum of 2 percent (the minimum necessary to encourage adequate drainage) and a maximum of 3 percent.

# **D.** Coefficient of Friction

The coefficient of friction depends upon speed, surface type, roughness, and condition; tire type and condition; and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed.

# E. Coefficient of Friction Values

Extrapolating values used in highway design, design friction factors for paved bicycle paths can be assumed to vary from 0.27 at 20 mph to 0.22 at 30 mph. Unpaved surface friction factors are to be reduced by 50 percent to allow a sufficient margin of safety.

# F. Minimum Radius

Based upon a superelevation rate (e) of 2 percent, the minimum radius of curvature to be used is 95 feet for 20 mph.

# G. Substandard Radius Curves

When substandard radius curves must be used on bicycle paths because of Right-of-Way, topographical, or other considerations, standard curve warning signs and supplemental pavement markings shall be installed in accordance with the MUTCD. The negative effects of substandard curves can also be partially offset by widening the pavement through curves.

# 17.3.7 Sight Distance

Refer to **Figures 17-2** through **17-4** and Chapter 7, Street Design and Technical Criteria, for sight distance requirements.

# 17.3.8 Cross Slope

The cross slope shall be 2 percent.

# 17.3.9 Drainage

# A. Requirements and Standards

All bike path designs shall satisfy the storm drainage requirements of the Local Entity's utilities department. Bike paths located within state Right-of-Way shall meet CDOT standards.

#### **B.** Ditch Placement

Where a bike path is cut into a hillside, a ditch shall be placed along the high side of the bike path to prevent sheet flow across it.

## 17.3.10 Safety Considerations

#### A. Consideration of Pedestrians

The safety of pedestrians, and others who may use or travel on a bike path, shall be a prime consideration in the bike path design.

#### B. Clearance Between a Bike Path and a Street

A utility easement, as required in **Chapter 12**, **Utility Locations**, is required between the edge of the bike path and the back edge of curb and gutter. No bike path shall be constructed directly adjacent to street curb or street pavement. Minimum separation shall be 6 feet.

The Local Entity Engineer may require a larger distance of separation when it is feasible and would improve safety.

#### C. Barriers and Other Safety Devices

For bike paths adjacent to streets with speed limits over 25 mph, and with slopes greater than 6 percent, the Local Entity Engineer may require special safety measures. Examples include barriers or other safety devices between the roadway and bike path, or an increase in the distance between the bike path and highway.

#### D. Signs for Hazards and Regulatory Messages

Standard signing and pavement markings in the MUTCD shall be specified in the design of the bike path to alert bike path users to hazards and to convey regulatory messages.

#### **E.** Intersection Grade

Maximum grade of the bike path at intersections is 3 percent extending for 30 feet in each direction from the centerline of the intersection.

#### F. Access Ramps

Standard access ramps will be provided at all bike path curb crossings to allow continuity of bike path use by bicyclists and pedestrians. Curb depressions equaling the bike path width shall be used, with the bike path surface sloping to the pavement at 1:12 maximum slope.

# 17.3.11 Bicycle Path Bridges

## A. Crossings of Water Courses

All bike paths require either a bridge or a fair weather crossing. See Chapter 11, Structures, for design requirements for bridges.

# B. Pedestrian Crossings on Major Collectors and Arterials

On all Local Entity major Collectors and Arterials, wherever desirable, underpass or overpass (grade separated) pedestrian crossings shall be provided for regional/neighborhood bike paths. These pedestrian crossings must be coordinated with the Local Entity Engineer or the Local Entity's appropriate department.

# C. Railings, Fences, or Barriers

Railings, fences, or barriers on both sides of a bicycle path structure shall be a minimum of 4.5 feet high. Smooth rub rails should be attached to the barriers at handlebar height of 3.5 feet. Barriers should not impede storm water runoff from the path.

# D. Bridge Requirements

See Chapter 11, Structures.

# E. Bridge Underpass Lighting

All bike path bridge underpasses shall have lighting in accordance with **Chapter 15**, **Street Lighting**.

# 17.3.12 Bicycle Path Underpasses

The minimum clearances for underpasses are as follows:

Horizontal:	10 feet from abutment to curb or edge of water, 12 feet if
Vertical:	equestrian accommodation is required. 10 feet from trail surface to underside of bridge, 12 feet if equestrian accommodation is required.

The trail surface elevation shall be at or above the high water mark for the 10 year storm.

# 17.3.13 Signage and Pavement Marking

# A. Basic Requirements

All signs, except locally adopted bike route signs, shall conform to MUTCD.

#### **B.** Painted Centerline on Curves

All curves with restricted sight distances are required to be painted with a centerline to separate traffic. The centerline shall be 4 inches in width and painted yellow.

# 17.3.14 Lighting

See Chapter 15, Street Lighting.

#### 17.3.15 Intersections

The following requirements apply to all bike path intersections with either streets or other bike paths:

#### A. Curb Ramps

Curb ramps the same width as the bike path shall be provided at each intersection.

#### **B.** Sight Distance

Sight distance requirements shall be in conformance with AASHTO requirements. The Designer shall ensure sufficient stopping and intersection sight distance at all bike path intersections and curves, particularly where steep grades are proposed at bike path/ roadway intersections. Obstructions to the visibility of motorists or bike path users shall be removed or the bike path aligned around the obstruction to maximize visibility.

#### C. Turning Radius at Intersections

The minimum turning radius at bike path intersections shall be 20 feet.

# 17.4 BICYCLE PARKING AREAS

#### 17.4.1 Bicycle Parking Area Requirement

#### A. U Type Bike Rack

The inverted U type bike rack is required for all bicycle parking racks. See **Construction Drawings 1701** through **1707.** 

#### **B.** Bike Parking Spaces

For proposed nonresidential land uses, bicycle parking shall be equivalent to 5 percent of the off-street vehicle parking requirement with a minimum of 2 spaces. Each inverted U rack provided will count as two bicycle parking spaces.

#### 17.4.2 Placement of Bike Racks

Racks shall be within 30 feet of building entrances. All bicycle parking provided shall be on concrete, and located a minimum distance as follows from any wall:

Bike OrientationMin. Distance of Rack from WallParallel to wall24 inchesPerpendicular to wall30 inchesCovered parking is encouraged where possible.



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# CHAPTER 18 – NEIGHBORHOOD TRAFFIC SAFETY

# 18.1 GENERAL

This chapter presents acceptable methods of neighborhood traffic calming that are determined by the Local Entity to be necessary for existing Local and Minor Collector Roadways. This chapter also provides for specific design criteria for a number of traffic calming methods.

# 18.1.1 Intended Use

The necessity or desire for traffic safety and calming stems from the perception that Local and Minor Collector Roadways, particularly in residential areas, do not always function as intended. These roadways should be low traffic volume roadways used for direct access to residences on the street. They are also intended as a multi-modal system that is shared by vehicular, bicycle, and pedestrian traffic equally, in a manner that minimally impacts residents in these areas.

# 18.1.2 Traffic Calming for New Street Design

The devices presented in this chapter are generally not intended for use on new roadways. New roadway design is addressed in **Chapter 7**, **Street Design and Technical Criteria**. New (local streets and minor collectors) are to be designed to minimize cut through traffic, high volumes, and high speed operation and to maximize the efficiency of the roadway to provide vehicular access and bicycle and pedestrian traffic.

#### 18.1.3 Roundabouts and Mini Roundabouts

Roundabouts and Mini Roundabouts, considered traffic control measures, are included in **Chapter 8, Intersections**. These traffic control measures may be used in new or existing street design if the appropriate criteria are met.

# 18.2 TRAFFIC SAFETY PROBLEMS

Some residents in certain residential areas maintain that excessive speed, volume, or cut-through traffic is unacceptable. The resident believes the presence of too many vehicles traveling at high speeds diminishes that neighborhood's quality of life. Traffic calming measures are intended to minimize these issues and return the quality of life to the neighborhood. Care must be taken by the designer so that the installation of traffic calming devices does not create unintended hazards that delay emergency response or jeopardize the safety of bicyclists, pedestrians or motorists.

# 18.2.1 Speeding

Speeding may occur on roadways that allow the driver to feel safe while exceeding the posted speed limit. Factors that contribute to this perception include long, unbroken lines of sight, steep roadway grades, wide roadways, low density developments, low pedestrian activity, and large building setbacks. In addition, speeding may occur when the street functions as a higher classification street than originally intended.

# 18.2.2 Measuring Speed of Roadway

The standard method of measuring speed on any street is the determination of the 85th percentile speed. The 85th percentile speed is the speed at which or below which 85 percent of the vehicles travel. If the 85th percentile speed is at or below the posted speed limit, a speeding problem does not exist. However, if the 85th percentile speed is over the posted speed limit by 5 miles per hour or greater, either the posted speed limit may be inappropriate or a speeding problem may exist. Many other factors must be evaluated for determining speed limit.

# 18.2.3 Intrusion (Cut-Through Traffic)

Intrusion is increased volume or excessive non-local traffic along a neighborhood street. This cut-through traffic is caused by drivers who use a Local Street to go through a neighborhood and save time on their trip. Local Streets that are less impeded than other local streets within the same neighborhood will often invite cut-through traffic. Routes that are perceived to be time-saving will attract more traffic. This increased cut-through traffic can cause a local street to function more like a Collector.

# 18.2.4 Pedestrian Safety

Pedestrian safety is a concern on streets experiencing speeding vehicles, cut-through traffic, or a combination of these problems. The high concern areas are in the vicinity of neighborhood schools and parks or mid-block pedestrian crossings, particularly on streets with on-street parking. These areas require special consideration for the mobility and safety of the pedestrian.

# 18.3 TRAFFIC CALMING DESIGN CRITERIA

For existing Local or Minor Collectors that are defined for Traffic Calming. Refer to the **City of Loveland's Traffic Calming Procedures**. Refer to the **City of Fort Collins' Traffic Calming Procedures**. This chapter describes design criteria for the engineered solutions. It does not state when or where these improvements are to be used.

# 18.3.1 Speed Limit Signs

Refer to Chapter 14, Traffic Signals, Signing, and Striping

# 18.3.2 Speed Humps

Refer to Construction Drawing 1801F and 1802F for design criteria in Fort Collins (GMA and city limits).

# 18.3.3 Dips

Refer to Chapter 8, Intersections, for standard Crosspan design.

# 18.3.4 Mini Roundabouts

Refer to Chapter 8, Intersections for Mini Roundabout design requirements.

# 18.3.5 Neckdowns

When neckdowns are used they must be designed to maintain a constant cross fall in the pavement surface. Refer to **Figure 18-1** for design criteria.

# 18.3.6 Traversable Barriers

Refer to Figure 18-2 for design criteria.

# 18.3.7 Deviations (Chicanes)

Refer to Figure 18-3 for design criteria.

# 18.3.8 Raised Intersections

Refer to Figure 18-4 for design criteria.

# 18.3.9 Neighborhood Identification Island

Refer to Figure 18-5 for design criteria.

# 18.3.10 Drop Off Zone for Schools

Refer to Figure 18-6 for design criteria.

# **18.3.11 Intersection Chokers**

Refer to Figure 18-7 for design criteria.

# 18.3.12 Turn Prohibitors

Refer to Figure 18-8 for design criteria.

#### 18.3.13 Semi-Diverters

Refer to Figure 18-9 for design criteria.

# 18.3.14 Lane Eliminating Choker – Loveland (GMA and city limits)

Refer to Figure 18-10 for design criteria.

# 18.3.15 Diagonal Diverters

Refer to Figure 18-11 for design criteria.

# 18.3.16 Realigned Intersections

Refer to Figure 18-12 for design criteria.



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RAISED INTERSECTIONS				
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(	NEIGIIDU	MIOOD IDENTIFICATION ISLAND				
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DROP OFF ZONE FOR SCHOOL					
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#### LANE ELIMINATING CHOKER LARIMER COUNTY FIGURE **REVISION NO:** DESIGN URBAN AREA FIGURE 08/07/00 18 - 10STREET STANDARDS DATE:

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- Figure 19-6 Minimum Off Street Parking Setback Distance
- Figure 19-7 Parking Area Dimensions

# **CHAPTER 19 – PARKING**

# 19.1 GENERAL

This chapter defines the parking criteria for on-street parking, including Downtown parking, parking on cul-de-sacs, and other special requirement areas. This chapter also establishes clearance requirements for off-street parking. Parking stall dimensions for various parking configurations shall be designed in accordance with **Standard Drawing 19-4**.

# 19.2 ON-STREET PARKING

#### 19.2.1 Parallel Parking

Parallel parking is permitted on certain streets in accordance with the Construction Drawing cross sections in Chapter 7, Street Design and Technical Criteria, (Chapter 7 Standard Details).

#### A. No Parking Signs

For all streets in which parking is limited or not allowed, "No Parking" street signs shall be required in accordance with **Chapter 14, Traffic Control Devices**.

#### 19.2.2 Non-Parallel Parking

In Downtown areas and other special designation areas, the Local Entity may permit perpendicular or diagonal parking. The Local Entity Engineer must specifically approve any on-street parking areas that are not designed as parallel parking. All parking shall be designed in accordance with **Figure 19-7**.

#### A. Diagonal Parking

All diagonal parking areas approved by the Local Entity Engineer shall be designed at an angle of thirty, forty-five, or sixty degrees.

#### 19.2.3 Parking in Cul-de-Sacs

The Local Entity will require that at least one off-site parking space be provided for each residence that has frontage on a cul-de-sac bulb.

#### A. Design Methods

The on-street parking can be developed in the following three design methods:

1. <u>Parallel Parking</u>. Each space that is provided on the perimeter of cul-de-sac bulbs must be designed in accordance with **Figure 19-4**.

- 2. <u>Center Island in the Cul-de-Sac Bulb</u>. The center island for parking shall be designed in accordance with **Figure 19-1**. In Loveland (GMA and city limits), parking may be provided as shown in **Figure 19-2L**.
  - a. <u>Fort Collins (GMA and city limits)</u>. This island shall be limited to a total of 16 spaces, 8 on each side.
- 3. <u>Off Street Perpendicular Parking Areas</u>. The parking areas shall be designed in accordance with **Figure 19-3**. These areas shall be in easements. Off street parking areas shall be maintained by a private entity.
- 4. <u>Off Street Parallel Parking Areas</u>. In Loveland (city limits only), parallel parking may be allowed in accordance with **Figure 19-5L**.

# **B.** Drainage

Cul-de-sac parking areas must be paved and designed for drainage to flow to the curb and into the drainage system.

#### C. Landscaped Areas

All landscaped areas within the center islands or off-street areas must be maintained by a private entity (i.e., Homeowner's Association). The Local Entity will not be responsible for maintenance. Any proposed irrigation should be designed as a drip system to minimize spray onto the pavement areas. In Fort Collins (GMA and city limits), the irrigation system shall be designed in accordance with streetscape standards in **Appendix C**.

# 19.2.4 On-Street Handicapped Parking Requirements

Streets within commercial areas that include parking may be required to provide at least two spaces per block (one on each side) specifically designated for handicapped parking. The parking area shall be appropriately signed in accordance with **Chapter 14**, **Traffic Control Devices**.

# 19.3 OFF-STREET PARKING REQUIREMENTS

The requirements for off-street parking shall be designed in accordance with the Local Entity's zoning requirements.

# 19.3.1 Minimum Distance

The minimum setback distance from the street curb face to the nearest parking space in an off-street parking area must be designed in accordance with **Figure 19-6**.

# 19.3.2 Off-Street Straight-In Cul-de-Sac Parking Requirements

Refer to Figure19-3.

# **19.4 PARKING CLEARANCES**

# **19.4.1** Driveway Clearance

A vehicular parking space within the roadway shall be designed with a minimum clearance of 6 feet from the edge of a driveway.

## **19.4.2** Intersection Clearance

A vehicular parking space in the roadway shall be designed with a minimum clearance of 35 feet from the intersection flowline. Depending on traffic conditions, the Local Entity may require a greater clearance.



(	CENTER IS	LAND PARKIN	G IN CU	L-DE-SA	IC N
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URBAN AREA STREET STANDARDS

REVISION NO: DATE: 08/07/00 FIGURE



STANDARD VEHICLE				Dimension in feet			
А	B <sup>②</sup>	C <sup>①</sup>	D	E	F*	G*	
O°	8	23	8	23	20	12	
30 <sup>°</sup>	8.5	20	17.4	17	20	15	
$45^{\circ}$	8.5	20	20.2	12	20	15	
60 <sup>°</sup>	9	19	21	10.4	24	20	
$90^{\circ}$	9	19	19	9	24	NA	

## COMPACT VEHICLE Dimension in feet

А	В	С	D	Е	F *	G*
O°	7.5	19	7.5	19	20	12
30 <sup>°</sup>	7.5	16.5	14.8	15	20	15
45 <sup>°</sup>	7.5	16.5	17	10.6	20	15
60°	8	16	17.9	9.2	24	20
90°	8	15	15	8	24	NA

\* Under special conditions, these dimensions could be varied with the Local Entity's approval. <sup>①</sup>Stall length (only) can be reduced by 2' when overhanging is provided.

<sup>(2)</sup>For handicap spaces, width shall be 13' with ramp access to walks.

- A Angle of Parking
- B Stall Width
- C Stall Length
- D Stall Depth
- E Curb Length
- F Two-Way Drive Width or Double Loaded Drive Width
- G One-Way Drive Width or Single Loaded Drive Width



$\left( \right)$	PAH	RKING AREA I	DIMENSIONS	
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## CHAPTER 20 – PUBLIC IMPROVEMENTS OPINION OF COSTS

#### 20.1 GENERAL

This chapter defines units for certain construction items used in the Opinion of Costs required with the submittal of Construction Plans. These costs will be the basis of the surety amount to be provided by the Developer. The unit costs represent what the Local Entities would expect to pay for similar projects. The purpose is to cover the cost of the project in case the Local Entity is for any reason forced to take over constructing the project.

The Opinion of Costs shall be prepared and stamped by a Professional Engineer. The Opinion of Costs shall be broken down by the categories shown herein and shall provide the public improvement name, units of measure, unit cost, quantity included in the project, and total cost of each item and grand total. The Opinion of Cost shall be itemized by phase.

#### 20.2 UNITS AND COSTS

The units presented here are intended to assist the Developer in providing consistent units and quantities for review by the Local Entities. The Local Entity will approve unit costs used to determine the Opinion of Costs. There may be additional items that are not shown. The Developer should show each of those items, with their units, unit prices, quantities, and item cost. Separate summaries shall be provided for phases when applicable. In addition, separate summaries shall be provided for adjacent, on-site and off-site public improvements.

-- .

#### 20.2.1 Erosion Control

			Unit	Estimated	Item
	<b><u>Public Improvement Item</u></b>	<u>Units</u>	<u>Cost</u>	<b>Quantity</b>	<u>Cost</u>
	Stockpile Topsoil	CY			
	Straw Bales	Each			
	Inlet Protection	Each			
	Silt Fence	Lineal Feet			
	Sediment Trap	Each			
	Vehicle Tracking Pad	Each			
20.2.2	2 Street Improvements				
			Unit	Estimated	Item
	Public Improvement Item	<u>Units</u>	Cost	<b>Quantity</b>	Cost
	Clearing and Grubbing	Lump Sum			
	Removal of Structures	-			
	and Obstructions	Each			
	Subgrade Preparation	SY			
	Excavation	CY			
	Borrow	CY			
	Fill	CY			

Filter Material	CY
Lime Treatment	SY
Asphalt Patching	TONS
Asphalt Pavement	TONS
Base Course	TONS
Concrete Pavement	SY-IN
Geotextile	SY
Riprap	CY
Survey Monuments	Each
Adjust Manholes	Each
Adjust Valves	Each
Adjust Monuments	Each
Median Cover Material	
(Concrete)	SY

#### 20.2.3 Structures

		Unit	Estimated	Item
Public Improvement Item	<u>Units</u>	<u>Cost</u>	<b>Quantity</b>	<u>Cost</u>
Bridge Structure	Each			
Culverts	Each			
Guardrail	LF			
Railing(Pedestrian)	LF			
Railing (Traffic)	LF			
Headwalls	Each			

## 20.2.4 Pedestrian and Bikeway Facilities

		Unit	Estimated	Item
Public Improvement Item	<u>Units</u>	Cost	<b>Quantity</b>	<u>Cost</u>
Sidewalk Grading	SY			
4-inch Thick Sidewalk	SY			
6-inch Thick Sidewalk	SY			
Directional Curb Ramp	SY			
Corner Curb Ramp	SY			
Mid Block Ramp	SY			
Concrete Bikeway	SY			
Sidewalk Chase	Each			
Curb and Gutter Grading	LF			
Curb and Gutter – Type II	LF			
Curb and Gutter – Type I	LF			
Glue-down Curb	LF			

# 20.2.5 Street Lighting – Local and Minor Collector Streets in Loveland (City Limits Only)

	Public Improvement Item	<u>Units</u>	Unit <u>Cost</u>	Estimated <u>Quantity</u>	Item <u>Cost</u>
	Standard Pedestrian Light Standard Street Light	Each Each			
20.2.6	Traffic Signals, Signing	and Stripii	ng		
			Unit	Estimated	Item
	Public Improvement Item	<u>Units</u>	Cost	<u>Quantity</u>	<u>Cost</u>
	Standard Street Signs	Each			
	Standard Sign Posts	Each			
	Standard Regulatory Signs	Each			
	Standard Speed Limit Signs	Each			
	Latex Paint (4 inches)	LF			
	Latex Paint (8 inches)	LF			
	Latex Paint (12 inches)	LF			
	Latex Paint (18 inches)				
	Latex Paint (24 inches)	LF			
	(4 inches)	IE			
	(4 menes) Epoxy Pavement Marking				
	(8 inches)	LF			
	Epoxy Pavement Marking	LI			
	(12 inches)	LF			
	Epoxy Pavement Marking				
	(18 inches)	LF			
	Epoxy Pavement Marking				
	(24 inches)	LF			
	Preformed Tape for Symbols				
	& Crosswalks	LF			
	Preformed Thermoplastic	SF			
	Traffic Signals	EA			
20.2.7	Work Zone Traffic Cont	rol			
			Unit	Estimated	Item
	Public Improvement Item	Units	Cost	Ouantity	Cost
	Traffic Control	IS			
20.2.8	Storm Drainage Faciliti	es			
			Unit	Estimated	Item
	Public Improvement Item	<u>Units</u>	<u>Cost</u>	<u>Quantity</u>	<u>Cost</u>
	Grading	SY			

Inlets	EA
Manholes	EA
Pipe (Material Type - Size)	LF
Trickle Channel (width)	LF

#### 20.2.9 Water

Public Improvement Item	Unita	Unit Cost	Estimated	Item Cost
<u>r ubic improvement item</u>			Quantity	Cost
Main (including main fittings, main valves, temp. blow-offs, standard bedding, thrust restraint)	LF			
Main Testing & Disinfection	LS			
Fire Hydrant Assembly, Complete	EA			
Special Valves (not main, fire hydrant)	EA			
Meter Services/Pits <sup>3</sup> / <sub>4</sub> "-1" (including saddle, corp stop, service line, curb stop, yoke, meter pit)	EA			
Meter Services/Vaults $1\frac{1}{2}$ " - 8" (including saddle/fitting, corp or valve, service line, curb stop or valve, meter set, meter)	EA			
Steel Casing	LF			
Special Vaults	EA			
Special Lowering/Crossings	EA			
Special Tie-In/Connection	EA			
Blow-offs/Permanent/Complete	EA			
Air-Vacs/Complete	EA			
Special Bedding	CY			
Asphalt Repair & Removal	SY			
Site Restoration & Reveg.	LS			
Traffic Control	LS			
Erosion Control	LS			
Other	LS/LF/EA			

## 20.2.10 Sanitary Sewer

Public Improvement Item	<u>Units</u>	Unit <u>Cost</u>	Estimated <u>Quantity</u>	Item <u>Cost</u>
Main (including standard bedding)	LF			
Manhole	EA			
Main & Manhole Testing	LS			
Services/Complete	EA			
Steel Casing	LF			
Special Vaults	EA			
Special Tie-In/Connection	EA			
Special Bedding	CY			
Asphalt Repair & Removal	SY			
Site Restoration & Reveg.	LS			
Traffic Control	LS			
Erosion Control	LS			
Other	LS/LF/EA	Δ		

## 20.2.11 Removals and Repair

<u>Units</u>	Unit <u>Cost</u>	Estimated <u>Quantity</u>	Item <u>Cost</u>
SY			
SY			
LF			
SY			
SY			
	<u>Units</u> SY SY LF SY SY	Unit <u>Units</u> <u>Cost</u> SY SY LF SY SY SY	UnitEstimated <u>UnitsCostQuantitySYSYLFSYSYSY</u>

## 20.2.12 Construction Surveying/Staking

Public Improvement Item	<u>Units</u>	Unit <u>Cost</u>	Estimated <u>Quantity</u>	Item <u>Cost</u>
20.2.13 Material Testing				
		Unit	Estimated	Item
<u>Public Improvement Item</u>	<u>Units</u>	<u>Cost</u>	<b>Quantity</b>	<u>Cost</u>

## 20.2.14 Record Drawings

Public Improvement Item Units	Unit <u>Cost</u>	Estimated <u>Quantity</u>	Item <u>Cost</u>
20.2.15 Construction Management			
	Unit	Estimated	Item
Public Improvement Item Units	<u>Cost</u>	<u>Quantity</u>	<u>Cost</u>

#### 20.3 FINANCIAL CONTINGENCY

The total amount of the financial security for public improvements must also include a 15 percent contingency for projects in Loveland (GMA and city limits) per Section 24.3, Surety, Insurance, and Security Requirements.

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## **CHAPTER 22 – MATERIALS AND CONSTRUCTION SPECIFICATIONS**

#### 22.1 RIGHT-OF-WAY GRADING

#### 22.1.1 Site Remediation

#### A. Disposal of Waste Materials

- 1. <u>Burning on Developer's Proper</u>ty. Burning is not permitted on Developer's property except for training burns authorized and overseen by the local fire authority.
- 2. <u>Removal from Developer's Property</u>. Removal of waste materials and unsuitable or excess topsoil from the Developer's property shall be legally disposed of.

#### 22.1.2 Site Demolition

#### A. Removal of structures and Obstructions

- 1. <u>General.</u> The work shall consist of removal, salvaging, and backfilling according to **CDOT Specifications Section 202.01**. Refer also to **Ch. 25, Reconstruction and Repair.** 
  - a. <u>Salvage</u>. Salvageable material shall be handled according to **CDOT Specifications Section 202.03** in locations designated by the Local Entity Engineer.
  - b. Disposal.
    - 1) <u>Developer R</u>esponsibility. The Developer shall make all necessary arrangements for securing legal and suitable disposal sites.
    - 2) <u>Unestablished Dump S</u>ites. If disposal is to be at other than established dump sites, the Local Entity Engineer may require the Developer to furnish written permission from the property owner on whose property the materials are placed.
    - 3) <u>Concrete and A</u>sphalt. Broken concrete and asphalt, with no other waste material, may be taken to Local Entity's recycling yard. Asphalt and concrete must be separated. Mingling of materials is prohibited.
  - c. <u>Backfill</u>. Except in areas to be excavated, all cavities left by structure removal shall be cut to clean undisturbed material and backfilled with suitable material and compacted in accordance with **Section 22.2.3** of these Standards. Jetting or ponding will not be allowed.
  - d. <u>Preservation of Property</u>. Existing improvements, adjacent property, utilities, trees, and plants that are not to be removed shall be protected from injury or damage resulting from the Developer's operations.

- 2. Construction Requirements.
  - a. <u>Structures</u>. The Developer shall raze, remove, and dispose of all structures, according to **CDOT Specifications Section 202.02**.
  - b. <u>Demolition Permit</u>. Building demolition requires a demolition permit issued by the Local Entity.
  - c. <u>Abandoned pipelines/conduits</u>. Abandoned pipelines and conduits shall be removed or abandoned in place by plugging and filling with sand or appropriate alternative in accordance with direction from the Local Entity Engineer.
  - d. Other Obstructions.
    - 1) <u>Miscellaneous Obstructions</u>. The Developer shall remove miscellaneous obstructions and properly dispose of them.
    - <u>Traffic Signals and Signs</u>. Removal of traffic signals and related materials shall be per CDOT Specifications Section 202.02. All traffic signal equipment shall remain the property of the Local Entity. Contact the Local Entity Engineer for disposal instructions.
    - 3) <u>Portions of S</u>tructures. Removal of portions of structures shall be per **Section 22.3.2** of these standards.
    - 4) <u>Detour Struc</u>tures. Materials used in detour structures for the project shall be removed according to **CDOT Specifications Section 202.06**.

#### 22.1.3 Site Clearing and Grubbing

#### A. General

The work shall consist of clearing, grubbing, removing, and disposing according to **CDOT Specifications Section 201.01**. This work does not include objects designated to remain nor which are to be removed in accordance with other sections of these Standards.

#### **B.** Construction Requirements

Construction requirements for site clearing and grubbing shall follow those requirements outlined in **CDOT Specifications Section 201.02** with the addition of the following:

- 1. <u>Construction Limi</u>ts. The Developer will establish construction limits in accordance with the Local Entity requirements.
- 2. <u>Buried Perishable Objects</u>. Buried perishable objects shall be removed to a depth of 3 feet below the existing ground or subgrade, whichever is lower.
- 3. <u>Burning</u>. Burning of perishable material shall be done in accordance with in **Section 22.1.1** A.

4. <u>D</u>isposal. Disposal of materials or debris shall be done in accordance with **Section 22.1.1 A**.

#### 22.1.4 Embankment and Excavation

#### A. General Construction Requirements

Excavation and embankment operations shall be done in accordance with **CDOT Specifications Section 203.04**. Prior to beginning grading operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with **Section 22.1.3**.

#### **B.** Embankment Material

Embankment material shall consist of approved material acquired from excavations, and shall be hauled and placed in embankments in reasonably close conformity with the line, grades, thicknesses, and typical cross-sections shown on the plans.

- 1. <u>Compa</u>ction. The embankment shall be free of organic material, and shall be moisture treated to within 2% (or as specified on the plans or geotechnical report) of optimum moisture content and placed in 6-inch lifts compacted to 95% standard proctor.
- 2. <u>Source of Material</u>. When the source of embankment materials is not designated on the plans, approval of the source will be contingent on the material meeting the requirements of **Chapter 5**, **Soils Investigations**, and having a resistance value that matches or exceeds the R-value of the in-situ material or as shown on the plans when tested by the Hveem Stabilometer.
- 3. <u>Unsatisfactory Material</u>. Refer to the unacceptable soil classification groups from **ASTM** which apply for locally available material. No top soil shall be used for fill. In addition, no gap graded material nor material weighing less than 90 pounds per cubic foot shall be used for fill.

#### C. Excavation

- 1. <u>General.</u> This work shall consist of excavation, disposal, shaping, or compaction of all material encountered within the limits of the work, including excavation for ditches and channels.
  - a. <u>Protection of Property and Workmen</u>. Excavation shall be performed in a careful and orderly manner with due consideration given to protection of adjoining property, the public, and workmen.
  - b. <u>Damage Repair Respons</u>ibility. Any damage to streets, parking lots, utilities, irrigation systems, plants, trees, building or structures or private property, or the bench marks and construction staking shall be repaired and restored to its original conditions by the Developer at the Developer's expense. Following completion of construction, should any of these trees, shrubs, or irrigation facilities, etc. require replacement, it shall be done at the Developer's expense.

- c. Compliance with Standards. All excavation and the like shall comply with OSHA's "Construction Industry Standards" as well as all applicable Federal and State regulations.
- 2. <u>Stockpile</u>. Refer to Chapter 25, Reconstruction and Repair.
- 3. <u>D</u>isposal. Excess excavated material shall be disposed of outside of the Right-of-Way unless approval is given by the Local Entity Engineer to do otherwise.
- 4. <u>Explosives</u>. The use of explosives will not be permitted without a blasting permit issued by the local fire authority. Refer to **Chapter 6**, **Permits**, for permit conditions and procedures.
- 5. <u>Unsanitary Materials</u>. Unacceptable material defined as any earthen material containing vegetable or organic silt, topsoil, frozen material, trees, stumps, certain manmade deposits, or industrial waste, sludge, or landfill, or other undesirable materials will be removed from the site and disposed of in accordance with applicable Local Entity, State, and Federal requirements.
- 6. <u>Unauthorized Excavation</u>. Unauthorized excavation consists of removal of materials beyond specified elevations without the specific direction of the Local Entity Engineer. Unauthorized excavation shall be backfilled and compacted as specified for authorized excavations.
- <u>Rock.</u> Rock shall be excavated and disposed of according to CDOT Specifications Section 203.05(a), or Local Entity Requirements. Rock shall be removed to a level 3 feet below the subgrade surface within the right-of-way. Drainage facilities may be required by the Local Entity Engineer.
- 8. Excavation for Appurtenances. See Section 22.4.4.

#### 22.1.5 Embankment Construction

#### A. General

Embankment construction shall consist of constructing roadway embankments within project areas where unsuitable material has been removed as well as in other areas as noted in **CDOT Specifications Section 203.06.** 

- 1. <u>Water in Material</u>. Free running water shall be drained from the material before the material is placed.
- 2. <u>Maximum Size of Solid Material</u>. Rocks, broken concrete, or other solid materials more than 3 inches in greatest dimension shall not be placed in embankment, unless approved by Local Entity Engineer.
- 3. <u>Archaeological Sites or Artifacts</u>. When the Developer's excavating operations encounter remains of prehistoric peoples' dwelling sites or artifacts of historical or archaeological significance, the operations shall be temporarily discontinued. The Developer shall contact archaeological authorities to determine the disposition thereof. When directed, the Developer shall excavate the site in such

manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the proper state or Local Entity authorities.

4. <u>Protection of Existing Installations</u>. The Developer shall at all times take precautions for the protection of culverts, irrigation crossings, mail boxes, driveway approaches, valve boxes, manholes, survey monuments, underground or overhead utility lines, and all other public or private installations that may be encountered during construction. The Developer shall be responsible for the repair of any installations damaged due to their work. Manholes and valve boxes shall be observed by the Local Entity Engineer for displacements and introduction of foreign matter. It shall be the Developer's responsibility to correct any displacement and to remove any foreign matter resulting from the Developer's work.

## 22.1.6 Borrow Material

#### A. General

Provide approved borrow soil materials from off-site locations when sufficient approved soil materials are not available from excavations on-site. Borrow material shall be placed only after the approved excavation material has been replaced in the fill. Borrow areas shall be finished so that water will not collect or stand therein. The "R" value of the borrow shall be equal or greater than the design "R" value required for the existing subgrade soil. In addition, the LL and PI shall be equal to, or better than, the LL and PI of the subgrade material. Refer to **Chapter 10, Pavement Design and Technical Criteria**.

#### **B.** Satisfactory Borrow Materials

Borrow material must be free of rock or gravel larger than 3 inches, and free of debris, waste, frozen materials, vegetation and other deleterious matter. Refer to **ASTM** soil classification groups which apply for locally available material.

#### C. Unsatisfactory Borrow Materials

Refer to the unacceptable soil classification groups from **ASTM** which apply for locally available material. No top soil shall be used for fill. In addition, no gap graded material nor material weighing less than 90 pounds per cubic foot shall be used for fill.

#### 22.1.7 Earthwork Grading

#### A. General

Grade all areas to a uniformly smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross-sections, lines, and elevations indicated. Provide a smooth transition between existing adjacent grades and new grades. Remove soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

#### **B.** Grading During Construction

Grading shall be done as necessary to prevent surface water from entering the excavation. Any other water accumulation therein shall be promptly removed.

#### **C.** Accessibility During Construction

Earthwork construction shall be performed in a manner that does not obstruct surface drainage or prohibit access to operational driveways, fire hydrants, manholes, and water valves.

#### **D.** Site Grading

- 1. <u>Slope and Elevation of G</u>rades. The ROW shall be sloped to direct storm runoff flow to the roadway, unless otherwise specified on the plans. Finish subgrades to required elevations within the following tolerances:
  - a. Lawn or Unpaved Areas. Plus or minus 0.25feet.
  - b. Walks. Plus 0 or minus 0.1 feet.
  - c. Pavements. Plus 0 or minus .04 feet.
- 2. <u>Construction S</u>takes. The Developer shall provide all stakes necessary for curb, gutters, sidewalks and structures and furnish all necessary information relating to lines and grades. The Developer shall be held responsible for preservation of all such stakes.
  - a. <u>Stake Remov</u>al. The Developer shall not remove stakes until three working days after placement of concrete unless approved by the Local Entity Engineer.
  - b. <u>Vertical Curves</u>. Curb stakes shall be placed at 25 foot intervals and at the lowest and highest elevations along the vertical curve. This is intended to minimize flat grades at the high and low points.

#### 22.1.8 Erosion Control

#### A. Soil Protection

All disturbed soil, on or off-site and related to work at the project site, is required to be protected from wind and storm water erosion. To mitigate erosion, the contractor shall use standard erosion control techniques described in "Volume 3 – Best Management Practices of the Urban Storm Drainage Criteria Manual," published by the Urban Drainage and Flood Control District.

#### **B.** Fort Collins (City Limits Only)

Erosion control standards for Fort Collins (city limits only) shall follow the **City of Fort Collins Storm Water Utility Specifications**.

#### C. Larimer County GMA

Erosion control standards are found in Larimer County Storm Water Management Manual, Section 10.

#### D. Loveland (City Limits Only)

Erosion control standards for Loveland (city limits only) shall follow the **City of** Loveland Storm Drainage Standards.

#### 22.2 TRENCHING FOR UTILITIES

#### 22.2.1 Excavation for Utility Trenches

#### A. General

All trenching activities shall comply with the requirements of OSHA's "Construction Industry Standards" as well as all applicable Federal and State regulations for safety.

Trenches shall be excavated, shored or graded, with sides sloped to conform to the requirements for the soil conditions.

No more than 300 feet of trench length shall be open at any time, unless approved by the Local Entity Engineer.

Repair of failed trenches, and all associated pavement patching and concrete repairs will be the responsibility of the party requiring the trench, and shall be repaired in accordance with Chapter 25. The Local Entity may require mill and inlay or overlay of the affected areas.

#### **B.** Tracked Vehicles

No tracked vehicles shall be permitted on streets unless approved by the Local Entity Engineer. When tracked vehicles are allowed, existing facilities will be restored to original condition at the Developer's expense.

#### C. Removal of Pavement

Refer to Chapter 25, Reconstruction and Repair.

#### **D.** Protection of Existing Underground Utilities

Refer to Chapter 25, Reconstruction and Repair.

#### **E.** Relocation of Utilities

Refer to Chapter 25, Reconstruction and Repair.

#### F. Subdrains

Subdrains shall only be installed where shown on, and in accordance with, the approved plans.

#### G. Trenching Through Existing Pavement

Refer to Chapter 25, Reconstruction and Repair.

#### 22.2.2 Utility Crossings

#### A. Trenches

All utility trenches that must be in existing streets shall be backfilled with flowable fill after the utility line has been installed, unless otherwise directed by the Local Entity Engineer. Refer to **Section 22.2.3** for flow fill criteria.

#### **B.** Markings on Concrete Patches

Refer to the discussion on markings in Section 22.4.3 A about concrete finishing.

#### 22.2.3 Backfill

#### A. Ordinary/Native Backfill

This shall consist of material excavated from the site except rubbish, frozen material, broken pavement, stones, or other consolidated material greater than 3 inches in diameter, organic muck, or other materials considered unacceptable by the Inspector.

#### **B. Imported Backfill**

See Section 22.1.6 Borrow Material.

#### C. Structure Backfill

This material shall be Class I structure backfill, conforming to **CDOT Standard Specifications, Section 703**. Class I structure backfill shall be used on all bridges, box culverts, or where otherwise specified.

#### **D.** Flowable Fill

This material shall be required as utility trench backfill unless otherwise directed by the Local Entity Engineer. This requirement applies to all locations under existing pavement. Vibration of flowable fill shall be required unless otherwise approved by the Local Entity Engineer. The approved mix for flowable fill is shown below:

Flowable Fill	
Ingredients	<b>Pounds/Cubic Yard</b>
Cement*	42 (0.45 sack)
Water	325 (39 gallons as needed)
Coarse Aggregate (No.57)	1700
Sand (ASTM C-33)	1845

\*fly ash may be approved by the Local Entity Engineer. Curing accelerators ("flash-fill") shall not be used

The maximum desired 28-day strength is 60 psi. The combination of material listed above, or an equivalent, may be used to obtain the desired flowable fill. Flowable fill shall not be used as a temporary or permanent street surface.

Trenches shall be initially backfilled to the level of the original surface. After flowable fill has cured, the top surface of the flowable fill shall be removed to the depth necessary to allow repair of the permanent surface.

#### E. Conventional Backfill

Conventional backfill is "nonflowable fill."

- 1. <u>Backfill L</u>ifts. Backfill material shall be placed in uniform loose lifts, not to exceed 8 inches prior to compaction. Alternate methods may be considered by the Local Entity Engineer.
- 2. <u>Compaction</u>. Each layer shall be compacted to a density not less than 95 percent of maximum density, in accordance with **AASHTO T99** and at the moisture content as specified in the soils or pavement design report. If the moisture content is not specified, soils shall be compacted at +/- 2 percent.
- 3. <u>Categories of Conventional Backfill</u>. Backfill lifts under existing or proposed streets, curbs, gutters, sidewalks, and alleys is divided into 3 categories: initial, intermediate, and final lifts as defined below.
  - a. <u>Initial Lift (be</u>dding). This is designated as Class B and generally comprised of a washed, clean gravel material, consisting of the section from the bottom of the excavation to a point 12 inches above the top of the underground structure installation. Placement and compaction of the initial layer shall be as specified by the utility to protect their installation. Sections deeper than described above for class B will not be allowed.
  - b. <u>Intermediate Lift</u>. This is generally comprised of native material, consisting of the section above the initial layer to a point within 6 inches of the ground level or the bottom of the pavement section, whichever is greater. Excavated material may be used in the intermediate layer provided that it is deemed suitable by the Local Entity Engineer.
  - c. <u>Final L</u>ift. This includes both roadbase and surfacing material. Roadbase material shall be CDOT class 5 or 6 aggregate course as specified in the pavement design report or as specified by the Local Entity Engineer.

## 22.2.4 Trench Cover

#### A. Subgrade

1. <u>Compa</u>ction. After the backfill has been placed and compacted as specified, it shall be cut and trimmed to the required depth and cross section (see **Section 25.5** 

**Pavement**). Trench cover subgrade shall be free of all rock over 3 inches in size. It shall be compacted to not less than the densities required for the given soil classification as listed in **Section 22.5.2** C. This density requirement also applies to all utility trenches within the public Right-of-Ways. Compaction shall be evaluated by standard tests, (see **Table 23-1**), at the time of constructing curb, gutter, sidewalk, pavement, and/or other permanent trench cover structure.

- 2. <u>Excess Excavated Material</u>. All excess excavated material shall be removed and disposed of outside the legal limits of the Right-of-Way as the work progresses, unless the approval of the Local Entity Engineer is obtained for disposal of the material within the legal limits of the Right-of-Way.
- 3. <u>Condition Res</u>tored. All parts of the roadway and various structures disturbed shall be restored in accordance with these Standards.
- 4. <u>Compaction Equipment</u>. Compaction equipment must be on the job site before excavation is started. Compaction equipment must be capable of compacting within the trench width limits to avoid bridging the ditch.

## 22.3 STRUCTURES

#### 22.3.1 General

This section discusses the removal, excavation, and backfill for structures as well as specifications for materials and construction criteria.

#### 22.3.2 Removal of Structures

Refer to Chapter 25, Reconstruction and Repair.

#### 22.3.3 Excavation for Structures

#### A. Tolerance and Placement

Excavations shall be done in accordance with the designed elevations and dimensions within a tolerance of plus or minus 1.2 inches. Excavations shall be extended a sufficient distance from structures for placing and removing concrete form work, installing services, and other construction, and for inspections.

#### **B.** Excavations for Footings and Foundations

Do not disturb bottom of excavation. Excavate by hand, if needed, to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base for receiving other work.

#### C. Excavation for Underground Structures

Excavation for tanks, basins, and mechanical or electrical appurtenances shall be to elevations and dimensions indicated within a tolerance of plus or minus 1.2 inches. The bottom of excavations intended for bearing surface shall not be disturbed.

#### 22.3.4 Structure Backfill Material

Refer to **Section 22.2.3** for backfill to be used for structures.

#### 22.3.5 Markings

All bridges, retaining walls, and box culverts shall have the year of construction permanently impressed therein. The impression for bridges and box culverts shall be located on the downstream head wall face in legible numbers as per **Section 22.4.3 A**. The Local Entity shall determine the location of the indentured construction year for all retaining walls and the size of letters shall be per **Section 22.4.3 A**.

#### 22.3.6 Materials

#### A. Concrete

- 1. Aggregate. Refer to Section 22.4.2 A.
- 2. <u>Waterproofing Membran</u>e. An approved waterproofing membrane shall be furnished according to these specifications. Refer to **CDOT Specifications Sections 515.01** and **515.02**.
- 3. <u>Waterstops</u>. Appropriate size and type of waterstop shall be furnished in accordance with these specifications and in conformance with the plans. Refer to **CDOT Specifications Section 518.02**.

#### **B.** Structural Steel

- 1. <u>Structural Carbon S</u>teel. Structural Carbon steel shall be furnished in accordance to these specifications and in conformance with the plans. Refer to **CDOT Specifications Section 509.03**.
- 2. <u>High-Strength Low-Alloy Structural Steel</u>. High-strength low-alloy structural steel shall be furnished in accordance to these specifications. Refer to **CDOT Specifications Section 509.04**.
- 3. <u>Self Weathering Tubing</u>. Self weathering tubing shall be furnished according to **CDOT Specifications Section 509.05**.
- 4. <u>Structural Tubing</u>. Structural tubing shall be furnished in accordance with **CDOT Specifications Section 509.06**.
- 5. <u>Bolts</u>. Bolts shall be furnished in accordance to **CDOT Specifications Section 509.07**.
- 6. <u>High Strength B</u>olts. High strength bolts shall be furnished in accordance with **CDOT Specifications Section 509.08**.
- 7. <u>Pins and Rollers</u>. Pins and rollers shall be furnished in accordance with **CDOT Specifications Section 509.09**.

- 8. <u>Anchor Bolts</u>. Anchor bolts shall be furnished in accordance with **CDOT Specifications Section 509.10**.
- 9. <u>Galvanized and Metallized Steel</u>. Galvanized and metallized steel shall be furnished in accordance with **CDOT Specifications Section 509.11**.
- 10. <u>Welded Stud Shear Connectors</u>. Welded stud shear connectors are to be furnished in accordance with **CDOT Specifications Section 509.12**.

#### C. Steel Structural Plate

Steel plate structures shall consist of materials as specified on the plans and be in accordance with **CDOT Specifications Section 510.02.** 

#### **D.** Timber

- 1. <u>General Timber</u>. Timber shall be furnished in accordance with **CDOT Specifications Section 508.02**.
- 2. <u>Treated Timber</u>. Treated timber shall be furnished in accordance with **CDOT Specifications Section 508.03**.
- 3. <u>Hardware</u>. Hardware for timber construction shall be furnished in accordance with **CDOT Specifications Section 508.05**.

#### **E. Bearing Device**

Bearing device materials shall be furnished in accordance with **CDOT Specifications Section 512.02**.

#### F. Pipe Railing

Pipe for railing shall conform to the plans and be furnished in accordance with **CDOT Specifications Section 514.02**.

#### G. Concrete Reinforcement

- 1. Reinforcing Materials General.
  - a. <u>Reinforcing Bars</u>. ASTM A 615 Grade 60, deformed (unless otherwise specified on plans).
  - b. <u>Supports for Steel Reinforcement</u>. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
    - 1) For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
    - 2) For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).
- 2. Shop Drawings.

- a. <u>D</u>rawings. Before fabrication of the reinforcement, the Developer shall prepare or have prepared complete bending, fabrication, and setting drawings and bar lists covering all required reinforcement steel.
- b. <u>Review</u>. Drawings and bar lists shall be submitted to the Local Entity Engineer for review of general conformity to specified requirements. The review of the Shop Drawings by the Local Entity Engineer in no way relieves the Developer of sole responsibility for correct placement of reinforcing steel.
- 3. Placing Reinforcement.
  - a. <u>General.</u> Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as specified.
  - b. <u>Vapor R</u>etarder/Barrier. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
  - c. <u>Cleaning</u>. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
  - d. <u>Positioning to Prevent Displacement</u>. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by the Local Entity Engineer.
  - e. <u>Tie Bars, Bar Supports, and Wire Ties</u>. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
  - f. <u>Wire Fabric</u>. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
  - g. <u>Bending and Placing</u>. Reinforcing steel, before being placed, shall be thoroughly cleaned of coatings that will destroy or reduce bond. A light coating of rust may be allowed by the Local Entity Engineer. Reinforcement shall be carefully formed to the dimensions indicated on the plans. It shall not be bent or straightened in a manner that will injure the material. THE USE OF HEAT IN BENDING BARS SHALL NOT BE PERMITTED. Bars with kinks or bends not shown on the plans shall not be used. Reinforcing steel shall be accurately placed and secured against displacement by using annealed iron wire of not less than No. 18 gauge, or suitable clips at intersections. Where necessary, reinforcing steel shall be supported by metal chairs or spacers, pre-cast mortar blocks, or metal hangers. Reinforcing bars shall not be spliced at points of maximum stress. Splices, where permitted, shall be

placed in the position and at the spacing shown on the plans with the tolerances specified in **ACI 301**, **Section 5.4**.

- h. <u>Preventing Displacement</u>. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete. On ground, and where necessary, supporting concrete blocks shall be used. Over formwork, approved bar chairs and spacers shall be furnished.
- i. <u>Materials for Accessories</u>. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories in contact with the formwork shall be galvanized or shall be made of plastic. Where the concrete surface will be exposed to plant water, all accessories in contact with formwork shall be stainless steel or plastic.
- j. <u>Mesh.</u> Mesh shall lap at least 1-1/2 meshes, plus end extension of wires, but not less than 12 inches in slabs and shall extend across supporting beams and walls. In lieu of adequate support for mesh, one worker shall be designated to lift the mesh during placing of concrete so that it is completely surrounded by concrete and not less than 2 inches above the bottom of slabs on ground or 1/2 inch above formwork.
- k. <u>Offsetting Bar</u>s. Vertical bars in columns shall be offset to permit the bars to be adjacent and in contact at splices.
- 1. <u>Splices</u>. All splices not shown on the drawings must have prior approval of the Local Entity Engineer.
- m. <u>No B</u>ending. Reinforcement shall not be bent after being partially embedded in hardened concrete.
- n. <u>Splice Laps</u>. Laps in tension splices shall be 36-bar diameters and 30-bar diameters in compression splices, or as noted.
- o. <u>C</u>over. The minimum clear cover for reinforcing steel shall be as specified in **ACI 301, Section 5.5**, and as shown below, unless otherwise shown on the plans.

Bottom bars on soil bearing foundations and slabs:	3 inches
Bars adjacent to surfaces exposed to weather on	
earth backfill:	
Bars more than 3/4 inch in diameter	2 inches
Bars 3/4 inch or less in diameter	1-1/2 inches
Interior Surfaces: Slabs, walls, joints with 1-3/8 inches	
diameter or smaller bars	3/4 inches

- 4. Reinforcement Fabrication and Placing Tolerances.
  - a. Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

Sheared length	+1 inch
Stirrups, ties	+1/2 inch

	All other bends	+1 inch
b.	Bars shall be placed to the following tolerances:	
	Concrete cover to formed surfaces	+1/4 inch
	Minimum spacing between bars	+1/4 inch
c.	Top bars in slabs and beams:	
	Members 8 inches deep or less Members more than 8 inches but	+1/4 inch
	not over 2 feet deep	+1/2 inch
	Members more than 2 feet deep	+1 inch
d.	Crosswise of members spaced evenly within 2 inches:	
	Lengthwise of members	+2 inches
e.	Bars shall be placed with the following minimum concrete co tolerance unless noted on the drawings:	over, including
	Concrete cast against earth Concrete exposed to earth or water Beams, girders, and columns Inside face of walls not exposed to earth or water Structural slabs not exposed to earth or water	3 inches 2 inches 1-l/2inches 1 inch 3/4 inch

5. <u>Placing Welded Wire Fabric</u>. Wire fabric in crosspans and curb cuts shall be placed as shown in the plans and details. The fabric shall be fully supported on precast mortar blocks or other approved supports prior to placing the concrete.

#### 22.3.7 Construction Requirements

#### A. Structural Concrete

- 1. <u>Design Mix</u>. The design mix and approval shall be in accordance with **CDOT Specifications Section 601.05**.
- 2. <u>Batching</u>. Measuring and batching of materials shall be in accordance with **CDOT Specifications Section 601.06**.
- 3. <u>Mixing</u>. Concrete shall be mixed in various type mixers according to **CDOT Specifications Section 601.07**.
- 4. Structural Cast–in-Place Concrete Forms.
  - a. General.
    - 1) <u>Support of L</u>oads. Design, erect, support, brace, and maintain form work to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads.
    - 2) <u>Construction</u>. Construct form work so concrete members and structures are of correct size, shape, alignment, elevation, and position.

- 3) <u>Quality</u>. Maintain form work construction tolerances and surface irregularities complying with ACI 347 limits.
- b. <u>Conforming to Plans</u>. Construct forms to sizes, shapes, lines, and dimensions as shown on the plans and to obtain accurate alignment location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes.
- c. <u>Joints</u>. Butt all joints solidly and provide backup at joints to prevent cement paste from leaking.
- d. <u>Constructing for Rem</u>oval. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- e. <u>Anchorage D</u>evices. Set and build into form work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- f. <u>Temporary Openings</u>. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- g. <u>Chamf</u>ering. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- h. <u>Provisions for Other Trades</u>. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- i. <u>Cleaning and Tightening</u>. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment. All forms shall be oiled prior to each use.
- j. <u>Checking Alignment</u>. Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems. During

concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed Work will be within specified tolerances.

- k. <u>Forms Material</u>. Forms shall be of wood, metal, or other material as specified below or approved by Local Entity Engineer. Approved flexible forms shall be used for construction where the radius is 100 feet or less. Unexposed surfaces shall have forms of No. 2 common (or better) lumber.
  - 1) <u>Forms for Exposed Finish Concrete.</u> Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable size to minimize number of joints.
  - 2) <u>Forms for Unexposed Finish Concr</u>ete. Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
  - 3) <u>Forms for Cylindrical Piers and Supports</u>. Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
  - 4) <u>Carton Forms</u>. Biodegradable paper surface, treated for moistureresistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
  - 5) <u>Form Release Agent</u>. Provide commercial formulation form release agent with a maximum of 350 g/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 6) <u>Form Ties</u>. Factory-fabricated, adjustable length, removable, or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

Provide ties that, when removed, will leave holes no larger than 1 inch in diameter in the concrete surface.

- 7) <u>Maximum Deflection</u>. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members. Suitable moldings or chamfer strips shall be placed in the corners of column, beam, and wall forms, except where specifically directed otherwise by the Local Entity Engineer.
- 8) <u>Compensating for Deflections</u>. Where necessary to maintain the specified tolerances, the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and construction loads.

- 9) <u>B</u>racing. Positive means of adjustment (wedges or jacks) of shores and struts shall be provided, and all settlement shall be taken up during the concrete placing operation. The shores and struts shall be securely braced against lateral deflections.
- 10) <u>Temporary Openings</u>. These shall be provided at the base of column and wall forms, and at other points where necessary, to facilitate cleaning and inspection immediately before concrete is deposited.
- 11) <u>A</u>ccessories. Forming accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type. Wire is not acceptable. The portion remaining within the concrete shall leave no metal within one inch of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 1 inch diameter. Embedded ties used in water containment structures shall have approved water seal washers.
- 1. <u>Form Removal Timing</u>. Forms shall not be disturbed until the concrete has adequately cured. The Developer or his superintendent shall be present at the time forms are removed and shall be responsible for the safety of this operation at all times. It is suggested that the minimum time between placing concrete and removal of forms be less than the following:

Item Poured	Minimum Time to Removal
Walks, Curb and Gutter	6 hours
Side forms for footings and slabs	12 hours
Side forms for walls, beam, and columns	24 hours

Forms under structural beams and slabs require shoring 7 days or when concrete has reached 2/3 of 28-day field design strength as indicated by compressive strength tests on field cured specimens.

- m. Removal of Forms and Reshoring.
  - 1) <u>Non-Weight B</u>earing. Form work for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations. See **Section 22.3.7 A.4.1**.
  - 2) <u>Weight Bearing</u>. Form work for beam soffits, slabs, and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
  - 3) <u>Ability to Carry L</u>oads. Forms shall not be removed in any case until the concrete has had time to set sufficiently to carry the deadloads and any construction loads it has to sustain, and in no case will the forms be removed until permission is obtained from the Engineer or his representative.

- 4) <u>Facing Material</u>. When shores and other vertical supports are so arranged that the form-facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted. The shores and supports shall remain in place until the concrete has reached its specified strength, unless otherwise specified or permitted. See Section 22.3.7 A.4.1.
- 5) <u>Reshoring</u>. Reshoring for the purpose of early form removal shall be performed, so that at no time will large areas of new construction be required to support their own weight. While reshoring is underway, no live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads, but they shall not be over tightened so that the new construction is over-stressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- 6) <u>Removal S</u>trength. This shall be based upon test cylinder strengths, as specified in **Chapter 23, Street Inspection and Testing Procedures**, or pullout tests in accordance with ASTM C900, and upon the approval of the Local Entity Engineer.
- n. Refer to **Section 22.3.7 A.4** for construction, fabrication, type, cleaning, and removal of forms.
- 5. <u>Permanent Steel Bridge Deck Forms</u>. Permanent steel bridge deck forms shall be installed according to **CDOT Specifications Section 601.10**.
- 6. <u>Falsework</u>. Falsework shall be designed, constructed, and removed according to **CDOT Specifications Section 601.11**.
- 7. <u>Placement</u>. The placement of concrete, conditions, holes, and joints shall be in accordance with **CDOT Specifications Section 601.12**.
- 8. <u>Curing Concrete Other Than Bridge D</u>eck. Refer to Section 22.4.3 C.
- 9. Finishing.
  - a. Ordinary Surface Finish. All concrete surfaces shall be given a Class 1 finish per CDOT's Class 1 Finish, **Section 601.14(b)** unless additional finish classes are specified by the plans for designated surfaces.
  - b. Class 3, CDOT Class 5, Masonry Coating Finish. Refer to CDOT
  - c. Specifications Section 601.14(b).
- 10. <u>Bridge Deck Placing</u>. Concrete shall be placed in accordance with **CDOT Specifications Section 601.12** except where there are conditions and procedures in accordance with **CDOT Specifications Section 601.15**.
- 11. <u>Bridge Deck Curing</u>. Concrete bridge decks, including bridge curbs shall be cured according to **CDOT Specifications Section 601.16**.
- 12. <u>Waterproofing</u>. Installation of waterproofing membrane over a prepared concrete bridge shall be in accordance with **CDOT Specifications Sections** 515.03 through 515.07.
- 13. <u>Waterstops</u>. Waterstops of appropriate size and type shall be installed according to **CDOT Specifications Section 518.03**.

#### **B.** Structural Steel

- <u>General.</u> Welding, fabrication, and construction of steel structures shall conform to AASHTO's LRFD Bridge Construction Specifications, latest edition, AASHTO's Standard Specifications for Highway Bridges, latest edition, and CDOT Specifications Section 509.02.
- 2. <u>Fabrication</u>. General fabrication, welding, shop assembly, connections, cleaning and painting, galvanizing, and marking of steel structures shall conform to **CDOT Specifications Sections 509.19** through **509.25**.
- 3. <u>Construction</u>. Erection, connections, field cleaning, and painting of steel structures shall be in accordance with **CDOT Specifications Sections 509.27** through **509.29**.

#### C. Structural Plate

- 1. <u>Fabrication</u>. Fabrication of structural plate structures shall be in accordance with **CDOT Specifications Section 510.03**.
- 2. <u>Construction</u>. Erection of structural plate structures shall be in accordance with **CDOT Specifications Section 510.05**.

#### **D.** Timber

- 1. <u>General</u>. Treated and untreated timber shall be erected according to **CDOT Specifications Section 508.06**.
- 2. <u>Holes and Bolts</u>. Holes bored and drilled and bolt accessories shall be installed according to **CDOT Specifications Section 508.07**.
- 3. <u>Painting</u>. All old and new timber, handrails, posts, and parts shall be painted in accordance with **CDOT Specifications Section 508.08**.

#### E. Bearing Device

- <u>Fabrication</u>. Fabrication of bearing devices shall apply to three types of devices and be in accordance with CDOT Specifications Sections 512.03 through 512.05. Bearing devices shall include hardware and provide for movement in accordance with CDOT Specifications Section 512.06.
- 2. <u>Construction</u>. Bearing devices are to be installed, protected, certified, and approved according to **CDOT Specifications Sections 512.09** through **512.15**.

# F. Pipe Railing

Pipe railing shall be installed and painted according to **CDOT Specifications Section 514.03**.

# G. Cold Weather Requirements

Prior to placing concrete, ice, snow and frost shall be removed from the forms and subgrade. In no case shall concrete be placed against frozen ground or against ground containing frost. Except by specific written authorization, concrete shall not be placed unless the air temperature adjacent to the concrete placement is 30°F and rising and placing shall cease when the air temperature adjacent to the concrete placement falls below 40°F as determined by the Local Entity Engineer. When concrete placement is permitted during cold weather, the temperature of the mix shall not be less than 50°F nor more than 90°F at the time of placement. Aggregates or water shall not be heated to a temperature exceeding 150°F. Materials containing frost or lumps of frozen material shall not be used. If heated mixing water and/or an accelerator are used, the above limits may be waived only with written permission of the Local Entity Engineer. When concrete is placed in cold weather and the air temperature is expected to drop below 35°F, a suitable blanketing material shall be at the job site during placement. At any other time when the air temperature is expected to reach the freezing point for a period of 72 hours after placement, the work shall be blanketed for protection of the concrete.

# 22.4 NON-STRUCTURAL CONCRETE

Non-structural concrete includes curb, gutter, walks, driveways, crosspans, and ramps.

# 22.4.1 General

#### A. Protection

It shall be the Developer's responsibility to protect new concrete from damage with appropriate methods. For areas exposed to vehicular traffic, the concrete shall be protected until 80% of required concrete strength is achieved.

#### **B.** Damaged Concrete

Damaged concrete shall be repaired, removed and/or replaced according to **Chapter 25, Reconstruction and Repair**.

#### **C. Sequence of Construction**

- 1. <u>Sanitary and Storm Sewer</u>. All curb, gutter, crosspans, and sidewalk (where attached) shall be constructed after installation of sanitary sewer, water, and storm sewer mains, laterals, and service lines have been installed and properly compacted in accordance with these specifications.
- 2. <u>Water Mains</u>. Water mains which cross curb, gutters, attached walks, and driveways shall also be installed and properly compacted prior to installation of said curb, gutter, attached walks, and driveway approaches.

- 3. <u>Water Service, Valve Boxes, and Manholes</u>. Water service lines may be installed after curb, gutter, and attached walks have been in place at least 7 days. Water valve boxes and manholes shall be adjusted to final grade after installation of curb and gutter.
- 4. <u>Electrical Services</u>. Electrical services shall be installed after water services but prior to installation of curb radii except where previous arrangements for use of conduit have been made and approved by the Local Entity's Light and Power department.

#### 22.4.2 Materials and Methods

#### A. Concrete

Concrete shall be composed of cement, coarse and fine aggregate, water, and entrained air. The concrete shall contain a minimum of 6 sacks of cement per cubic yard or an equivalent cement/fly ash combination not to exceed 20 percent cement replacement (when approved), a maximum of 6 gallons of water per sack of cement, an air content between 5 percent and 8 percent by volume, and a maximum coarse aggregate size of 1-1/2 inches. Any admixture (except air entraining agent) must be approved by the Local Entity Engineer.

- 1. <u>Concrete Str</u>ength. The finished concrete shall have a minimum 28-day compressive strength of 4000 psi.
- 2. <u>Water/Cement R</u>atio. The concrete shall have a maximum water/cement ratio of 0.45.
- 3. Fine Aggregate.
  - a. <u>Comp</u>osition. Fine aggregate shall be natural sand composed of clean, hard, durable, uncoated grains, preferably of siliceous materials.
  - b. <u>Deleterious Substances</u>. The maximum percentage of deleterious substances shall not exceed the following values:

Substance Maximum Percentage

Material finer	
than 200 mesh sieve	3% by weight
Shale	1% by weight
Coal and lignite	0.25% by weight
Clay lumps	1% by weight
Other deleterious substances	2% by weight
Sum of all above shall not exceed	5% by weight

All fine aggregate shall be free from injurious amounts of alkali and organic impurities.

c. <u>Gradation</u>. Fine aggregate shall be well graded and conform to **AASHTO M6** as shown in **CDOT Specifications Section 703, Table 703-1**.

- 4. Coarse Aggregate.
  - a. <u>Composition</u>. Coarse aggregate shall consist of crushed limestone, trap rock, granite, washed gravel, or other approved inert materials having clean, hard, strong, durable pieces, free from adherent coating, and conforming to the requirements or these specifications.
  - b. <u>Deleterious Substances</u>. The maximum percentage of deleterious substances shall not exceed the values listed in **Table 22-3**.
  - c. <u>G</u>radation. Course aggregate shall be well graded and conform to AASHTO M43 and as shown in **CDOT Specifications Section 703, Table 703-1**.
- 5. <u>Fly Ash, Water, Admixtu</u>res. Refer to Sections 22.5.5 A.3, 22.5.5 A.5, and 22.5.5 A.6.

#### **B. Job-Mixed Concrete**

Job-mixed concrete shall be mixed in a drum-type mixer which shall conform to the Standards of the Mixer Manufacturers Bureau of the Associated General Contractors of America.

- 1. <u>Mixing and D</u>ischarging. The mixer shall be capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified time and discharge the material without segregation. The entire contents of the drum shall be discharged before recharging. The volume of the mixed materials per batch shall not exceed the manufacturer's rated capacity of the mixer. Mixers must be kept clean of hardened concrete.
- 2. <u>Mixing Time and Rate of R</u>evolutions. The mixing of each batch shall continue for not less than one minute after all materials, except water, are in the drum. All mixing water shall be introduced before 1/4 of the mixing time has elapsed. The mixer shall rotate at the rate recommended by the manufacturer, but not less than 14 or more than 20 revolutions per minute. When additional water is added, another 30 revolutions of the drum will be required.
- 3. <u>Cement Type</u>. When concrete is mixed at the site, cement must be Type IA or IIA. The addition of any admixture at the job site is prohibited.

#### C. Ready-Mixed Concrete

Ready-mixed concrete shall be proportioned, mixed, and transported in accordance with the current ASTM Specifications for Ready-Mixed Concrete (Designation C-94). Delivery of central-mixed concrete shall not be made in non-agitating equipment.

#### 22.4.3 Construction

#### A. Concrete Finishing

1. General.

- a. Exposed faces of curbs and sidewalks shall be finished to true line and grade as shown on the plans. The surface shall be floated to a smooth, but not slippery finish.
- b. After completion of finish and before concrete has taken its initial set, all edges in contact with the forms shall be edged with an edger.
- c. Sprinkling of the surface with water, to facilitate finishing, shall not be permitted.
- 2. Finish Types.
  - a. <u>Broom Finish</u>. All concrete curb-gutter and sidewalk, unless otherwise specified.
  - b. <u>Float Finish</u>. All access ramps and transitions shall be hand-finished, with a wood or magnesium float.
  - c. Exposed Aggregate for median surface.
- 3. Markings.
  - a. <u>Appurtenances</u>. In Ft. Collins (city limits), concrete used in curb-gutter, sidewalk, curb cuts, driveways, inlets, bicycle paths, retaining walls, and slope paving shall have the name of the Concrete Contractor and the year of construction impressed therein, using letters not less than 1 inch high and 3/8 inch deep. Impressions shall be made in concrete at the beginning and end of each pour.
  - b. <u>U</u>tility. Impressions (similar to appurtenances) delineating the location of water and sewer, (S for sanitary sewer, C for clean out, + for water, with the top of the + pointing to the water stop box), shall be located on the curb face at all service crossings.
  - c. <u>Structures</u>. Structures shall have the year constructed impressed therein, using letters 3 inches high, 1-1/2 inches wide and 3/8 inches deep.

#### **B.** Repairs

- 1. <u>Defective Areas</u>. If, after stripping of forms, any concrete is found to be not formed as shown on the drawings, or is out of alignment or level, or shows a defective surface, it shall be considered as not conforming with these Standards. The defective area shall be removed and replaced by the Developer at his expense.
- 2. <u>Sidewalk Areas</u>. For Loveland (GMA and city limits), bolt holes, tie-rod holes, and minor imperfections, for sidewalks only, as approved by the Local Entity Engineer, shall be filled with dry-patching mortar.
  - a. Dry-patching Mortar shall be composed of one part Portland cement to two parts of regular concrete sand (volume measurement), and water. Use only enough water that the mortar will stick together upon being molded, after the

ingredients are mixed thoroughly. These mortar mix proportions are approximate.

b. <u>Placing Mortar</u>. Mortar repairs shall be placed in layers and thoroughly compacted by suitable tools. Care shall be taken in filling rod and bolt holes so that the entire depth of the hole is completely filled with compacted mortar.

# C. Concrete Curing

1. <u>General</u>. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures as well as rain, flowing water, and mechanical injury. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

- 2. <u>Materials</u>. Refer to the Materials Specification in CDOT 601.13 for concrete curing methods.
- 3. <u>Curing M</u>ethods. Cure concrete by one of the following methods:
  - a. <u>Liquid Membrane Curing Comp</u>ound. Apply pigmented curing compound to exposed interior slabs and on exterior slabs, walks, and curbs as soon as final finishing operations are complete. Apply uniformly in continuous operation, according to manufacturer's directions, and at a rate of 150 sq ft per gallon for all concrete. The compound shall be kept agitated to prevent the pigment from settling.
  - b. <u>Moisture Retaining Cover C</u>uring. This curing approach is optional in Loveland (GMA and city limits) only Cover concrete surfaces with moisture-retaining cover (polyethylene sheets) for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

# **D.** Cold Weather Requirements

Refer to **22.3.7** G.

# E. Joints

- 1. <u>Tooled Joints</u>. Transverse joints shall be located at intervals of 10 feet in curbs, gutters, and crosspans. When combination curb, gutter, and walk are used, the joint shall be continuous through all three elements with a maximum spacing of ten feet. The joints shall be initially cut a minimum of one-third the thickness of the concrete. For detached sidewalks, the tooled joint spacing shall equal the sidewalk width.
- 2. <u>Expansion Joints</u>. Expansion joint material shall be installed every 500' in long runs and between new structure slabs and existing concrete slabs, where called for and around fire hydrants, poles, inlets, sidewalk underdrains, midblock ramps,

radius points at intersections, and other fixed objects, i.e. joins with existing sidewalk slabs and curbs. Expansion joint material must be set vertical and installed in accordance with the CDOT specification titled M&S Standards for Concrete Pavement Joints. The joint shall be edged with a suitable edging tool and sealed in accordance with **CDOT Section 412.18**.

# F. Backfilling

The space adjoining the concrete shall be backfilled with suitable material, properly compacted, and brought flush with the surface of the concrete and adjoining ground surface no earlier than 7 days after concrete placement, unless otherwise approved by the Inspector.

In embankments, the backfill shall be level with the top of the concrete for at least 2 feet and then sloped to meet existing grade. Maximum slope shall be 4:1. For walks detached from the curb, the space between the curb and walk shall be backfilled on a straight line from the top of walk to the top of curb.

#### G. Opening to Traffic

It shall be the Developer's responsibility to protect new concrete and repairs from damage with appropriate methods. For areas to be exposed to traffic, the concrete shall be protected until 80% of required concrete strength is achieved.

#### H. Warranty

The Developer shall guarantee curb, gutter, walks, driveways, and crosspans after completion against defective workmanship, materials and vandalism. The determination of the necessity during such guarantee period for the Developer to repair said curb, gutters, walks, driveways or crosspans, or any portion thereof, shall rest entirely with the Local Entity Engineer whose decision upon the matter shall be final and binding upon the Contractor. Refer to **Chapter 24, Acceptance Procedures and Record Drawings/Warranty**, for additional information.

#### I. Initial and Final Acceptance

Upon substantial completion and upon written request of the Developer, the Local Entity Engineer shall, with the Developer, physically examine the work and/or phase of the work. The Local Entity Engineer shall issue written initial acceptance of the work with a "punch list" of deficiencies to be completed within 30 days and prior to final acceptance. If no deficiencies are found, the Local Entity Engineer shall issue a written final acceptance of the work. Refer to **Chapter 24, Acceptance Procedures and Record Drawings/Warranty**.

# 22.4.4 Tunneling or Boring Under Curb, Gutter, Walks, and Pavements

#### A. General

Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades on plans.

### **B.** Borings

Boring for utilities shall be permitted if approved by the Local Entity Engineer.

- 1. <u>Less Than 6 Inches.</u> For openings less than or equal to 6 inches in diameter, bore holes shall be filled with patching material (cold mix is not acceptable) to prevent entry of moisture. Patching material used shall be in all cases compatible with the existing surface. Subgrade shall be replaced with flowable fill to provide necessary support to the surface. The sealing of bore holes is the responsibility of the Contractor or persons making the bore.
- 2. <u>Greater Than 6 Inches</u>. For openings greater than 6 inches in diameter, the limits of repair shall be identified in the field.
- 3. <u>Finished Condition</u>. The completed job shall be flush with the surrounding pavement and have no indentations, pockets, or recesses that may trap and hold water.

# 22.5 PAVEMENT

# 22.5.1 Fill

Cavities that are a result of excavation and areas deficient in grade shall be brought to grade with fill material. All imported fill material shall be tested in accordance with **Chapter 23, Street Inspection and Testing Procedures**.

#### A. Engineered Fill

Subbase or base materials. See Sections 22.5.3 and 22.5.4.

# 22.5.2 Subgrade and Roadbed

# A. General

Subgrade material shall conform to the lines, grades, cross-sections, and thickness shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day's progress in advance of base construction.

# **B.** Subgrade Approval

- 1. <u>Notifi</u>cation. Notify the Local Entity Engineer when excavations have reached required subgrade.
- 2. <u>Inspection. See Chapter 23</u>, Street Inspection and Testing Procedures.
- 3. <u>R</u>econstruction. See Chapter 23, Street Inspection and Testing Procedures.

#### C. Subgrade Preparation

1. <u>Preparation Conditions</u>. Work shall not occur on the subgrade in freezing conditions, or when the subgrade is frozen.

- 2. <u>Compaction</u>. The subgrade shall be free of organic material and shall be deepplowed to a minimum depth of 12 inches, moisture-treated to within 2 percent (or as specified on the plans or geotechnical report) of optimum moisture content, thoroughly mixed, and replaced and compacted to 95% maximum standard proctor in 6-inch lifts.
- 3. <u>Testing</u>. See Chapter 23, Table 23-1 Material Testing.
- 4. <u>Final Proof-Rolling</u>. After the subgrade has been compacted, tested, and found to meet specifications, the entire subgrade shall be mechanically proof-rolled with a heavily loaded vehicle to ensure uniformity of the subgrade. The vehicle must have a loaded GVW of 50,000 pounds with a loaded single axle weight of at least 18,000 pounds and a tire pressure of 90 psi. Subgrade which is pumping or deforming under loading must be reworked, replaced or otherwise modified, to form a smooth, stable, non-yielding base for subsequent paving courses. The Local Entity Engineer shall be notified at least 24 hours before final proof-rolling. All proof rolls shall be observed and approved by an Inspector.
- 5. <u>Preparation of Cut Subsurfaces and Undisturbed Areas</u>. Subgrade surfaces below excavated areas such as cut areas and undisturbed areas require additional preparation. Unless otherwise approved by the Local Entity Engineer, said subgrade shall be scarified to a depth of 12-inches, wetted or aerated as needed, and compacted to 95% maximum standard proctor dry density (AASHTO T-99) at +/-2% of optimum moisture content for cohesive soils or +/-3% for non-cohesive soils.
  - a. <u>Expansive soils</u>, refer to **Chapter 10**.
- 6. <u>Acceptance</u>. See Chapter 23, Street Inspection and Testing Procedures.

# **D.** Subgrade Protection

During construction, subgrades and excavations shall be kept shaped and drained. Ditches and drains along the subgrade shall be maintained to drain effectively at all times. Where ruts occur in the subgrade, the subgrade shall be brought to grade, reshaped, and recompacted prior to placing of subbase material. The storage or stockpiling of materials on the subgrade will not be permitted. No base course shall be laid until the subgrade has been inspected and approved. Under no circumstances shall base or pavement material be placed on a muddy or unstable subgrade.

#### E. Soil Stabilization

- 1. <u>General</u>. For new construction, soil stabilization shall extend to back of curb for detached walk and to back of walk for attached walk.
- 2. <u>Lime Stabilization</u>. This section specifies requirements for design, materials, and construction of lime-stabilized subgrades. This section is applicable to stabilizing fine-grained soils (clays and silts) only. It is not applicable to stabilizing sands and gravels used as bases or subgrades.

- a. <u>General</u>. The purpose of lime stabilization is to improve the subgrade quality of a clay soil by increasing its strength and reducing its swell-shrink potential during wet-dry cycles.
- b. <u>Materials</u>. The material for lime treated subgrade consists of a mixture of native or imported soils, hydrated or quick lime and water, as outlined by ASTM Specification C977. Hydrated lime shall conform to the requirements of ASTM C 207-79, Type N. In addition, the residue retained on a 200 mesh sieve shall not exceed 10 percent when determined in accordance with ASTM C 110. Drying of the residue in an atmosphere free from carbon dioxide will not be required.

The materials to be used in construction shall be tested and a mix design submitted to the Local Entity Engineer for approval. See **Chapter 23, Street Inspection and Testing Procedures**, concerning mix design report.

- c. <u>Preparation and Application</u>. The surface of the roadbed shall be graded to the established lines, grades, and cross sections as shown on the plans. The prepared roadbed shall be scarified to the depth and width required for the subgrade stabilization. The material thus obtained shall be pulverized. Application, mixing, and finishing shall be in accordance with **CDOT Specification Sections 307.05 through 307.09**.
- d. <u>Design and Testing</u>. A site-specific lime-stabilization design is required prior to construction and based on a soil report with additional testing required. See **Chapter 5, Soils** Investigations **and Report**. The design shall be prepared by a Colorado Registered Professional Engineer competent in the field of geotechnical engineering and shall be included in the Pavement Design Report as required in **Chapter 10, Pavement Design and Technical Criteria**. Testing shall verify that projected "R" values were achieved.
- e. <u>Mix Design Approval</u>. To be approved, the mix shall have a minimum 7-day compressive strength of 160 psi. In addition, the plasticity index of the treated soil shall not exceed 6. The minimum acceptable hydrated lime content shall be 4 percent by weight.

Only mix designs approved by the Engineering Division shall be used. Approvals are required on a project basis prior to issuing construction permits. Minimum in-place thickness for this material shall be 8 inches.

- f. Pavement Design.
  - <u>Flexible Pavement Over Stabilized Subgrade</u>. The AASHTO Guide for the Design of Pavement Structures is the basis of the Local Entity's design procedure. For lime-stabilized subgrades with a minimum compressive strength of 160 psi, a strength coefficient of 0.14 shall be used in the layer-thickness equation. Refer to Chapter 10, Pavement Design and Technical Criteria, for the flexible pavement design procedure and show calculations in the pavement design report.

- 2) <u>Rigid Pavement Over Stabilized Subgrade</u>. The appropriate design nomographs for rigid pavement referenced in Chapter 10, Pavement Design and Technical Criteria shall be used to determine slab thickness. Evidence supporting a total modulus of subgrade reaction for the untreated subgrade and the lime-stabilized layer shall be provided.
- 3. <u>Fly Ash Stabilization</u>. This item shall consist of treating the subgrade or existing base, by pulverizing, adding Class C fly ash, and mixing and compacting the mixed material to the required density. This item applies to natural ground or embankment and shall be constructed as specified herein and in conformity with the typical sections, lines and grades as shown on the plans or as established by the Engineer.
  - a. Materials.
    - 1) <u>Fly Ash.</u> Fly Ash shall meet **ASTM C 618** for Class C Fly Ash.
    - 2) <u>Water.</u> The water used in the stabilization mixture shall be potable.
  - b. Equipment.
    - 1) The machinery, tools and equipment necessary for proper execution of the work shall be on the project and approved by the Local Entity Engineer prior to the beginning of construction operations.

All machinery, tools, and equipment used shall be maintained in a satisfactory and workmanlike manner.

- a) Fly ash shall be furnished in trucks. Each truck shall have the weight of fly ash recorded on certified scales.
- c. Construction Methods.
  - 1) <u>G</u>eneral. It is the purpose of this specification to secure a completed course of treated material which contains a uniform fly ash/soil mixture with no loose or segregated areas, has a uniform density and moisture content, is well bound for its full depth, and has a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Developer to regulate the sequence of work; to process a sufficient quantity of material to provide full depth as shown on the plans; to use the proper amounts of fly ash; to maintain the work and to rework the courses as necessary to meet the above requirements.
  - 2) <u>Preparation of Subgrade</u>. Before other construction operations have begun, the subgrade shall be graded and shaped to enable the fly ash treatment of materials in place, in conformance with the lines, grades, and thickness shown on the plans.
  - 3) <u>Application</u>. The fly ash shall be spread by a method approved by the Local Entity Engineer at the rates shown on the plans or as directed by the Local Entity Engineer. Fly ash shall not be applied when wind conditions,

in the opinion of the Local Entity Engineer, are such that blowing fly ash becomes objectionable to traffic or adjacent property owners.

During final mixing, the materials shall be sprinkled, as directed by the Local Entity Engineer, until the proper moisture content has been secured. However, initial mixing after the addition of fly ash will be accomplished dry, or with a minimum of water, to prevent fly ash balls.

Final moisture content of the mix, prior to compaction, shall not exceed the optimum moisture content of the mix by more than 2 percent, nor less than optimum by more than 2 percent. Should the natural moisture content of the soil be above the specified range, aeration of the soil may be required prior to addition of the fly ash.

4) <u>Mixing</u>. The soil and fly ash shall be thoroughly mixed by approved road mixers or other approved equipment. The mixing shall continue until, in the opinion of the Local Entity Engineer, a homogeneous, friable mixture of soil and fly ash is obtained, free from all clods or lumps.

Water required to achieve the specified moisture content for the mixture should be added after initial mixing. There shall be a 6 inch overlap between passes to assure a consistent mix.

5) <u>Compaction</u>. Compaction of the mixture shall begin immediately after mixing of the fly ash and shall be completed within two hours following addition of water to the fly ash. The material shall be sprinkled as necessary to maintain the optimum moisture.

Compaction of the mixture shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted to the specified density. All non-uniform (too wet, too dry, or insufficiently treated) areas that appear shall be corrected immediately by sprinkling and rolling. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until work is placed thereon of the work is accepted.

The stabilized section shall be compacted to the extent necessary to provide the density specified in **Table 22-1**.

	•
Description	Density
For fly ash treated subgrade, existing subbase or existing base that will receive subsequent subbase or base courses.	Not less than 95% maximum dry density (ASTM D 698)
For fly ash treated base that will receive surface course.	Not less than 97% maximum dry density (ASTM D 698)

Table 22-1Required Density for Stabilized Compaction

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests as necessary may be required by the Engineer.

If the material fails to meet the density requirements, the Engineer may require it to be reworked as necessary to meet those requirements or require the Developer to change construction methods to obtain required density on the next section. Throughout this entire operation the shape of the course shall be maintained by blading, and the surface, upon completion, shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades. Blading should be terminated within two hours after blending of the fly ash.

Should the material, due to any reason or cause, lose the required stability, density or finish before the next course is placed, or the work is accepted, it shall be reprocessed, re-compacted, and refinished at the sole expense of the Developer. Reprocessing shall follow the same pattern as the initial stabilization, including the addition of fly ash.

- 4. <u>Finishing, Curing, and Preparation for Surfacing</u>. After the final layer or course of the treated subgrade, subbase or base has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections.
  - a. The resulting base surface shall be thoroughly rolled with a pneumatic tire roller and "clipped," "skinned" or "tight bladed" by a power grader to a depth of approximately ¼ inch, removing all loosened stabilized material from the section. Re-compaction of the loose material should not be attempted.

The surface shall then be thoroughly compacted with the pneumatic roller, adding small increments of moisture as needed during rolling. If plus No. 4 aggregate is present on the surface of the mixture, one complete coverage of the section with the flat wheel roller shall be made immediately after the "clipping" operation.

When directed by the Local Entity Engineer, surface finishing methods may be varied from this procedure provided a dense, uniform surface, free of surface compaction planes, is produced. The moisture content of the surface material must be maintained within the specified range during all finishing, and shall proceed in such a manner as to produce, in not more than two hours, a smooth, closely knit surface, free of cracks, ridges or loose material conforming to the crown, grade and line shown on the plans.

1) After the fly ash treated course has been finished as specified herein, the surface shall be protected against rapid drying in a thorough and continuously moist condition by sprinkling for a period of not less than three days, or until the surface or subsequent courses are placed.

5. <u>Other Materials for Stabili</u>zation. Other methods of stabilization may be considered only with sufficient supporting data submitted by the Designer for the proposed method.

#### F. Subgrade Surface Tolerance

Variations from the subgrade shall not be more than 1 inch in soil. Where asphalt or Portland cement concretes are to be placed directly on the subgrade, the subgrade plane shall not vary more than 1/2 inch.

#### 22.5.3 Subbase

#### A. Materials

Subbase material shall be well mixed, free of organic matter, and lumps or balls of clay, and shall consist of sound aggregate particles and suitable filler or binding materials which, when placed and compacted, will result in a firm, dense, unyielding foundation. Subbase material need not be crushed, but may be of the pit run variety, providing it is graded according to **CDOT Table 703-2**, **Class 1 Aggregate Base Course**. The plasticity index shall not exceed 6 when the aggregate is tested in accordance with **AASHTO T89** and **T90** respectively. "R" value shall be a minimum of 50 and the test loss for the Los Angeles Abrasion test (**AASHTO M147**) shall be less than 50 percent.

Deviations from the CDOT gradation limits will be permitted when approved by the Local Entity Engineer for unpaved roads, where it can be adequately demonstrated that the proposed subgrade material can fulfill the intent of these specifications.

#### **B.** Application

Subbase shall be deposited and spread, without particle segregation, in loose layers not to exceed 6 inches in depth. Each layer shall be thoroughly and individually compacted to 95 percent standard proctor (**AASHTO T 99**) density. Wetting or aerating and rolling of the material shall be required when ordered by the Engineer. Subbase shall not be placed on soft, spongy, or frozen subgrade or other subgrade, the stability of which, in the opinion of the Local Entity Engineer, is unsuitable.

#### C. Surface Tolerance

The prepared surface of the subbase shall not vary from the established grade by more than one inch.

#### 22.5.4 Base Course

This section covers furnishing, placing, and watering gravel or stone to provide a firm and stable foundation for subsequent construction. The base course shall be constructed on a previously constructed subgrade in accordance with the lines, grades, quantity requirements, and the typical cross-sections shown on the plans.

# A. General

Base material shall conform to the lines, grades, cross-sections, and thicknesses shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day's progress in advance of placing prime coat or paving material.

# **B.** Aggregate Base Course Material

Base material shall consist of hard, durable particles or fragments of stone or gravel crushed to the required sizes. Material shall contain an appropriate quantity of sand or other finely-divided mineral matter which conforms to the requirements of **AASHTO M 147**, and to **Section 703.03**, **CDOT Standard Specifications Class 5 or Class 6 Aggregate Base Course**. In addition, the material must have an R-value of 72 or greater, and must be moisture stable. When produced from gravel, not less than 60 percent by weight of the aggregate retained on a No. 4 sieve shall consist of particles having at least one fractured face. Base material shall be free from vegetable matter and lumps or balls of clay and when placed and compacted will result in a firm, dense, unyielding foundation. The Local Entity Engineer may approve recycled asphalt or concrete pavement.

Coarse aggregate shall show a loss of not more than 50 percent when tested in accordance with **AASHTO Standard Method of Test for Abrasion of Coarse Aggregate** by use of the Los Angeles Machine, Designation: AASHTO T-96 (AASHTO M 147).

1. <u>Approval of Sources</u>. Only aggregate from the Local Entity approved sources shall be used. Refer to **Chapter 23, Street Inspection and Testing Procedures**. (Approval of sources will, at a minimum, consist of supplying documented gradation, Atterberg limits, and R-value testing on an annual basis).

# C. Cement Treated Aggregate Base Course Material

This material shall consist of a mixture of aggregate materials, Portland cement, and water as outlined in **Section 308 of the CDOT Standard Specifications**, latest version. Acceptable aggregates include **CDOT Classes 4**, **5**, and **6**. Other aggregates may be used, if previously approved by the Local Entity Engineer. The materials to be used in construction shall be tested and a mix design submitted to the Local Entity Engineer.

1. <u>Mix Design Approval</u>. To be approved, the mix shall have a 7-day compressive strength of at least 650 psi, and no more than 1000 psi. The minimum acceptable cement content shall be 5 percent by weight.

Only mix designs approved by the Local Entity Engineer shall be used. Approvals are required on a project basis, or an annual basis for suppliers, prior to issuing construction permits.

# **D.** Application

Base material shall be deposited and spread without particle segregation in loose layers not to exceed 6 inches in depth. Each layer shall be thoroughly and individually compacted to 95 percent standard Proctor (AASHTO T-99) density. Wetting or aerating and rolling of the material shall be required as ordered by the Local Entity Engineer, following review of all field test results. No base course shall be placed upon a soft, spongy, or frozen subgrade or other subgrade, the stability of which, in the opinion of the Local Entity Engineer, is unsuitable.

# E. Surface Tolerance

The prepared surface of the base shall not vary above or below the established grade by more than 1/2 inch.

# F. Soil Sterilization

Soil sterilization shall be applied under all new paving. The sterilization agent shall be a pre-emergent herbicide, soluble, dispersible, or mixable in water and nontoxic to humans when applied per the manufacturer's recommendations. The agent shall be active for one year after application. The applicator shall be certified by the U.S. Environmental Protection Agency and licensed in the State of Colorado as a pesticide applicator and shall be held responsible for any damage to plant growth outside of the roadway or to pavement where such damage is attributable to carelessness or improper application of the agent. Care shall also be taken to prevent contamination of surface waters.

# 22.5.5 Portland Cement Concrete Pavement

# A. Materials

This material shall consist of a mixture of coarse and fine aggregates, Portland cement, water, and other materials or admixtures as required. Colorado Department of Transportation Class "P" or "AX" mix may be used. The only alternatives to "P" or "AX" shall be according to **Section 412.03 of CDOT Standard Specifications**. Other high-early strength concretes may be used only where special conditions warrant, subject to written approval by the Local Entity Engineer.

- 1. <u>Portland Cement</u>. Portland cement shall comply with the Colorado Department of Transportation requirements. The type of cement shall be Type II, unless sulfate conditions necessitate otherwise. **Table 2.2.3** in **Chapter 2.2** of **ACI 201** indicates recommendations for sulfate resistance.
- 2. <u>Fine Aggregates</u>. Fine Aggregates shall meet Colorado Department of Transportation **Section 703.01** requirements and gradation as shown in CDOT Table 703-1 and **Table 22-2**.
- <u>Coarse Aggregates</u>. Coarse Aggregates shall meet Colorado Department of Transportation Section 703.02 requirements and gradation as shown in Table 22-3.

- 4. <u>Fly Ash. Fly ash shall comply with Colorado Department of Transportation</u> Section 701.02.
- 5. <u>Water</u>. Water shall meet the requirements of Colorado Department of Transportation Section 712.01.
- 6. <u>Air Entraining and Chemical Admixtures.</u> Shall meet the requirements of Colorado Department of Transportation Sections 711.02 and 711.03. No additive manufactured with the purposeful addition of chloride shall be permitted. Water-reducing admixtures are used when concrete temperatures are as follows: Type A is used with ambient temperature range of 50 to 90 degrees inclusive; Type D is used when ambient temperature is over 90 degrees.

	Percent Passing or Test
Sieve Size or Test Procedure	Requirement
Friable Particles, %	1.0, Maximum
Coal & Lignite, %	1.0, Maximum
Deleterious Material (AASHTO T-1 1), %	3, Maximum
Sand Equivalent (AASHTO T 176), %	80, Minimum
Fineness Modulus	2.50-3.50
Sodium Sulfate Soundness, %	20.0, Maximum

Table 22-2Fine Aggregates for Portland Cement Concrete

Table 22-3
<b>Coarse Aggregates for Portland Cement Concrete</b>

Sieve Size or Test Procedure	Percent Passing or Test Requirement
2"	100
1-1/2"	95–100
3/4"	35–70
3/8"	10–30
#4	0–5
#200	1.0, Max. (1.5% if crusher
	fines)
% Wear	45, Maximum
Clay Lumps and Friable Particles, %	2.0, Maximum
Coal and Lignite, %	0.5, Maximum
Sodium Sulfate Soundness, %	12, Maximum

#### **B.** Concrete Forms

Refer to Section 22.3.7 A.4.I. Removal of forms shall occur at no less than 12 hours.

#### C. Construction

1. <u>Placing</u>. Concrete pavement may be placed using slipform methods or fixed forms. The concrete shall be deposited on moist subgrade in such a manner as to

require as little rehandling as possible. Reasonable care shall be taken to prevent any segregation of the concrete materials. Workers shall not be allowed to walk in freshly mixed concrete with boots or shoes coated with earth or foreign substances.

- 2. <u>V</u>ibrating. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. Vibrators shall not be used to move the concrete into place.
- 3. <u>Consolidation and Floating</u>. The concrete shall be struck off and consolidated with a mechanical finishing machine, vibrating screed, or hand finishing methods. A slipform paver may also be used. After the concrete has been struck off and consolidated and joints formed (if necessary), it shall be leveled with a bull float having a handle to permit operation from the edge of the pavement. Any excess water and latencies shall be removed from the surface of the pavement. The straightedge shall be operated at 90 degrees to the transverse joints and shall be overlapped 1/2 of its length after each pass. Irregularities shall be corrected by adding or removing concrete. All disturbed places shall again be straight-edged. The use of hand tools shall be kept to a minimum. They may be used in areas not accessible to finishing equipment and for compacting concrete in the vicinity of formed joints.
- 4. Joints. Transverse and longitudinal joints shall be constructed to the dimensions and at the spacing shown on the plans. Transverse joints shall extend the entire width of the pavement and through the curbs. Joints may be formed in the plastic concrete or sawed after the concrete has hardened. Tooled joints may be constructed by depressing an approved tool into the plastic concrete cut a minimum of 1/3 the thickness of the slab.

Sawing of joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and before uncontrolled cracking occurs. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. At Contractor's option, tooled joints may be installed during initial placement to control cracking.

- a. <u>Construction Joints</u>. All longitudinal joints may be construction joints at the Contractor's option. Transverse construction joints shall be installed whenever the placing of concrete is suspended an excessive length of time as determined by the Local Entity Engineer.
- b. Joint Filling. Joints shall be filled in accordance with CDOT 412.18 before the pavement is opened to traffic. Prior to filling, all foreign material shall be removed from the joints and the joints shall be thoroughly dry. Where preformed compression-type sealers are used, they shall be lubricated to allow the sealer to be inserted the full depth of the joint. Liquid elastic type fillers shall be poured to within 1/4 inch of the top of the joint. Care should be taken to keep from over-filling the joint.

- 5. <u>C</u>uring. Refer to the Materials Specification in CDOT 601.13 for concrete curing methods.
- 6. <u>Opening to Traffic</u>. The Local Entity Engineer shall decide when the pavement shall be opened to traffic. It shall not be opened to traffic until the field-cured concrete has attained a flexural strength of 450 psi, and a compressive strength of 3,000 psi or .80 F<sub>c</sub>', whichever is greater. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete is placed. Before opening to traffic, the pavement shall be cleaned.

# **D.** Warranty

Refer to Section 22.4.3 H and substitute the word "street" for the words "curb, gutters, walks, driveways and crosspans."

#### **E.** Initial and Final Acceptance

Refer to Section 22.4.3 I.

# 22.5.6 Asphalt Pavement

This section specifies materials and methods to be used for constructing superior performing pavements for streets, or other miscellaneous areas within the Right-of-Way. This work shall consist of constructing one or more courses of plant mix hot asphalt pavement, overlay, or leveling course on a prepared foundation and to the finished dimensions shown on the plans, or as directed by the Local Entity Engineer. (**Reference CDOT 403**)

#### A. Materials

1. <u>Aggregates</u>. All Aggregates shall conform to the current Colorado Department of Transportation "Standard Specifications for Road and Bridge Construction".

# Table 22-4 Design Mix Criteria

	Test	Value for All Gradings (gyrations)		
Property	Method	(75)	(100)	Reference
Air Voids, percent at: N (design)	CPL 5115	3.5 – 4.5	3.5 – 4.5	
Lab Compaction (gyrations): N (design)	CPL 5115	75	100	
Hveem Stability, minimum	CPL 5106	28	30	
Aggregate Retained on the 4.75mm (No. 4) sieve with at least 2 mechanically induced fractured faces, % minimum	CP 45	90	90	
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109; Method B	80	80	
Minimum Dry Split Tensile Strength, psi	CPL 5109; Method B	30	30	
Grade of Asphalt Binder, Top Layer		See Ta	ble 22-7	
Grade of Asphalt Binder, below Top Layer		See Table 22-7		
Voids in Mineral Aggregate (VMA), % minimum	CP 48	See Table 22-6		
Voids Filled with Asphalt (VFA), %	AI SP-2	65 - 80	65 - 75	
Aggregate Design Grading	CDOT	S or SX	S or SX	
Laboratory Design Temperatures		See Tal	ole 22-5	

Note:

1. AI SP-2 = Asphalt Institute Superpave Series No. 2

2. The current version of CP (Colorado Department of Transportation) standards is available from the Region 4 Materials Engineer.

3. Warm mix asphalt is allowed as an alternate to Hot Mix Asphalt, provided all material requirements and specifications are met and approved by the Local Entity Engineer. The supplier and method of warm mix asphalt must be on CDOT approve list.

4. Gyration design revolution (Ndes) will be 75 unless otherwise specified by the Local Entity Engineer based upon project specific criteria and/or traffic levels.

Laboratory with Design Temperatures			
Superpave Binder Grade	Laboratory Mixing Temperature, °C (°F)	Laboratory Compaction Temperature, °C (°F)	
PG 58 - 28	154 (310)	138 (280)	
PG 64 - 22	163 (325)	149 (300)	
PG 64 - 28	163 (325)	149 (300)	
Warm Mix Asphalt is exempt from this table			
*All temperatures in	n this table have a tolerance of +	2.8°C (+ 5°F)	

Table 22-5 Laboratory Mix Design Temperatures

		Table 22-6		
Minimum	Voids in	the Mineral	Aggregate (V	MA)

Nominal Maximum	Design Air Voids <sup>2</sup>		
Size', mm (inches)	3.5%	4.0%	4.5%
37.5 (1-1/2)	11.5	12.0	12.5
25.0 (1)	12.5	13.0	13.5
19.0 (3/4)	13.5	14.0	14.5
12.5 (12.5)	14.5	15.0	15.5
9.5 (3/8)	15.5	16.0	16.5
Notes: 1. The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%			

2. Interpolate specified VMA values for design air voids between those listed.

3. Air Void Criteria: A design air void range of 3.5 to 4.5% with a target of 4.0% will be used on all mixes. The air void criteria will be applied to the approval of the design mix.

<u>Selection of Gyratory Design Revolutions</u>. Gyratory Design Revolutions shall be as follows: for arterial roadways 100 gyrations; for collector and local roadways 75 gyrations.

- 2. Selection of Performance Graded Binders (Asphalt Cement) for Mix Design
  - a. Asphalt Binders Permitted

The Asphalt binder properties address pavement performance for the climate and traffic found in the specific area of the project. The high and low temperature properties required are then specified according to a percent reliability against rutting (high temperature properties) and thermal cracking (low temperature properties) found for a given pavement. The high and low temperatures used to select asphalt cement grades are pavement temperatures at 20 mm below the pavement surface and at the pavement surface respectively.

The physical properties that the asphalt cement are required to meet stay the same. What changes is the temperature at which these asphalt cement properties must be met. Because of the many climate conditions, specifying asphalt cements based on climate conditions results in a very large number of asphalt cements nationwide. However, only a limited number of PG grades are needed for Colorado. Therefore, only three PG Graded Binders will generally be permitted in these specifications. PG 58-28, PG 64-22, PG 64-28

Asphalt Binders shall conform to the requirements listed in the current Colorado Department of Transportation **Standard Specifications for Road and Bridge Construction**.

b. Binder Grades

In an effort to simplify the binder selection process, the following binder grades have been specified for the various types of construction and road classifications. Refer to **Table 227.** 

Top Lift		Lower Lift	
Local/Residential	PG 58-28	Local/Residential	PG 58-28
Minor Collector	PG 58-28	Minor Collector	PG 58-28
Major Collector	PG 64-28	Major Collector	PG 64-22
Industrial/Commercial	PG 64-28	Industrial/Commercial	PG 64-22
Arterial	PG 64-28	Arterial	PG 64-22

Table 22-7Binder Grade Requirement

- 3. <u>Anti-Stripping Additive</u>. An anti-stripping additive shall be required and the following shall apply:
  - a. <u>Hydrated Lime</u>. If additive is not added at refinery, a minimum of one percent hydrated lime by mass (weight) of the combined aggregate shall be added to the aggregate for all hot asphalt pavement. Hydrated lime shall meet the requirements of ASTM C207, Type N. The "F" factor used in calculating P values for lime gradation shall be 0.3.
  - b. Liquid Additive
    - 1) The Developer shall use an approved anti-stripping additive. The amount of additive used shall be a minimum of 0.5 percent by mass (weight) of the asphalt cement.
    - 2) <u>In-Line Blen</u>der. The additive shall be added at the refinery or at the hot plant. If liquid anti-stripping additive is added at the plant, an approved in-line blender must be used. The blender shall be in the line from the storage tank to the drier drum or pugmill. The blender shall apply sufficient mixing action to thoroughly bmix the asphalt cement and anti-stripping additive.

4. <u>Filler</u>. Filler shall meet the requirements of **AASHTO M17**.

#### B. Job Mix

- 1. <u>Testing Laboratory</u>. See Chapter 23, Job Mix for Asphaltic Concrete Pavement.
- 2. <u>Composition of Mixtures</u>. The Asphalt plant mix shall be composed of a mixture of aggregate, filler or additives if required and approved, asphalt material, and reclaimed material if permitted and used.
- 3. <u>Mix Design</u>. The Contractor shall submit the following to the Engineer for each proposed mix design:
  - a. A proposed mix design job-mix gradation for each mixture certified by an AASHTO accredited laboratory complying with CDOT Field Materials Manual Colorado Procedure 10 shall be wholly within the Master Range Table, **Table 22-8**. The mass of lime shall be included in the total mass of the material passing the No. 200 sieve. The restricted zone boundaries given in the Asphalt Institute's Superpave Series No. 2 (SP-2) Manual, Appendix B, are to be used as guidelines in mix design development. However, the job-mix gradation is not required to pass above or below the restricted zone boundaries.
  - b. The aggregate source, percentage of each element used in producing the final mix, the gradation of each element, and the proposed job-mix formula (JMF) gradation. The gradation used shall be based on the Contractor's JMF.
  - c. The name of the asphalt cement supplier.
- 4. <u>Sampling for JMF T</u>esting. The contractor's proposed job-mix formula for each hot asphalt pavement grading will be tested utilizing materials actual produced and stockpiled.
- 5. <u>JMF Target Values</u>. The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt material to be added to the aggregate, and a single temperature for the mixture at the discharge point of the plant.
- 6. <u>Aggregate Source Changes</u>. Should a change in the sources of material be made, a new job-mix formula shall be established and approved in accordance with section 3 before the new material is used.
- 7. <u>Recycle Asphalt Pavement</u>. The hot asphalt pavement shall not contain more than 20 percent reclaimed asphalt pavement where allowed. The reclaimed asphalt pavement shall meet the requirements of **CDOT subsection 703.04**.
- 8. <u>Aggregate Quality</u>. Test for cleanliness, abrasion loss, and percent of fractured faces will be made on representative samples of aggregate taken during production or from the stockpiles.

- 9. <u>JMF Compl</u>iance. When laboratory tests indicate that a proposed job-mix formula complies with the specifications the JMF may be submitted for mix design approval in accordance with section 3.
- 10. <u>Mix Design Approval</u>. Mix designs will be approved on a Laboratory/Production approval system. Initial approval will be given based on laboratory design. Production approval will then be given based on testing conducted on plant mixed samples to verify the approved laboratory design.

New mix design shall be submitted for approval for a two year period with a one point verification submitted and approved on an annual basis. Should a change in sources of materials be made a new mix design will be required & shall remain in effect for the remainder of the approval period.

- a. <u>Laboratory Mix Design Approval</u>. The Developer may receive preliminary mix design approval of a new asphalt mix design, based on the following procedure:
  - 1) The mix designs will be performed by an AASHTO accredited laboratory complying with CDOT Field Materials Manual Colorado Procedure 10 and approved by the Local Entity.
  - 2) <u>C</u>onditions. The following conditions shall apply to this preliminary approval:
    - a) Written Request and Submittals. The Developer shall make a written request for preliminary mix design approval, and submit three copies of the independent lab mix design containing all the information required in Laboratory Mix Design checklist in Appendix E-7.
    - b) Test Results. The results of all required tests shall meet the mix design specification requirements listed in Table 23.5.
    - c) Asphalt Content. The Local Entity Engineer, only, shall approve the asphalt content based on the private lab mix design.
- b. <u>Production Mix Design Approval</u>. The Developer may receive and maintain production mix design approval of an HMA mix design, based on the following procedure:
  - 1) Following laboratory mix design approval verification of mix properties will be performed by an independent laboratory on plant-produced mix and approved by the Local Entity. This verification is to be performed on or before the first day of production within the GMA.
  - 2) To maintain production mix design approval verification of mix properties shall be performed by an independent laboratory on plant-produced mix and approved by the Local Entity every 10,000 ton of mix produced.
  - 3) <u>C</u>onditions. The following conditions shall apply to production mix design approval:

- a) Written <u>Request and Submi</u>ttals. The Developer shall make a written request for production mix design approval, and submit the results of the mix verification report performed by a independent lab.
- b) <u>Test Results</u>. The results of all required tests shall meet the mix design specification within the tolerances listed in Error! Reference source not found.8.

Element	Tolerance		
Asphalt cement content	+/-0.30%		
Voids in Mineral Aggregate (VMA)	+/-1.2%		
Air Voids (Va)	+/-1.2%		
Lottman	Min. 80		
Hot Mix Asphalt Gradation			
Passing the 3/8" and larger sieves	+/-6%		
Passing the No. 4 and No. 8 sieves	+/-5%		
Passing the No. 30 sieve	+/-4%		
Passing the No. 200 sieve	+/-2%		

Table 22-8 Tolerances for Hot Mix Asphalt

- c) Local entity shall have 5 days to review production mix design verification test results and approve or reject the mix design.
- d) <u>Stop Work</u>. If the results of mix design verifications are not within the tolerances as determined by the local entity the contractor shall immediately stop paving within the GMA and submit a mitigation plan to the local agency for approval. If given approval paving may resume and a new mix design verification test will be performed on the first day of production. If after implementation of the mitigation plan the contractor in not capable of meeting the original mix design specifications he shall complete and submit a new mix design to the local entity for laboratory mix design approval.

# 22.5.7 Construction Requirements

- 1. Weather.
  - a. <u>Placement Tempe</u>ratures. Plant mix pavement shall be placed only on properly prepared unfrozen surfaces which are free of water, snow, and ice. The plant mix pavement shall be placed only when both the air and surface temperatures equal or exceed the temperatures specified in Error! Reference source not found.9 and the Local Entity Engineer determines that the weather conditions permit the pavement to be properly placed and compacted.

Placement Temperature Limitations in °F			
Compacted Layer	, Minimum Surface and Ai Temperature ° F		
(Inches)	Top Layer	Layers Below Top Layer	
2" – 3"	50	40	
3 or more	45	35	

**Table 22-9** 

Note: Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed. If the temperature falls below the minimum air or surface temperatures, paving shall stop.

- b. Temporary Pavement Layer. The Work shall be scheduled so that no planed or recycled surface is left without resurfacing for more than 10 calendar days from October 1 to March 1. The Developer shall immediately place a temporary hot asphalt pavement layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the above temperature requirements within 10 calendar days after being planed or recycled.
  - 1) Thickness. The minimum thickness of the temporary hot asphalt pavement layer shall be 2 inches. The Developer shall perform the quality control required to assure adequate quality of the hot asphalt pavement used in the temporary layer.
  - 2) Markings. All applicable pavement markings shall be applied to the temporary layer surface.
  - 3) <u>Maintenance</u>. The Developer shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Local Entity Engineer.
  - 4) Removal. The temporary hot asphalt pavement layer shall be removed when work resumes.

#### 22.6 MISCELLANEOUS

#### **Rebuilt Miscellaneous Structures** 22.6.1

#### A. General

This section addresses removing, relaying, resetting, or adjusting structures, fences, guard rail, signs, pipe, end sections, traffic signals, and related materials. All designated items shall be carefully removed and every precaution taken to avoid damage. Coordinate relocation of permanent traffic devices with the Local Entity Engineer. The Developer will be required to replace or repair any material damaged

due to their operations at their own expense. The work shall include the back-filling of any resulting trenches, holes, or pits.

### **B.** Construction

- 1. Pipe to be re-laid and structures to be re-set shall be thoroughly cleaned. Removal sites shall be neatly backfilled with suitable material and compacted in accordance with these Standards.
- 2. All material that is unserviceable shall be handled according to CDOT Specifications Section 210.02.
- 3. Fences and gates should be rebuilt or reset according to **CDOT Specifications Section 210.04.**
- 4. Mailboxes complete with supporting structures are to be removed and reset according to **CDOT Specification Section 210.06**. Reset height shall be 42 to 48 inches. The box face shall be no closer than 2 feet from the curb face or edge of sidewalk, whichever is applicable.
- 5. Re-setting of all traffic control signs and traffic signaling devices will conform to **Section 22.6.2** and be coordinated with the Local Entity Engineer.
- 6. Structures shall be adjusted according to **CDOT Specifications Section 210.10**.
- 7. At no time shall manholes and valve boxes be covered up or buried. Valve boxes and manholes are to be maintained fully accessible at all times for emergency and maintenance operation by the Local Entity personnel.

# 22.6.2 Traffic Signals, Signing, and Striping

#### A. General

This section addresses the material specifications for traffic control devices as well as requirements for their installation.

The specification and installation of all traffic control devices shall conform to the Manual on Uniform Traffic Control Devices and the Colorado Standard Specifications for Road and Bridge Construction, latest edition.

Permanent signing, striping, and traffic signals, shall be in place before new roadways are completely opened to the public.

- 1. <u>Traffic Control Devices on Public Property</u>. The Developer shall submit a striping and signage plan approved by the Local Entity Engineer. The Developer shall install all traffic control devices, except signals. Devices shall be placed to conform to the drawing details.
- 2. Traffic Control Devices on Private Property.

- a. <u>R</u>esponsibility. All traffic control devices on private property; i.e., pavement markings, regulatory signs, fire lane signs, and handicapped parking signs shall be installed and maintained by the property owner.
- b. <u>Placement</u>. A signage and striping plan specifying the various types and combinations of traffic control devices shall be submitted to the Local Entity Engineer for approval. Refer to **Chapter 3**, Information **Requirements for Construction Plans**, for requirements.

# **B.** Traffic Signal

- 1. <u>Signals</u>. All permanently fixed traffic signals will typically be installed by the Local Entity.
- 2. <u>L</u>oop. For traffic loop installation, contact the Local Entity Engineer.

# C. Traffic Signal Controller

All traffic signal controllers will typically be installed by the Local Entity.

# **D.** Traffic Signing

- 1. Street Name Signs.
  - a. <u>Materials</u>. Street name signs shall be fabricated from Scotchlite reflective sheeting, Engineer grade, on 0.80 gauge aluminum or approved equal.
  - b. Installation.
    - 1) <u>L</u>ocation. Street name signs shall be placed on diagonally opposite corners at each intersection at the point of curvature of the corner radius. Thus, they will be on the far right-hand side of the intersection for traffic on the major street. Tee intersections will also require two sign locations. Signs naming both streets shall be erected at each location. This requirement includes local and collector streets in residentially zoned areas.
    - 2) <u>Placement/Setback</u>. The street name assembly is usually combined on top of stop signs. Sign placement for the stop sign or other regulatory sign shall govern in these cases. In other instances, the street name assembly should be placed according to the following, as measured from the edge of the sign:
      - a) Curb, Gutter and Sidewalk Combination. Two feet behind sidewalk.
        - (1) <u>Curb with no Sidewalk or Detached S</u>idewalk. Two to three feet behind curb on local streets. On Collector streets, 4 to 5 feet behind curb, and on Arterial streets, 6 to 8 feet behind curb.
        - (2) <u>No Curb or G</u>utter. Six to twelve feet from edge of pavement.
    - 3) <u>Mounting</u>. Street name signs shall be mounted with two standard rivets (TL3806 EG, Drive Rivet) with nylon washers placed against the face. Typical installation includes four street name signs, two for each direction.

- 4) <u>Post and Mounting Installation</u>. Refer to **Sections 22.6.2 D.6.a** and **6.b**.
- 2. <u>Traffic Control Signs</u>. Traffic control signs are categorized as regulatory, warning, and guide signs.
  - a. <u>Materials.</u> All regulatory signs shall be fabricated using reflective Diamond grade sheeting, on aluminum blanks.
  - b. <u>Installation</u>. These signs shall be placed generally as per the MUTCD and the Colorado Supplement.
  - c. <u>Mounting</u>. Traffic control signs shall be mounted on existing sign posts, street lights, and utility poles where possible. Refer to **Section 22.6.2 D.6**.
- 3. Crosswalk Signs.
  - a. <u>Materials</u>, Installation, and Mounting. Materials for and installation and mounting of signs for crosswalks shall be in accordance with the above **Section 22.6.2 D.2**. All pedestrian crossing and W16-7P signs shall use fluorescent yellow/green (diamond grade) sheeting.
  - b. <u>Placement.</u> A crosswalk sign with the W16-7P "Arrow" placard shall be erected at the crosswalk and at a minimum distance before the crosswalk without placard per M.U.T.C.D. requirements.
- 4. Roundabout Signs.
  - a. <u>Materials, Installation and Mounting</u>. Materials for and installation and mounting of signs for Roundabouts shall be in accordance with the above **Section 22.6.2 D.2**.
  - b. <u>Placement.</u> The in advance warning and regulatory signs (refer to Chapter 14, Traffic Control Devices) and "Yield" sign shall be placed in accordance with MUTCD. The "Arrow" signs shall be placed two feet outside the edge of the circulating roadway per MUTCD between each entrance and exit of the roundabout. Refer to **Figure 8-14** for general locations.
- 5. <u>Bikeway Signs.</u> "No Parking" signs (R7-9a) as shown in **Construction Drawing 1402** shall be installed, generally, at intervals of 250 feet, at an angle of 45 degrees to the roadway.
- 6. Posts and Mountings.
  - a. <u>Materials</u>. The sign post system shall be comprised of three sections, an anchor, post, and sign. The anchor specification shall be Telspar 22F12A-03PG-2-1/4 inch square x 3 feet, 12 gauge, Anchor Stub with holes. The post specification shall be Telspar 20F12P-10PG 2 inch square x 10 feet, 12 gauge, post with holes. Refer to **Section 22.6.2 D.2** for sign materials.
  - b. <u>Installation</u>. The anchor is driven into the ground 30 to 33 inches with 6 to 3 inches above the adjacent ground level. The square post section with holes is inserted into the anchor six to eight inches and bolted with two 2-1/2 inch

long, 3/8 inch hex head bolts. These bolts are installed at the top two holes at 90 degrees to one another.

- c. <u>Mounting</u>. The top of the sign shall be mounted with one TL3806 EG Drive Rivet with a nylon washer on the sign face. The bottom of the sign shall be mounted using one 5/16" hex bolt, one metal washer, and one nylon washer against the sign face. A 5/16" hex nut is used to secure the bolt on the backside of the post.
- 7. <u>Sign H</u>eight. Signs shall be mounted at a height of 7 feet, measured from the bottom of the sign to the top of curb. The height to the bottom of a secondary sign mounted below another sign shall be 6 feet from the top of the curb. Where a traffic control sign is mounted on the same post with a street name sign, it shall be placed below the street name sign, with the bottom of the traffic control sign 7 feet from the top of curb.

# E. Traffic Striping and Marking

1. <u>General.</u> Existing and temporary pavement striping and marking shall be removed prior to new installations according **CDOT Specifications Section 202.05**.

Surfaces shall be thoroughly cleaned and prepared prior to application of striping and marking.

On chip seals, changes to existing markings shall require removal of existing markings prior to new installations. Removal shall be according to **CDOT Specifications Section 202.05** which could include water blasting, sandblasting, or grinding.

A Right-of-Way Work Permit is required prior to striping removals and installations. Refer to **Chapter 6, Permits,** for permits.

- 2. Striping.
  - a. Striping Materials.
    - <u>Asphalt Pavement</u>. All new striping on asphalt streets shall meet the minimum standards for latex applications. A minimum of 15 mils thick (when dry) of latex paint (Flint Trading Co.) specified in CDOT Specifications Section 708.05 will be used. The paint will be used with standard moisture resistant beads specified in CDOT Specifications Section 713.08 and designed for waterborne paint. The beads shall be applied at a minimum rate of 6.5 pounds per gallon of paint applied.
    - <u>Concrete Pavement</u>. Striping on concrete streets shall meet the minimum standards for latex waterborne paint per CDOT Specifications Section 708.05.
  - b. <u>Pre-Striping Materials</u>. Layout (spot taping) of striping shall be done using standard, reflective 3M Temporary (foil backed) roadway marking tape specified according to **CDOT Specifications Sections 713.14 and 713.15** or tabs (for chip seals or slurry seals only). Tape shall be 4 x 4 inches. Tabs and tape shall be the same color as the future striping and symbols.

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- c. <u>Pre-striping</u>. Prior to permanent installation of traffic striping, the contractor shall place temporary tabs or tape depicting alignment and placement of the same. Prior to the use of tape or tabs, a layout shall be done neatly using string or chalk line, inspected, and adjusted as necessary and must be in the center of the line.
- d. <u>Layout and Tab Installation</u>. Installation of temporary marking tape shall be according to **CDOT Specifications Section 627.08**. There shall be a tab or tape for each line. Therefore, in the case of a double line, there will be two tabs, one for each line. To improve night visibility, protective tab covers shall be removed immediately after chip, slurry, or sand sealing.

A typical 25-foot spacing of tabs or temporary tape for each spot will be used. Breaks in each line shall be marked with a "T" (using tape) to define the end and beginning of lines.

- e. <u>Striping Application</u>. Application rates and specifications for striping shall be according to **CDOT Specifications Section 627.04**. Striping on new asphalt and/or concrete pavement must receive two (2) full applications (two coats) of paint with beads. Refer to **Construction Drawings 1403 and 1404**.
  - 1) <u>C</u>enterline. All centerline striping shall be double yellow, each 4 inch wide, with a 4-inch minimum gap between the two.
  - 2) <u>Parking Stalls and Angle Parking</u>. All striping for parking conditions shall be white and 4 inches wide. All edge lines of parking areas shall also be white and a minimum of 4 inches wide.
  - 3) <u>Turn B</u>ays. If a turn bay occurs on a curve, it shall be marked with an 8inch wide dotted extension line, in accordance with **MUTCD** requirements.
- 3. Marking.
  - a. <u>Materials</u>. All pavement markings such as arrows, onlys, crosswalks, stopbars, and bike symbols shall meet minimum standards for preformed thermoplastic. Refer to **Chapter 14, Traffic Control Devices,** for specifications. A minimum thickness of 125 mil (Flint Trading Co.) or approved equal, shall be required. Markings on all concrete (and where required by manufacturer on asphalt) shall use correct 2 part primer. Other requirements from **CDOT Specifications Section 708.07** still apply.
  - b. <u>Application</u>. Application specifications shall be according to **CDOT Specifications Sections 627.06 and 627.07**.
  - c. <u>Stopbars</u>. Stopbars are to be installed in accordance with the Local Entity Engineer. Refer to **Construction Drawing 1403**.
  - d. <u>C</u>rosswalks. Crosswalks will be marked using the continental/Denver style starting from the flowline (or extended flowline) then back from the intersection the standard 9 feet in Loveland (GMA and city limits),, or 12 feet in Fort Collins (GMA and city limits). Where a concrete pan is present the concrete surface cure shall be removed, the

specific manufacturer's 2 part primer must be applied as per manufacturer's specifications. Refer to **Construction Drawings 1403, 1404** and **1405**.

- e. Roundabouts.
  - 1) <u>Yield Marking</u>. The yield line shall be placed where the entry roadway meets the outer edge of the circulatory roadway (where the entering vehicles wait). Refer to **Figures 8-13** and **8-14**.
  - 2) <u>C</u>rosswalk. The crosswalk shall be placed approximately one car length in advance of each entry point. Refer to **Figure 8-13**.
- f. <u>Bike</u> Lanes. All on-street bike lanes shall be designated with bicycle arrow signs. See **Construction Drawings 1406 and 1408L**. The arrow designates the direction of recommended travel. The bike lane symbols shall be placed approximately 10 feet downstream from all intersections. Refer to **Construction Drawings 1403, 1404** and **1410**.

# 22.6.3 Bus Shelters

Shelters shall be placed on a 6-inch-thick concrete pad. The size and location of the pad as well as shelter criteria are discussed in **Chapter 16**, **Pedestrian Facilities**. The material and construction specifications are the same as those for concrete sidewalks. Refer to **Section 22.4**, concerning non-structural concrete.

# 22.6.4 Streetscape Standards - Fort Collins (City Limits Only)

See Appendix "C" – City of Fort Collins Streetscape Standards.

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23.6	Paver 23.6.1 23.6.2 23.6.3	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course.   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Roadway Inspection for Renairs or Replacement Work	<b>23-18</b> <b>23-18</b> 23-18 23-18 <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b>
23.6	Paver 23.6.1 23.6.2 23.6.3	Subgrade and Roadbed	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-21</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course.   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Roadway Inspection for Repairs or Replacement Work   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course.   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Roadway Inspection for Repairs or Replacement Work   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications	<b>23-18</b> <b>23-18</b> 23-18 23-18 23-18 <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4	<b>Subgrade and Roadbed</b> .   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization <b>Base Course</b> .   A. Aggregate Base Course Material. <b>Portland Cement Concrete Pavement</b> A. Concrete Mix Design.   B. Concrete Roadway Inspections.   C. Concrete Roadway Inspection for Repairs or Replacement Work. <b>Hot Mix Asphalt (HMA)- Superpave Method</b> A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification	<b>23-18</b> <b>23-18</b> 23-18 23-18 23-18 <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-21</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4	<b>Subgrade and Roadbed</b> .   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization <b>Base Course</b> .   A. Aggregate Base Course Material. <b>Portland Cement Concrete Pavement</b> A. Concrete Mix Design.   B. Concrete Testing and Inspections.   C. Concrete Roadway Inspection for Repairs or Replacement Work. <b>Hot Mix Asphalt (HMA)- Superpave Method</b> A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification.   D. Bituminous Pavement Inspection for Repairs or Replacement Work.	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-22</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4	Subgrade and Roadbed	<b>23-18 23-18 23-18 23-18 23-18 23-19 23-19 23-19 23-19 23-19 23-19 23-19 23-19 23-21 23-21 23-21 23-22 23-22 23-22 23-22 23-22 23-24</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Misce	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course.   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Testing and Inspections.   C. Concrete Roadway Inspection for Repairs or Replacement Work.   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification.   D. Bituminous Pavement Inspection for Repairs or Replacement Work	<b>23-18</b> <b>23-18</b> 23-18 23-18 23-18 <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-22</b> <b>23-24</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Misce 23.7.1	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Testing and Inspections.   C. Concrete Roadway Inspection for Repairs or Replacement Work   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification.   D. Bituminous Pavement Inspection for Repairs or Replacement Work	<b>23-18</b> <b>23-18</b> 23-18 23-18 <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-22</b> <b>23-24</b> <b>23-24</b> <b>23-24</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Misce 23.7.1	Subgrade and Roadbed	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-22</b> <b>23-24</b> <b>23-24</b> <b>23-24</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Misce 23.7.1	<b>Subgrade and Roadbed</b> A. Subgrade Approval   B. Subgrade Preparation   C. Soil Stabilization <b>Base Course</b> A. Aggregate Base Course Material <b>Portland Cement Concrete Pavement</b> A. Concrete Mix Design.   B. Concrete Testing and Inspections.   C. Soil Stabilization for Repairs or Replacement Work   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification.   D. Bituminous Pavement Inspection for Repairs or Replacement Work <b>Bituminous Pavement Inspection for Repairs or Replacement</b> A. Surface Tolerance. Refer to Section 23.6.4 D.1.   B. Thickness Tolerance. Refer to Section 23.6.4 D.2.	23-18   23-18   23-18   23-18   23-18   23-19   23-19   23-19   23-19   23-19   23-19   23-19   23-19   23-19   23-19   23-23   23-24   23-24   23-24   23-24
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Xisce 23.7.1	Subgrade and Roadbed	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Xisce 23.7.1	Subgrade and Roadbed	<b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-18</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-22</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>33-24</b> <b>31-26</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31-27</b> <b>31</b>
23.6	Paver 23.6.1 23.6.2 23.6.3 23.6.4 Misce 23.7.1	Subgrade and Roadbed.   A. Subgrade Approval.   B. Subgrade Preparation   C. Soil Stabilization   Base Course   A. Aggregate Base Course Material.   Portland Cement Concrete Pavement   A. Concrete Mix Design.   B. Concrete Testing and Inspections.   C. Concrete Roadway Inspection for Repairs or Replacement Work.   Hot Mix Asphalt (HMA)- Superpave Method   A. HMA Testing and Reporting.   B. Conformity with Plans and Specifications.   C. PG Asphalt Binder Testing and Certification.   D. Bituminous Pavement Inspection for Repairs or Replacement Work   Illaneous   Bituminous Pavement Inspection for Repairs or Replacement.   A. Surface Tolerance. Refer to Section 23.6.4 D.1.   B. Thickness Tolerance. Refer to Section 23.6.4 D.2.   C. Rim Tolerance.   D. Cracks.   E. Additional Requirements for Repairs (Patching). Refer to Chapter 25, Reconstru Remain	<b>23-18</b> <b>23-18</b> 23-18 23-18 <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-19</b> <b>23-21</b> <b>23-21</b> <b>23-21</b> <b>23-22</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b> <b>23-24</b>
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# 23.1 GENERAL REQUIREMENTS

#### 23.1.1 Quality Assurance

#### A. Inspection.

A Local Entity Engineer shall observe key steps of the construction process, including permit processing, key inspections, overall compliance with these Standards, and the approved plan set and acceptance procedures. Key inspection times will occur in the following phases: right-of-way grading, trenching for utilities, structures, non-structural concrete, pavement and traffic signs, striping and signals. Adequate construction inspections are also the basis for acceptance by the Local Entity.

Upon completion of the construction work, and prior to Local Entity's acceptance of work and issuance of Certificate of Occupancy, copies of the "Record Drawings," all required test reports, and the Designer's statement that the roads and appurtenances have been constructed in conformance with the approved lines, grades, specifications, and Standards shall be delivered to the Local Entity Engineer before a request for collateral release will be considered.

#### **B.** Qualifications for Local Entity Engineer and Tester.

All inspection and testing personnel shall be certified at the NICET Level II or above or appropriate Lab Cat level for work performed. Equivalent training and/or experience may be accepted by the Local Entity in lieu of the NICET Certification. All concrete field testers are required to have Level I, ACI field certification. Documentation of all qualifications for Local Entity Engineer and testers shall be submitted at the construction coordination meeting.

#### C. Testing.

During the construction process the Developer is required to provide testing from an independent laboratory on all infrastructure installation including soils, concrete, asphalt, and other applicable tests as described in **Table 23-1** of this chapter.

All testing laboratories engaged in testing for projects shall be pre-qualified by the Local Entity.

#### D. Developer Responsibility.

These Standards state the minimum requirements for materials sampling, testing, and inspection. All tests shall be made and certified by an approved independent testing laboratory. The Developer shall be responsible for retaining a licensed Geotechnical Engineer for material testing. All costs required and pertaining to testing, the work performed, and materials supplied to verify compliance with these Standards shall be the responsibility of the Developer. All retesting shall be at the Developer's expense.

Where certified test reports are required to be furnished by the manufacturer, the Developer shall furnish duplicate copies of the reports to the Local Entity Engineer before the material will be approved for use. The test data shall be delivered to Local Entity within 48 hours of the testing.

The use of the Geotechnical Engineer's services does not relieve the Developer of the responsibility to furnish the required materials and to perform the required construction in full compliance with these Standards. Passing test results do not constitute acceptance of the work or materials represented by the test. The Developer is responsible for quality control of their work.

In various sections of these Standards, specific testing or other data is required by the Local Entity to insure that the intent of these Standards is fulfilled. The costs of such tests or other specific data where required by these Standards or on the approved plans shall be borne by the Developer. When evidence indicates that the work performed may not comply with these standards or the approved plan, the Local Entity Engineer may require additional tests or data beyond that required in these Standards or on the approved plans. The costs of such tests shall be borne by the Developer. Should such tests or additional data show a failure to meet these Standards or the approved plans, the Developer shall be responsible for all costs associated with repair or replacement of said failure.

The costs of all inspections and oversight of the construction process shall be paid for by the Developer. Refer to **Section 23.8** for requirements and fees.

## E. Use of Non-Approved Material.

In the event any material or equipment proposed to be used by the Developer is disapproved by the Local Entity Engineer as not meeting the requirements of these Standards, said materials or equipment shall not be used on the Project. If, after approval of the Plans, the Developer desires to change any materials or equipment from that previously approved by the Local Entity Engineer, said change shall be accomplished only by a written request to the Local Entity Engineer. The Local Entity Engineer must approve any change before any materials can be ordered.

All materials used on the project shall be approved by the Local Entity. The Developer shall submit the proper documentation and receive approval or denial from the Local Entity within 45 days.

# F. Pavement Design Report.

The pavement design report required in these Standards shall be submitted and approved a minimum of 5 working days prior to any paving. Refer to **Chapter 10**, **Pavement Design and Technical Criteria**.

#### G. Geotechnical Engineer Access and Assistance.

The Developer shall allow the Geotechnical Engineer access to the job site at all times. The Developer shall furnish any labor required to assist the Geotechnical Engineer in obtaining and handling samples at the source of material and at the Project. The Developer shall provide and maintain, for the sole use of the Geotechnical Engineer, adequate facilities for safe storage and proper curing of concrete test specimens on the Project site as required by **AASHTO T23**.

The Geotechnical Engineer personnel are not authorized to stop work, to revoke, alter, relax, enlarge, or release any requirements of the Standards, nor to approve, accept, or reject any portion of the Work on behalf of the Local Entity.

#### H. Mix Designs.

The Developer shall furnish to the Local Entity Local Entity Engineer pavement mix designs meeting the requirements of these Standards a minimum of 5 working days prior to intended use of the mix. The mix design shall be reviewed and accepted by the Local Entity Engineer prior to use. If a mix design not accepted by the Local Entity is used, the Local Entity may require removal of all improvements placed with the unaccepted material.

### I. Test Reports.

Test reports submitted to the Local Entity shall include all tests performed on the project. Reports shall be reviewed by a Professional Engineer competent in the required testing practice. All test reports shall show the location where the test was performed or at which the work or batch represented by the test. Test reports shall include all information specified in the **AASHTO**, ASTM, or Colorado test procedure used. Improperly completed reports will not be accepted.

Prior to acceptance of each phase of a project, all final reports signed and sealed by a Professional Engineer shall be submitted to the Local Entity indicating compliance with these specifications.

# J. Warranty Period.

The warranty period for the completed public street improvements cannot start until all required test reports, record drawings, inspection reports, and other documentation are submitted in the proper format and accepted by the Local Entity.

# 23.1.2 Quality Assurance Testing and Reporting

All testing methods and procedures performed by the Geotechnical Engineer personnel shall be done in accordance with the applicable **AASHTO**, ASTM, or Colorado Procedure requirements and procedures (see **Table 23-1**). Test reports shall include the **AASHTO**, ASTM, and Colorado Procedures (CP) test designations of all tests taken. All testing and retesting services shall be done at the expense of the Developer.

When changes in materials or proportions are encountered during construction, or when the work fails to pass tests or fails to meet the Standards, additional tests shall be taken as directed by the Local Entity Engineer. Failure of the Developer to furnish satisfactory test data shall be sufficient cause for rejection of the work in question.

# Table 23-1 Material Testing

Soils	AASHTO	ASTM	Frequency
Sampling	T87	D420	
Soil Classification	M145	D3282 D2488/D2487	Per soil type encountered
Moisture-Density (Proctor)			Per soil type encountered
Standard	T99	D698	As specified in Geotechnical Report
Modified	T180	D1557	As specified in Geotechnical Report
Density and Moisture Content	T238 & T239	D2922 & D3017	"Right of Way"
-Grading			1/1000 cubic yards
-Embankment			1/500 lf/lane (min. of 1 per street) 1' vertical
-Subgrade			1/500 lf/lane (min. of 1 per street)
-Utility Trench			
-Main			1/100 If horizontal & per 1.5' vertical
-Services			2 per service (vertical)
-Manhole/Fire Hydrants			1/2' vertical within 2' alternating directions (min. of 4)
Hot Mix Asphalt (HMA)			
Sampling	T168	D979	
Density			
-Nuclear		D2950	1/500 lane feet (min. of 1 per street) per lift
-Coring	T166	D2726	As required or directed
-Laboratory Theoretical	T209	D2041	As required or directed
Asphalt Content & Gradation		D5444 or C136	1/500 tons
		(Gradation)	
Solvent	T164	D2172	
Ignition Oven	T308	D6307	
Nuclear	T287	D4125	
Thickness		D3549	As required or directed
Aggregate Gradation	T27	D5444 or C136	As required or directed
Fractured Faces		D5821	As required or directed
Concrete			
Sampling	T141	C172	
Mold and Cure	T23	C31	
Transportation of Cylinders	T23	C31	
Physical Properties			1/75 cubic yards/One per day Min.
Slump	T119	C143	Refer to 23.4.1,I; 23.5.3,C and Table 23-2
Air Content	T152	C231	Refer to 23.4.1,I; 23.5.3,C and Table 23-3
Compressive Strength	T22	C39	Refer to 23.4.1,I; 23.5.3,C and Table 23-4
Obtaining Cores	T24	C42	As required or directed
Compressive Strength of	T24	C42	As required or directed
Cores			
Aggregate Base Course			
Gradation	T27	C136	Per source or as required or directed
Moisture-Density (Proctor)			Per source or as required or directed
Modified	T180	D1557	As specified in Geotechnical Report
Standard	T99	D698	As specified in Geotechnical Report
Density/ Moisture Content			1/1000 lf/LaneMin. 1 per street

# 23.1.3 Material Specifications

#### A. General.

The Specifications presented in this section are performance oriented. The Local Entity's objective in setting forth these Specifications is to achieve an acceptable quality of roadway structures.

#### B. List of Materials to Be Annually Approved by Local Entity.

All sources for the mined or manufactured materials that are listed below shall be annually tested by the supplier and approved by the Local Entity Engineer for compliance with the appropriate materials performance specifications. No material sources shall be used for public improvement construction without approval of the Local Entity Engineer. For the purpose of these Standards, public improvements are all roadway improvements, driveways, sidewalks, curbs and gutters, crosspans, ramps, structures, and other public infrastructure within Local Entity right-of-way, or within a public access easement.

- 1. The following materials shall be annually approved:
  - a. Concrete mix design
    - 1) Admixtures, water reducing agents, and accelerators
    - 2) Air-entraining agents
  - b. HBP mix design
  - c. Admixtures, water reducing agents, and accelerators
  - d. Fly ash
  - e. Aggregate base course material
  - f. Flowable concrete fill
- 2. The following additional materials may be required to be tested and approved at the discretion of the Local Entity Engineer:
  - a. Liquid membrane curing compound (white pigmented liquid linseed oil based curing compound) shall conform to ASTM Specification C309-81 Type II, Class B.
  - b. Polyethylene sheets
  - c. Expansion joint material
  - d. Welded steel wire fabric
  - e. Lime
  - f. Aggregate
  - g. Pipe materials

- h. Geotextile/Fabric
- i. Steel rebar
- j. Signage materials
- k. Striping materials
- 1. Traffic signal materials
- m. Lighting types

#### C. Procedure for Material Source Approval.

On or before April 1 of each year, or a minimum of 14 calendar days before construction, a material supplier for any Local Entity public improvements shall supply written documentation and material test results from a competent materials testing laboratory that describes:

- 1. Material(s) being tested to meet Local Entity specifications
- 2. The test procedures employed
- 3. The supplier's manufacturing, mining, or treating process by which the tested materials were created
- 4. The material test results
- 5. A signed statement by the material supplier that the materials to be provided for public improvements in the Local Entity during the coming 365 day period have been tested within the last sixty days.

#### **D.** Violations of Approval Conditions

1. <u>Random Testing</u>. The Local Entity Engineer may order random tests of materials used in Local Entity public improvements to verify compliance with material specifications.

Any and all material used to construct Local Entity public improvements that is not from a certified source, or that is from a certified source and fails one or more random material tests, may be subject to complete removal as a condition of Local Entity acceptance of that public improvement. Additional tests will be required to confirm the existence and extent of the substandard material prior to the initiation of remedial action. The extent of the material to be removed will be at the discretion of the Local Entity Engineer.

 <u>Materials Not Listed in Section 23.1.3 B</u>. Other permitted materials include those deemed by the Local Entity to be the primary structural materials commonly or typically used in public improvements. Ancillary public improvement materials such as manufactured paints and coatings, bonding agents, sealers, gaskets, insulating materials, etc., should be in compliance with Colorado Department of Transportation material specifications for the appropriate material employed. Decisions on acceptability of alternative materials will be made by the Local Entity Engineer.

# 23.2 RIGHT-OF-WAY AND PUBLIC EASEMENT GRADING

### 23.2.1 Soil Testing

#### A. Referenced Standards.

All testing shall be done in accordance with testing methods of **AASHTO** or **ASTM** as designated in **Table 23-1**.

#### **B.** Moisture-Density Determination.

A moisture-density determination shall be taken for each soil type encountered. For A-6 and A-7 soils, **AASHTO T99** shall apply.

#### C. Compaction.

Refer to Chapter 22, Construction Specifications, for compaction criteria. Also refer to Table 23-1 for the material test method.

#### **D.** Imported Fill.

All imported fill material shall be tested and accepted in accordance with **Chapter 5**, **Soils Investigations and Report**, prior to placement of any fill material.

#### E. Frequency of Testing.

Refer to Table 23-1.

#### 23.2.2 Erosion Control

#### A. Fort Collins (city limits only)

Refer to City of Fort Collins Storm Drainage Standards

#### **B.** Rip-Rap

- 1. <u>Materials</u>. For riprap, plastic filter cloth, and impervious plastic lining material criteria, refer to the discussion of erosion control in **Chapter 22**, **Materials and Construction Specifications**.
- 2. Construction Requirements.
  - a. <u>Plastic Filter Cloth</u>. If, in the opinion of the Local Entity Engineer, field lap joints of plastic filter cloth or impervious plastic lining are necessary, refer to the discussion of erosion control in Chapter 22, Materials and Construction Specifications.

#### C. Plant Preparation.

Plant inspection and acceptance shall be done prior to installation according to **CDOT Specification Section 214.02 (b)**.

#### D. Lawns and Grasses (Sod and Seeding).

Inspection of materials will be limited to that shown by the submittals outlined in the erosion control discussion in Chapter 22, Materials and Construction Specifications.

#### 23.3 TRENCHING FOR UTILITIES

#### 23.3.1 Excavation for Utility Trench

#### A. Construction Inspection.

Inspection of construction shall be provided, as frequently as necessary, to confirm that the construction conforms to the plans and specifications. The Developer shall notify the Local Entity 24 hours prior to placement of trench backfill.

#### 23.3.2 Bedding

Inspection of bedding material is the responsibility of the utility owner and is not governed by these standards. Refer to the utility standards.

#### 23.3.3 Backfilling

#### A. Inspection.

Inspection of backfill materials shall be made prior to installation to determine compliance with these Standards. Refer to **Table 23-1** for compaction requirements. All backfill compaction shall meet the compaction requirements. Compaction testing shall be required for all utility trench backfill. Trench backfill placement within public easements, as well as the right-of-way, shall be observed and accepted by the Local Entity Engineer and shall meet these requirements.

#### 23.4 STRUCTURES

#### 23.4.1 Concrete Structure Inspections

This section delineates the testing, inspection, and related documentation requirements for all structures, including bridges, retaining walls, cast-in-place box culverts, and other concrete structures specified within.

#### A. Concrete Mix Design.

Concrete mix designs shall be performed according to Section 23.5.1.

#### **B.** Plan and Specifications Review.

It is the Developer's responsibility to familiarize the materials testing firm with the plans and specifications approved by the Local Entity Engineer prior to any construction.

#### C. Structural and Inspection Requirements.

The structural design Engineer or his representative, familiar with assumptions inherent in the structure design, shall inspect the construction in sufficient detail to confirm that the construction meets the requirements of the plans and specifications.

#### **D.** Specialty Inspection.

Specialty inspection of construction may be required, as frequent as necessary to confirm that the construction conforms to the plans and specifications, by qualified personnel experienced in the inspection of similar structures. A written log or report of all work shall be furnished to the Local Entity Engineer at or prior to the request for initial acceptance of the structure. These inspection costs shall be borne by the Developer in addition to any other inspection fees required in **Section 23.8**. All bridges and major drainage structures with a span greater than twenty feet shall be inspected and rated in accordance with CDOT bridge rating criteria, to meet proper rating for a new bridge, prior to the structure's acceptance by the L.E.

#### E. Material Testing Requirements

Testing of materials shall conform to the requirements of **AASHTO** "Standard Specifications for Highway Bridges," latest edition, and applicable interims, as well as applicable **CDOT** standards.

#### F. Foundation Testing and Inspection Requirements.

Unstable foundation material shall be removed to a depth approved by the Local Entity Engineer below the finish grade elevation and be replaced with a material and construction procedure as approved by the Local Entity.

#### G. Inspection of Forms and False Work

- 1. The forms shall be clean of all dirt, mortar, and all foreign material. Forms that will later be removed shall be thoroughly coated with an approved form oil.
- 2. The forms shall be mortar tight and of a quality (in addition to the bracing) to withstand the pressures from deposited concrete.
- 3. Unless otherwise specified, forms for exposed surfaces shall be constructed with triangular fillets 3/4 inch at all exterior corners.

#### H. Inspection of Reinforcing Steel

1. <u>Material Grade and Size</u>. The material grade and size shall be as specified by the Designer on the certified construction plans.

- 2. Tying.
  - a. The intersections of all bars shall be tied in accordance with the following requirements: Slab bars shall be tied at every intersection around the periphery and at spacing according to bar sizes. Unless bar spacing is less than 12" in which case every other intersection shall be tied. However, in no case shall less than 30% of the intersections be tied.
  - b. Wall bars should be tied sufficiently to prevent shifting, at least 3 times in any bar length at every third or fourth intersection and at spaces according to bar sizes, staggered:

#5 and smaller	- 3'0"
#6 to #9	- 4'0" to 5'0"
#10 to #11	- 6'0" to 8'0"

Upper and lower mats shall be tied or otherwise fastened at 4 foot maximum spacing in each direction. Minimum splice length shall be 24 bar diameters.

- 1) All reinforcing steel shall be supported with steel chair or precast mortar.
- 2) Reinforcing steel shall be clean and free of all foreign material before concrete is placed.
- 3) All clearances shall be in compliance with approved plans and specifications.

# I. Concrete Testing and Inspections

- 1. <u>Materials Specifications</u>. The class of concrete used on structures shall be in accordance with **CDOT Specifications Section 601.02** and **CDOT Table 601-1**. Concrete that does not meet strength in 28 days is subject to removal.
- 2. Concrete Tests.
  - a. All testing shall be done in accordance with **AASHTO** or **ASTM** as designated in **Table 23-1**.
  - b. Sampling and testing shall be required on all concrete work including curb, sidewalk, crosspans, pavement, ramps, slope paving, retaining walls, inlets, manholes, or any other structures.
  - c. Maximum time allowed between sampling and casting cylinders shall not exceed 15 minutes. If the concrete cannot be taken to the laboratory and cylinders cast within 15 minutes, the cylinders shall be cast in the field. Cylinders shall be transported to the laboratory within 24 hours of casting but after the concrete has hardened, (see **AASHTO T23 or ASTM C-31**).
  - d. Concrete cylinders shall be load-tested and broken at the times listed on **Table 23-2**.

Concrete Cylinder Breaks				
Number of Cylinders	Break Interval (Days)			
Series (4 Cylinders) *				
1	7			
2	28			
1	HOLD			

#### Table 23-2 Concrete Cylinder Breaks

NOTE: Additional cylinders may be required, as directed by the Local Entity Engineer. 56-day cylinder shall be used if 28-day cylinder strength is less than the required design strength.

\* For high strength early concrete operations a minimum of one additional cylinder shall be poured for additional breaks.

- e. The slump test shall be performed in accordance with **AASHTO T119**. The air test shall be performed in accordance with **AASHTO T196** or **T121**. Slump and air test measurements shall be taken with each cylinder series. Concrete slump and air content shall be done in accordance with **CDOT Table 601-1**.
- f. <u>Coring</u>. Coring is not generally permitted unless approved by the Local Entity Engineer and if approved, the section cored shall be repaired to the satisfaction of the Local Entity Engineer.
- g. <u>Low Strength Test Results</u>. If compressive strength of cylinders and beams does not meet the specified values, the Professional Engineer shall recommend and the Local Entity Engineer shall approve the necessary mitigation measures needed.

# J. Testing Frequency and Related Inspections

- 1. At least 4 compressive strength cylinders shall be taken from the same concrete delivery truck to provide design compliance testing at the laboratory. Two of the four specimens will be tested at 28 days for acceptance and 1 shall be tested at 7 days for information. The fourth cylinder shall only be necessary if the 28-day fails. This is required for each pour per day with at least 1 strength test series for each 75 cubic yards of concrete placed. Note: Additional cylinders may be required, as directed by the Local Entity Engineer. Cylinder strength shall be 56-day if 28-day cylinder strength is insufficient for the required design strength.
- 2. Slump, air content, unit weight, and mix temperature shall be tested for each pour per day with at least 1 test for each 75 cubic yards of concrete placed. Standards in **Section 23.4.1 I** shall also apply.

# K. Placement (Inspection)

1. Concrete placement shall be done in a manner such that the concrete is not segregated or altered before placing. It shall not be allowed to free fall more than 5 feet. Concrete shall be placed in lifts not to exceed 18 inches.

- 2. A sufficient number of vibrators shall be used to properly consolidate the concrete as required.
- 3. Weepholes and drainage systems should be installed in the structure at the locations noted on the plans or specifications.
- 4. Construction joints and expansion joints shall be constructed in conformance with approved plans and specifications.
- 5. Curing concrete other than bridge decks shall be done in conformance with **CDOT Specifications Section 601.13** with a minimum curing period of 7 days.
- 6. Curing of bridge decks shall follow CDOT Specifications Section 601.16.
- 7. When placing concrete next to recently constructed lane (bridge decks), refer to **Section 23.6.3 C.2.k**.

### L. Finishing of Hardened Concrete Surfaces

- 1. Unless otherwise authorized, all formed surfaces shall be given a Class 1 finish immediately following curing, as defined by **CDOT Specification 601.14**.
- 2. Culvert headwall and wingwall surfaces above ground, where visible from a traveled way, shall receive a CDOT Class 2, Class 5 or approved structural concrete coating finish, as defined in CDOT Specification Section 601.14(b), at the Developer's option.
- 3. A CDOT Class 5 or approved structural concrete coating finish shall be given to all bridge type surfaces as noted in CDOT Specification Section 601.14(a).

#### M. Final Surface Test (Bridge Deck).

All work shall be true to line and grade as established by the Local Entity Engineer. Prior to acceptance of the work, the Developer shall test the surfaces with a 10-foot straightedge. Any areas higher than 1/4 inch, but not higher than 1/2 inch, above the correct surface thus indicated shall be ground to the correct surface by the Developer at his expense. When the deviation exceeds the foregoing limits, the Developer shall remove and replace that portion of the work at his expense, as directed by the Local Entity Engineer. Any depressions shall be mitigated according to **CDOT Specifications Section 601.15(d)**.

The following standards where relevant shall also apply:

- 1. Section 23.5.2, Inspection Criteria.
- 2. Section 23.6.3, Portland Cement Concrete Pavement.

#### N. Permanent Steel Bridge Deck Forms.

Inspection and testing of concrete placement shall be done in accordance with **CDOT Specifications Section 601.10f**.

#### **O. Bridge Deck Concrete Placing**

- 1. <u>Straight Edge Testing</u>. Refer to **Section 23.4.1 M** for testing of finished surface of concrete.
- 2. <u>Moveable Bridge for Inspection</u>. A moveable bridge or platform shall be provided for inspection in accordance with **CDOT Specifications Section 601.15e**.

#### P. Waterproofing Membrane.

Measurement of waterproofing membrane effectiveness shall be done in accordance with **CDOT Specifications Section 515.04(h)**.

### 23.4.2 Structural Steel

#### A. Material and Certification Testing.

Material mill test reports shall be furnished in accordance with **CDOT Specifications Section 509.13**. Suppliers test reports for fasteners and fastener requirements shall be in accordance with **CDOT Specifications Section 509.28**.

#### **B.** Fabrication Testing.

Fabrication notice, inspection and testing shall be submitted and/or implemented in accordance with **CDOT Specifications Sections 509.14**, **509.17** and **509.18**.

#### C. Field Welding and Erection.

Inspection of field welding and erection of steel structures shall be in accordance with **CDOT Specifications Sections 509.26** and **509.27**.

# 23.4.3 Timber

#### A. Materials Inspection.

All treated and untreated timber furnished shall be inspected in accordance with **CDOT Specifications Section 508.04**.

# 23.4.4 Bearing Device

#### A. Fabrication Testing.

Completed bearings shall be tested and approved in accordance with **CDOT Specifications Section 512.09**.

# 23.5 NON-STRUCTURAL CONCRETE

Non-structural concrete includes curb, gutter, walks, driveways, crosspans, and ramps.

## 23.5.1 Concrete Mix Design

Concrete mix design shall be performed in accordance with the provisions of **CDOT Specifications 601.05**. A separate mix design shall be provided if pumped concrete is used. These shall be submitted no less than 5 working days prior to placement of any concrete.

### 23.5.2 Inspection Criteria

#### A. Tolerances for Repairs or Replacement of Work

- 1. <u>Humps and Depressions</u>. Any localized humps and/or depressions greater than 1/4 inch (as measured with a 10-foot straight edge) will require removal and replacement of the work in question.
- 2. <u>Water Ponding</u>. No ponding of water, according to **Section 23.5.3 B.3.a**, shall be allowed.
- 3. <u>Flowline Depth</u>. Combination curb, gutter, and walk and/or vertical curb and gutter flowline depth shall not vary from adopted standards by more than  $\pm 1/4$  inch, measured vertically from the top of curb to the gutter invert.
- 4. <u>Cross Slope in Pedestrian Walks</u>. Pedestrian walks shall have a minimum of 1.0 percent and a maximum of 2.0 percent cross slope, unless otherwise approved by the Local Entity Engineer.
- 5. <u>Joint Spacing</u>. Contraction and construction joints shall be placed at a maximum spacing of 10 feet in curb, gutter, sidewalks, crosspans, trickle channel, etc. A minimum spacing of 6 feet will be allowed.
- 6. <u>Heave or Settlement of Sidewalk</u>. Heave or settlement of sidewalk, relative to separate curb pour, greater than 1 inch in Loveland (GMA and city limits) and <sup>1</sup>/<sub>2</sub>" in Ft. Collins (GMA and city limits), shall be cause for corrective action.

#### **B.** General Specifications

- 1. <u>Utility Facilities Placement</u>. No utility facilities shall be placed in curb, gutter, or walk, crosspans, etc., unless shown on the approved construction plans. This includes water stop box, manholes, power poles, fire hydrants, water valves, etc.
- 2. Concrete Cracks.
  - a. At the time of preliminary or final acceptance inspection, no cracks outside of the control joint will be accepted and shall be removed to the nearest control joints. Time of replacement (preliminary acceptance) shall be decided by the Local Entity Engineer.
  - b. At the time of final acceptance inspection, the repair of all cracks will be completed.
    - 1) Any longitudinal cracked section of concrete will require complete removal and replacement of that section between joints.

- 2) Repair action for hairline cracks may be waived at the discretion of the Local Entity Engineer. For the purpose of this section, a hairline crack is one that is reasonably immeasurable and without separation as determined by the Local Entity Engineer.
- 3. Concrete Chips.
  - a. One chip that penetrates into the gutter pan or back of walk 2 inches or more and is 5 inches or longer in one stone will require removal and replacement.
  - b. Four or more chips that penetrate 1 inch or more and are 4 inches or longer in one stone will require removal and replacement.
- 4. <u>Concrete Gouges</u> (to any surface of the curb, gutter, and walk). The following requires removal and replacement of the damaged panel/stone:
  - a. One gouge that penetrates 3/4 inch or deeper and covers an area of 10 square inches.
  - b. Two gouges that penetrate 1/2 inch or deeper and cover a combined area of 15 square inches.
  - c. Three gouges that penetrate 1/4 inch or deeper and cover a combined area of 25 square inches.
  - d. Four gouges that penetrate 1/8 inch or deeper and cover a combined area of 35 square inches.
- 5. <u>Other Imperfections in Concrete Surface</u>. Stress cracking, D-cracking, pop-outs, spalling, rain damage, graffiti, and other surface defects will remain discretionary and will usually require removal and replacement.
- 6. Final Grade.
  - a. A light broom finish (not to expose the aggregate) to all concrete shall be required.
  - b. All concrete work shall have the proper finished grade. No reversal of the flow direction will be accepted by Local Entity.
  - c. No abrupt changes in grade shall be allowed, i.e., curb returns from new to existing, driveway entrances, etc.

#### C. Additional Inspection Requirements for Repairs

Follow the guidelines in Chapter 25, Reconstruction and Repair, concerning repairs.

#### 23.5.3 Concrete Testing and Inspections

#### A. Materials Specifications.

Compressive strength of non-structural concrete shall be 3500 psi at 28 days. For additional specifications refer to **Section 23.4.1 I**.

### **B.** Concrete Tests

- 1. <u>Testing and Sampling Standards</u>. Refer to **Section 23.4.1 I** for the following standards:
  - a. Sampling and Testing
  - b. Sampling Time
  - c. Slump and Air Tests
  - d. Coring
- 2. Concrete cylinders shall be load-tested and broken at the times listed in Table 23-2.
  - a. The testing laboratory and Local Entity Engineer shall determine the areas of concrete with potentially low strength and clearly denote the areas to the Developer.
  - b. The Developer shall have an independent testing laboratory, acceptable to the Local Entity Engineer, obtain and cure core samples per ASTM C 42 or AASHTO T 24. A minimum of 3 samples shall be taken for each 100 cubic yards or fraction thereof of concrete in question.
  - c. Strength level of concrete in the area represented by core tests will be considered adequate when the average compressive strength of the cores are equal to at least 85% of specified compressive strength and if no single core is less than 75% of the specified compressive strength.
  - d. If the concrete is determined not to have adequate strength, the Local Entity Engineer may require the Developer to replace low strength areas.
- 3. Grade Verification of Gutter Flowline.
  - a. After completion of curb and gutter, including curb returns and crosspans, and prior to installation of asphalt, the new installation must be flow-tested with water to confirm that there are no areas that hold water. The Local Entity Engineer will confirm the results and accept or reject the work. The work will not be accepted if it holds water more than 1/4 inch deep for a distance greater than 5 feet. Unacceptable work must be removed and replaced.
  - b. After completion of curb, gutter, radii, and crosspans, the Developer must provide to the Local Entity Engineer a field verification of critical elevations to ensure the construction complies with the approved plans. The verification

must include flowline elevations at intersections, high points, and inlets. The Developer must provide the Local Entity with the following:

- 1) A letter from a licensed Professional Engineer or Land Surveyor stating that the field verification has found the work conforms to the approved plans, and;
- 2) Mylar copies of the approved construction plans showing the actual spot elevations and profile grades must be provided. All deviations shall be noted in the letter and on the required drawings. If gutter profile grades are less than 0.4 percent, the work will not be accepted. Any field changes to the approved plans that change the profile grades by more than 0.5 of 1 percent will require revisions, by the Designer, to the original Mylar grading and street plans by the Developer and approval by the Local Entity Engineer prior to construction of improvements.

# C. Testing Frequency

- 1. At least 4 compressive strength cylinders shall be taken from the same concrete delivery truck to provide design compliance testing at the laboratory. Two of the 4 specimens will be tested at 28 days for acceptance and one shall be tested at 7 days. The fourth specimen shall be tested at 56 days if the 28-day specimen does not conform to these specifications. This is required for each pour per day with at least 1 strength test series for each 75 cubic yards of concrete placed. Additional cylinders may be required to determine the rate of strength gain on high-early concrete mixes.
- 2. Slump, air content, unit weight, and mix temperature shall be tested for each pour per day with at least 1 test for each 75 cubic yards of concrete placed. Also refer to the slump and air testing requirements in **Section 23.4.1 I**.

#### **D.** Placement Standards

- 1. Refer to Section 23.4.1 I for the following.
  - a. Free Fall and Lifts
  - b. Vibrators
- 2. Refer to Chapter 22, Construction Specifications, concerning non-structural concrete curing for the following:
  - a. Joints
  - b. Curing Concrete

# E. Finishing Standards for Hardened Concrete Surfaces.

Refer to Section 23.4.1 L.

# F. Backfill.

Compaction of soil placed behind the curb in landscaped areas shall be compacted to 90 percent standard Proctor density.

# 23.6 PAVEMENT

# 23.6.1 Subgrade and Roadbed

# A. Subgrade Approval

- 1. <u>Inspection</u>. When the Local Entity Engineer determines an unsatisfactory soil is present, excavate and replace with suitable material.
- 2. <u>Reconstruction</u>. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Local Entity Engineer.

# **B.** Subgrade Preparation

- 1. <u>Testing</u>. Field moisture-density tests using acceptable methods will be required at random locations. Refer to **Chapter 22** for soil types and compaction percentages for **AASHTO T99** and **T180** tests.
- 2. Acceptance.
  - a. <u>Compaction</u>. The results of field density tests shall be submitted and reviewed by the Local Entity Engineer prior to placing the next course. Should testing indicate results less than those specified, the necessary reworking, compaction, or replacement will be required prior to continuation of the paving process. The approval is valid only to a time when weather conditions may have changed the condition of the subgrade. Changes in weather such as freezing or precipitation, which may cause changes in the subgrade, will require re-approval of the subgrade. Refer to **Chapter 22, Construction Requirements**, concerning subgrade preparation for compaction criteria.
  - b. <u>Final Proof-Rolling</u>. Final proof rolling of subgrade shall be required prior to placing base. Refer to **Chapter 22, Construction Requirements**, concerning subgrade preparation.

# C. Soil Stabilization

- 1. <u>Lime Stabilization</u>. The field placement of lime must comply with design requirements in Chapter 5, Soils Investigation and Report and Chapter 22, Materials and Construction Specifications.
  - a. <u>Design Testing Summary</u>. Tabulated summaries of laboratory test results for field samples, composite samples, and lime-soil mixes shall be provided to the Local Entity Engineer written 24 hours and include the following:

Field Sample No. (also shown on map) Group No. (composite sample)

- Soil description #200 sieve analysis Atterberg limits AASHTO classification and group index % soluble sulfates pH value Maximum dry density % optimum moisture content % stabilization agent content % swell Compressive strength
- 2. <u>Fly Ash Stabilization</u>. Consult the Local Entity's Engineer for requirements for this special case. Also see **Table 10-4**, **Pavement Strength Coefficients**.
  - a. <u>Kiln Dust Stabilization</u>. Consult the Local Entity's Engineer for requirements for this special case. See **Table 10-4**, **Pavement Strength Coefficients**. Construction Requirements must be specified by the Designer and approved by the Local Entity Engineer.

#### 23.6.2 Base Course

#### A. Aggregate Base Course Material

- 1. <u>Testing Frequency</u>. Aggregate base course shall be tested for compaction and moisture once every 1000 feet for each lane.
- 2. <u>Approval of Sources</u>. Approval of sources will, at a minimum, consist of supplying documented gradation, Atterberg limits, and R-value testing on an annual basis.

#### 23.6.3 Portland Cement Concrete Pavement

#### A. Concrete Mix Design.

Refer to Section 23.5.1.

#### **B.** Concrete Testing and Inspections.

Concrete shall conform to the requirements for Class "P" (4200 psi) concrete as specified in CDOT subsections 601.02 and 601.03. When the quantity of pavement concrete is too small to make use of mechanical equipment practical, the contractor will be permitted to use **AASHTO M43** size 57 or 67 aggregate in lieu of coarse concrete specified in **CDOT Table 601.01**.

#### C. Concrete Roadway Inspection for Repairs or Replacement Work

1. <u>Tolerances</u>.

- a. All manholes, water valves, range boxes, etc., shall be flush to 1/4 inch below the final surface roadway grade. Refer to **Section 23.7.1** for adjustments to final grade.
- b. Where the constructed surface varies from the design cross slope by more than 1/2 inch in 10 feet, the pavement shall be removed and replaced. This technique may not apply in areas with less than 2% cross slope.
- c. Areas showing high spots greater than 1/4 inch as measured with a 10-foot straight edge, but less than 1/2 inch, may be diamond ground to within the specification of 1/4 inch. High spots more than ½ inch may be permitted, if acceptable to the Local Entity Engineer.
- d. <u>Thickness Tolerance</u>. The thickness of the pavement shall be determined by average caliper measurement of cores tested, if required by the Local Entity Engineer. A minimum of 2 cores per 1000 square yards will be taken at random. Should any deviation be found, additional cores may be taken to define the horizontal limits of the deviation. When measurement of the core from a unit is not deficient by more than 1/4 inch from the design thickness, the pavement thickness will be considered to be within acceptable tolerance. When such measurement is deficient more than 1/4 inch and not more than 1 inch from the design thickness, two additional cores at intervals not less than 300 ft will be taken and used to determine the average thickness for that area. When the thickness of pavement is deficient by more than 1 inch the Local Entity Engineer may require that the area be removed and replaced.
- 2. Specifications.
  - a. All panels with cracks wider than 1/8 inch shall be repaired by total removal of the panel and replacement as required by the criteria herein. At the time of initial acceptance no cracks will be allowed and shall be repaired on full panel basis.
  - b. All panel cracks 1/8 inch and narrower may be routed and sealed at the discretion of the Local Entity Engineer.
  - c. There shall be no more than one structural crack per panel. Panels with more than one structural crack shall be repaired by total panel removal and replacement.
  - d. All sections removed shall have edges parallel to adjacent panel joints.
  - e. All saw cuts for removal of slabs shall be full depth cuts.
  - f. No panel shall be allowed that has a crack meeting an adjacent panel at an angle more acute than 45 degrees to a finished edge or control joint.
  - g. All corner cracks to a panel shall be removed and replaced as required by the criteria contained herein.
  - h. Any vertical differential movement across a crack greater than 3/16 inch shall be repaired by either partial or total panel removal and replacement.

- i. All panels with faulted joints resulting from settlement, pumping, and/or curling of the edges shall be repaired by removal and replacement, or in the case of curling, may be repaired by grinding at the discretion of the representative of the Local Entity.
- j. All joint seal damage that allows the intrusion of water or foreign material shall be cleaned and replaced in accordance with **CDOT 412-18**.
- k. Where concrete is to be placed adjoining a previously constructed lane of pavement and heavy equipment will be operated upon the existing lane, that lane shall have attained a 3000 psi compressive strength, prior to its use. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted when that lane has attained a 3000 psi compressive strength.
- 1. All compaction shall meet the requirements of these Standards.
- m. Any other defect not mentioned but noted as a problem by the Local Entity Engineer shall be repaired or replaced per these specifications.

### 23.6.4 Hot Mix Asphalt (HMA)- Superpave Method

#### A. HMA Testing and Reporting

- 1. All testing shall be done in accordance with **AASHTO**, ASTM, or Colorado Procedures (CP), as designated throughout this chapter.
- 2. In addition to the requirements of **Table 23-1** all reports shall include elevation or depth below finish grade at which test was taken. Results shall report densities (maximum dry and relative) to nearest 0.11b/ft<sup>3</sup>, and compaction (relative and required) to nearest 0.1 percent, results of the daily standardization checks, and the most recent adjusted manufacturer's calibration curve. The manufacturer's calibration curve shall be adjusted as required by ASTM D2950 whenever a change in either the material to be tested or the testing equipment is made. If a nuclear device is used, the report shall contain the method used (i.e. back scatter, direct transmission, etc.)
- 3. <u>In-place pavement thickness</u> shall be determined as follows, if requested by Local Entity Engineer: The pavement shall be cored at 500 foot intervals, or fraction thereof, in each 12 feet lane (nominal), with a minimum of 3 cores in any area. The Local Entity Engineer may require additional cores to define deficient areas. Core samples shall be taken prior to final lift. Pavement section shall be within <sup>1</sup>/<sub>4</sub>" of design thickness.

#### **B.** Conformity with Plans and Specifications.

Conformity to the Standards for all hot mix asphalt, CDOT Item 403 will be determined by tests and evaluations of asphalt content, aggregate gradation, and in-place density.

# C. PG Asphalt Binder Testing and Certification

Local Entity can sample and test binder from bank at plant. If requested, supply c.o.c. of binder properties and deliver tickets to plant.

1. If requested by the Local Entity, the developer shall provide the Local Entity a safe access to the binder storage tanks at the asphalt plant and shall provide information and assistance as required for the Local Entity to make a complete and detailed inspection; including sampling of the binder for acceptance testing. All costs associated with providing access and assistance as well as the cost of the binder sampled shall be considered subsidiary to the work and will not be paid for by the Local Entity. The costs of all acceptance testing performed on the PG binder will be paid for by the local entity. It shall be the responsibility of the developer to reimburse the Local Entity for the cost of all failed tests and be responsible for additional testing to assure that the binder is back in compliance.

If the testing indicates that the binder is not in compliance with the requirements of Table 23-3 the developer shall correct the deficiencies at the direction of the Local Entity, including removal of the pavement if deemed necessary by the Local Entity.

2. If requested by the Local Entity, the developer shall supply copies of the "Certificate of Compliance" and "Certified Test Reports" from the binder supplier. These submittals shall meet all requirements of CDOT Standard Specifications for Road and Bridge Construction Section 106.09 and 106.10 respectively.

Binder furnished on the basis of "Certificates of Compliance" and "Certified Test Reports" may be sampled and tested by the Local Entity to determine compliance with the applicable specifications.

- 3. If requested by the Local Entity, the developer shall provide the Local Entity with copies of the load delivery tickets for the binder supplied to the asphalt plant. These load delivery tickets shall include the following information:
  - a. Date and time of delivery
  - b. Address of delivery
  - c. Type and grade of binder delivered
  - d. Quantity of binder delivered
  - e. Lot or batch number

# **D.** Bituminous Pavement Inspection for Repairs or Replacement Work

1. <u>Surface Tolerance</u>. The finished surface of the bituminous pavement, when tested with a 10-foot straightedge parallel to the centerline or perpendicular across joints, will show variations as measured from the testing face of the straightedge to the surface of the pavement, which shall not exceed 1/4 inch. Areas that do not meet the required surface accuracy shall be clearly marked and if the Local Entity Engineer requires repair, the Developer shall repair the pavement.

2. <u>Thickness Tolerance</u>. Any deficiency in the total thickness of the asphaltic pavement shall not exceed 10 percent for any one sample with the average deficiency for all samples not to exceed 7.5 percent. Final decision for correction of deficiencies shall not be made until a pavement evaluation is made by an independent testing laboratory.

Dronortu	Dominament For Dr Dindor				AASHTO		
Ргорегту	Requirement For Pg Binder				Test No.		
	58-28	58-34	64-22	64-28	70-28	76-28	
Original Binder Properties							
Flash Point Temp., °C, minimum	230	230	230	230	230	230	T28
Viscosity at 235°C, Pa•s, maximum	3	3	3	3	3	3	TP 48
Dynamic Shear, Temp. °C, where G*/Sin δ @ 10 rad/s ≥ 1.00 kPa	58	58	64	64	70	76	TP 5
Ductility, 4°C (5cm/min.), cm minimum	-	-	-	50	-	-	T 51
Toughness, joules (inch-lbs)	-	-	-	12.4 (110)	-	-	*CP L-2210
Tenacity, joules (inch/lbs)	-	-	-	8.5 (75)	-	-	*CP L-2210
RTFO Residue Properties							T240
Mass Loss, percent maximum	1.00	1.00	1.00	1.00	1.00	1.00	T240
Dynamic Shear, Temp. °C, where G*/Sin δ @ 10 rad/s ≥ 2.20 kPa	58	58	64	64	70	76	TP 5
Elastic Recovery, 25°C, percent min.	-	-	-	-	50	50	*CP L-2211 Method A
Ductility, 4°C (5 cm/min.), cm minimum	-	-	-	20***	-	-	T 51
PAV Residue Properties, Aging Temperature 100°C							PP 1
Dynamic Shear, Temp. °C, where G*•/Sin δ @ 10 rad/s ≥ 5000 kPa	19	16	25	22	25	28	TP 5
Creep Stiffness, @60 s, Test Temperature in °C	-18	-24	-12	-18	-18	-18	
S, maximum, Mpa	300	300	300	300	300	300	TP 1
m-value, minimum	0.300	0.300	0.300	0.300	0.30 0	0.30 0	TP 1
**Direct Tension, Temperature in °C, @ 1 mm/min., where failure strain $\geq$ 1.0%	-18	-24	-12	-18	-18	-18	TP 3

Table 23-3SuperPave Performance Graded Binders

\* Colorado Procedure.

\*\* Direct tension measurements are required when needed to show conformance to AASHTO MP 1.

\*\*\* If the PG 64-28 RTFO residue fails the ductility test, the binder will be accepted if the TFO residue (AASHTO T 179) has a ductility of 25 cm or more.

#### 23.7 MISCELLANEOUS

### 23.7.1 Bituminous Pavement Inspection for Repairs or Replacement

- A. Surface Tolerance. Refer to Section 23.6.4 D.1.
- B. <u>Thickness Tolerance</u>. Refer to Section 23.6.4 D.2.

#### C. <u>Rim Tolerance</u>.

All manholes, water valves, range boxes, etc., shall be 1/4 inch to 5/8 inch below the final paved grade.

D. Cracks.

Individual and nondeflecting cracks in the asphalt shall, at the discretion of the Local Entity Engineer, be sealed with rubberized asphalt sealant approved by the Local Entity Engineer, to include cracks or open sawed joints at patch areas.

# E. <u>Additional Requirements for Repairs (Patching)</u>. Refer to Chapter 25, Reconstruction and Repair.

#### 23.7.2 Manhole Frames and Valve Boxes

To provide proper protection to the public, manhole frames and covers and valve boxes shall be accessible no later than 24 hours after they have been buried by the work in progress. Prior to placement of the final lift of pavement, manhole frames and covers and valve boxes and all other similar devices that must be accessed from the surface should be raised to final grade. After final adjustment, the Developer shall notify the Local Entity Engineer who shall make an inspection to check for grouting of the manhole frame, cleanliness and proper alignment, elevation and slope of the grade ring. All valve boxes shall be inspected by applying a valve key to each operating nut to assure an acceptable alignment.

After inspection and acceptance by the Local Entity Engineer of the manhole frames and covers and valve boxes, the Developer shall proceed with the final wearing surface.

All materials necessary for adjusting manholes or valve boxes as required by resurfacing must be on hand at the job site prior to placement of any asphalt or concrete pavement.

#### A. Adjustment for Asphalt Pavements.

If manhole frames and covers and valve boxes are adjusted to final grade between any two lifts of bituminous pavement or within 24 hours following placement of the placement of the final wearing surface as provided for above, complete the adjustment in accordance with requirements in **Chapter 25, Section 25.5.6J**.

#### **B.** Adjustment for Concrete Pavement.

After placement of the concrete and jointing has begun, a transverse joint will be placed at each manhole frame and at each water valve box. In the event that a manhole frame or water valve box should be covered up during construction, the Developer will be responsible for raising the manhole frame or water valve box up through the concrete. This work will take place no later than 24 hours after completion of the work. The adjustment shall be made in accordance with requirements in **Chapter 25, Section 25.5.5F**.

# 23.7.3 Traffic Signs, Striping, and Signals

#### A. Materials.

All materials shall be tested and sampled according to CDOT Specifications Sections 708.09 and 713.09.

# **B.** Installation/Application.

The Local Entity Engineer shall verify that traffic control devices are installed or applied at appropriate locations as shown on the approved signing and striping plans.

All striping layouts will be reviewed by the Local Entity Engineer prior to any installation of paint or markings. The Local Entity requires a 48-hour notice before any application for inspection or approval.

The Local Entity Engineer shall approve tabs and markings prior to permanent installation of striping and symbols.

# 23.7.4 Streetscape in Fort Collins (City Limits Only)

See Appendix "C" – City of Fort Collins Streetscape Design Standards and Guidelines.

# 23.8 INSPECTION FEES

# 23.8.1 Fees for Inspection by Local Entity's Staff

The inspection shall be performed by the Local Entity's staff. The fees for inspection shall be in accordance with current fees adopted by the Local Entity and shown in **Appendix "B"**.

# 23.8.2 Payment of Fees by Developer

The Developer is required to fund all costs associated with the inspection. In Loveland (city limits only), the inspection fees are paid in arrears by the builder at the time a building permit is issued. In Fort Collins (GMA and city limits) and Loveland (GMA only), the Developer pays all inspection fees in full prior to issuance of the Development Construction Permit.

# 23.9 STOP WORK ORDER

The Inspector is authorized to issue Stop Work Orders, as described in **Chapter 6**, **Permits**. In Fort Collins (city limits only) Construction Inspectors are authorized to issue

a municipal court summons for refusal by the Developer or any person who refuses to stop work.

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# CHAPTER 24 – ACCEPTANCE/WARRANTY PROCEDURES AND RECORD DRAWINGS

#### 24.1 GENERAL

This chapter defines the requirements for approval and acceptance of the Public Improvements performed within the rights-of-way and easements. This chapter also covers warranty and record plan requirements.

#### 24.1.1 Developer's Process

The Developer shall be required to meet the following process prior to the acceptance of the public improvements and maintenance:

#### A. Completion of Work.

Completion of all Public Improvements required in the Public Improvement Construction Plans (Plans) and Agreements in accordance with these Standards.

#### **B.** Notification.

Developer notifies the Local Entity of the completion of the Project Completion.

#### C. Inspection.

Local Entity inspects the Public Improvements for compliance to the Plans, Standards, Specifications, and Agreements and develops a deficiency list.

#### **D.** Correction of Deficiencies.

Developer shall correct deficiencies.

#### E. Submittal of Record Plans.

Developer submits signed and sealed Record Plans in accordance with the description in **24.5**. Both hard copy and electronic files are required in Loveland (city limits only).

#### F. Initial Acceptance.

After receipt of a written request from the Developer, the Local Entity shall inspect the corrections. Upon satisfactory completion and posting of warranty surety by the developer, Initial Acceptance shall be granted.

#### G. Start of Warranty Period.

Upon Initial Acceptance, the Warranty Period shall commence.

#### H. Inspection Before the End of Warranty Period.

After the Developer has submitted a written request for final acceptance, and no more than forty-five days prior to the completion of the Warranty Period, the Local Entity Engineer shall inspect all Public Improvements for defects in workmanship or material. A deficiency list shall be developed and provided to the Developer. Normal wear and tear shall not be considered a deficiency.

#### I. Written Notification of Release.

Once the Developer has satisfactorily completed all repairs or replacements, a written notification from the Local Entity shall release the Developer of all future repairs for the Public Improvements.

### J. Release of Surety.

The Warranty Surety is released.

# 24.2 INITIAL ACCEPTANCE

# 24.2.1 Recommendation for Initial Acceptance

The Local Entity Inspector shall recommend granting or denial of Initial Acceptance based on re-inspection for compliance with the written deficiency list, which was previously provided to the Developer. If new deficiencies are found, either in quality or extent of construction, the Developer shall be notified in writing that these new deficiencies shall be corrected as a condition of Final Acceptance. Initial Acceptance will not be delayed by discovery of new deficiencies.

# 24.2.2 Initial Acceptance Letter

The Local Entity shall issue written notice either granting or withholding Initial Acceptance within ten working days of the acceptance re-inspection. The Initial Acceptance letter shall specify the date on which the Developer is eligible to request Final Acceptance.

# 24.2.3 Submittal of Record Plans

Prior to issuance of the Initial Acceptance, Record Plans shall be completed, stamped, and signed by the Engineer of Record and submitted to the Local Entity. The Record Plans shall be submitted in paper and electronic form (as specified by the Local Entity Engineer). Refer to **Section 24.5** for Record Drawing requirements.

# 24.2.4 Adjustment of Collateral

Upon written notification of Initial Acceptance, the collateral for Transportation Public Improvements may be reduced to the percentage required by each Local Entity of the total required collateral for the project as defined in **Chapter 6, Permits**. The reduction of collateral may be adjusted if deemed appropriate by the Local Entity.

# 24.3 WARRANTY PERIOD

# 24.3.1 Definition of the Warranty Period

The Warranty Period for all Public Improvements shall be two years. The Warranty Period shall start the date that Initial Acceptance occurs. The Warranty Period shall end with the Final Acceptance of the Public Improvements. If deficiencies are noted during the Local Entity's warranty inspection, the Developer shall repair the deficiencies. If approved by the Local Entity, the deficiencies may remain in place and the Warranty Period for the defective public improvements may be extended up to three additional years. Repair or acceptance of the deficiencies shall occur at the expiration of any such extension. A new warranty period shall not be applied to any repair work performed during the warranty period.

# 24.3.2 The Warranty Surety

A Warranty Surety shall be required for the entire Warranty Period. The Warranty Surety shall be in the form of a letter of credit, bond, escrowed funds, or cash deposit in accordance with the Local Entity's approved format. The Surety shall be in the amount of 15% of the total value of the public improvements for the project. In Fort Collins (city limits only) the amount shall be determined by the Local Entity Engineer and shall not exceed 25% of the total value of the public improvements for the project.

In addition the amount of Warranty Surety may be increased to the amount equal to 150 percent of the cost of any defective public improvements allowed to remain in place during the warranty period.

# 24.3.3 Time Frames for Completing Repair

At any time before the completion of the Warranty Period, the Local Entity may notify the Developer of needed repairs. If repair areas are considered to be an imminent danger to the public health, safety, and welfare, the Contractor shall act within 24 hours to complete the repair. If the work is not considered a safety issue, the Developer has 10 working days to schedule the work, and 60 calendar days to complete the work. Extensions of time may be considered when necessary due to weather constraints.

# 24.3.4 Failure to Complete Repair

If the Developer has not completed the warranty repairs in the time frame specified, the Local Entity may choose to effect the necessary repairs. The Local Entity will either invoice the Developer for all costs for the related work plus a \$500.00 administrative fee or it will collect from the surety.

# 24.3.5 Responsibility for Maintenance

The Developer is responsible for maintaining all public improvements, including sweeping, throughout the Warranty Period.

### 24.4 FINAL ACCEPTANCE

#### 24.4.1 Request for Final Inspection

During the Warranty Period, the Developer shall guarantee the work to be free of any damage or defects in workmanship and material. Within 45 days of the end of the Warranty Period, the Developer shall request a final inspection and acceptance, in writing, to the Local Entity Inspector.

#### 24.4.2 Preparation for Inspection

The Developer is responsible for sweeping and cleaning public improvements for inspection. If the Developer does not provide a clean site, including having curb flowlines clear of debris and dirt, then the inspection may be postponed until the site is sufficiently clean.

### 24.4.3 Inspection and Punchlist

The Local Entity Engineer shall inspect all Public Improvements related to the Project. If applicable, a written final punchlist shall be compiled listing any necessary repair or replacement of materials or workmanship. The punchlist shall be sent to the Developer.

# 24.4.4 Damage Caused by Local Entity Crews

If the Developer can demonstrate that the Local Entity maintenance crews (e.g., snow plows) caused damage to certain improvements, the Developer will not be held responsible for the replacement.

#### 24.4.5 Re-Inspection

If repair or replacement of Public Improvements is required, the Developer shall complete repair or replacement within thirty calendar days of receipt of the final punchlist, unless otherwise agreed upon. Upon completion, the Developer shall contact the Local Entity Engineer for a re-inspection.

# 24.4.6 Release from Responsibility

Once all repairs or replacements are satisfactorily completed, the Developer shall received written notice from the Local Entity that all Public Improvements are complete and the Local Entity releases the Developer from responsibility for all future maintenance and repairs for the Public Improvements on this project.

# 24.4.7 Release of Warranty Surety

Upon the satisfactory completion of the punchlist and the receipt and approval of the Record Plans, the Local Entity will release the Warranty surety.

## 24.4.8 Failure to Complete Repair

If the punchlist is not completed within the thirty days, the Local Entity may withhold current plan reviews, additional permits, or start procedures to call the surety.

# 24.5 RECORD PLANS

### 24.5.1 Updating Plans with Design Changes

The Public Improvement Construction Plans shall be updated with all design changes that occurred after plan approval. Record storm drainage drawings shall document the size and invert elevation of all pipes (including pipe class), inlets, riprap, headwalls, detention pond volumes, swale cross-sections and all other storm drainage infrastructure shown on the construction plans, including those improvements located in areas outside of the public right-of- way if appropriate. Record drawings shall also show all pipe and/or drainageway/swale grade percentages.

Street construction record drawings shall identify the actual pavement type and grade or mix type used; if the subgrade was treated; and document all changes to widths and lengths for streets, sidewalks, curbs and crosspans. Record drawings shall identify all signage, striping and traffic signal controller locations as actually placed in the project.

Record drawings shall verify other information as specifically requested by the Local Entity Engineer.

#### 24.5.2 Minor Design Changes

Minor changes are not required to be included on the Record Plans. Minor changes include incorrect references and grade changes less than 0.1 foot.

#### 24.5.3 Submittal of Plans

A Colorado Professional Engineer shall update and stamp the Public Improvement Construction Plans. A Colorado Professional Engineer shall submit the plans to the Local Entity and receive approval prior to the release of the Warranty surety.

#### 24.5.4 Form of Submittal

All Record Plans shall be submitted in the following formats as required by the Local Entity Engineer:

- Electronic whenever required by the Local Entity Engineer.
- Paper for Larimer County GMA projects, and/or
- Mylar For Loveland (city limits only) and Fort Collins (city limits only) projects.

# 24.5.5 Bridge/Culvert Load Rating

A bridge/culvert inspection report certifying load rating in accordance with CDOT standards shall be submitted with the plans

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# **CHAPTER 25 – RECONSTRUCTION AND REPAIR**

## 25.1 GENERAL

This chapter addresses reconstruction and repair of improvements within the public right-of-way and public easements.

## 25.1.1 Condition of Repair

All infrastructure elements that undergo reconstruction and repair shall be restored to a condition equal to, or better than, the condition prior to repairs.

#### 25.1.2 Testing and Inspection

Street inspection and testing for all reconstruction and repair shall be performed according to **Chapter 23**, **Street Inspection and Testing Procedures**, unless otherwise identified in this chapter.

## 25.1.3 Completion Time for Work

Refer to Chapter 6, Permits.

## 25.1.4 Unsatisfactory Work

Removal and replacement of unsatisfactory work shall be completed within 15 days of written notification from the Local Entity Engineer of the deficiency unless the condition is deemed an emergency requiring immediate correction. In the event the replacement work is not completed within the specified time period, the Local Entity Engineer may take action to complete the work and charge the Developer for all related costs.

#### 25.1.5 Guarantee

All work shall be warranted according to Chapter 24, Acceptance Procedures and Record Drawings/Warranty.

## 25.1.6 Verification of Existing Utilities

#### A. Responsibility

The Developer is responsible for field locating and verifying elevations of all existing sewer mains, water mains, curbs, gutters, and other utilities at the points of connection shown on the plans, and at utility crossings prior to any reconstruction or repair.

#### **B.** Design Modifications

If a conflict exists and/or a design modification is required, the Developer shall have the Designer revise the plans. The revised plans shall be reviewed and approved by the Local Entity Engineer prior to their implementation.

## 25.1.7 Permit Requirements

Refer to Chapter 6, Permits, for all permit requirements.

## 25.1.8 Traffic Accommodations

Timing of reconstruction and repair work may be restricted by the Local Entity Engineer to certain time periods to accommodate traffic and other public uses. The Developer shall make adequate provisions to assure that traffic and adjacent property owners experience a minimum of inconvenience.

No bridges, culverts, and other drainage structures in use by traffic shall be removed until arrangements have been made to accommodate traffic and an approved permit has been issued by the Local Entity Engineer.

## 25.1.9 Protection of Existing Improvements

#### A. Surface Improvements

The Developer shall at all times take proper precautions and be responsible for the protection of existing street and alley surfaces, driveway culverts, street intersection culverts or aprons, irrigation systems, mail boxes, driveway approaches, curb, gutter and sidewalks and all other identifiable installations that may be encountered during construction. Existing improvements to adjacent property such as landscaping, fencing, utility services, driveway surfaces, etc., that are not to be removed, shall be protected from injury or damage resulting from the Developer's operations.

#### **B.** Locates

The Developer shall at all times take proper precautions for the protection of existing utilities, the presence of which are known or can be determined by field locations of the utility companies. The Developer shall contact the UNCC (One Call) at 1-800-922-1987 for utility locates, a minimum of two (2) working days prior to his proposed start of work. Other unregistered utility entities (e.g. ditch company) are to be contacted individually to arrange locating their utilities. Utility service laterals shall be located prior to beginning excavation or grading.

#### C. Survey Markers

The Developer shall at all times take proper precautions for the protection of property pins/corners and survey control monuments encountered during construction. Any damaged or disturbed survey markers shall be replaced by a registered land surveyor at the Developer's expense.

#### D. Repair and Responsibility

The repair of any damaged improvements as described above shall be the responsibility of the Developer.

## 25.1.10 Equipment

## A. Trenching Equipment

The use of trench digging equipment will be permitted in places where its operation will not cause damage to existing structures or features, in which case hand methods shall be employed.

## **B.** Tracked Vehicles

No tracked vehicles shall be permitted on streets unless approved by the Local Entity Engineer. When tracked vehicles are allowed, damaged facilities will be restored to original condition at the Developer's expense.

#### C. Haul Routes

Haul routes for equipment and materials may be restricted as a condition of the Permit.

## 25.2 UTILITY EXCAVATION

## 25.2.1 Protection of Existing Underground Utilities

## A. Types of Utility Excavation

The construction of any repair activity within the street or alley rights-of-way shall be accomplished by open cut, jacking, boring, or a combination of these methods, as approved by the permit. <u>The Local Entity Engineer must approve any change from the approved permit</u>. Crossings under sidewalks or curbs may be made by tunneling only when approved by the Local Entity Engineer.

#### **B.** Location of Underground Structures

The Developer shall proceed with caution in the excavation of the trench, so that the exact location of underground structures, both known and unknown, may be determined. The Developer shall locate all existing underground utilities, by non-destructive means, before trench excavation. Excavation and visual verification of the utility location shall be performed by the Developer when required by the Local Entity Engineer or the utility owner.

#### C. Open Trenches

Once trenches are excavated, the Developer shall proceed diligently towards completion of the work and completion of the backfill. The Local Entity Engineer reserves the right to limit the length of open trench. Failure by the Developer to comply with these requirements may result in an order to stop the excavation in progress until compliance has been achieved.

## D. <u>Stockpiling.</u> See the requirements of Section 25.2.3 D.

## 25.2.2 Relocation of Utilities

Relocation of utilities in an existing public right-of-way or public easement shall be done at the expense of the utility involved or the Developer.

#### 25.2.3 Removal of Pavement

#### A. Open Pavement Cuts

Open pavement cuts shall not be permitted on any street unless approved in writing by the Local Entity Local Entity Engineer Local Entity Engineer.

#### **B.** Placement of Pavement Cuts

The pavement cut shall follow a line parallel to the roadway centerline and at least 2 feet beyond the trench side wall. All pavement cuts parallel to the direction of travel shall be placed on the lane line or at the center of the aligned travel lane. For bicycle lanes, the cut shall be at the line or the edge of the gutter. Longitudinal joints are not allowed in the wheel path.

#### C. Repair of Damage Beyond Original Cut

If pavement adjoining the original pavement cut is damaged during construction, additional pavement shall be removed and repaired after trench backfilling. The additional pavement shall be removed with cuts, with the original cuts. The additional pavement damaged by the Developer shall be repaired at the Developer's expense.

#### D. Stockpiling and Disposal of Excavated Paving

All excavated pavement material and concrete may be used as fill if the material meets requirements for borrow material. If the material is unacceptable, it shall be stockpiled separately and disposed of by the Developer off site at his expense and shall not be used as trench backfill material.

#### E. Excavation Near Failed Pavement

When the proposed excavation falls within 3 feet of a section of failed pavement, the failed area shall be removed up to sound pavement and patched. Scarring, gouging, or other damaged pavement adjacent to a patch shall be removed and the pavement repaired.

## 25.2.4 Backfilling of Potholes and Trenches

Flowable fill shall be required in all voids and openings created by jetting, pumping, and pneumatic removal of the soil and where compaction equipment is unsuitable. Refer to **Chapter 22, Materials and Construction Specifications,** for criteria on flowable backfill.

## 25.2.5 Installing Dry Utilities Under Existing Pavement

## A. Use of PVC Sleeving

The use of existing sleeves for method of installation shall be the first priority when installing utilities under existing sidewalks, curbs and pavement. Tunneling is discouraged in major intersections and will not be allowed if existing PVC conduits are available.

## **B.** Location of PVC Sleeves

The location of PVC sleeves will be marked on the curb according to Standard Detail 12-3 and used on a first come, first serve basis. Ducts installed by, or for, the Local Entity Electric Utility, are reserved for Local Entity Electric Utility use only and are not available for use by other utility providers.

## C. Boring and Casing

Utility crossings under sidewalks, curbs and pavement may be made by boring and casing and then installing the utility. However, boring and casing will not be allowed if existing PVC conduits are available. Boring for utilities shall be permitted if approved by the Local Entity Engineer.

- 1. Boring and Casing Materials
  - a. <u>Casing Pipe</u>. The casing pipe shall be fabricated steel having a minimum yield strength of 35,000 psi. The size and wall thickness shall be shown below or as otherwise noted on the drawing.

Casing Diameter	Minimum Thickness
42" and larger	5/8 inch
36" and smaller	3/8 inch

- b. Casing placed by boring may be bare steel pipe unless otherwise noted on the plans.
- c. <u>Carrier Pipe</u>. The carrier pipe shall be approved PVC pipe, reinforced concrete pipe, vitrified clay pipe or other materials approved by the Local Entity Engineer.
- 2. Boring and Casing Installation
  - a. <u>Placement of Casing by Boring</u>. Casing shall be kept on line and grade as required by the approved plans. Joints in casing shall be field welded and watertight. Welds shall be of a size to develop the full strength of the pipe materials. After welding, the joints of coated and wrapped pipe shall be primed and tarred.
  - b. <u>Placement of Carrier Pipe</u>. Upon completion of the casing installation, the utility pipe shall be installed in the casing pipe at the designed grade. The utility pipe shall be installed by pushing the pipe into the casing on "skids"

and subsequently supporting the pipe by placing a sand bed under the pipe and around the "skids."

- c. The voids between the carrier pipe and the casing shall be completely filled with flowable fill. Refer to **Bedding and Backfill in Chapter 22, Materials and Construction Specifications.**
- 3. Repair of Bore Holes
  - a. <u>Less than 6 Inches</u>. For openings less than or equal to 6 inches in diameter, bore holes in asphalt pavement shall be filled with patching material (cold mix is not acceptable) to prevent entry of moisture. Patching material used shall be in all cases compatible with the existing surface. Subgrade shall be replaced with flowable fill and mechanically vibrated to provide necessary support to the surface. Bore holes in concrete pavement and structures shall be repaired in accordance with **Chapter 22**, **Materials and Construction Specifications**. The sealing of bore holes is the responsibility of the Developer.
  - b. <u>Greater than 6 inches</u>. For openings greater than 6 inches in diameter, the limits of repair shall be identified in the field.
  - c. <u>Finished Condition</u>. The completed job shall be flush with the surrounding pavement and have no indentations, pockets, or recesses that may trap and hold water.

## D. Open Cut

In the event that the use of existing sleeves or boring and casing is not an option, an open cut may be made and repaired with flowable fill done in accordance with Chapter 22, Construction Specifications.

## E. Gas Lines

The installation of gas lines will not require the use of the existing PVC conduits.

## 25.3 STRUCTURES

## 25.3.1 Removal of Structures

When it is necessary to remove structures or portions of structures, care shall be taken to protect surrounding improvements.

#### A. General

- 1. <u>Preparation for Construction</u>. Where portions of structures are to be removed, remaining portions shall be prepared to fit construction. The work shall be done in accordance with plan details.
- 2. <u>Partial Abandonment</u>. Portions of structures may remain in place when approved by the Local Entity Engineer.

- 3. <u>Damage to Structure</u>. All damage to structures remaining in place shall be repaired by, and at the expense of, the Developer.
- 4. <u>Cleaning and Preparing Structures</u>. Reinforcing steel projecting from the remaining structure shall be cleaned and aligned to join with the new construction. Dowels required by plans shall be secure within drilled holes, with an approved grout.

#### **B.** Bridges, Culverts, and Drainage Structures

- 1. <u>Removing Substructures</u>. The substructures of existing structures shall be removed according to **CDOT Specifications Section 202.08**. Steel, pre-cast concrete, and wood bridges as specified shall be carefully dismantled without unnecessary damage.
- 2. <u>Removal of Pipe</u>. All pipe designated for removal and reuse within the project shall be carefully removed, cleaned, and care taken to prevent damage to the pipe.
- 3. <u>Bypass Service for Sewers</u>. In removing manholes, catch basins, and inlets, any active drainage or sanitary sewers shall be properly bypassed in order to maintain service during the repair operation.

#### 25.3.2 Construction Requirements

All repairs and reconstruction of structures shall be evaluated and designed according to **Chapter 22, Construction Specifications**.

## 25.4 NON-STRUCTURAL CONCRETE

#### 25.4.1 Removal of Concrete Curb, Gutter, Sidewalk, and Driveways

#### A. Saw Cut Edges

Concrete shall be removed to edges that are neatly sawed to a minimum of one-half the concrete thickness. Sidewalks and driveways shall be saw cut in straight lines either parallel to the curb or perpendicular to the alignment of the sidewalk or curb.

#### **B.** Minimum Replacement Dimensions

No concrete section to be replaced shall be less than 5 feet in either width or length for a driveway or crosspan, and 5 feet in length, for sidewalk, curb, and gutter.

#### C. Joints

If a proposed saw cut in the driveway falls within 5 feet of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge.

#### D. Fort Collins (GMA and city limits) Specifications

Sidewalk shall be removed joint to joint in Fort Collins (GMA and city limits).

## 25.4.2 Widening Existing Sidewalks

When existing walks are widened (a minimum width of 4.0 feet), they shall be edge thickened in accordance with **Construction Drawing 2501**.

# 25.4.3 Reconstruction or Repair of Apron, Radius, Ramp Area, or Pedestrian Crossing

Whenever construction, alteration, or repair to an existing street affects any part of the apron, radius, ramp area, or pedestrian crossing area, the entire apron, radius, ramp area, or pedestrian crossing area shall be removed and replaced with a pedestrian ramp. Work shall be done in accordance with these standards and as required by the Americans With Disabilities Act Guidelines, Section 14, Public Rights of Way, as amended. Refer to Chapter 16, Pedestrian Facilities, for design.

#### 25.5 PAVEMENT

All street cuts shall be patched in accordance with the requirements of Section 25.7.

## 25.5.1 Temporary Patch

#### A. When to Use Temporary Patch

All trenches across traffic lanes, where it becomes necessary to remove any existing surfacing or pavement, shall be provided with temporary trench cover if the pavement is not replaced within the same day.

#### **B.** Street Closure Period

Trenches cut across traffic lanes that cannot be permanently patched within the approved time period shall be patched with a temporary material approved by the Local Entity Engineer.

#### C. Placing and Maintenance

Refer to Section 25.5.6 D for placing and maintenance requirements.

#### **D.** Specifications for Asphalt

Minimum requirements for temporary patching material shall be well-compacted surfacing material conforming to "Road Mixed Asphalt Surfacing Material" of the CDOT Standard Specifications. Patching material shall match flush with the existing pavement surface and shall not be less than 4 inches thick. The mineral aggregate shall conform to the grading specified for 3/8 inch maximum aggregate  $\pm 5$  percent. Asphalt binder to be mixed with the mineral aggregate shall be liquid asphalt, Grade MC-3000, and shall be an amount between 5.5 percent and 6 percent by weight of the dry mineral aggregate.

#### E. Stockpiling

Temporary patching material may be stockpiled on the job site.

#### F. Time Requirements

Temporary patching material shall be placed in the time frame required by the permit.

#### G. Open to Traffic

Trenches patched with temporary patching material may be opened to traffic immediately following completion.

#### H. Surface

The surface of the temporary patch shall provide a smooth driving surface.

#### I. Using Steel Plates

Steel plates, with appropriate strength, may also be used for overnight temporary trench cover. The steel plates shall be placed such that traffic will not cause them to move.

## 25.5.2 Permanent Patch

#### A. Patch Geometry

Existing pavements should be removed to clean, straight lines parallel or perpendicular to the flow of traffic. Patches shall not be constructed with angled sides or irregular shaped edges.

#### **B.** No Patches within Existing Patches

Patches within existing patches are to be avoided. Where this cannot be avoided, boundaries of the new patch shall match the existing patch.

#### C. Separation

Strips of pavement greater than 6 feet in width from the edge of the new patch to the edge of an existing patch or the lip of the gutter may remain.

#### **D.** Series of Patches

Where three or more pavement cuts are proposed within a 75-foot-long roadway section, the pavement between the patches shall be milled and inlaid with new pavement over the entire work area. In cases where the existing pavement is in poor condition and may require overlay within the next few years, this requirement may be modified or waived by the Local Entity Engineer. A series of patches may also be repaired with an overlay. Refer to **Section 25.5.6 G**.

#### E. Patch Widths

Trenches shall be patched for the entire lane width for a distance of 2-foot minimum on all sides of the trench. Transverse patch lengths shall extend across the full width of the travel lane. Minimum width for transverse patches shall be as listed in the Minimum Patch Requirements table below.

#### F. Longitudinal Patches

Longitudinal Patches on Major Collector and Arterial Roadways. Edges of patches shall not fall in existing wheel paths. The edges of patches parallel to the direction of traffic shall be limited to the boundaries of lanes or to the centerline of travel lanes.

#### G. Transitions

Patches should have a smooth longitudinal grade consistent with the existing roadway. Patches should also have a cross slope or cross section consistent with the design of the existing roadway.

#### H. Older Pavement

In the case of older pavement where the likelihood of cracking and potholes next to the patch is greater, extend the "shoulders" of the pavement beyond the 2-foot minimum, and reinforce this area with a geotextile fabric. "T" cutting is required for all repairs in accordance with **Section 25.7.5 A.4**.

#### I. Width Consistency

The width of patches shall be consistent to simplify future maintenance.

#### J. Patch Thickness

The thickness of asphalt patches in asphalt streets shall typically be the thickness of the existing asphalt plus one (1) inch with the minimums listed in **Table 25-1**, or as specified by the Local Entity Engineer.

Minimum Aspha (for full depth pay	Minimum Widths (Transverse Patches)	
Residential – 6 inches	2" grading S on 4" grading SG	Residential – 5 feet
Collector – 8 inches	2" grading S on 6" grading SG	Collector – 8 feet
Arterial – 10 inches	3" grading S on 7" grading SG	Arterial – 10 feet

Table 25-1Minimum Patch Requirements

#### 25.5.3 Pavement Evaluation

In most cases, and particularly in the cases of extensive excavation and repairs, it is desirable to survey the existing pavement condition with the Local Entity Engineer prior to the work. After completion of the work, the pavement condition again shall be surveyed to verify that the pavement condition has been maintained or improved.

#### A. Minor Repairs

In the case of minor repairs, pavement surveys can be made by visual observation.

#### **B.** Major Repairs

In the case of major projects that involve excessive haul of materials or unusually heavy construction equipment or activity, nondestructive testing of the pavement condition before and after construction may be required.

## 25.5.4 Base Course

If the existing base course is untreated, it shall normally be replaced with CDOT Class 5 or 6 aggregate base course material and compacted in layers not to exceed 6 inches thick. The resulting total compacted base thickness shall be the thickness of the removed base plus 2 inches. Asphalt pavement may be used in lieu of aggregate base course in trench patches. If this option is used, the total pavement patch thickness shall match the minimum thickness for full depth pavement specified in **Section 25.6.1**, A-10 above.

## 25.5.5 Portland Cement Concrete Pavement

#### A. Removal of Concrete Pavement, Crosspans, and Alley Intersections

- 1. <u>Concrete Cutting</u>. Concrete that is to remain shall be cut in a straight, true line with a vertical face, unless otherwise specified. Concrete shall be cut with a saw in accordance with **CDOT Specifications Section 202.02**. Concrete that must be dowelled shall be sawed to the full depth of the concrete.
- 2. <u>Depth</u>. Concrete pavement shall be removed to full depth.
- 3. <u>Removal at Joints</u>. If the removed portion falls within 3 feet of a construction joint, cold joint, expansion joint, or edge, the concrete shall be removed to the joint or edge.
- 4. <u>Responsibility for Over-Break</u>. The Developer shall be responsible for the cost of removal and replacement of all over-breaks.
- 5. <u>Determining Limits of Removal</u>. In the case of damaged concrete, the limits of removal should be identified in the field by a representative of the Local Entity Engineer.

#### **B.** Concrete Surfacing and Patching

- 1. <u>Strength and Thickness of Concrete</u>. The concrete pavement shall be replaced with 4,000 psi concrete to match the finish and thickness of the existing pavement, but not less than 8 inches thick. Mix design must meet the requirements of **Chapter 22**, **Materials and Construction Specifications**.
- 2. <u>Curing</u>. Concrete shall be coated and sealed with a uniform application of membrane curing compound applied in accordance with manufacturer's recommendations. Refer to Chapter 22, Materials and Constructions Specifications, for additional curing information.
- 3. <u>Quick Curing Concrete</u>. The use of quick curing concrete (3000 psi strength within 48 hours) shall be used on all Arterial and Collector streets when repair

areas are less than 500 square feet or when temperatures are below 40° F. Quick curing concrete repairs may be opened to traffic within 2 days or when the concrete has achieved a minimum strength equaling 80 percent of the 28-day design strength. Concrete cylinders shall be taken and broken according to **Chapter 23, Street Inspection and Testing Procedures**. The mix design shall be designed in accordance with CDOT specifications.

4. <u>Extending the Repair to Adjacent Damage</u>. Where existing cracks or damage are adjacent to the area being repaired, the repair area shall include the cracked or damaged concrete. Pavement repairs shall include all areas of damage, including leak test holes, potholes, equipment, and/or material scarring of the existing surface.

## C. Opening to Traffic

Refer to Chapter 22, Construction Specifications.

#### D. Connection Between Existing and New Pavements (Joints)

- 1. <u>Grade Change</u>. Where new construction abuts existing pavement, the work shall be accomplished so that no abrupt change in grade between the old and new work results.
- 2. <u>Concrete Joint Filling</u>. Expansion joint material shall be installed between new structure slabs and existing structure slabs. Joints shall be thoroughly cleaned of all foreign material, and then filled with a hot-poured elastic type joint filler conforming to M 173, ASTM D1190-80, or ASTM D1751-83, D1752-84, D3405-78, D3406-78, D3407-78. Silicone sealants or other materials may be approved by the Local Entity Engineer. Joint material shall be filled to within 1/2 inch of the surface. Excess material shall be scraped off to provide a smooth riding surface.
- 3. <u>Edge Treatment</u>. When repairing concrete, the removal perimeter shall be saw cut full depth of the concrete, and dowels inserted into the existing concrete as directed by the Local Entity Engineer.

#### E. Reconstruction of Concrete

When pavement has been identified to require reconstruction, the pavement shall be removed and replaced in sections from joint to joint. Replaced sections may require doweling connections. Refer to **CDOT M-Standards** for details.

#### F. Manhole Frames and Valve Box Adjustments

Manhole frames, covers, and valve boxes shall be adjusted using the following criteria: The concrete edges will be a full depth saw cut and be a minimum of 1.0 foot from the manhole frame or water valve box. After removal of the old concrete, the existing slab will be drilled 8 inches deep and a 16 inch long #4 bar will be placed at 12 inches on center. Concrete pavement shall be replaced to the existing depth or a minimum of 6 inches, whichever is greater, with a minimum mix design of 6 sacks of cement and a minimum 28-day compressive strength of 4200 psi. The concrete shall

be protected from weather and rapid loss of moisture. Concrete shall be protected from vehicular traffic for a period not less than 7 days (three days with High/Early Concrete). Compressive strength of concrete shall reach 3000 psi prior to any traffic loading. Concrete patches shall be a minimum of 9 square feet. The same process of notification, inspection, and acceptance as outlined above shall apply to this method and shall occur prior to the application of the final wearing surface around these appurtenances.

## 25.5.6 Asphalt Pavement

#### A. Removal of Asphalt Pavement

- 1. <u>Edges</u>. Pavement designated for removal shall be cut vertically with square edges such that each edge of the finished patch will be parallel or at right angles to the direction of traffic. The edge for removal will be in a straight line set by a string line, chalk line, or other means to ensure a straight removal line.
- 2. <u>Scoring Edge of Removal Area</u>. Marking or scoring the asphalt pavement shall be done in such a way that damage to the adjoining mat is minimized. Use of a power cut-off saw is an approved method of scoring or precutting the perimeter of the asphalt removal area.
- 3. <u>Damage Outside Removal Limits</u>. Any overbreak, separation, gouging, or other damage to the existing asphalt mat outside of the designated removal limits shall be repaired at the Developer's expense.

#### B. Materials and Application for Tack Coat, Prime Coat, and Blotter

- 1. <u>Preparing Existing Surface</u>. If needed, this work shall consist of preparing and treating an existing surface with asphalt material, and blotter material if required, in accordance with these specifications and in reasonably close conformity with the lines shown on the approved construction plans.
- New and Existing Pavement Interface. This work shall be done prior to placing new pavement on top of existing pavement. Also, when new pavement is to abut existing pavement, the Developer shall cut the old pavement according to Section 25.5.6 A and as directed by the Local Entity Engineer. The Developer shall also paint the edge of the existing pavement with a tack coat. In this case, after placing the new asphalt, all seams (joints) between the new and existing pavements shall be sealed with an asphalt tack coat or rubberized asphalt sealant.
- 3. Materials.
  - a. <u>Tack Coat and Prime Coat</u>. The type and grade of asphalt material to be used for the tack and/or prime coats shall be as specified in the Pavement Design Report referenced in **Chapter 10**, **Pavement Design and Report**. This material shall meet all of the requirements of **CDOT Specifications Sections 407.02**, **407.03**, and **702**.

b. <u>Blotter Material</u>. Blotter material, if required, shall meet the gradation requirements shown in **Table 25-2**.

Blotter Material				
Standard Sieve Size	Percent by Weight Passing			
1/2 inch	100			
No. 4	90–100			
No. 16	30–75			
No. 200	0–12			

Table 25-2 Blotter Material

Blotter material shall be used in the amounts necessary to absorb excess asphalt material. Excess blotter material shall be removed prior to the placement of the subsequent courses. Blotter material shall be free from all organic matter, lumps or balls of dirt, and any other foreign matter that could cause adverse effects on the final product.

- c. <u>Paving Fabric</u>. Paving fabric may be used when approved by the Local Entity Engineer. Pavement thickness shall be a minimum of 2 inches over the fabric.
- 4. <u>Construction</u>. Construction will proceed as follows.
  - a. <u>Equipment</u>. The Developer shall provide equipment for heating and applying the asphalt material and for applying blotter material. The equipment shall be capable of applying the materials in a uniform manner for the specified rates of application.
  - b. <u>Weather</u>. Asphalt material shall not be applied when the weather conditions would inhibit the desired function. No asphalt material shall be applied to any surface that is wet, frozen, or in any other condition that the Local Entity Engineer or his authorized representative shall consider unsuitable. In any case, no asphalt material shall be applied when the atmospheric temperature is below 50° F for the top lift. Refer to the **CDOT** book for lowest temperatures (**Section 401**).
  - c. <u>Preparation of Surface</u>. The surface upon which the asphalt tack and/or prime coat is to be placed shall conform to the established lines. Grades shall be smooth and uniform and shall be compacted to the required density. If the required density deteriorates between the time the gravel course was originally compacted and the time the prime coat is placed, for any reason whatsoever, the surface shall be recompacted to the required density at the expense of the Developer.
  - d. Application.
    - 1) <u>General</u>. Asphalt material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. When traffic is maintained, not more than one-half the width of the section shall be treated in one application. Care shall be taken that the application of asphalt material at the junctions of spreads is not used in excess of the

specified amount. Excess asphalt material shall be squeegeed from the surface. Skipped areas or deficiencies shall be corrected.

When traffic is maintained, one-way traffic shall be permitted on the untreated portion of the roadbed. As soon as the asphalt material has been absorbed by the surface and will not pick up, traffic shall be transferred to the treated portion and the remaining width of the section shall be primed.

2) <u>Tack Coat</u>. The tack coat shall be pressure sprayed in the form of a mist onto roadway surfaces at a uniform rate of 0.05 to 0.10 gallon residual asphalt per square yard. Emulsions shall be diluted in the ratio of 3 parts emulsion to 1 part water by volume prior to use.

Tack coat shall be applied sufficiently in advance so that a tacky surface exists at time asphalt surface mix is placed. After tack coat application, it shall be worked into the roadway surface by use of rubber-tired equipment approved by the Local Entity Engineer. Extra tack coat shall not be applied except with the specific approval of the Local Entity Engineer. The time interval between application of the tack coat and placement of the asphalt mix will be regulated by the Local Entity Engineer.

3) <u>Prime Coat</u>. The prime coat shall be pressure sprayed at the rate of 0.2 to 0.5 gallon per square yard. Emulsions shall be diluted as in tack coat above.

Prime coat application shall be made less than 12 hours prior to placing asphalt base course. Application methods and equipment shall be approved in advance by the Local Entity Engineer.

4) <u>Temperatures</u>. The temperature requirements pertaining to the application of liquid asphalts and asphaltic emulsions shall conform to the requirements of **Table 25-3**.

Spraying remperature of Liquid Asphalts					
Grade & Type	Distribution Spraying Temperature				
RC, MC & SC	Minimum		Maximum		
Toss	F°	C°	F°	C°	
70	120	49	180	82	
250	165	74	220	104	
800	200	93	255	124	
3,000	235	113	290	143	

Table 25-3Spraying Temperature of Liquid Asphalts

e. <u>Maintenance of Primed Surface</u>. The primed surface shall be maintained by removing all loose sand prior to placing any pavement or surfacing material thereon. Immediately before placing asphalt concrete or asphalt concrete base, additional prime coat shall be applied as directed to areas where the prime coat has been damaged. Loose or extraneous material shall be removed.

#### C. Minimum Repair of Cracked or Damaged Asphalt

- 1. <u>Cracks</u>. Individual and non-deflecting cracks in the asphalt shall, at the discretion of the Local Entity Engineer, be sealed with rubberized asphalt sealant approved by the Local Entity Engineer.
- 2. <u>Damage</u>. Any damage, even superficial, to the existing asphalt surface shall be repaired at the expense of the Developer, including but not limited to gouges, scrapes, outrigger marks, backhoe bucket marks, etc. A slurry seal type covering will be considered the minimum repair. Patching may be required, at the discretion of the Local Entity Engineer. Refer to **Section 25.5.6 F** for Patching.

#### **D.** Temporary Surfaces

- 1. <u>Temporary Patches</u>. When the final surface is not immediately installed, it shall be necessary to place a temporary asphalt surface on any street cut opening immediately after backfilling. The temporary surface installation and daily maintenance shall be the responsibility of the Developer until the permanent surface is completed and accepted. The temporary surface shall be either a hot mix or cold mix paving material. Temporary surfaces shall be compacted, rolled smooth, and sealed to prevent degradation of the repair and existing structures during the temporary period.
- 2. <u>Backfilling or Covering with Steel Plates</u>. When required by the Local Entity Engineer, trenches within Arterials or Collectors shall be backfilled or covered with steel plates (4 feet x 8 feet, 1-inch thick minimum) at the conclusion of the work done in order to open the roadway to traffic. Asphalt material shall be placed at the edges of the plate to provide a ramp at a minimum 1:12 slope.
- 3. <u>Permanent Patching</u>. Permanent patching shall occur within 2 weeks unless approved in advance by the Local Entity Engineer. The temporary patch shall be removed prior to placement of the permanent patch. Refer to **Section 25.5.6 F** for patching.

#### E. Asphalt Joint Filling

After placing the new asphalt, all seams (joints) between the new and existing pavements shall be sealed with an asphalt tack coat or rubberized asphalt sealant.

#### F. Patching

- 1. Conventional Patch.
  - a. <u>Removal of Asphalt Pavement</u>. Refer to Section 25.5.6 A.
  - b. <u>Tack Coat</u>. For patches in asphalt, a tack coat shall be applied to all edges of the existing asphalt and to the subgrade before placing the new pavement. Refer to **Section 25.5.6 B** for additional information.
  - c. <u>Protection from Solvents and Oils</u>. The Developer shall protect the asphalt (both existing and new) from solvents and oils. Any piece of equipment leaking any fluid shall be removed from the work site immediately and shall

not return to the work site until all leaks are repaired. If any piece of equipment leaks any fluid a second time, it shall be removed from the work site immediately and shall not be allowed on the work site again for the remainder of the project. The Developer shall not use diesel or other solvents to remove or prevent the sticking of asphalt to the wheels of rubber-tired rollers or other equipment used on the asphalt. Remove and replace any asphalt damaged by solvents or oils.

- d. <u>Base Material</u>. Aggregate base course required for any areas that have been opened up during inclement weather (rain/snow) shall be replaced at the expense of the Developer. The Developer shall protect all excavated areas from water infiltration of any type and will be responsible for any dewatering or subgrade stabilization.
- e. Placement of New Asphalt. The materials must conform to requirements of Chapter 22, Materials and Construction Specifications. A mix design may be required. In all cases, the pavement wearing course must match the grading of the surrounding pavement. The asphalt must be placed with a selfpropelled paver if patching widths are greater than 8 feet. For patch widths greater than 4 feet and up to 8 feet, the mixture must be placed with either a self-propelled paver or a box spreader. These machines may be used to patch areas wider than 8 feet with the use of a screed extension that will extend beyond the width of the proposed patch. Patches paved with a self-propelled paver shall conform with the requirements specified in CDOT Specifications Section 401.1. Rollers shall move at a uniform speed with the drive roll or wheels nearest the paver. Steel-wheeled rollers shall operate at a maximum speed of 3 mph. The use of plate type compactors will not be permitted except in areas not accessible to the roller. Areas wider than the machine screed may be patched with a box spreader only if the length of the patch is less than 50 feet. Areas as wide as the street or longer than 50 feet shall be patched with an asphalt lay down machine.

Where irregularities, unavoidable obstacles, or patch widths of less than 4 feet make the use of mechanical spreading and finishing equipment impractical, the mixture shall be spread, raked, and luted by hand tools. For such areas, the mixture shall be dumped, spread, and screeded to give the required compacted thickness. New asphalt shall be added in compacted layers, until the patch thickness meets the requirements of **Section 25.5.2 J**.

2. Cold In-Place Recycling.

Patching may be achieved by cold in-place recycling. This is also used for reconstruction of larger areas of pavement as well.

- 3. Infrared Patch.
  - a. <u>General</u>. Infrared patching may be allowed only where approved by the Local Entity Engineer.
  - b. Preparation of Existing Surface. Refer to Section 25.5.6 H.1.f.

- c. <u>Protection from Solvents and Oil</u>. Refer to Section 25.5.6 F.1.c.
- d. <u>Infrared Heating Unit</u>. The infrared heating unit must be equipped with adjustable height controls and heating chambers capable of heating the existing asphalt pavement to a workable temperature without oxidizing or burning the oils. There shall be no flame in direct contact with the existing pavement surface. The infrared heating unit must be capable of heating an area that extends a minimum of 12 inches beyond the edge of the patch area.
- e. <u>Infrared Procedure</u>. All asphalt removed for infrared patching shall be removed to a width of 4 to 8 inches, as measured perpendicular from the face of the newly placed concrete. Heat shall be continuously applied to the patch area until the existing pavement material can be manually raked and shaped to a depth of 2 inches below the existing surface and replaced with new material. A minimum depth of 1-1/2 inches of new pavement shall be provided at the joint line.

Prior to placement of new material, the patch area will be raked, compacted, and tacked. Mechanized compaction equipment shall be used to compact bottom lifts of the patch, then a self-propelled, vibratory roller shall be used to provide complete compaction of the patch area. The tack agent shall be applied at the rate of 0.20 gallons per square yard. Excess material shall be disposed of by the Developer or used in the bottom layer of the patch.

- f. <u>Placement of New Asphalt</u>. Refer to Section 25.5.6 F.1.e.
- 4. <u>Adjoining Concrete Repairs</u>. All asphalt removed for conventional patching shall be removed to a width of 24 inches minimum, as measured perpendicular from the face of the newly placed concrete. Patching shall generally consist of placing the lower layers of asphalt necessary to accomplish the roadway widening. In addition, the Local Entity Engineer may authorize patching of areas prepared by in-place recycling.
- 5. <u>Wheel Path</u>. The asphalt patch area for street excavations that fall within the wheel path of the vehicular travel lane shall be increased in size to the center of the lane or adjacent lane.

#### G. Overlays

The determination of need for a complete milling and overlay shall be made by the Local Entity Engineer. In streets where more than one cut is made within a 75-foot long roadway segment, an overlay of the entire street width, including the patched area may be required. All overlay work shall be coordinated with adjacent landowners such that future projects do not cut the new asphalt overlay work.

- 1. <u>Protection from Solvents and Oils</u>. Refer to Section 25.5.6 F.1.c.
- 2. Preparation of Existing Surface.
- 3. <u>Tack Coat</u>. Refer to Section 25.5.6 B.

- 4. <u>Materials.</u> All materials must comply with Chapter 22, Materials and Construction Specifications. The Local Entity Engineer may require a mix design. Materials shall comply with Table 22-4.
- 5. Placement of New Asphalt.
  - a. <u>General</u>. The Developer shall construct the work for asphalt overlay such that all roadway pavement placed prior to the time paving operations end for the year shall be completed to the full thickness required by the plans.
  - b. <u>Procedure</u>. There shall be no feathered edges on any type of street. When edge of existing pavement adjoins gutter, overlays should be placed by first removing the edge of existing pavement to the desired depth by grinding and then replacing the pavement with an asphalt lay down machine. Grinding shall be to a depth such that the top of overlay is no more than 1/4 inch from the top of the gutter lip.
- 6. <u>Cooling to Prevent Rutting</u>. Overlaying layers of asphalt shall not be placed until the lower layer has cooled sufficiently to provide a stable material that will support the equipment without rutting, shoving, or moving in any manner. All paving on each street shall be completed in one continuous operation, weather permitting, unless otherwise approved in writing by the Local Entity Local Entity Engineer.
- 7. <u>Tandem Paving</u>. Refer to Chapter 22, Materials and Construction Specifications.
- 8. <u>Temporary Pavement Layer</u>. The Developer shall schedule the work so that no planed or recycled surface is left without resurfacing for more than 10 calendar days between October 1 and March 1.
  - a. <u>Application of Material</u>. The Developer shall immediately place a temporary hot asphalt pavement layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the above temperature requirements within 10 calendar days after being planed or recycled. The minimum thickness of the temporary hot asphalt pavement layer shall be 2 inches.
  - b. <u>Quality Control</u>. The Developer shall perform the quality control required to assure adequate quality of the hot asphalt pavement used in the temporary layer. All applicable pavement markings shall be applied to the temporary layer surface.
  - c. <u>Developer Responsibility</u>. The Developer shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Local Entity Engineer. The temporary hot asphalt pavement layer shall be removed when work resumes.

#### H. Reconstruction

1. Hot In-Place Recycling.

- a. <u>General</u>. Hot in-place recycling is a mixture of RAP, rejuvenating agent, and virgin hot mix. The mixture is produced at the paving site by use of special in-place heating and mixing equipment.
- b. <u>Projects Not Suited for Hot In-Place Recycling</u>. Projects with the following characteristics are not recommended for hot in-place recycling:
  - 1) Unstable subgrades
  - 2) Asphalt stripping from aggregates
  - 3) Wide transverse thermal cracks
- c. <u>Projects Appropriate for Hot In-Place Recycling</u>. Two types of applications have been identified for hot in-place recycling: maintenance and Local Entity Engineering. Maintenance applications are those that are used to maintain the existing roadway in a usable condition. Local Entity Engineering applications are those where hot in-place recycling is part of the structural rehabilitation or reconstruction of the pavement. **Table 25-4** shows the types of possible distresses and the applications to treat the pavement.
- d. <u>Mix Design</u>. The design shall be performed by **CPL-5140**. For Local Entity Engineering applications, 55 to 110 pounds per square yard of additional asphalt should be used, and for maintenance applications, a minimum of 55 pounds per square yard of additional asphalt is recommended.

Type of Distress	Maintenance Application	Local Entity Engineering Application
Narrow Cracks in a Thin		
Pavement	Yes	Yes
Narrow Cracks in a Thick		
Pavement	Yes	Yes
Leveling	Yes	Yes
Rutting	Yes	—
Corrugation or Ride		
Improvement	Yes	—

Table 25-4Distresses Treated by Hot In-Place Recycling

- e. <u>Structural Design</u>. The structural layer coefficient will be a minimum of 0.35 and a maximum of 0.44. For Local Entity Engineering applications, design structural requirements will be met, and a minimum 2 inch overlay will be used in conjunction with the hot in-place recycling. For maintenance applications, a chip seal coat may be used as a wearing surface, if needed.
- f. <u>Construction Considerations</u>. The depth to be recycled will be a minimum of 1-3/4 inches for all applications. There should not be any hot in-place recycling done closer than 1 inch above the bottom of the existing mat. Hot in-place recycling is a good choice for treatment of the old pavement prior to

an overlay and should be considered a better alternative than a leveling course. Hot in-place recycling can be performed either full width or in the driving lanes only. It should be noted that when 110 pounds per square yard of additional asphalt is added to the recycled mix, the driving lane will be approximately 1 inch higher than the shoulder, and lane/shoulder drop off needs to be taken into consideration. Traffic control for a long paving train must be taken into consideration.

For Local Entity Engineering applications, the variability of the amount of virgin mix and rejuvenating agent will be determined by data from Developer supplied testing.

#### I. Inclusion of Adjacent Cracks or Damage

Where existing cracks or damage are adjacent to the area being repaired, the repair area shall include the cracked or damaged asphalt.

#### J. Manhole Frames and Valve Box Adjustments

Manhole frames and covers and valve boxes shall be adjusted using the following criteria: Excavate the pavement around the object to clear the object by at least 2 feet from the outside edge of the device and 8-inches deep. This area shall be filled with asphalt lifts and compacted per Chapter 22. The same process of notification, inspection and acceptance as outlined above shall apply to this method and shall occur prior to the application of the final lift around these appurtenances.

## 25.6 OTHER RECONSTRUCTION AND REPAIR

#### 25.6.1 Trenches in Gravel Streets or Alleys

#### A. Gravel Specifications

When trenches are excavated in streets or alleys that have only a gravel surface, the Developer shall replace such surfacing on a satisfactory compacted backfill with RAP conforming to CDOT Class 5 or Class 6 aggregate base course or as approved by the Local Entity Local Entity Engineer.

#### **B.** Thickness and Grade

The thickness of gravel replacement shall be 1 inch greater than the thickness of the original gravel surface, but not less than 4 inches. The surface shall conform to the original street grade.

#### C. Settling

Where the completed surface settles, additional gravel base shall be placed and compacted by the Developer immediately after being notified by the Local Entity Engineer, to restore the roadbed surface to finished grade.

#### **D.** Special Surface Treatment

Some streets may have been previously treated with a special surface treatment to control dust and/or bind the aggregates together. In these cases, the Developer is responsible for installing the gravel surface in the same manner. Such surface treatments shall be of the same chemical composition as what existed prior to the excavation work. The Local Entity Engineer shall note on the permit the surface treatment that will be required.

## 25.7 DEVELOPING A "QUALITY" APPROACH

#### 25.7.1 General

Every street and street repair situation is unique. Design criteria and construction standards cannot address every situation but, in order to maintain some form of consistency, these standards have been developed. In most cases, they provide the minimum acceptable standards for construction or repair. Consequently, when strictly applied, they will provide the minimum acceptable product. Therefore, this criteria has been developed to maintain the same integrity of the street pavement and subsurface condition as existed prior to its being cut for utility installations or repairs.

To achieve the goal of "Quality" or "Excellence" in street repairs, these criteria shall be viewed as guidelines when used in conjunction with good planning and judgement. This will restore the street to an acceptable condition with minimal patching failures. In many cases, it will be necessary to **exceed** the minimum standards to achieve a quality repair.

Issues that shall be considered in a quality approach to street repairs are as follows (these criteria must all be balanced against the long-term maintenance needs of the utility):

#### 25.7.2 Appearance

Does the final appearance of the street suggest the repairs were planned, or that they happened by accident?

#### A. Public Perception

Consciously or not, the driving public "rates" the appearance of the street system including street repairs—every day. Street repairs which are satisfactory from a functional point of view may produce a negative reaction from the public if they give the appearance of being poorly planned or executed.

#### **B.** Appearance Guidelines

The public's perception of the street repairs is based primarily on shape, size, and orientation—the geometry of a patch. Refer to **Figure 25-1**, **Patching (Appearance)** for graphic illustrations of the following patching guidelines. for the geometry of a quality patch:

- 1. Existing pavements should be removed to clean, straight lines **parallel** and **perpendicular** to the flow of traffic. Do not construct patches with angled sides and irregular shapes. (See **Figure 25-1**, item A)
- 2. Avoid patches within existing patches. If this cannot be avoided, make the boundaries of the patches coincide. (See Figure 25-1, item B)
- 3. Do not leave strips of pavement less than one-half lane in width from the edge of the new patch to the edge of an existing patch or the lip of the gutter. (See Figure 25-1, item C)
- 4. Asphalt and concrete pavements should be removed by saw cutting or grinding. Avoid breaking away the edges of the existing pavement or damaging the remaining pavement with heavy construction equipment. (See Figure 25-1, item D)
- 5. In concrete pavements, sidewalks and other public use areas where the surface is in good repair, **remove sections to existing joints**. In damaged concrete, the limits of removal should be determined in the field by a representative of the Local Entity Engineer. (See **Figure 25-1**, item D)
- 6. In the case of a **series of patches** or patches for service lines off a main trench, repair the pavement over the patches by **overlay** shall be required when the spacing between the patches is less than 75 feet (in cases where the existing pavement is in poor condition and may require overlay within the next few years, this requirement may be modified or waived by the Local Entity Engineer). (See **Figure 25-1**, item E)

#### 25.7.3 Rideability

Completed street repairs shall have rideability at least as good as, or better than, the pavement prior to the repairs being made. Street repairs may be visible but, should not be "felt" when driving over them.

#### A. Guidelines for Rideability

Refer to Figure 25-2, Patching (Rideability) for graphic illustrations of the following patching guidelines:

- 1. Do not construct asphalt overlays in such a manner that create a bump to the motoring public. If the leading edge of an overlay is substantially noticeable to a car it is likely to be significant to the snow plow trucks. The Local Entity Engineer shall determine whether or not the rideability of the overlay is acceptable. If the transition is not smooth the Developer shall remove and replace the pavement to provide a smooth leading edge to the satisfaction of the Local Entity Engineer. (See Figure 25-2, item A)
- 2. Surface tolerances for street repairs should meet the standard for new construction. That is, the finished surface of the street repair, when tested with a ten (10) foot straightedge parallel to the centerline or perpendicular across joints,

will show variations measured from the testing face of the straightedge to the surface of the street repair which do not exceed one-quarter (1/4) inch. (See **Figure 25-2**, item B)

## 25.7.4 Pavement Management

Street repairs should leave a pavement in a condition at least as good as, if not better than, the condition prior to the repairs.

#### A. Pavement Management Guidelines

Refer to **Figure 25-3**, **Patching (Pavement Management)** for graphic illustrations of the following patching guidelines:

- 1. In most cases, and particularly in the cases of extensive excavation and repairs, it is desirable to survey the existing pavement condition with a representative of the Local Entity Engineer prior to the work. After completion of the work, survey the pavement condition again to verify that the pavement condition has been maintained or improved.
- 2. In the case of minor repairs, these pavement surveys can be made by visual observation. However, in the case of major projects that involve excessive haul of materials or unusually heavy construction equipment or activity, non-destructive testing of the pavement condition before and after construction is required.
- 3. Consideration of pavement management issues may also identify opportunities for joint efforts between the utilities and the Local Entity Engineer.

For example, suppose the repair of a utility line requires an overlay on half of a street, and that the condition of the remaining half of the street might also warrant an overlay. We may decide at that point to overlay the entire street, with Local Entity Engineer's street authority and the utility splitting the cost of the overlay.

In such a case, the utility may be able to save the cost of grinding half the street. The Local Entity Engineer's street authority will allocate a reasonable percentage of their annual overlay program to accommodate their share of these situations. This includes minor (2-3 block) maintenance projects and larger capital improvement projects (water main line extensions). Coordination for these types of cooperative repairs shall occur as far in advance of actual construction as possible.

- 4. Transverse patches shall be replaced across the entire street width for a distance of one (1) foot minimum on both side of the trench, thus creating a 'T' shaped patch above the trench. (See **Figure 25-3**, item A)
- 5. Do not allow the edges of patches to fall in existing wheel paths. The edges of patches parallel to the direction of traffic shall be limited to the boundaries of lanes or to the centerline of travel lanes. (See Figure 25-3, item B)

6. Patches should have a **smooth longitudinal grade** consistent with the existing roadway and crown. Patches should also have a cross slope or cross section consistent with the design of the existing roadway. (See **Figure 25-3**, item C)

## 25.7.5 Future Maintenance

Excavations and street repairs, even well constructed street repairs, shorten a pavement's life. Several types of street distress, settlement, alligator cracking, and potholes, often show up around patches. Quality street repairs should **attempt to include adjacent minor damage** and reduce the chances of associated growth out to these types of distress.

#### A. Future Maintenance Guidelines

Refer to Figure 25-4, Patching (Future Maintenance) for graphic illustrations of the following patching guidelines:

- 1. Avoid weakening or destroying the existing pavement around an excavation with heavy construction equipment, stockpiling or delivery of materials, etc. When damage does occur, remove the damaged pavement, extending the limits of the street repair, before replacing the pavement. Remember, no stockpiling of backfill or road building materials is permitted on the pavement. (See **Figure 25-4**, item A)
- 2. When the proposed excavation falls within three feet of a section of failed pavement, the failed area shall be removed to sound pavement and patched. Scarring, gouging, or other damaged pavement adjacent to a patch shall be removed and the pavement repaired. (See Figure 25-4, item A)
- 3. With older pavement where the likelihood of cracking and potholes next to the patch is greater, it shall be necessary to extend the "shoulders" of the pavement beyond the one-foot minimum. When the adjacent deterioration is less than 3' away, reinforce this area with a geotextile fabric. (See **Figure 25-4**, item B)
- 4. "T" cutting shall be required for all asphalt repairs in all streets.
- 5. For patches in asphalt, a tack coat shall be applied to all edges of the existing asphalt before placing with the pavement.
- 6. After placing the new asphalt, all seams (joints) between the new and existing pavements shall be sealed with an asphalt tack coat or rubberized crack seal material.
- 7. Avoid frequent changes in width of patches. For future maintenance, this simplifies removal of adjacent pavement failures. (See Figure 25-4, item C)



$\left( \right)$	PATCHING (APPEARANCE)				
	LARIMER COUNTY	DESIGN	REVISION NO:	FIGURE	
$\overline{\ }$	STREET STANDARDS	FIGURE	DATE: 12/06/01	25-1	





LARIMER COUNTY	DESIGN	REVISIO	N NO:	FIGURE		
STREET STANDARDS	FIGURE	DATE:	12/07/01	25-3		



# APPENDIX A – STANDARD DRAWINGS

- 701 Curb and Gutter
- 702 Curb and Gutter/Sidewalk
- 703 Median (Island Curbs)
- 704 Standard Details for Raised Median 705 Standard Details for Raised Median
- 706
- Standard Driveway Approach (Types I and II)
- 707 Standard Driveway Approach (High Volume Drive, Types III and IV)
- 708 Street Intersection Crosspan
- 709 Standard Details for Drainage Under Sidewalk
- 710 Asphalt Paving Detail (Crosspan)
- 711 Bus Bay and Stop Standard
- Concrete Details Loveland Affordable 712L Housing Only
- 713.1F Subdrain Service Wye Detail Fort Collins (GMA and City Limits)
- 713.1L Subdrain Service Wye Detail Loveland (GMA and City Limits)
- 713.2F Subdrain Main Installation Details Fort Collins (GMA and City Limits)
- 713.2L Underdrain Main Bedding Requirements - Loveland (GMA and City Limits)
- 801 Standard Details for Raised Median Geometry
- 802 Forced Turn Barrier (Splitter Island)
- 803 Alley Intersections
- 901 Access on Rural Roadways (without Curb and Gutter)
- Handrail Details 1101
- 1102L Oklahoma TR-1 Bridge Railing - Loveland (GMA and City Limits)
- 1103L Safety-Shaped Concrete Bridge Railing -Loveland (GMA and City Limits)
- 1104L Nevada Concrete Safety Shape Loveland (GMA and City Limits)
- 1105L Texas Type HT Loveland (GMA and City Limits)
- 1106L Texas Type TT Loveland (GMA and City Limits)
- 1107 Type C Aluminum Bridge Railing
- 1108F Bridge Railing/Parapet Wall Configuration Detail
- 1201 Standard Manhole Cover
- 1202 Sleeve Locations
- 1401 Sign Post
- 1402 No Parking Sign Detail
- 1403 Standard Pavement Markings
- 1404a/b Standard Pavement Markings with Turn Lane
- 1405 Pavement Markings for Bike Crossing
- 1406 Typical Bicycle Lane Pavement Markings
- 1407 Handicap Parking Requirements (as per "ADA")
- 1408L Bicycle and Parking Pavement Markings -Loveland (GMA and City Limits)

- 1409L Bicycle/Parking Sign Loveland (GMA and City Limits)
- Bicycle Lane Approaching Vehicle Right 1410 Turn Lane
- Street Name Sign 1411
- 1413 Standards Temporary Dead End Barricades
- 1414 Cantilever Arm Bracket for Flat or Extruded Blades
- 1415 Delineator Detail
- Signs and Pavement Markings for Speed 1416L Tables – Loveland (City Limits only)
- 1417L Signs and Pavement Markings for Raised Crossings – Loveland (City Limits only)
- 1418 Fire Access Road Signs
- 1419 Fire Apparatus Access Road Stenciling & Fire Lane Sign Installation
- 1420 New FHWA Arrows (Elongated)
- 1421 Rectangular Rapid Flashing Beacon (RRFB)
- 1601 Standard Sidewalk
- 1602 Sidewalk Detail
- 1603 Access Ramp Details
- 1604 Detached Walk/Intersection Detail
- Detached Walk/Intersection Detail 1605
- 1606 Pedestrian Ramp Detail (For New
- Construction and Alterations) 1607
- Access Ramp Scoring
- 1608 Median Islands and Pedestrian Refuge Area
- 1609L Raised Speed Table - Loveland (GMA and City Limits)
- 1609aL Raised Pedestrian Crossing Loveland (GMA and City Limits)
- 1610 Decorative Concrete Crosswalk (Patterned/Colored Concrete)
- Enhanced Asphalt Crosswalk 1611 (Patterned/Colored Asphalt)
- 1612 Enhanced Concrete Crosswalk (Construction Detail)
- 1613 Raised Crosswalk Detail
- 1701 **Bicycle Rack Details**
- 1702 **Bicycle Rack Details**
- 1702 **Bicycle Rack Details**
- 1703 **Bicycle Rack Details**
- 1704 Bicycle Rack Foundation Details
- 1705 **Bicycle Rack Details**
- Bicycle Rack Details Fort Collins 1706F (GMA and City Limits)
- **Bicycle Rack Details** 1707
- 14' Local Speed Hump Fort Collins 1801F (GMA and City Limits)
- 1802F 22' Speed Hump - For Collins (GMA and City Limits)
- 2201 Trench Detail
- 2501 Sidewalk Details





LARIMER COUNTY	CONSTRUCTION	REVISION NO: 1		DRAWING
STREET STANDARDS	DRAWINGS	DATE:	03/01/02	702



LARIMER COUNTY	CONSTRUCTION	REVISION	N0: 2	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	04/01/07	703




LARIMER COUNTY	CONSTRUCTION	REVISION NO:		DRAWING
STREET STANDARDS	DRAWINGS	DATE:	04/01/07	705





















DRAWINGS DATE:

STREET STANDARDS

709

04/01/07





URBAN AREA STREET STANDARDS CONSTRUCTION DRAWINGS DATE:

04/01/07

711









	SUBDRAIN	MAIN – INST	'ALLATIO	N DETAIL	s \
	LARIMER COUNTY	CONSTRUCTION	REVISION	NO:	DRAWING
$\backslash$	STREET STANDARDS	DRAWINGS	DATE:	10/25/01	713.2F









URBAN AREA STREET STANDARDS

**REVISION NO:** CONSTRUCTION

DATE:

DRAWINGS

803

04/01/07



LARIMER COUNTY
URBAN AREA
STREET STANDARDS

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LARIMER COUNTY	CONSTRUCTION	REVISION	N NO:	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	08/07/00	1102L



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	LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION	REVISION NO:		DRAWING
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LARIMER COUNTY URBAN AREA STREET STANDARDS

**REVISION NO:** CONSTRUCTION

DATE:

08/07/00

DRAWING 1104L



TEXAS TYPE HT				
LARIMER COUNTY	CONSTRUCTION	REVISION	N0:	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	08/07/00	1105L



## FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

## TEXAS TYPE TT

LARIMER COUNTY URBAN AREA STREET STANDARDS

CONSTRUCTION	REVISION	N0:	DRAWING
DRAWINGS	DATE:	08/07/00	1106L



LARIMER COUNTY	CONSTRUCTION DRAWINGS	<b>REVISION NO:</b>		DRAWIN
STREET STANDARDS		DATE:	08/07/00	1107







$\left( \right)$		SLEEVE LOC	ATIONS		
	LARIMER COUNTY	CONSTRUCTION	REVISION	NO: 1	DRAWING
$\bigcirc$	STREET STANDARDS	DRAWINGS	DATE:	04/01/07	1202





$\left( \right)$	NO PARK	ING BIKE LA	NE SIGN	N DETAIL	
	LARIMER COUNTY	CONSTRUCTION	REVISION	N0: 2	DRAWING
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$\left( \right)$	NO PARK	KING ANY TIM	ME SIGN	DETAIL	
	LARIMER COUNTY	CONSTRUCTION	REVISION	NO: 2	DRAWING
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LARIMER COUNTY Urban Arfa	CONSTRUCTION DRAWINGS	REVISION	NO:	1	DRAWING
STREET STANDARDS		DATE:	03/01/	02	1403


LARIMER COUNTY	CONSTRUCTION	REVISION	N0:	1	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	03/02/	/01	1404





LARIMER COUNTY	CONSTRUCTION DRAWINGS	REVISION	NO:	1	DRAWING
STREET STANDARDS		DATE:	03/01	/02	1406











LARIMER COUNTY URBAN AREA STREET STANDARDS CONSTRUCTION REVISION N

DATE:

DRAWINGS

N0: 2 04/01/07 DRAWING





	-3/4" BAND # C206 (2)	-3/4" BUCKLE # C256 (2)	
		V	
USE TWO IDENTICAL CANTLEVER ARM ASSEMBLIES PER SIGN B			× 18" × 1/2" set screw). < 20" × 1/2" socket head bold). e IDEX Corporation.
BAND-IT   CANTILEVER SIGN   ARM ASSEMBLY LENGTH   ARM ASSEMBLY LENGTH   AA B   PART # INCHES   SX0405 18.0   SX0406 24.0   SX0407 30.0   SX0409 36.0   SX0409 42.0   SX0409 42.0   SX0410 48.0			NOTES: 1. Standard drilling (5/16' 2. Bolt Thru drilling (1/4") 3. BAND-IT is a unit of th
CANTILEVER ARM BF	RACKET FOR 1	FLAT OR EXTRUDEI	) BLADES
LARIMER COUNTY URBAN AREA	CONSTRUCTION DRAWINGS	REVISION NO:	





LARIMER COUNTY	CONSTRUCTION	REVISION	NO: 1	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	03/01/02	1416L



DRAWINGS

URBAN AREA STREET STANDARDS

**REVISION NO:** 2 CONSTRUCTION 04/01/07 DATE:

DRAWING 1417L





LARIMER COUNTY	CONSTRUCTION	REVISION	NO: 1	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	02/27/02	1419



	LARIMER COUNTY	CONSTRUCTION DRAWINGS	REVISION	NO: 1	DRAWING
S	TREET STANDARDS		DATE:	02/28/02	1420



LARIMER COUNTY	CONSTRUCTION	REVISION	N0: 4	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	02/17/15	1601





LARIMER COUNTY	CONSTRUCTION DRAWINGS	REVISION	N0: 2	DRAWING
STREET STANDARDS		DATE:	02/17/15	1603







- . No joints are allowed in the from flow line as shown.
- 2. Pedestrian landing area required 4 ft length x 4 ft width, max slope in any direction is 1:50 or  $\frac{1}{4}$ " per foot.
- 3. Joint pattern to be according to intersection gutter detail or as determined by the local entity.
- 4. Wood float finish is required over the sloped surface of ramp and flares.
- 5. A 6" wide curb option may be poured along side of the ramp as shown if required. If curb is used it shall match style of adjacent curb and gutter.
- 6. Minimum ramp width shall be four feet, or the same as the widest adjacent sidewalk, whichever is greater, up to a maximum width of 8 feet.
- 7. Detectable warning is to extend full width of the ramp and be a minimum of 2.0' in the direction of travel. Material to be approved by local engineer
- 8. T = Concrete thickness, 6" minimum for entire ramp area.

## NOT TO SCALE

Γ	DIRECTIONAL	ACCESS	S RAMP	DET	AIL 8	& DETA	CHED	SIDEWALK	
	LARIMER COUN	TY	CONSTRU	CTION	REVIS	SION NO:	2	DRAWING	
$\checkmark$	STREET STANDA	RDS	DRAWIN	IGS	DATE	: 02/	17/15	1606	







LARIMER COUNTY	CONSTRUCTION	REVISION	N0: 2	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	04/01/07	1608



$\left( \right)$	RAISED PEDES	STRIAN CROSS	SING /	SPEED TA	ABLE
	LARIMER COUNTY	CONSTRUCTION	<b>REVISION NO:</b>		DRAWING
$\bigcirc$	STREET STANDARDS	DRAWINGS	DATE:	01/26/01	1609L









LARIMER COUNTY	CONSTRUCTION	REVISION	N NO:	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	04/16/02	1613

## LOVELAND ONLY

1

Notes:

WIDTH A = 4' WIDE RAMP: 47-1/2" 5' WIDE RAMP: 59-1/4" 6' WIDE RAMP: 71"

23-3/4" + 1/4"

Note: Do Not Use Pieces of Brick Smaller Than Half A Brick.

> ENLARGED VIEW OF PAVER JOINTS

Set joint gap with brick paver nipples.

## Delete

1. Contractor shall verify block out dimensions for paver brick.

2. Contractor shall make certain that block out for paver brick is perfectly square corners.

3. Dimensions shown for block out shall allow approximately 1/4" extra length in each dimension.

4. Color of brick pavers shall be "River Red".

NOT TO SCALE

	TRUNCATED	DOME -	Delete		
LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION	NO:	2	DRAWING
		DATE:	02/17/	15	1614










LARIMER COUNTY URBAN AREA STREET STANDARDS		CONSTRUCTION	REVISION	NO: 1	DRAWING
		DRAWINGS	DATE:	03/01/02	1703







LARIMER COUNTY	CONSTRUCTION	<b>REVISION NO:</b>		DRAWING	
STREET STANDARDS	DRAWINGS	DATE:	08/07/00	1706F	







LARIMER COUNTY	CONSTRUCTION DRAWINGS	REVISION	NO: 1	DRAWING
STREET STANDARDS		DATE:	03/01/02	1802F



LARIMER COUNTY	CONSTRUCTION	REVISION	NO: 1	DRAWING
STREET STANDARDS	DRAWINGS	DATE:	04/01/07	2201



TOOL JOINT FOR WALKS

NOTES:

1. Joint shall be cut 1/4 thickness of initial concrete; tool joint for walks.

$\left( \right)$	SIDEWALK WIDENING DETAILS				
	LARIMER COUNTY	CONSTRUCTION	REVISION	NO:	DRAWING
$\checkmark$	STREET STANDARDS	DRAWINGS	DATE:	08/07/00	2501

### **Appendix B-1**

### **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

### **City of Loveland Reimbursement Forms:**

- Reimbursement Agreement for New Street Construction & Related Exhibits
- Agreement for Incomplete Public Improvements Cash Deposit & Related Exhibits
- Agreement for Incomplete Public Improvements Letter of Credit & Related Exhibits
- Agreement for Incomplete Development Improvements Cash Deposit & Related Exhibits
- Agreement for Incomplete Development Improvements Letter of Credit & Related Exhibits

#### REIMBURSEMENT AGREEMENT FOR NEW STREET CONSTRUCTION

**THIS AGREEMENT,** made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_, by and between the CITY OF LOVELAND, COLORADO, a municipal corporation, hereinafter called the "City" and \_\_\_\_\_\_, hereinafter called the "Developer",

#### WITNESSETH

**WHEREAS,** the City has required that the Developer provide for and the Developer finds it necessary and desirable to provide for the installation of certain improvements ("Improvements") which are the subject of this Agreement and which Improvements are described in more detail in Exhibit A, attached hereto; and

**WHEREAS,** pursuant to the Reimbursement Policy for New Street Construction adopted by the City ("Policy"), the City and the Developer desire to enter into this Agreement in order for the City to attempt to collect a charge per front foot from the owners of abutting properties prior to the issuance of any building permits for the abutting properties;

**NOW THEREFORE,** in consideration of the mutual covenants contained herein, it is agreed as follows:

#### 1. **REIMBURSEMENT.**

It is agreed that the Developer shall have an opportunity to be reimbursed from subsequent future development or re-development of property adjacent to and abutting the Improvements installed by the Developer ("Obligated Property") for a portion of actual costs of the Improvements.

Attached hereto as Exhibit B is a listing of the total certified cost of the Improvements eligible for reimbursement.

Attached hereto as Exhibit C is a description of each Obligated Property and the name, address and telephone number of the owner of each Obligated Property adjacent to and abutting the eligible Improvements. It shall be the Developer's obligation to maintain the accuracy of this Exhibit and to provide the notice required by the Policy.

Attached hereto as Exhibit D is a calculation of the frontage of each Obligated Property and the reimbursement amount due from each Obligated Property based on the certified costs.

For the purpose of providing an opportunity for reimbursement to the Developer, the City agrees, subject to the provisions contained in this Agreement, to attempt to collect certain sums of money as set forth herein, in addition to all other fees and sums collected by the

#### City of Loveland Reimbursement Forms

City, from those owners who commence subsequent future development or redevelopment of the Obligated Property prior to the issuance of a building permit on the Obligated Property. Any undeveloped portions, lots, or pieces of property that result from the splitting, subdividing or replatting of any of the Obligated Properties after the date this agreement is recorded are subject to this Agreement. The Developer acknowledges that the issuance of any building permits on any split, subdivided or replatted portion of the Obligated Properties which occurred prior to the date this Agreement is recorded may prevent the applicability of this Agreement to certain portions of the Obligated Properties. The City makes no representations as to the applicability of this Agreement to any portion of the Obligated Properties which may have been split, subdivided, replatted and developed prior to the date this Agreement is recorded.

- a) At, or prior to, the issuance of a building permit for any development or redevelopment within the Obligated Property, the City shall attempt to collect from the applicable owner the reimbursement amount set forth in Exhibit D subject to adjustment as set forth below.
- b) The sum of money paid by each obligated property shall be the amount, as calculated above, multiplied by the ratio of the <u>Engineering News Record (ENR)</u> construction cost index for Denver for the month in which the reimbursement payment is made, divided by \_\_\_\_\_\_, the construction cost index for \_\_\_\_\_\_ when the construction cost was paid by the Developer.
- c) Any fees collected by the City shall be payable to the Developer as reimbursement for the costs of installing the Improvements. Within sixty (60) days of receipt of any fees from the owner(s) of the Obligated Property, the City shall provide written notification to the Developer at \_\_\_\_\_\_\_. The City's obligation to pay the collected fees shall be conditioned upon the Developer making written request to the City Engineer for payment of the fees within one year of their collection by the City. Failure to make such a request shall result in the collected fees becoming the sole property of the City.
- d) The obligations of the City under this Agreement in attempting to assess and collect the reimbursement fees described herein are offered solely as an accommodation to the Developer. Accordingly, the City shall not be liable to the Developer for the City's failure in any fashion to collect the monies specified herein and shall have no obligation to commence litigation for the purpose of attempting to make such collection. In the event the City's attempt to collect such charge, including without limitation the City's withholding of building permits, results in the filing of any claim against the City and/or the commencement of litigation against the City, Developer agrees to pay all costs and fees incurred by the City in defense of the same, including without limitation, reasonable attorneys fees. Developer further agrees to indemnify and hold harmless the City from any damages or awards arising from or relating to any such claim or litigation. Prior to the City being required to litigate any claim under this Agreement, the City may require the Developer to pay to the City cash funds or provide the City other collateral acceptable to the City sufficient to cover the amount of any damages

#### City of Loveland Reimbursement Forms

sought in the litigation as well as a reasonable amount to cover the City's anticipated costs and attorneys' fees in the litigation or, if damages are not sought in the lawsuit, then such amount as the City may consider reasonably necessary to ensure payment of all the City's costs and attorneys fees which may result therefrom. Notwithstanding the foregoing, the City shall not commence any litigation to collect any charge under this Agreement without the prior written consent of the Developer.

- e) Payments of fees collected shall be made to the Developer prior to the last day of each year during the term of this Agreement. The Developer's failure to comply with all of the requirements, terms and conditions of the Policy, attached hereto as Exhibit E, including the notice requirements, shall relieve the City of any obligation to impose the fees upon the Obligated Property and to make any payment to the Developer.
- f) In the event that the Developer is in default with regard to any other obligation to the City, the City shall have the right to set off any reimbursement which may be due to the Developer hereunder to satisfy, in whole or in part, any such default.

### 2. **TERM, EFFECT AND INTEGRATION.**

It is expressly understood and agreed that the terms of this Agreement shall be binding upon and inure to the benefit of the heirs, successors, representatives, and assigns of the parties hereto; and that the reimbursement provisions of this Agreement shall be in force and effect only for a period of 10 years from the date of acceptance of the Improvements unless extended by the City Council, or until maximum reimbursement is made prior to expiration of the term of this Agreement.

This Agreement and any rights hereunder may not be assigned without the written consent of the parties hereto, which consent shall not be unreasonably withheld.

Documents attached to this Agreement are:

- 1. Exhibit A Description of Improvements;
- 2. Exhibit B Certified Reimbursement Costs;
- 3. Exhibit C Description of Obligated Property and list of owners;
- 4. Exhibit D Calculation of Reimbursement Amounts;
- 5. Exhibit E Reimbursement Policy for New Street Construction;
- 6. Exhibit F Construction Improvements Map.

This Agreement constitutes the entire Agreement of the parties, and may be altered, amended or revised only by written agreement of the parties hereto.

#### City of Loveland Reimbursement Forms THE CITY OF LOVELAND A Municipal Corporation

ATTEST: City Engineer		
City Clerk		
	APPROVED AS TO FORM:	
	City Attorney	
State of Colorado ) ) County of Larimer )		
Subscribed and swor by My commission exp	n to before me this day of, 20, _, City Engineer and, City Clerk.	
SEAL		
	Notary Public	
	, Developer	
	By:	
	Title:	

#### ATTEST:

 Corporate Secretary

 State of Colorado

 )

 County of Larimer

 )

 Subscribed and sworn to before me this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 20\_\_\_\_\_, by \_\_\_\_\_\_\_, Corporate \_\_\_\_\_\_, and \_\_\_\_\_\_, Corporate Secretary.

 My commission expires \_\_\_\_\_\_\_.

S E A L

Notary Public

## **EXHIBIT** A

### STREET REIMBURSEMENT AGREEMENT

Description of Improvements:

## **EXHIBIT** A

#### STREET REIMBURSEMENT AGREEMENT

Description of Improvements:

Public street construction along North Wilson Avenue of which 1/2 of the center 34' for a length of 1074' is adjacent to the properties of Buck First and Second Additions.



EXHIBIT A, PAGE 1 OF 1

#### STREET REIMBURSEMENT AGREEMENT

### Certified Reimbursement Costs:

### PERMANENT PUBLIC STREET IMPROVEMENTS INSTALLED FOR \_\_\_\_\_

Date of City Acceptance for the Completed Street Improvements \_\_\_\_\_

DESCRIPTION OF BASIC CONSTRUCTION AND CERTIFIED COST ELEMENTS:					
QTY	UNIT	ITEM	UNIT COST	EXTENDED COST	
	LF	Curb and gutter installed for the roadway		\$ 0.0	0
	LF	Sidewalk installed along the roadway (within public street right-of-way or pedestrian easement)		\$ 0.0	0
		Accesses constructed onto the roadway (includes street pans, radii curb returns, and/or handicap ramps)		\$ 0.0	0
	CY	Excavation removed for the roadway		\$ 0.0	0
	CY	Fill installed for the roadway		\$ 0.0	0
	SY	Pavement section installed for the roadway (includes layers of asphalt and base course(s))		\$ 0.0	0
	SY	Subgrade prep installed for the roadway		\$ 0.0	0
Cost of pe					
Cost of te					
Cost of sig					
Traffic co					
Actual de					
Actual finance costs incurred for the public street improvements					
Actual administration costs incurred for the public street improvements					
TOTAL	COST OF	THE PERMANENT PUBLIC STREET IMPRO	VEMENTS		

### STREET REIMBURSEMENT AGREEMENT

Letters with Detailed Breakdown of Eligible Fees and Certification of Payment of Eligible Fees

#### STREET REIMBURSEMENT AGREEMENT

### Certified Reimbursement Costs:

### PERMANENT PUBLIC STREET IMPROVEMENTS INSTALLED FOR North Wilson Avenue

Date of City Acceptance for the Completed Street Improvements September 15, 1995

DESCRIPTION OF BASIC CONSTRUCTION AND CERTIFIED COST ELEMENTS:					
QTY	UNIT	ITEM	UNIT COST	EXTEN COS	IDED ST
0	LF	Curb and gutter installed for the roadway		\$	0.00
0	LF	Sidewalk installed along the roadway (within public street right-of-way or pedestrian easement)		\$	0.00
0		Accesses constructed onto the roadway (includes street pans, radii curb returns, and/or handicap ramps)		\$	0.00
49	CY	Excavation removed for the roadway	\$5.60	\$	274.40
0	CY	Fill installed for the roadway		\$	0.00
108	SY	9" Hot Bituminous Pavement section installed for the roadway	\$13.35	\$	1,441.80
900	SY	1-1/2" Asphalt Overlay Pavement section installed for the roadway	\$2.45	\$	2,205.00
1015	SY	4" Hot Bituminous Pavement section installed for the roadway	\$6.90	\$	7,003.50
147	SY	Subgrade prep installed for the roadway	\$1.20	\$	176.40
Cost of permanent drainage facilities installed for the roadway \$ 0.0					0.00
Cost of te	Cost of testing materials for construction of the roadway \$ 0				
Cost of sig	Cost of signs, striping, and barricades installed for/on the roadway \$ 0				0.00
Traffic control costs incurred during and for construction of the roadway \$ 1,12					1,125.00
Actual design costs incurred for the public street improvements \$ 800.					800.00
Actual finance costs incurred for the public street improvements \$ 0.					0.00
Actual administration costs incurred for the public street improvements \$ 0.0				0.00	
TOTAL	TOTAL COST OF THE PERMANENT PUBLIC STREET IMPROVEMENTS       \$13,026.10				3,026.10

### STREET REIMBURSEMENT AGREEMENT

July 8, 1998

Mr. Greg Muhonen City of Loveland Community Services 500 East Third Loveland, CO 80537

Re: North Wilson Avenue Improvements in the Emerald Glen Subdivision

Dear Mr. Muhonen:

This letter hereby certifies that all fees owed to Connell Resources Inc. for the eligible North Wilson Avenue improvements (See attached Schedule 4) have been paid in full. The fees were paid by Glen Properties, Inc. with check #1104, dated September 13, 1995.

If you have any questions or need further information, please call me at (970) 223-3151.

Sincerely,

Connell Resources Inc.

## **EXHIBIT C**

### STREET REIMBURSEMENT AGREEMENT

Description of Obligated Property and List of Owners:

## **EXHIBIT C**

#### STREET REIMBURSEMENT AGREEMENT

Description of Obligated Property and List of Owners:

Tract A, Buck 1st Addition Assessor's parcel #9504005001 Book: 8800 Page: 7305

Tract A, Buck 2nd Addition Assessor's parcel #9504006001 Book: 8800 Page: 7302

Owner of both properties:

JS Buck & Assoc 813 Marble Dr Fort Collins, CO 80526



EXHIBIT C, PAGE 1 OF 1

## **EXHIBIT D**

### STREET REIMBURSEMENT AGREEMENT

Calculation of Reimbursement Amounts:

			Total
Owner			
Frontage (ft.)			
% of Total			100%
Share of Costs*	\$0.00	\$0.00	\$0.00
City Fee**			
(deduction)			(\$0.00)
Reimbursement			\$ 0.00

\*Amounts subject to collection by the City of Loveland at or prior to issuance of a building permit for any development or re-development of the above described properties. Amounts subject to adjustment as set forth in the Street Reimbursement Agreement item 1(b).

\*\*\$500.00 or 3%, whichever is greater, service charge will be deducted from the reimbursement to the installing developer when the obligated amount is collected.

## **EXHIBIT D**

#### STREET REIMBURSEMENT AGREEMENT

Calculation of Reimbursement Amounts:

	Tract A, Buck 1st Addition	Tract A, Buck 2nd Addition	Total
Owner	JS Buck & Assoc.	JS Buck & Assoc.	
Frontage (ft.)	449	625	1074
% of Total	41.81%	58.19%	100%
Share of Costs*	\$5,446.21	\$7,579.89	\$13,026.10
City Fee**			
(deduction)			(\$500.00)
Reimbursement			\$12,526.10

\*Amounts subject to collection by the City of Loveland at or prior to issuance of a building permit for any development or re-development of the above described properties. Amounts subject to adjustment as set forth in the Street Reimbursement Agreement item 1(b).

\*\*\$500.00 or 3%, whichever is greater, service charge will be deducted from the reimbursement to the installing developer when the obligated amount is collected.

## EXHIBIT E

#### STREET REIMBURSEMENT AGREEMENT

Reimbursement Policy (Non-Capital Expansion Fee Streets)

<u>General</u>. When any Developer, as a Local Entity-required condition of development, constructs a public street, alley or pedestrian-bike way to serve property through undeveloped areas or areas that may be redeveloped, or constructs a public street, alley or pedestrian-bike way along the perimeter of the property, the entire cost of such construction, including acquisition of all necessary rights-of-way, shall be the responsibility of such person or Developer.

- 1. <u>Front Footage Charge</u>. If the following conditions are satisfied, the installing Developer may enter into a reimbursement agreement with the Local Entity such that, as a condition of approval of subsequent development or re-development of property adjacent to the newly constructed public street, alley or pedestrian-bike way, the Local Entity may collect a front footage charge from the abutting Developer prior to the issuance of any building permits for the abutting property. The front footage charge shall be established by prorating the total amount of original certified costs to the lineal frontage of all properties abutting the constructed improvement.
- 2. <u>Notice of Agreement</u>. The Local Entity shall not attempt to make such collection until the reimbursement agreement is properly prepared and executed and the owners of abutting property have received or reasonably should have received notice of the reimbursement agreement.
- 3. <u>Letter of Intent</u>. Within thirty (30) days of the completion and acceptance by the Local Entity of such improvements, the Developer shall notify the Local Entity in writing of its intent to enter into a proper reimbursement agreement with the Local Entity.
- 4. <u>Full Payment</u>. All costs for the construction of improvements must be fully paid by the Developer before such person shall be entitled to reimbursement under any agreement established hereunder.
- 5. <u>Documentation of Costs and Obligated Properties</u>. After written acknowledgement by the Local Entity of receipt of said written intent to enter into a reimbursement agreement, the Developer shall have sixty (60) days to provide the Local Entity Engineer with copies of the following:
  - a. A letter from the Designer with detailed breakdown of all fees that are directly attributable to the street, alley or pedestrian-bike way improvements eligible for reimbursement and a statement certifying that all such fees have been paid in full.

## **EXHIBIT E**

### STREET REIMBURSEMENT AGREEMENT

- b. A letter from the Developer's Contractor with a detailed breakdown of costs for all improvements eligible for reimbursement and a statement certifying that all such costs have been paid in full.
- c. A letter from the Developer's financing office certifying any financial charges assessed that are eligible for reimbursement.
- d. An accurate map prepared by a licensed Engineer or Surveyor which shows:
  - 1) the location and limits of the eligible street, alley or pedestrian-bike way improvements;
  - 2) the name, address and telephone phone number of the owner of each property abutting the eligible improvements;
  - 3) the frontage of each property (with lineal footage shown);
  - 4) the reimbursement amount due from each property based on the original certified costs, divided by the frontage of all abutting properties, multiplied by the frontage of the individual property;
  - 5) the book, page and reception number from the records of the County Clerk and Recorder or the name of the recorded plat from which the information for each property was obtained; and
  - 6) any other information deemed necessary by the Local Entity Engineer to properly prepare a reimbursement agreement.
- 6. <u>Reimbursement Agreement Forms</u>. After receipt of written notice from the Local Entity Engineer documenting Certified Costs, the Developer shall provide City three signed original Reimbursement Agreement forms to the Local Entity. (Refer to Appendix B-1 of the Larimer County Urban Area Street Standards for Reimbursement Agreement.) Following execution of the agreement by the Local Entity, two signed originals shall be returned to the Developer, who shall record the agreement with the Larimer County Clerk and Recorder.
- 7. <u>Notification of Agreement</u>. After execution and recording of the reimbursement agreement, the installing Developer shall certify, by affidavit, that all owners of properties obligated to provide reimbursement have been notified in writing through certified mail with return receipt requested. The Local Entity shall then cause to be published a public notice listing the properties and reimbursement amounts. The Local Entity shall endeavor to provide notice on future plats of property obligated to provide reimbursement of the

## EXHIBIT E

#### STREET REIMBURSEMENT AGREEMENT

recorded agreement, but the failure to provide notice shall not relieve the owner of the platted property of any reimbursement obligation.

- 8. <u>Inflation Adjustment</u>. The amount of the reimbursement assessed by the Local Entity for each adjacent property as it develops shall be based on the certified costs of the improvements plus an adjustment for inflation based on the construction cost index for Denver, Colorado, as published monthly by "Engineering News Record." The Local Entity Engineer's determination concerning total eligible costs shall be final.
- 9. <u>Collection</u>. The Local Entity's obligation to reimburse the Developer shall be contingent upon the Local Entity's actual collection of the front footage charge from the abutting developer. The Local Entity shall have no obligation to reimburse any funds that it fails to collect, for whatever reason, provided that the Local Entity made a good faith attempt to collect such funds.
- <u>Payment</u>. When the front footage charge is collected, the Local Entity shall reimburse the installing developer to the extent of such collection after deducting a service charge of \$500 or three (3) percent of the amount collected, whichever is greater, to cover the Local Entity's legal, engineering and administrative costs.

Funds collected pursuant to a reimbursement agreement shall be paid to such person as identified in the agreement, and if such person cannot be found, to an alternate if designated in the agreement.

11. <u>Limitations</u>. Any right to reimbursement pursuant to this provision shall not exceed a period of ten (10) years from the acceptance by the Local Entity of the street, alley or pedestrian-bike improvements. The Local Entity Governing Body may approve extensions of the reimbursement agreement for additional ten year periods. No such reimbursement shall be made unless the person entitled to reimbursement has fully satisfied their obligations under any other agreements with the Local Entity.

## **EXHIBIT F**

STREET REIMBURSEMENT AGREEMENT

Map:

#### AGREEMENT FOR INCOMPLETE PUBLIC IMPROVEMENTS WITH CASH DEPOSIT AGREEMENT

RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_,200\_\_\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* hereinafter called "Developer"),

WITNESSETH:

WHEREAS, Developer has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40 and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Developer comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permit upon the agreement of the Developer herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Developer mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Developer, and in that regard, Developer will furnish to City a cash deposit.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Developer according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for \*\*\*\* **Subdivision**, as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by Developer by \*\*\*\*\*.

3. Developer agrees to and hereby does submit with this Agreement a certified or cashier's check, acceptable to the City in the amount of \*\*\*\* (<u>\$\*\*\*\*</u>) (Developer's Deposit) which is the estimated cost of satisfaction of the improvement herein described. The City may deposit Developer's Deposit in a City interest bearing account and agrees to hold Developer's Deposit as collateral for Developer's promise to construct the improvements. If Developer does not construct the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, the City shall be entitled to use Developer's Deposit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Developer agrees that it is obligated for the actual cost of constructing the improvements and Developer's Deposit is only collateral for Developer's promise to pay such cost. If Developer constructs the improvements and upon inspection and acceptance of the improvement by the City, the City will refund Developer's Deposit, less any interest earned, to the Developer.

4. Developer acknowledges that time is of the essence of this Agreement. Developer's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Developer breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party, whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Developer, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the Developer's Deposit to City, and provided all other conditions not herein contained have been met by Developer, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

DEVELOPER
-----------

	By:
	Title:
STATE OF COLORADO )	
County of Larimer )	
The foregoing instrument was ackno , 200 by	wledged before me this day of
My commission expires	·
(SEAL)	Notary Public
	Address
	* * * *
CITY OF LOVELAND	ATTEST
By: Title: City Engineer	By: Title: Administrative Specialist
APPROVED AS TO FORM	

Assistant City Attorney

#### EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Public Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	\$
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
Subtotal	\$
+10% Contingency & Inflation	
* Total	\$

\* Estimate Only

Approved by (Initials):

\_\_\_\_\_ Developer

\_\_\_\_\_ City Engineer

Reviewed by:\_\_\_\_\_

#### AGREEMENT FOR INCOMPLETE PUBLIC IMPROVEMENTS LETTER OF CREDIT

#### RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_, 200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* (hereinafter called "Developer"),

WITNESSETH:

WHEREAS, Developer has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40, and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Developer comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permits and certificates upon the agreement of the Developer herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Developer mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Developer, and in that regard, Developer will furnish to City a letter from a bank or other financial institution acceptable to City.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Developer according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for the \*\*\*\* **Subdivision** as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by the Developer by \*\*\*\*.

3. It is estimated that the cost of satisfaction of the improvements herein described will not exceed \*\*\*\*\* (\$\*\*\*\*\*). Developer will furnish City a letter of credit from a bank or other financial institution ("issuer") acceptable to City, guaranteeing that funds in the amount of the aforesaid estimated cost are held by it for the account of Developer for the purpose of securing Developer's promise to make the required improvements. The letter of credit shall strictly comply with Exhibit "B" attached hereto and incorporated herein. In the event that Developer does not complete the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, City shall be entitled to draw down such funds under the letter of credit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Should City not require all funds that it draws to complete the required improvements, it shall refund the balance to Developer. However, nothing herein shall in any way limit the Developer's obligations hereunder, and Developer shall, in any event, remain liable for completion of all requirements herein provided for and for payment for the actual cost of all work and materials utilized in the completion of said improvements, notwithstanding the estimated cost in sentence one of this paragraph.

4. Developer acknowledges that time is of the essence of this Agreement. Developer's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Developer breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to

2

complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Developer, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the letter of credit to City, and provided all other conditions not herein contained have been met by Developer, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

#### DEVELOPER

Signature: \_\_\_\_\_

#### STATE OF COLORADO) ) ss COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ by \_\_\_\_\_.

My commission expires \_\_\_\_\_\_.

Notary Public

#### CITY OF LOVELAND

ATTEST

By:\_\_\_\_\_ Title: City Engineer

By: \_\_\_\_\_\_ Title: Administrative Specialist
# APPROVED AS TO FORM

Assistant City Attorney

# EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Public Improvements:

		TOTAL
DESCRIPTION OF ITEMS		COST
1.		
2.		
3.		
4.		
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9.		
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14.		
15.		
16.		
17.		
18.		
	Subtotal	
	+10% Contingency & Inflation	
	* Total	

\* Estimate Only

\_\_\_\_\_ Developer

\_\_\_\_\_ City Engineer

Reviewed by:\_\_\_\_\_

### EXHIBIT "B"

# **INSERT FINANCIAL INSTITUTION NAME & LETTERHEAD**

### IRREVOCABLE LETTER OF CREDIT NO. insert financial institution LOC number

ISSUE DATE:

APPLICANT: Insert name of Developer

BENEFICIARY: City of Loveland 500 East Third Street Loveland, CO 80537

AMOUNT: Insert amount from Exhibit A

EXPIRATION DATE: EXPIRATION DATE MUST BE ONE YEAR FROM ISSUE DATE.

Dear Sir or Madam:

We hereby establish our irrevocable Letter of Credit in your favor in the amount of \$ <u>insert amount</u> <u>from Exhibit A</u>. The purpose of this Letter of Credit is to secure performance of an Agreement for Incomplete Public Improvements for <u>insert subdivision name</u> dated <u>leave blank</u> <u>City will fill in</u> <u>when agreement is signed</u>, 200 between the City of Loveland and <u>insert name of Developer</u>.

You are hereby authorized to draw on sight on **insert name of financial institution**, by drafts, up to the aggregate amount of \$<u>insert amount from Exhibit A</u>. Such total amount may be reduced, at the sole discretion of the City, from time to time, as a result of the completion of a portion of the Incomplete Public Improvements by <u>insert name of Developer.</u>

The sole condition for payment of any draft drawn against this Letter of Credit is that the draft be accompanied by a letter, on the City's letterhead, signed by the City Manager, Public Works Director, or other City designee to the effect that **insert name of Developer** is in default of Developer's obligations pursuant to the Agreement for Incomplete Public Improvements. In the event of wrongful dishonor, we will reimburse the City for all court costs, investigative costs and reasonable attorney fees incurred by the City in enforcing this letter of credit. We further agree that jurisdiction and venue for any legal action enforcing this letter of credit shall be in the District Court of Larimer County, Colorado.

We hereby agree with drawers and endorsers, and bona fide holders of drafts negotiated under this Letter of Credit that the same shall be duly honored upon presentation and delivery of the documents as specified above.

Multiple drafts may be presented.

This Letter of Credit will be automatically extended without amendments for one year from the present, and each future expiration date thereof, unless Issuer delivers written notice within ninety

(90) days prior to any such expiration date to the City of Loveland of its intents not to renew this Letter of Credit. Any such notice shall be in writing and shall be delivered with an acknowledged receipt, either in hand or by certified mail.

This Letter of Credit is not transferable.

This Letter of Credit sets forth in full our understanding, and such undertaking shall not in anyway be modified, amended, amplified, or limited by reference to any document, instrument or agreement referred to herein, except for such certificate and draft(s) referred to herein; and any such reference shall not be deemed to incorporate herein by reference any document, instrument, or agreement except for such certificate and draft(s).

Except so far as otherwise expressly stated herein, this Letter of Credit shall be subject to Article 5 of the State of Colorado Uniform Commercial Code (UCC) and the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500 (UCPDC). To the extent of any conflict between the UCC and the UCPDC, the UCC shall control.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ on behalf of insert name of financial institution.

Name, Title Name of financial institution

On behalf of <u>insert name of Developer</u>, I hereby authorize <u>insert name of financial institution</u> to pay the City of Loveland, all, or a portion of this Letter of Credit upon receipt by <u>insert name of financial institution</u> of the letter described in paragraph 3 above, and waive any claims or defenses which I may have to the payment to the City of Loveland by <u>insert name of financial institution</u>.

Name, Title Authorized Agent of **insert name of Developer** 

#### AGREEMENT FOR INCOMPLETE DEVELOPMENT IMPROVEMENTS WITH CASH DEPOSIT AGREEMENT

RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_,200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* hereinafter called "Contractor"),

WITNESSETH:

WHEREAS, Contractor has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40 and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Contractor comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permit upon the agreement of the Contractor herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Contractor mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Contractor, and in that regard, Contractor will furnish to City a cash deposit.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Contractor according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for \*\*\*\* Subdivision, as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by Contractor by \*\*\*\*.

3. Contractor agrees to and hereby does submit with this Agreement a cashier's or certified check, acceptable to the City in the amount of \*\*\*\* (<u>\$\*\*\*\*</u>) (Contractor's Deposit) which is the estimated cost of satisfaction of the improvement herein described. The City may deposit Contractor's Deposit in a City interest bearing account and agrees to hold Contractor's Deposit as collateral for Contractor's promise to construct the improvements. If Contractor does not construct the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, the City shall be entitled to use Contractor's Deposit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Contractor agrees that it is obligated for the actual cost of constructing the improvements and Contractor's Deposit is only collateral for Contractor's promise to pay such cost. If Contractor constructs the improvements and upon inspection and acceptance of the improvement by the City, the City will refund Contractor's Deposit, less any interest earned, to the Contractor.

4. Contractor acknowledges that time is of the essence of this Agreement. Contractor's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Contractor breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party, whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Contractor, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the Contractor's Deposit to City, and provided all other conditions not herein contained have been met by Contractor, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

# CONTRACTOR

	By:
	Title:
STATE OF COLORADO )	
County of Larimer )	
The foregoing instrument was ackno	owledged before me this day of
My commission expires	
(SEAL)	Notary Public
	Address
	* * * *
ATTEST	CITY OF LOVELAND
By: Title: Current Planning Manager	By: Title: Administrative Specialist
APPROVED AS TO FORM	

Assistant City Attorney

#### EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Development Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	
2.	
3.	
4.	
5.	
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14.	
15.	
16.	
17.	
18.	
Subtotal	
+10% Contingency & Inflation	
* Total	

\* Estimate Only

Approved by (Initials):

\_\_\_\_\_ Contractor

\_\_\_\_\_ Current Planning Manager

Reviewed by:\_\_\_\_\_

#### AGREEMENT FOR INCOMPLETE DEVELOPMENT IMPROVEMENTS LETTER OF CREDIT

#### RELATING TO THE DEVELOPMENT OF: \*\*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_, 200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\*\* (hereinafter called "Contractor"),

WITNESSETH:

WHEREAS, Contractor has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40, and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Contractor comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permits and certificates upon the agreement of the Contractor herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Contractor mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Contractor, and in that regard, Contractor will furnish to City a letter from a bank or other financial institution acceptable to City.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Contractor according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for the **\*\*\*\*Subdivision** as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by the Contractor by \*\*\*\*\*.

3. It is estimated that the cost of satisfaction of the improvements herein described will not exceed **\*\*\*\*\*** (**\$\*\*\*\*\***). Contractor will furnish City a letter of credit from a bank or other financial institution ("issuer") acceptable to City, guaranteeing that funds in the amount of the aforesaid estimated cost are held by it for the account of Contractor for the purpose of securing Contractor's promise to make the required improvements. The letter of credit shall strictly comply with Exhibit "B" attached hereto and incorporated herein. In the event that Contractor does not complete the improvements herein described, and perform all matters herein agreed to be performed, by **\*\*\*\*\*** to the City's satisfaction, City shall be entitled to draw down such funds under the letter of credit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Should City not require all funds that it draws to complete the required improvements, it shall refund the balance to Contractor. However, nothing herein shall in any way limit the Contractor's obligations hereunder, and Contractor shall, in any event, remain liable for completion of all requirements herein provided for and for payment for the actual cost of all work and materials utilized in the completion of said improvements, notwithstanding the estimated cost in sentence one of this paragraph.

4. Contractor acknowledges that time is of the essence of this Agreement. Contractor's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Contractor breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to

2

complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Contractor, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the letter of credit to City, and provided all other conditions not herein contained have been met by Contractor, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

#### CONTRACTOR

Signature: \_\_\_\_\_

Title:

# STATE OF COLORADO) ) ss COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ by \_\_\_\_\_.

My commission expires \_\_\_\_\_\_.

Notary Public

CITY OF LOVELAND

ATTEST

By:\_\_\_\_\_\_ Title: Current Planning Manager

APPROVED AS TO FORM

By: \_\_\_\_\_\_ Title: Administrative Specialist Assistant City Attorney

# EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\*\* **Subdivision** Estimated cost for the following Incomplete Development Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	
2.	
3.	
4.	
5.	
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7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
Subtotal	\$
+10% Contingency & Inflation	
* Total	\$

# \* Estimate Only

\_\_\_\_\_ Contractor

\_\_\_\_\_ Current Planning Manager

Reviewed by:\_\_\_\_\_

### EXHIBIT "B"

# **INSERT FINANCIAL INSTITUTION NAME & LETTERHEAD**

### IRREVOCABLE LETTER OF CREDIT NO. insert financial institution LOC number

ISSUE DATE: \*\*

APPLICANT: Insert name of Contractor

BENEFICIARY: City of Loveland 500 East Third Street Loveland, CO 80537

AMOUNT: Insert amount from Exhibit A

EXPIRATION DATE: EXPIRATION DATE MUST BE ONE YEAR FROM ISSUE DATE.

Dear Sir or Madam:

We hereby establish our irrevocable Letter of Credit in your favor in the amount of \$ <u>insert amount</u> <u>from Exhibit A</u>. The purpose of this Letter of Credit is to secure performance of an Agreement for Incomplete Development Improvements for <u>insert subdivision name</u> dated <u>leave blank City will</u> <u>fill in when agreement is signed</u>, 200\_\_\_\_\_ between the City of Loveland and <u>insert name of Contractor</u>.

You are hereby authorized to draw on sight on **insert name of financial institution**, by drafts, up to the aggregate amount of \$<u>insert amount from Exhibit A</u>. Such total amount may be reduced, at the sole discretion of the City, from time to time, as a result of the completion of a portion of the Incomplete Development Improvements by **insert name of Contractor.** 

The sole condition for payment of any draft drawn against this Letter of Credit is that the draft be accompanied by a letter, on the City's letterhead, signed by the City Manager, Public Works Director, or other City designee to the effect that **insert name of Contractor** is in default of Contractor's obligations pursuant to the Agreement for Incomplete Development Improvements. In the event of wrongful dishonor, we will reimburse the City for all court costs, investigative costs and reasonable attorney fees incurred by the City in enforcing this letter of credit. We further agree that jurisdiction and venue for any legal action enforcing this letter of credit shall be in the District Court of Larimer County, Colorado.

We hereby agree with drawers and endorsers, and bona fide holders of drafts negotiated under this Letter of Credit that the same shall be duly honored upon presentation and delivery of the documents as specified above.

Multiple drafts may be presented.

This Letter of Credit will be automatically extended without amendments for one year from the present, and each future expiration date thereof, unless Issuer delivers written notice within ninety (90) days prior to any such expiration date to the City of Loveland of its intents not to renew this Letter of Credit. Any such notice shall be in writing and shall be delivered with an acknowledged receipt, either in hand or by certified mail.

This Letter of Credit is not transferable.

This Letter of Credit sets forth in full our understanding, and such undertaking shall not in anyway be modified, amended, amplified, or limited by reference to any document, instrument or agreement referred to herein, except for such certificate and draft(s) referred to herein; and any such reference shall not be deemed to incorporate herein by reference any document, instrument, or agreement except for such certificate and draft(s).

Except so far as otherwise expressly stated herein, this Letter of Credit shall be subject to Article 5 of the State of Colorado Uniform Commercial Code (UCC) and the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500 (UCPDC). To the extent of any conflict between the UCC and the UCPDC, the UCC shall control.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ on behalf of insert name of financial institution.

Name, Title Name of financial institution

On behalf of <u>insert name of Contractor</u>, I hereby authorize <u>insert name of financial institution</u> to pay the City of Loveland, all, or a portion of this Letter of Credit upon receipt by <u>insert name of financial institution</u> of the letter described in paragraph 3 above, and waive any claims or defenses which I may have to the payment to the City of Loveland by <u>insert name of financial institution</u>.

Name, Title Authorized Agent of <u>insert name of Contractor</u>

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Licensing (City of Fort Collins)

# City of Fort Collins Contractor's License & Endorsements

#### **General Information**

- A Right-of-Way Contractor's License is required to perform <u>work of any kind</u> in the public right-of-way.
- An Endorsement to the Right-of-Way Contractor's License is required to perform work in the following categories:
  - Asphalt:Required in order to perform asphalt placement, asphalt patching,<br/>slurry seal, crack seal and other similar asphalt related work.Utility:Required in order to perform work on any utility which is or will be<br/>owned, operated or maintained by the city or any utility which will<br/>connect to and become a part of a city owned utility.Non-Structural:Required in order to construct curb, gutters, sidewalks, cross-pans,<br/>trickle-pans and other similar non-structural concrete work.Structural:Required in order to construct concrete box culverts, inlets,<br/>bridges, reinforced drainage structures and other similar structural<br/>concrete work.

#### What is Required

- Fees: A \$25.00 application fee is required with the submittal of the license application. A \$75.00 licensing fee is required after the license is approved. These are one-time fees, although new fees will be charged if a revoked license is reinstated. \* Please see License Renewals below. \*
- Insurance: A \$1,000,000 certificate of Commercial General Liability insurance is required from an insurance company with a minimum of a "B++" rating. The City of Fort Collins must be listed as <u>both</u> a Certificate Holder and an Additional Insured. \* Please see the attached example for details.\* An original, signed insurance certificate is required for license approval and a faxed copy will **not** be accepted.
- Bond(s): A \$20,000 license & permit bond is required to obtain a Right-of-Way Contractor's License, with an additional and <u>separate</u> \$10,000 license and permit bond for <u>each</u> endorsement. The bonding company must have a minimum rating of "A-" and the bond must be original and signed. A faxed copy will **not** be accepted for license approval.

#### License Renewals

• There is no formal renewal process. A contractor's license will be kept current as long as the bonds and insurance are kept up to date and the Engineering

Department receives original continuation certificates each year. If continuation certificates are not received within 30 days of the bond or insurance expiration date, the license will have to be renewed, and the contractor will be charged the \$25 application fee and the \$75 license fee before being reinstated.

CERTIFIC	ATE OF L	IABIL	ITY IN	SURANCE
Insurance Agency Info				
Contractor Info		Insurance Company Name(s) (must be rated a minimum of B++)		s) f B++)
Commercial General Liability	Policy #	Start Date	Expiration Date	Each Occurrence must equal a minimum of \$1,000,000
The City of Fort Collins is	listed as an additior	nal insured.		
Certificate Holder				
City of Fort Collins Attn: Engineering Depa PO Box 580	artment			
Fort Collins, CO 8052	2-0580		Origina	I Signature

#### This is an example of what is needed on an insurance certificate for a City of Fort Collins Contractors' License to work in the Right of Way.

# ARTICLE XIII. RIGHT-OF-WAY CONTRACTOR'S LICENSE

#### Sec. 15-361. License required.

It shall be unlawful for any person, company, corporation, partnership, joint venture, limited liability company or other association (hereinafter referred to as *person*) (1) to perform or contract to perform work of any kind in the public right-of-way without first obtaining a license to perform such work, or (2) to perform work in any category described in § 15-365 without first obtaining an endorsement as provided therein for the specific category of work sought to be performed. It shall be unlawful for any person to perform or contract to perform work on any utility which is or will be owned or maintained by the city or which will connect to and become a part of a city-owned or maintained utility, whether located in the public right-of-way or in an easement, without first obtaining a license and endorsement to perform such work.

(Code 1972, § 73-127; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-362. Application and fee for license and endorsement.

Applications for a right-of-way contractor's license and endorsement (as provided in § 15-365) shall be made to the City Engineer. The City Engineer is hereby authorized to establish forms for the application and to require any such information and documentation from applicants as may be reasonably necessary to accomplish the purposes of this Article. An application fee shall be established as authorized in Chapter 7.5, Article I of this Code, which fee shall be paid prior to or concurrently with submittal of the application.

(Code 1972, § 73-128; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-363. Bond required.

All license applications shall be accompanied by a license and permit bond executed by a reliable surety company with a rating of "A-" or better. The bond certificate provided to the city shall be an original (not a copy). The bond shall be in the amount of twenty thousand dollars (\$20,000.) with an additional and separate bond in the amount of ten thousand dollars (\$10,000.) for each license endorsement as provided in § 15-365. All bonds shall be continuous, with a minimum cancellation notice of sixty (60) days. In the event a bond is canceled, the license will be immediately revoked and no further work will be allowed to occur; however the bond, even though canceled, must remain effective through the warranty period associated with all previously completed work items.

(Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-364. Insurance required.

All license applications shall be accompanied by an original certificate of commercial general liability insurance insuring the contractor and naming the city as an additional insured against any liability arising out of ownership, use, occupancy or construction of the work and all areas appurtenant thereto with a combined single limit of one million dollars (\$1,000,000.). The limits of said insurance shall not, however, be a limit to the liability of the licensee hereunder. Insurance required shall be with companies qualified to do business in the state with a general policy holder's financial rating of not less than "B++" as set forth in the most current edition of "Bests Insurance Reports" and may provide for deductible amounts as the contractor may deem to be reasonable, but in no event greater than one thousand dollars (\$1,000.). No such policies shall be cancelable or subject to reduction in coverage limits or other modification except after thirty (30) days prior written notice to the city. However, where cancellation of coverage is due to nonpayment of the premium a ten-day written notice to the city is required. The contractor shall not do or permit to be done anything which will invalidate the insurance policies referred to in this Section. Policies described above shall be for the mutual and joint benefit and protection of the contractor and the city. Such policies shall contain a provision that the city, although named as an additional insured, shall nevertheless be entitled to recovery under said policies for any loss occasioned to it, its servants, agents, citizens and employees by reason of negligence of the contractor. Such policies shall be written as primary policies not contributing to and not in excess of coverage which the city may carry.

(Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-365. Licenses and endorsements.

Any person wishing to perform work, regardless of the nature of the work, shall be required to obtain a right-of-way contractor's license prior to performing the work as provided in § 15-361. Additionally, any person wishing to perform work in one (1) of the following categories shall first qualify for, and obtain a license endorsement to perform such work as follows:

#### Endorsements:

Nonstructural

- Asphalt: Required in order to perform asphalt paving, asphalt patching, slurry seal, chip seal, crack seal and other similar asphalt related work.
- Utility: Required in order to perform work on any utility which is or will be owned, operated or maintained by the city or any utility which will connect to and become a part of any city-owned utility.
- Concrete: Required in order to construct curbs, gutters, sidewalks, cross pans, tricklepans and perform other similar nonstructural concrete work.
- Structural Concrete: Required in order to construct concrete box culverts, inlets, concrete underwalk culverts, bridges, concrete drainage structures, and perform other similar structural concrete work.

The City Engineer shall be authorized (1) to determine whether the applicants are qualified to perform the kind of work included under the endorsement(s) being requested, and (2) to issue the license and appropriate endorsement(s) to qualified applicants who fully comply with this Article. (Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-366. Issuance of license and fee.

Upon approval of qualifications by the City Engineer, receipt by the city of an original bond certificate and insurance certificate, purchase of the current edition of all applicable city standards and specifications and payment of the license fee, the applicant will be issued a license and endorsement(s) as applicable. A license fee shall be established as authorized in Chapter 7.5, Article I of this Code, which fee shall be paid prior to or concurrently with issuance of the license. (Ord. No. 180, 1998, § 1, 10-20-98

#### Sec. 15-367. Guarantee of work.

Any person licensed to perform work in the public right-of-way shall guarantee the work for a period of two (2) years or as required in the applicable city standards and specifications which apply to the work performed, whichever is longer. This guaranty shall include all repairs required due to defects in materials or workmanship. This guaranty shall also include defects consisting of settling of trenches or other fills or excavations. The determination of the necessity for such repairs shall be made by the City Engineer, which determination shall be final. If, at any time within the period of the guaranty, the licensee shall fail or refuse to make repairs required by the guaranty, then the city may proceed to cause the repairs to be made and to recover the cost by action against the bond of the licensee.

(Code 1972, § 73-129; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-368. Suspension or revocation of license or endorsements.

The City Engineer may suspend or revoke any license or endorsement issued under this Article upon determining that the licensee:

(1) Has failed to abide by the requirements of this Code, including this Article, relating to work done under the license and/or endorsement.

- (2) Is unqualified to perform the work for which the license or endorsement was issued.
- (3) Has demonstrated a careless, dangerous or destructive approach to the work being performed.
- (4) Has violated provisions of the applicable construction or repair standards or specifications.

Upon taking action to suspend or revoke a license, the City Engineer shall give written notice to the licensee of such action. Such license shall not be in effect again until duly reinstated by the City Engineer, nor shall any refund of the license fee be made for any length of time for which the license has been suspended or revoked. The licensee may appeal the decision of the City Engineer to the City Manager by filing a notice of such appeal with the City Clerk within ten (10) days after the notice is mailed to the licensee. In the event of such appeal, the City Manager shall schedule a hearing on the question, and the action taken by the City Manager at the hearing shall be final.

(Code 1972, § 73-131; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-369. Exceptions.

The requirements of this Article shall not apply to:

- (1) City crews performing work in the public right-of-way;
- (2) Any party contracting with the city to perform work in the public right-of-way;
- (3) Utility companies performing work in the public right-of-way using utility company crews (not including contractors for such utility companies); or
- (4) Individual residential property owners who are working within the public right-of-way abutting such residential property.
- (Ord. No. 180, 1998, § 1, 10-20-98)

# **Application for Contractor's License** to work in the Right-of-Way

#### **Company Information**

Applicant Name:	Company Phone:
Company Name:	Company Fax:
Mailing Address:	
City, State & Zip:	
Insurance Information	
Local Agency Contact:	Local Agency:
Mailing Address:	
Phone:	Fax:
Insurance Company Name:	Policy Number:
Dates of Coverage:	Rating:
Bond Information	
Local Agency Contact:	Local Agency:
Mailing Address:	
Phone:	Fax:
Bonding Company Name:	Bond Number:
Dates of Coverage:	Rating:
By signing this application, the applicant ag In the event the applicant or surety compan in Chapter 15 of the City Code, the Enginee applicable endorsements. Applicant agrees to abide by the current Cit conditions, restrictions and/or regulations th	rees to maintain the required bond(s) and insurance in full effect. y should fail to refuse to perform according to the terms set forth ering Department shall immediately terminate this license and all by of Fort Collins Standards and Specifications and to any special hat may be imposed by the City Engineer.
Applicant Signature:	Date:

Engineering Approval: \_\_\_\_\_ Date: \_\_\_\_\_

# Endorsement to Contractor's License for work in the Right-of-Way

Asphalt N	Non- Structural Concrete	Structural Concrete Utility
Company Information		
Applicant Name:		Company Phone:
Company Name:		Company Fax:
Bond Information		
Bond Number:	Dates of Covera	age: Rating:
Other Information		
Years company has been in bu	siness: Years com	pany has performed this type of work:
Names of two key members of	company personnel and their y	years of experience:
1	# yrs	
2	# yrs	
Names of any other municipaliti	es in which company is curren	tly licensed to perform this type of work:
2		Phone
2		Phone
Has this company ever had a lid	cense revoked or suspended?	Yes No
If yes, list agency and date of re	evocation or suspension:	
Has license been reinstated?	Ň	Yes No
Two references (name and age	ncy) to confirm the quality of c	ompany's work:
1		Phone
2		Phone
Company equipment:		
Applicant Signature:		Date:
Engineering Approval:		Date:

#### Appendix B-2 Licensing (City of Fort Collins Only)

#### RIGHT-OF-WAY CONTRACTORS LICENSE BOND

Bond No.\_\_\_\_\_

#### KNOW ALL MEN BY THESE PRESENTS:

THAT WE, \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, a corporation duly incorporated under the laws of the State of \_\_\_\_\_\_, and authorized to do business in the State of Colorado, as Surety, are held and firmly bound unto the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 in the penal sum of Twenty thousand and 00/100 Dollars (\$20,000), for the payment which we hereby bind ourselves, or heirs, executors and administrators, jointly and severally by these presents.

THE CONDITIONS OF THIS BOND OBLIGATION are such that the Principal has applied for a license as/for

Right-of-Way Contractor in accordance with the requirements of the ordinances of the City of Fort Collins, and

has agreed to hold the City of Fort Collins harmless from any damage by reason of his/her engaging in said

business.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all the duties of Right-of-Way Contractor according to the requirements of the ordinances of the City of Fort Collins and protect the City of Fort Collins from any damage as hereinbefore stated, and guarantee work, as set forth in Sec. 15-367 of the Code of the City of Fort Collins, for a minimum of two years after completion of work, and final acceptance thereof by the City of Fort Collins, and shall fully indemnify and save harmless the City of Fort Collins from all costs and damages which it may suffer by reason of the Principal's failure to honor its obligations as aforesaid, and shall reimburse and repay the City of Fort Collins all outlay and expense which the City of Fort Collins may incur in making good any default, then this obligation shall be null and void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change to the terms of the ordinances of the City of Fort Collins, including Section 15-367 of the Code of the City of Fort Collins or to the standards and specifications of the City of Fort Collins applicable to the work shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change(s).

PROVIDED, FURTHER, this bond may be terminated as to future acts of the Principal upon the giving of sixty (60) days advance written notice by the Surety; said notice to be sent to the Engineering Department of the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 by certified mail.

PROVIDED, HOWEVER, that this bond may be continued at the option of the Surety by the issuance of a non-cumulative Continuation Certificate.

This bond becomes effective on the day of	,, for a period
ending on the day of	_,
IN WITNESS WHEREOF, this instrument is executed this	day of,
	Principal:

Name:	 
By:	 
Title:	 

Surety Company:

Name: \_\_\_\_\_\_By: \_\_\_\_\_\_

Attorney-in-Fact

#### Appendix B-2 Licensing (City of Fort Collins Only)

#### ENDORSEMENT BOND

Bond No.\_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS:

THAT WE, \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, as Operation duly incorporated under the laws of the State of \_\_\_\_\_\_, and authorized to do business in the State of Colorado, as Surety, are held and firmly bound unto the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 in the penal sum of Ten thousand and 00/100 Dollars (\$10,000), for the payment which we hereby bind ourselves, or heirs, executors and administrators, jointly and severally by these presents.

THE CONDITIONS OF THIS BOND OBLIGATION are such that the Principal has applied for an Endorsement

in accordance with the requirements of the ordinances of the City of Fort Collins, and has agreed to hold the City

of Fort Collins harmless from any damage by reason of his/her engaging in said business.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all the duties of the \_\_\_\_\_\_ Endorsement according to the requirements of the ordinances of the City of Fort Collins and protect the City of Fort Collins from any damage as hereinbefore stated, and guarantee work, as set forth in Sec. 15-367 of the Code of the City of Fort Collins, for a minimum of two years after completion of work, and final acceptance thereof by the City of Fort Collins, and shall fully indemnify and save harmless the City of Fort Collins from all costs and damages which it may suffer by reason of the Principal's failure to honor its obligations as aforesaid, and shall reimburse and repay the City of Fort Collins all outlay and expense which the City of Fort Collins may incur in making good any default, then this obligation shall be null and void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, heregy stipulates and agrees that no change to the terms of the ordinances of the City of Fort Collins, including Section 15-367 of the Code of the City of Fort Collins or to the standards and specifications of the City of Fort Collins applicable to the work shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change(s).

PROVIDED, FURTHER, this bond may be terminated as to future acts of the Principal upon the giving of sixty (60) days advance written notice by the Surety; said notice to be sent to the Engineering Department of the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 by certified mail.

PROVIDED, HOWEVER, that this bond may be continued at the option of the Surety by the issuance of a noncumulative Continuation Certificate.

This bond becomes effective on the day of ending on the day of	,, for a period
IN WITNESS WHEREOF, this instrument is executed this	day of,
	Principal:
	Name:
	By:
	Title:
	Surety Company:
	Name:
	By:
	Attorney-in-Fact

Larimer County Urban Area Street Standards – Review Draft January 17, 2007 Adopted by Larimer County, City of Loveland, City of Fort Collins

# **Appendix B-3/Larimer County**

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Permits – Larimer County

- Development Construction Permit
- Temporary Development Construction Permit



Expiration Date \_\_\_\_\_

# **Development Construction Permit**

PROJECT INFORMATION				
Project Name				
Project Location				
Section	Tow	vnship	_Range	
Phase(s) of Phase	Description			
PRINCIPAL CONTACT				
Company		Phone: Office	Cell	
Contact		_ Thone. Onloc	Other	
Address		E-Mail		
//dd/000				
		-		
PERMIT CHECKLIST				
Approved Plan Set	Approval Date _		(review engineer)	
Plat Recorded	Recording Date		(planner)	
Copy of collateral letter	Project Completi	on Date (from Developme	ent Agreement)	
Three signed & stamped copies of a	approved plans provided	to Larimer County Engine	eering	
Signed Development Agreement w	ith Cost Estimate			
FEES (fees charged if preliminary approval b	by BCC is after March 1, 2001,	or admin approval for site plans	s)	
No. of single family units:	x \$150.00	= \$		
No. of duplex units:	x \$ 75.00	= \$		
No. of multi-family units:	x \$ 50.00	= \$		
No. of commercial lots:	x \$400.00	= \$	Total DCP Fees: \$	
- Pavement Impact Fees (requires separate	check from DCP fees)			
• • • • •	· · · · · · · · · · · · · · · · · · ·		Total Pavement Impact Fees: \$	
CONDITIONS OF PERMIT Permit expires sixty days after issuance; if work has Approved as-built drawings must be submitted to a Materials test reports, as per Larimer County stand Colorado registered engineer's certification letter at An additional permit (Right of Way Construction Pe An additional permit (Access Permit) may be required an additional permit (Access Permit) may be reported for failure to comply with all apper this permit may be revoked for failure to comply with Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall be Applicant shall be responsible for establishing safe Applicant shall be responsible for establishing safe Applicant shall be responsible for any repairs nece acceptance of the work has been made by the CA Applicant shall be the Larimer County Inspector is changed. Applicant shall be responsible for any repairs nece acceptance of the work has been made by the CA Applicant shall hold Larimer County Armless from If subsequent inspection determines that additional Applicant must submit revised drawings and other of modify, alter, or deviate from the original approx Engineering Department. In accepting this permit the undersigned, represent that by virtue of his signature the Applicant is bout the permit the undersigned, represent that by virtue of his signature the Applicant is bout the permit the undersigned, represent that by vinter of his signature t	s not begun on site prior to expir ind approved by Larimer County lards, must be submitted to and a not inspection reports must be su- ermit) is required for all construct red to tie in to Larimer County ro- isions of the Larimer County Lar blicable Federal, State, and Loca ith the terms of the permit and/ o y damaged Utilities, County Roa fully defended and indemnified rized representative of Larimer C ty procedures sufficient to protec on methods, equipment, and oper r 48 hours in advance of the date ssary as a result of construction. Jourty. . any and all claims, which may al l corrective measures are necess documents as required for the re ved construction drawings. Any s ting the Applicant, verifies that he not by all the conditions set forth bounty, constitutes written notice t	ation of permit fees may be applie prior to release of collateral. approved by Larimer County prior ibmitted to and approved by Larim ion activities within the Larimer Co ads. I Regulations. r the Larimer County Land Use ard d, or other County properties. against any claim for injury or dam County. t the traveling and general public t erational procedures that will be ut e work will be started and shall not The maintenance responsibility or rise from the construction and mai sary, such corrective measures sh view and approval of the Larimer I uch change in the approved plans e has read and understands all of i herein. o proceed with construction.	d to revised permit within 180 days of issuance. to release of collateral. er County prior to release of collateral. unty Right of Way. and Development Standards. hage to property sustained by reason of the exercise from any and all harm during construction. lized and obtain the County's concurrence. ify the Larimer County Inspector a minimum of 12 h f work repairs shall be an obligation of the applicant intenance of the Applicants development covered by all be completed within 30 days of notification. County Engineering Department in the event that the shall not be constructed without the written approva- its provisions; that he has the authority to sign for ar	of and use of this permit by nours in advance if this date for two years after final y this permit. e applicant whishes to al of the Larimer County ad bind the Applicant; and
Permit Approved Larimer County	Date	App	plicant Signature	Date
Final Inspection Approved Larimer County	Date	Арр	olicant Printed Name	
Warranty Inspection Approved Latimas Occurs	Deta		a	
	Date	110		
As-builts received and reviewed	by	App	plicants Address	
Engineer's certification received and	I reviewed by	Apr	plicants Address	
Material test results received and rev	viewed by	Арг	plicants Phone Number	



Expiration Date \_\_\_\_\_

# **Temporary Development Construction Permit**

PROJECT INFORMATION					
Project Name					
Project Location					
Section	Τον	nship	Range		
Phase(s) of Phase	Description				
PRINCIPAL CONTACT					
Company		Phone: Office	e	Cell	
Contact		Fax _		Other	
Address		E-Mai	il		
SCOPE OF WORK ALLOWED U	NDER TEMPORARY	DEVELOPME	NT CONSTRUCTI	ON PERMIT	
Work performed under this tempo	rary permit shall be lin	nited to:			
FEES (fees charged if preliminary approval	by BCC is after March 1, 2001, o	or admin approval for	r site plans)		
No. of single family units:	x \$150.00	= \$		_	
No. of duplex units:	x \$ 75.00	= \$			
No. of multi-family units:	x \$ 50.00	= \$			
No. of commercial lots:	x \$400.00	= \$		Total DCP Fees: \$	
Pavement Impact Fees (requires separate	check from DCP fees)				
			Total P	avement Impact Fees: \$	
CONDITIONS OF PERMIT					
This temporary permit shall be valid for only the w Permit expires sixty days after issuance; if work ha	ork described above. No further was not begun on site prior to expira	ork shall be performed ation of permit fees ma	d prior to the issuance of a f ay be applied to revised perr	Il Development Construction Permit. nit within 180 days of issuance.	
Approved as-built drawings must be submitted to a Materials test reports, as per Larimer County stan	and approved by Larimer County   dards, must be submitted to and a and inspection reports must be su	prior to release of colla approved by Larimer Co bmitted to and approve	ateral. ounty prior to release of col	ateral.	
e elerade regiotered engineer e contineation letter e	ermit) is required for all constructi	on activities within the	Larimer County Right of Wa	V.	
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ	red to tie in to Larimer County roa	ads.	, 0		
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w	ired to tie in to Larimer County roa visions of the Larimer County Lan plicable Federal, State, and Loca ith the terms of the permit and/o	ads. d Use Code. l Regulations. r the Larimer County L	and Use and Development	Standards	
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall b	ired to tie in to Larimer County roa visions of the Larimer County Lar. plicable Federal, State, and Loca i/ith the terms of the permit and/ ou y damaged Utilities, County Road > fully defended and indemnified a	ads. d Use Code. I Regulations. r the Larimer County L d, or other County prop against any claim for in	Land Use and Development perties. njury or damage to property	Standards.	s permit by
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to at Larimer County and its officers and agents shall b Applicant and applicants actions pursuant theret This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing soft	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/ or y damaged Utilities, County Roas a fully defended and indemnified a , virized representative of Larimer C ty procedures sufficient to protect	ads. I Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. the traveling and gen	Land Use and Development perties. ijury or damage to property	Standards. sustained by reason of the exercise of and use of this	permit by
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply v Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall bo Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing saft Applicant shall advise the Larimer County of construct Applicant shall advise the Larimer County Inspect	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/o y damaged Utilities, County Road e fully defended and indemnified a b vized representative of Larimer C sty procedures sufficient to protec on methods, equipment, and ope or 48 hours in advance of the date	ads. d Use Code. l Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. t the traveling and gen rational procedures the work will be started a	Land Use and Development perties. njury or damage to property eral public from any and all at will be utilized and obtain nd shall notify the Larimer (	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. ounty Inspector a minimum of 12 hours in advance i	s permit by f this date
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall b Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing saft Applicant shall advise the Larimer County Inspect is changed. Applicant shall be responsible for any repairs nec	rired to tie in to Larimer County rox visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/ on y damaged Utilities, County Road e fully defended and indemnified a , rized representative of Larimer C sty procedures sufficient to protec- ion methods, equipment, and ope or 48 hours in advance of the date resary as a result of construction.	ads. d Use Code. Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. t the traveling and gen rational procedures tha work will be started an The maintenance resp	and Use and Development perties. jury or damage to property eral public from any and all at will be utilized and obtain nd shall notify the Larimer C ponsibility of work repairs sh	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. iounty Inspector a minimum of 12 hours in advance i all be an obligation of the applicant for two years afte	s permit by f this date r final
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall b Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly author Applicant shall be responsible for establishing saft Applicant shall advise the Larimer County Inspect is changed. Applicant shall be responsible for any repairs nect acceptance of the work has been made by the C Applicant shall hold Larimer County harmless from If subsequent inspection determines that additional	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/ o y damaged Utilities, County Roar e fully defended and indemnified a b. vized representative of Larimer C ty procedures sufficient to protection nethods, equipment, and ope or 48 hours in advance of the date ssaary as a result of construction. ounty. ) any and all claims, which may a il corrective measures are necess	ads. d Use Code. Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. t the traveling and gen rational procedures the work will be started at The maintenance resp rise from the constructi ary, such corrective m	Land Use and Development perties. ijury or damage to property teral public from any and all at will be utilized and obtain and shall notify the Larimer ( consibility of work repairs sh ion and maintenance of the teasures shall be completed	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. ounty Inspector a minimum of 12 hours in advance i all be an obligation of the applicant for two years afte Applicants development covered by this permit. within 30 days of notification.	s permit by f this date r final
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Applicant Printed Name

Title

Applicants Address

Applicants Address

Applicants Phone Number

# **Appendix B-3/Loveland**

# **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Permits – City of Loveland

- Development Construction Permit Application
- Development Construction Permit
- Right-of-Way Work Permit
- Agreement for Right-of-Way
- Grant of Easement
- Grant of Temporary Turnaround Access
- Encroachment Permit
- Resolution for Eminent Domain (Example)
- Approval of Traffic Control Plan
- Application for Building Permits
- Grading, Excavation and Fill Permit
- Permit to Move a Building
- Agreement for Incomplete Public Improvements surety Bond
- Agreement for Incomplete Public Improvements surety Bond (Example)
- Erosion Control Procedures



# DEVELOPMENT CONSTRUCTION PERMIT APPLICATION

CITY OF LOVELAND

	Application Number:	
	Application Date:	
FOR CITY USE ONLY	Permit Application Fee:	
	Received by:	
	Construction Coordination Meeting Date:	

**INSTRUCTIONS:** 

- 1. Complete this form and attach all necessary documents.
- 2. If you have any questions or need additional information, contact the Public Works Department Transportation Development Review Engineering Division at (970) 962-2501.
- 3. Submit the Application and pay the Permit Fee at the Public Works Department Transportation Development Review Engineering Division Counter, which is located at 500 East 3rd Street, Ste 300.

#### **PROJECT INFORMATION:**

Project Name (as approved by the City):

Project A.K	.A. (Marketing name if o	different from Projec	ct Name):
Project Location:			
Property Owner (A	the time of this permit i	issuance):	
Individual N	ame:		
Company N	ame:		
Address:			
Phone num	per(s):		
Offi	ce:		
Cell	:		
Fax	:		
Email:			—
Applicant/Project I person responsible project):	<b>Manager</b> (The primary for all matters reference	contact person for cing "the Developer	all matters regarding this project, and the r" in the Development Agreement for the the development agreement for the development agreement agreem
Individual N	ame:		

Í Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	_
Cell:	
Fax:	
Email:	_

**Project Engineer** (A Colorado licensed professional engineer who is the civil engineer, the person responsible for the design of this project, responsible for certification that improvements are constructed in accordance with approved plans, responsible for making revisions to plans with City approval and for providing record drawings):

Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	-
Fax:	
Email:	

**Developer** (The party or parties referenced in the Development Agreement who are responsible for the Developer's obligations contained in the Agreement – add additional names below):

Individual Name:		
Company Name:		
Address:		
Phone number(s):	:	
Office:		
Cell:		
Fax:		
Email:		

General Contractor (The contractor in overall charge of the public infrastructure construction):

Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	

If you have no General Contractor, list all other contractors below.

Grading contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Utility contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	

Concrete contractor for flat work:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Concrete contractor for structures:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Paving contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Landscape contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Other contractors and parties involved in the project:	

#### SUBMIT THE FOLLOWING ITEMS WITH A COMPLETED APPLICATION FORM:

- 8<sup>1</sup>/<sub>2</sub>"x11" copy of a Vicinity Map
- Mylar and copies of the approved Public Improvement Construction Plans for the project
- **Proposed Project Schedule**
- Project quantities and cost estimate for all of the public improvements to be constructed. This information must be submitted in the format shown on the attached form titled "Project Quantities and Cost Estimate Sheet." The estimate shall be prepared and stamped by a Professional Engineer. These quantities and costs are also to be submitted in an electronic spreadsheet format.
- Traffic control plan(s) for the project
- Right-of-Way work permit from the Traffic Division
- Certificate of Insurance
- Copy of approved Development Agreement (if applicable)
- Copies of any Easements for the project
- Proposed haul routes shown on a City map (if applicable)
- Shop drawings (if applicable)
- . Other:

**CONSTRUCTION COORDINATION MEETING:** A construction coordination meeting to discuss plans and special requirements for your project is optional for all development projects. If held, the people required to attend the meeting are the Project Manager, Project Engineer, Developer, Architect/Land Planner and General Contractor (if no General Contractor, representatives for each of the contractors expected to work on this project). A construction coordination meeting will only be held at the request of the Applicant.

People to attend: List the people's names and their respective title for those who will attend the construction coordination meeting:

Name	Title

ESTIMATED COST OF INFRASTRUCTURE IMPROVEMENTS: Provide the estimated value of all public infrastructure improvements that will be constructed and accepted by the City to own and maintain. The estimate shall be in the same format as the attached sheet titled "Project Quantities and Cost Estimate Sheet."

Public infrastructure estimated cost: \$

I certify that the information on this permit application along with the required additional submittals are true and correct to the best of my knowledge, and that in filing this application, I am acting with the knowledge, consent, and authority of the owners of the property (including all owners having legal or equitable interest in the real property, as defined in Section 1.04.020 of the City Code; and including common areas legally connected to or associated with the property which is the subject of this application) without whose consent and authority the requested action could not lawfully be accomplished. Pursuant to said authority, I hereby permit City officials to enter upon the property for purposes of inspection and, if necessary, to enter upon such property to perform work required of the applicant if the applicant were to fail to perform the required work.

Applicant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# PUBLIC IMPROVEMENTS OPINION OF COSTS

### **Erosion Control**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Stockpile Topsoil	CY			
Straw Bales	Ea			
Inlet Protection	Ea			
Silt Fence	LF			
Sediment Trap	Ea			
Vehicle Tracking Pad	Ea			

# **Street Improvements**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
	Lump			
Clearing and Grubbing	Sum			
Removal of Structures and Obstructions	Ea			
Subgrade Preparation	SY			
Excavation	CY			
Borrow	CY			
Fill	CY			
Rock Excavation	CY			
Filter Material	CY			
Lime Treatment	SY			
Asphalt Patching	Tons			
Asphalt Pavement	Tons			
Base Course	Tons			
Concrete Pavement	SY-IN			
Geo-textile	SY			
Riprap	CY			
Survey Monuments	Ea			
Adjust Manholes	Ea			
Adjust Valves	Ea			
Adjust Monuments	Ea			
Median Cover Material (Concrete)	SY			

### Structures

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Bridge Structure	Ea			
Culverts	Ea			
Guardrail	LF			
Railing (Pedestrian)	LF			
Railing (Traffic)	LF			
Headwalls	Ea			

# Pedestrian and Bikeway Facilities

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Sidewalk Grading	SY			
4-Inch Thick Sidewalk	SY			
6-inch Thick Sidewalk	SY			
Directional Curb Ramp	SY			
Corner Curb Ramp	SY			
Mid Block Ramp	SY			
Concrete Bikeway	SY			
Sidewalk Chase	Ea			
Curb & Gutter Grading	LF			
Curb & Gutter – Type II	LF			
Curb & Gutter – Type I	LF			
Glue-down Curb	LF			

# Street Lighting – Local & Minor Collector Streets in Loveland (City Limits Only)

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost
Standard Pedestrian Light	Ea			
Standard Street Light	Ea			

# Traffic Signals, Signing & Striping

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Standard Street Signs	Ea			
Standard Sign Posts	Ea			
Standard Regulatory Signs	Ea			
Standard Speed Limit Signs	Ea			
Latex Paint (4 inches)	LF			
Latex Paint (8 inches)	LF			
Latex Paint (12 inches)	LF			
Latex Paint (18 inches)	LF			
Latex Paint (24 inches)	LF			
Epoxy Pavement Marking (4 inches)	LF			
Epoxy Pavement Marking (8 inches)	LF			
Epoxy Pavement Marking (12 inches)	LF			
Epoxy Pavement Marking (18 inches)	LF			
Epoxy Pavement Marking (24 inches)	LF			
Preformed Tape for Symbols & Crosswalks	LF			
Preformed Thermoplastic	SF			
Traffic Signals	Ea			

#### Work Zone Traffic Control

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Traffic Control	LS			
# **Storm Drainage Facilities**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Grading	SY			
Inlets	Ea			
Manholes	Ea			
Pipe (Material Type – Size)	LF			
Trickle Channel (width)	LF			

# **Removal and Repair**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Asphalt Patching	SY			
Concrete Sidewalk R&R	SY			
Concrete Curbwalk R&R	LF			
Milling	SY			
Asphalt Removal	SY			

# **Construction Surveying/Staking**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

## **Material Testing**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

# **Record Drawings**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost
•				

## **Construction Management**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

The units presented here are intended to assist the Developer in providing consistent units and quantities for review by the Local Entities. The Local Entity will approve unit costs used to determine the Opinion of Costs. There may be additional items that are not shown. The Developer should show each of those items, with their units, unit prices, quantities, and item cost. Separate summaries shall be provided for phases when applicable. In addition, separate summaries shall be provided for adjacent, on-site and off-0site public improvements.



# **DEVELOPMENT CONSTRUCTION PERMIT**

Permit	Number: <u><i>00-00</i></u>	Issuance Dat	e: 00/00/00
Project	t Name: Project A.K.A.:		
Project	t Location:		
Permit	tee:		
City an	d developer contacts:	See attached Exhibit "A" for names a persons for this project.	and phone numbers of all contact
Fees:	Permit Application Fee	(paid at the time of application)	\$
Develo	Amount of security depo to be constructed as sh	<b>pproved security:</b> osited with the City to guarantee the cor own on the approved plans for the deve	mpletion of all public improvements elopment. \$

Form of security deposited with the City:

# PERFORMANCE REQUIREMENTS OF THIS PERMIT:

- 1. The Permittee shall be responsible to require their Project Engineer to incorporate into all design drawings and specifications the certification of all materials testing by an Engineer. The Permittee shall have an Engineer prepare revised design drawings and secure City approval for all revisions to the Utility Plans and related documents. The Permittee shall have an Engineer represent, as required by the City in the Development Agreement, that the improvements are constructed in conformance with the approved Utility Plans and the standards and specifications of the City. The Permittee shall provide record drawings prepared by an Engineer prior to the City's acceptance of the constructed public improvements. (All reference above to the terms "Project Engineer" and "Engineer" shall mean a Professional Engineer licensed in Colorado.)
- 2. All contractors who perform work on this project must be bonded and licensed in conformance with City requirements.
- 3. Construction time restrictions:
- 4. The applicant understands that additional permits may be required for this development project and the applicant shall secure those permits directly from the issuing departments.

Development Construction Permit (3/1/01)

- 5. This permit, along with a complete set of all approved plans and documents for this project (utility plans, site plan, landscape plan, development agreement, soils report, pavement design, traffic study, drainage report, plat easements and any other official documents), shall be kept on the development site available for use by City staff doing inspections.
- 6. Permit Expiration (in accordance with Chapter 6 of the Larimer County Urban Area Street Standards):
  - a. If construction has not begun within sixty (60) days from the date of issuance of this permit, this permit shall expire and the applicant will <u>forfeit the permit fee</u> paid for this permit, whereupon the applicant must re-apply for a new permit.
  - b. In addition, this permit shall expire one year from the date of issuance. The applicant may apply for an extension by reapplication at least two weeks prior to the expiration date. Such application shall contain information sufficient to justify the granting of the extension. An extension may be granted for up to six months.
- 7. Building permits and certificates of occupancy will only be issued when all conditions contained in the Development Agreement and Section 16.40.010 of the City Code are met. If the Development Agreement does not specify times for completion of public improvements, or if there is no Development Agreement, then the improvement requirements specified in Section 16.40.010 of the City Code shall apply, which provides that construction of all improvements shall be required prior to the time of issuance of the first building permit.
- 8. Acceptance by the City of the public improvements shall be after (1) final inspection has been conducted by the City; (2) punch list items from the final inspection are completed and accepted by the City; and (3) required certifications from the licensed professional engineer that improvements are completed to City standards, specifications and approved Utility Plans; and the record drawings have been received and accepted by the City.
- 9. The warranty on street improvements is for two (2) years from the date of initial acceptance by the City of the completed improvements, in accordance with Section 24.3 of the Larimer County Urban Area Street Standards, as applicable.
- 10. The Public Works Inspector must be notified at least twenty-four (24) hours prior to any planned construction on this project. All required perimeter silt fencing and other erosion/sediment control best management practices (BMP's) that can be installed prior to construction must be in place and inspected by the Public Works Inspector before any land disturbing activity begins.
- 11. No work (including grading) shall be started in State Highway right-of-way until a permit is issued by the Colorado Department of Transportation to allow such work to begin.
- 12. Other conditions:

# Permittee's acknowledgement signature:

By signing this permit, I acknowledge that I am acting with the knowledge, consent, and authority of the owners of the property (including all owners having legal or equitable interest in the real property, as defined in Section 1.04.020 of the City Code; and including common areas legally connected to or associated with the property which is the subject of this application) without whose consent and authority the requested action could not lawfully be accomplished. Pursuant to said authority, I hereby permit City officials to enter upon the property for purposes of inspection and, if necessary, to enter upon such property to perform work required of the applicant if the applicant were to fail to perform the required work. I also acknowledge that I have read this permit document with all its requirements and conditions, and I agree to all of the terms and conditions so stated in this permit.

Date

Approval for issuance:

City Engineer Approval

Permit Issuance Date

# EXHIBIT "A"

# DEVELOPMENT CONSTRUCTION PERMIT LIST OF PROJECT CONTACT PERSONS

PROJECT NAME:

## **Developer's Contact Persons:**

Applicant/Project Manager:

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

### **Project Engineer:**

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

### Developer:

\_

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

### **General Contractor:**

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

# **City Staff Contact Persons:**

**Transportation Development Review Engineer:** 

City of Loveland 500 East 3rd Street Loveland, CO 80537

Phone Numbers:

Office:	
Fax:	(970) 962-2904
E-mail:	

## **Public Works Inspector:**

City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: 970-Cell: 970-Pager: 970-Fax: (970-962-2508 E-mail:

## Storm Water Engineer:

Kevin Gingery Senior Civil Engineer City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3571 Fax: (970) 962-3400 E-mail: gingek@ci.loveland.co.us

### Water/Wastewater Engineer:

Rod Hamilton Civil Engineer City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3712 Fax: (970) 962-3400 E-mail: hamilr@ci.loveland.co.us

# Water/Wastewater Construction Inspector:

Joe Bocson Construction Inspector City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3725 Cell: (970) 962-3725 Cell: (970) 962-3400 E-mail: bocsoj@ci.loveland.co.us

### Power:

Kathleen Porter Field Engineer Supervisor City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3561 Fax: (970) 962-3400 E-mail: portek@ci.loveland.co.us

### **Current Planner:**

Greg George Planning Manager City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: 970-962-2521 Fax: (970) 962-2904 E-mail: georgg@ci.loveland.co.us

## **Traffic Operations:**

Bill Hange Traffic Engineer City of Loveland 105 West 5th Street Loveland, CO 80537 Phone Numbers: Office: (970) 962-2528 Fax: (970) 962-2907 E-mail: hangeb@ci.loveland.co.us

## **Development Construction Permit Coordinator:**

Diana Montgomery Community Services Department Transportation Development Review Engineering Division City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: (970) 962-2501 Fax: (970) 962-2904 E-mail: montgd@ci.loveland.co.us

# CITY OF LOVELAND TRAFFIC OPERATIONS 01-20-2000 RIGHT-OF-WAY WORK PERMIT REGULATIONS

ALL work done on City of Loveland right-of-way shall have an approved right-of-way permit prior to commencement of the work. This includes work done off the street/highway including sidewalks and parkways, driveway approaches, curb and gutter, etc.

Contractors apply for a right-of-way permit from the city of Loveland Traffic Operations office located at 105 West 5th Street, Loveland. Permits will NOT be issued until a traffic control plan has been submitted and approved by Traffic Operations. The city requires forty-eight (48) hours for approval of the permit prior to the start of work.

Traffic control firms will NOT set out signage until they have received an approved copy of the right-of-way permit and traffic control plan. Traffic control will be set up according to the time and stipulations on the permit. There can be no variation from this regulation – without prior approval by the Loveland Traffic Operations office. If traffic control on any project is found to be in violation of the permit issued, city inspectors will shut the project down and all traffic control will be removed. Repeated violations could result in a ban from work in the city of Loveland rights-of-way.

The city of Loveland right-of-way work permit form has been revised. It is now a one page, two sided form. Certain items have been changed or subtracted, and new stipulations added. PLEASE READ THE NEW FORM CAREFULLY. If you have any questions you should contact our office.

# TRAFFIC CONTROL PLANS SUBMITTED

CHECK LIST:

- 1. Plans must show:
- a) transition or taper lengths
- b) street names and location of work
- c) north arrow
- d) distances between warning signs, cones, barricades, etc
- e) types of devices must be labeled and listed
- f) street and lane widths, flow line to flow line or edge of pavement to edge of pavement
- g) divided highway (medians) must have dual signings
- h) whether there is a state highway permit
- i) posted speeds
- j) if arrow boards are required
- k) if message boards are required
- 1) if affected properties have been given 48 hours notice
- m) if any "special" signs are required
- n) if emergency services and school districts have been notified of closures

# CITY OF LOVELAND RIGHT-OF-WAY WORK PERMIT

PERMIT NO.: DATE OF APPLICATION:
APPLICANT'S
NAME.
COMPANY
NAME.
ADDRESS: CITY:
ADDRESSCITT
TATE: 7IP: BUSINESS
PHONE:
EMERGENCY PHONE( ) EAX
mone.()
STARTING DATE OF WORK COMPLETION
DATE:
DATE
If exact date(s) are unknown at the time of application, applicant must notify the city 24 hours prior to start of work or
when inspection is requested so that it can be noted on the permit. If project goes past completion date, applicant must
obtain approval from the city.
WORK SITE
If a State Highway, a CDOT permit must be obtained prior to this permit.
STREET & NUMBER/OR LEGAL
DESCRIPTION:
Is this a City of Loveland Project: Yes No. City Project Manager's Name
<u>is this a city of Eoverand Project</u> . Tes1(o <u>city Project Manager 5 Name.</u>
If the city project was hid with the specific department taking responsibility for permit fees
the application must be initiated by that department. The TCP Contractor's insurance
requirements and transfer of funds form must be submitted before the issuance of the permit
requirements, and transfer of rands form must be submitted before the issuance of the permit.
TYPE OF WORK
Excavation Type:Open
Cut:* Boring:
Description of
Work:
Dimensions: Length: Width: Area: sf Pavement
Depth ·
Roadway Surface:
Asphalt: Concrete: Gravel: Other
Purpose of
Project Water Sewer Telenhone Flectric Case Other
Tojett. waterJewerTelephoneElectricGasOther:
*City of Loyaland regulations call for flow fill to backfill tranch Asphalt thickness -
avisting this knows plus 1" when patching
existing unickness plus 1 when patching.
CUNCKETE FLATWORK
Remove and Replace:New
Remove and Replace:New Placement:Other:
Remove and Replace:New      Placement:Other:      Sidewalk:lfCurb & Gutter:lfC. G. & SlfDrive

TRAFFIC CONTROL PLAN
TCP approved for date(s) and time
only
TCP provided
by
Notes
PERMIT FEE:
\$30.00       Application and Inspection Fee for Excavation and/or Flat Work         Open cut area (sf) multiplied by \$2.50 - \$7.50 if paved within the last 5 years         TOTAL PERMIT FEE
Contractor states that he has read and understands the regulations printed on the backside of this application.
Certified Traffic Engineering Rep/Date Applicant's Signature/Date

<u>APPLICANT CERTIFIES BEFORE SIGNING PERMIT THAT ALL THE FOLLOWING</u> <u>CONDITIONS ARE UNDERSTOOD:</u>:

1. IN ACCORDANCE WITH CITY OF LOVELAND ORDINANCE, ANY AND ALL WORK DONE ON STREETS, CURB & GUTTER, SIDEWALKS, AND PARKWAYS, REQUIRES A RIGHT-OF-WAY PERMIT. THE CITY REQUIRES A FORTY-EIGHT (48) HOURS NOTICE FOR APPROVAL OF THE PERMIT.

2. ANY WORK DONE ON A STATE HIGHWAY WITHIN THE LIMITS OF THE CITY OF LOVELAND REQUIRES BOTH A COLORADO DEPARTMENT OF HIGHWAYS PERMIT AND A CITY OF LOVELAND RIGHT-OF-WAY PERMIT. THE CDOT PERMIT MUST BE OBTAINED FIRST AND PRESENTED AT THE TRAFFIC DEPARTMENT OFFICES WHEN APPLYING FOR THE CITY RIGHT-OF-WAY PERMIT. THE CITY OF LOVELAND WILL NOT ISSUE A RIGHT-OF-WAY PERMIT WITHOUT DOCUMENTATION FROM THE STATE.

3. A COPY OF THE RIGHT-OF-WAY PERMIT MUST BE KEPT ON THE CONSTRUCTION SITE AT ALL TIMES.

4. ALL AFFECTED PROPERTY OWNERS/RESIDENTS ALONG WITH ALL EMERGENCY SERVICES AND SCHOOL DISTRICT; WILL BE NOTIFIED AT LEAST 48 HOURS PRIOR TO ANY LANE OR ROAD CLOSURE UNDER THIS PERMIT.

5. APPROVED CERTIFICATE OF INSURANCE , OR BOND EQUAL TO THE VALUE OF THE WORK DONE, IS IN FILE WITH THE CITY OF LOVELAND TRAFFIC OPERATIONS OFFICE.

6. APPLICANT WILL CALL FOR UTILITY LOCATES BEFORE DIGGING.

7. APPLICANT WILL CALL FOR AN INSPECTION 24 HOURS IN ADVANCE. LEAVE A DETAILED MESSAGE AT 962-2640.

ALL FOREGOING PROVISIONS HAVE BEEN READ AND UNDERSTOOD AND AGREED TO. CONTRACTOR WILL COMPLY WITH ALL CITY ORDINANCES, STATE LAWS, AND PROVISIONS REGARDING SUCH CONSTRUCTION AND ACTIVITIES PURSUANT TO THIS PERMIT. AGREEMENT FOR RIGHT-OF-WAY

THIS	AGREEMENT	FOR	RIGHT-OF-WAY	("Agreement") i	s made	and	entered	into	this
	day of		, 200	by and between	l				
	and								
	_								

# WITNESSETH:

WHEREAS, \_\_\_\_\_\_ is the contract purchaser of a portion of that certain real property comprising approximately \_\_\_\_\_\_ acres situated in the City of Loveland, Larimer County, Colorado, legally described in Exhibit "A" attached hereto ("Property");

WHEREAS, \_\_\_\_\_\_ is the owner of real property legally described in Exhibit "B" attached hereto which is adjacent to the Property ("Right-of-way Area");

WHEREAS, the City of Loveland requires \_\_\_\_\_ to obtain a Right-of-way from \_\_\_\_\_ across the Right-of-way Area for the extension of \_\_\_\_\_\_ : and

WHEREAS, \_\_\_\_\_\_\_ is willing to dedicate, and \_\_\_\_\_\_\_ is willing to purchase such a Right-of-way upon the terms and conditions set forth herein below.

NOW, THEREFORE, in consideration of the premises, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. Upon receipt by \_\_\_\_\_\_ of Final Development Plan and Development Agreement approval from the City of Loveland for development of the Property, \_\_\_\_\_ shall grant a Right-of-way for the extension of \_\_\_\_\_\_ Street across the Right-of-way Area ("Right-of -Way"). Such grant shall be made in the standard form utilized by the City of Loveland for such purposes at that time.

(\_\_\_\_) days of the date on which the Right-of-way is granted and the second installment shall be due and payable twelve (12) months thereafter.

3. This Agreement is entered into, and shall be interpreted in accordance with, the laws of the State of Colorado.

4. This Agreement shall be binding upon, and shall inure to the benefit of, the parties hereto and their respective heirs, successors and assigns.

5. This Agreement sets forth the entire understanding of the parties with respect to the matters addressed herein, and may only be modified by a written amendment signed by all of the parties.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement or caused it to be executed as of the date first written herein above.

(Company or individual)

By: <u>Title:</u>

# **DEED OF DEDICATION**

KNOW ALL MEN BY THESE PRESENTS, that the undersigned Grantor(s), for good and valuable consideration, receipt of which is hereby acknowledged, do(es) hereby sell, grant and convey unto the City of Loveland, a Colorado municipal corporation, the following described parcel of land situate in the County of Larimer, State of Colorado, towit:

SEE ATTACHED EXHIBITS "A" and "B"

with all its appurtenances and warrant(s) the title to the same, free and clear of all liens and encumbrances, subject to reservations, agreements and restrictions of record, and existing easements, if any.

The above described property is to be used for street and utility purposes, which purposes shall include, but not be limited to, streets, sidewalks, curbs, gutters, utility lines, structures, equipment, apparatus and poles.

Acceptance of this conveyance by the City of Loveland, Colorado, shall not impose upon said City any obligation for the opening, widening, installation, improvement or maintenance of the above described property for any purpose, which obligation shall arise, if at all, only by separate action of the Loveland City Council.

Signed this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 200\_\_\_.

Grantor(s):

STATE OF COLORADO ) ) ss

COUNTY OF LARIMER

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_, by

Witness my hand and official seal.

)

Notary Public

My commission expires \_\_\_\_\_

ATTORNEY'S CERTIFICATE

I, \_\_\_\_\_\_, an attorney licensed to practice law in the State of Colorado, certify, that I have examined title to the above described land dedicated to the City of Loveland, Colorado, and that the parties executing the dedication are owners thereof in fee simple, and the dedicated land is free and clear of all liens and encumbrances.

So sworn this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 200\_\_\_\_.

Attorney at Law, #\_\_\_\_\_

# **EXHIBIT "A"** (Legal Description)



# EXHIBIT "B" (Map)

## **GRANT OF EASEMENT**

THIS INDENTURE, made this \_\_\_\_\_\_ day of 200\_\_\_\_by and between \_\_\_\_\_\_ as party of the first part and the CITY OF LOVELAND, COLORADO, a municipal corporation, hereinafter referred to as "City".

### WITNESSETH:

**FOR GOOD AND VALUABLE CONSIDERATION,** the receipt of which is hereby acknowledged, first party has this day bargained and sold, and by these presents does bargain, sell, convey a, transfer and deliver unto the City, its successors and assigns, an easement and right-of-way in, over and across the real estate hereinafter described, including the perpetual right to enter upon said property at any time that it may see fit, and to construct a pedestrian way across and through the lands hereinafter described and to repair, replace, relocate, inspect, and operate said "pedestrian way" provided, however, that City shall restore the ground surface to its prior condition after disturbing the same. The term "pedestrian way" as used herein shall mean equipment and structures associated therewith.

The easement and right-of-way hereby granted, situated in Larimer County, Colorado is described as follows:

Exhibit "A" attached hereto and incorporated herein.

TO HAVE AND TO HOLD said easement and right-of-way unto the City, its successors and assigned forever.

The first part does hereby covenant with the City that it is lawfully seized and possessed of the real property above described, that it has a good and lawful right to convey the easement and right-of-way herein granted, that the said easement and right-of-way is free and clear of all encumbrances, and that it will forever warrant and defend the title thereto against lawful claims to all persons whomsoever.

**IN WITNESS WHEREOF**, the first party has executed this Grant of Easement the day and year first above written.

First Party	Attest:	
	Secretary	
By:	SEAL	
Name, Title		
STATE OF COLORADO )		
) ss		
County of Larimer )		
The foregoing instrument was acknowledged before me this	day of	2
of 2002, by		•
My commission expires:		
(SEAL)		
	Notary Public	

EXHIBHT "A" (Legal Description)

P.L.S.

Stamp

### **GRANT OF TEMPORARY TURNAROUND ACCESS**

	THIS INDENTURE, made this	day of	,
200	, by and between		as
their in	terest may appear, as party of the first part, an	d the CITY OF LOVELAND, COL	ORADO, a
munici	pal corporation, hereinafter referred to as "Cit	ty", WITNESSETH:	

FOR GOOD AND VALUABLE CONSIDERATION, the receipt of which is hereby acknowledged, first party has this day bargained and sold, and by these presents does bargain, sell convey, transfer and deliver unto the City, its successors and assigns, a temporary turnaround access, in, over and across the real estate hereinafter described, including the perpetual right to enter upon said property at any time that it may see fit, and to use a temporary turnaround for vehicles provided however, that the City shall restore the ground surface after installation of the temporary turnaround to its prior condition after disturbing same. This easement will be null and void upon acceptance by the City of the extension of the roadway which negates the need for the temporary turnaround, to the approval of the City Public Works Street Inspector.

The temporary turnaround access easement hereby granted, situated in Larimer County, Colorado, is described as follows:

# SEE TEMPORARY TURNAROUND ACCESS EXHIBIT "A"

TO HAVE AND TO HOLD said temporary turnaround access easement unto the City, its successors and assigns forever.

The first party does hereby covenant with the City that it is lawfully seized and possessed of the real property above described, that is has a good and lawful right to convey the temporary turnaround easement herein granted, that the said temporary turnaround access easement is free and clear of all encumbrances, and that it will forever warrant and defend the title thereto against lawful claims of all person whomsoever. IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

# DEVELOPER

By: \_\_\_\_\_

Title: \_\_\_\_\_

STATE OF COLORADO	)
	) ss
County of	_)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_ by \_\_\_\_\_.

Witness my hand and seal. My commission expires:\_\_\_\_\_\_.

Notary Public

(S E A L)

Address

### Page 1

# CITY OF LOVELAND ENCROACHMENT PERMIT APPLICATION

DATE:
ATTENTION:
TOTAL PAGES:
PLEASE REFAX THIS FORM WITH COMMENTS WITHIN TWO (2) WEEKS OF RECEIPT TO:
PHIL LINDGREN, ASSOCIATE TRAFFIC ENGINEER
CITY OF LOVELAND TRAFFIC
1-9/0-962-2907 FAX TELEPHONE: 1-970-962-2516
ENCROACHMENT PERMIT APPLICATION FOR:
TYPE OF STRUCTURE:
LEGAL DESCRIPTION OF PROPERTY:
APPROVED?
COMMENTS.

# Date:

# **ENCROACHMENT PERMIT REVIEW ROUTING LIST:**

Please return to:	Jane E. Conklin, Engineering Technician Loveland Traffic Operations 105 West 5 <sup>th</sup> Street Loveland, CO 80537 Telephone: 962-2535 FAX: 962-2907							
NAME OF APPLICANT:								
WORK LOCATION	J:							
ENGINEERING:	Signature/Date							
LIGHT AND POWI	ER:Signature/Date							
STREETS:	Cianatana /Data							
Comments:	Signature/Date							
WATER & WASTE	WATER:Signature/Date							

CITY OF LOVELAND TRAFFIC OPERATIONS 105 W. 5 <sup>TH</sup> ST., LOVELAND, CO 80537 (970) 962-2535 FAX: (970) 962-2907
DATE:
APPROVAL OF TRAFFIC CONTROL PLAN SUBMITTAL
PLAN SUBMITTED BY
FAX NODATE SUBMITTED
LOCATION SUBMITTED FOR
CONTRACTOR/ENTITY SUBMITTED FOR
DATES T.C.P. IS NEEDED
NOTES:
TRAFFIC CONTROL PLAN IS:       APPROVED         APPROVED       NOT APPROVED         IF NOT APPROVED FOLLOWING CHANGES / CORRECTIONS / ADDITIONS /         DELETIONS MUST BE MADE AND THE PLAN RE-SUBMITTED TO CITY OF         LOVELAND TRAFFIC:
Plan clean/legible
Transition or Taper Lengths
Street Names (Location of work)
North Arrow
Type of device
Street and lane widths, flowline / flowline, or edge of pavement / edge of pavement
Divided Highway/Dual Signage (Medians)
State Highway Permit
Posted Speed
Arrow Boards Required
Notification of Affected Properties
Notification of Emergency Services/School District
Special Signs Needed
Special Instructions:
RIGHT-OF-WAY PERMIT NUMBER FROM CITY OF LOVELAND

Authorized Representative/City of Loveland Traffic Operations

# **City of Loveland** Application for Building Permits Building Division \* 500 E 3rd St \* Loveland, CO 80537 General Information (970)962-2505 \* Inspection Line (970)962-2100 \* TDD (970)962-2620 \* FAX (970)962-2904

Address:		an the transmission of the second		Lot Size	e:		sf
Lot: Block:	: Subdivision	n:				5	
Owner Name:				Phon	e:		
Address:					(7)		
Contractor Name:	(Street)	(City)	) Jicense Numbe	(State) er: Ph	(Zip ( one:	Code)	<u>_</u> _
🗆 Residential 🛛	Non-Residential		□ New Build	ing 🗆 Alter	ration	🗆 Addit	ion
Proposed Use:	Existing Use:	Building Height:	Constructio ft. Type:	n Occupa Group:	ncy	Occupant Load:	
Number of Units:	Number of Stories:	Number of Bedrooms:	·	Number of Bathrooms: Full-	3/4	- 1/2	-
Fireplace? Gas Logs? Y N # Y N	Type of Heat: Gas Electric	Electric Servi Size:	ce Amps	Water Meter Size:	inch	Number Electric:	of Meters Water:
Garage (Detached / Attached) sf	Basement (sf) Fin Unfin	1st Fin	Floor (sf) Unfin	2nd Floor (s Fin Unfin	f)	3rd F Fin	loor (sf) Unfin
Carport sf	Porch sf (Roof? Y N)	Deck	sf (Roof? Y N)	Storage si	f (Proposed	d Use:	) .
Foundation Plans?  □ Recei	ved 🛛 At Issuance				Valua	ations	
Master Plan Number:	□ Full Permi □ Ftg. & Fnd	t 🗆 Trai in. 🗆 Traf	ffic Impact Study fic Worksheet	Total Valuation \$			
Describe Work/List Options:				Electrical Subcontractor		Valuation \$	
				Mechanical Subcontractor		Valuation \$	
				Plumbing Subcontractor		Valuation \$	
I certify this application is corre ordinances, state laws and build	ct. I agree to perform the work d	escribed accordin	g to plans and specif	fications submitted and	approved.	I agree to comp	ly with all city
Signature		Date	Recei	ved By	Da	ite	_
	*	** Office	Use Only *	**			
Staff Comments:				Application	Inform	nation	
and Standard (1999) All Angeler (1997) All Angeler (1997) All Angeler (1997)			LID No.:		<b></b>	F	Total
			Zoning:	Fees:			
			Insp. Area:	Date:		<u> </u>	2010 - 100 -
			SR No.:				•
Dunung Ciliciai:			variance No.:	Аррисацой	rumper:	ing and a set of the state of the set of the	

Ref: "Adequate" Community Facilities Data Form

Rev. 08/99



### **GRADING, EXCAVATING** AND FILL PERMIT

The city of Loveland has adopted Chapter 15 of the Loveland Municipal Code through which construction practices and building codes are administered. The grading, excavating and fill provisions are contained in the building code. The purpose of these guidelines is to safeguard life, limb, property and the public welfare by regulating the movement of dirtwork on private and surrounding property.

#### **Exemptions from this permit include:**

- >Grading in isolated, self-contained areas where there is no danger to public or private property.
- >Excavation activity when it is part of a project requiring a building permit (review and approval will be part of the building permit approval process).

For a complete list of exceptions, refer to the currently adopted building code.

Permit applications may be obtained at the Development Center, Building Division or contact (970) 962-2505.

### **Application information must include:**

>Name and address of the property owner and applicant. >Legal description and address of the property.



>Vicinity map showing important physical features such as creeks and streams, etc. >Three (3) sets of construction documents which indicate property boundaries, location of structures on the property or within 20 feet of the property, location of the excavation site, existing and proposed final contours of the site, detailed plans showing provisions for on site stormwater detention and runoff.

>Completion of the following ancillary documents to be completed with each grading permit application is required:

U.S. Army Corp of Engineers Pre-Construction Notification (PCN) and a copy of 404 Permit and/or correspondence from the Corp.

State of Colorado General Permit Application, Stormwater Discharge Permit and a copy of permit acceptance letter from the State.

Colorado Department of Public Health & Environment Air Pollutant Emission Notice-Dust Control Plan-and-Application for emission permit and copy of permit acceptance letter from the State.

### **Plan Review and Permit Fees**

Fees for both the plan review and permit are established in accordance with the most currently adopted building code and per the Table on the reverse of this sheet. To compute these fees, the total number of cublic yards of material involved as well as valuation of the project is needed.

#### Inspections

The City of Loveland will inspect the site during the review and during the construction process as well as after the project is complete.



# APPLICATION FOR A PERMIT TO MOVE A BUILDING

On Streets, Alleys and Other Public Ways in the City of Loveland

Date: \_\_\_\_\_

### A. OWNER AND BUILDING INFORMATION

Owner of Building:			Type of Building:				
Size of Building:	Length:	Width:	Ht.:	Loaded Ht.:			
Present Location:							
To Be Moved To:			Date/Tim	e of Move:			
Route to be Used:							

### **B. BUILDING MOVER INFORMATION**

Name of Mover: PUC License No.:		
Type of Insurance Coverage/Amount Carried:		
Insurance Company:	Date Insurance Filed with City Clerk:	

### C. NOTIFICATION OF CITY DEPARTMENTS AND UTILITY COMPANIES (see attached list):

City Department/ Utility Company	Person Coordinating	Est'd Cost to City Dept./Utility Co.	Comments (i.e. any further notice, meeting places/times)
City of Loveland Water and Power Dept.			
City of Loveland Police Department			Call dispatch prior to move at 667-2151.
U.S. West Communications, Greeley			
Public Service Company, Fort Collins			
Comcast Communications Longmont			
Poudre Valley REA, Fort Collins			1 day notice prior to move.
City of Loveland Engineering Division, Traffic Engineer			

D. If the date/time of move changes or at the time of application the date/time is unknown, it is the mover's responsibility to notify all the above agencies. The mover assumes all responsibility for damages resulting from the moving of the building in the City of Loveland. A FAX copy of the permit is acceptable in order to get agencies signatures, but we require the permit to have the mover's original signature on it.

Mover: \_\_\_\_\_

City Engineer Approval:

### **EROSION CONTROL PROCEDURES**

Erosion Control is required for any of the following operations: (1) The new construction of 3plex or larger residential or non-residential buildings and/or all non-residential building additions. (2) Land development earth work for subdivisions.

## (1) Building Construction - Grading and Building Permit Application:

At Permit Application the "Applicant" shall submit an Erosion Control Plan to the Building Division.

Routing and Review requires 15 Working Days: Two Copies of Plan Required The Building Division routes one plan to Public Works Stormwater Engineering (Kevin Gingery @ 962-3571) at the Service Center for review & comments. Stormwater Engineering will contact the "Applicant/Contractor" if revisions are required. The other plan is routed to Public Works Engineering.

### (2) Land Development Earth Work:

Earth Work may begin once the "Contractor" has installed an accepted Erosion Control Plan and been issued a Grading Permit by the City of Loveland.

### Routing and Review:

An Erosion Control Plan is required to be submitted with the final construction plans for public improvements. The Community Services Planning Division routes the plans to Public Works Stormwater Engineering (Kevin Gingery @ 962-3571) at the Service Center for review & comments. Stormwater Engineering will contact the "Applicant" if revisions are required. Stormwater Engineering also contacts Public Works Engineering once the plan is accepted.

### Field Installed Erosion Control:

The accepted Erosion Control Plan is installed at the work site. Once installation is complete the "Contractor" calls Public Works Engineering Two-Working-Days in advance for an inspection, (Dave DeBaere @ 962-2510). The Public Works inspector will inspect and list the inspection results on the AS-400 (the City's Computer System) and contact the "Contractor".

Acceptance: Once Erosion Control measures have been properly installed in the field. The Public Works Engineering Inspector will release that portion of the requirement for a grading and/or building permit.

### Erosion control NOT properly installed:

The Public Works Engineering Inspector will notify the "Contractor" of what is required to correct the plan.

### Permit Issued:

The Public Works Engineering Inspector will perform random inspections of temporary erosion control during construction. The "Contractor" is required to maintain temporary erosion control measures during construction, if temporary erosion control measures are not properly maintained the "Contractor" will be subject to a "Stop Work Order".

#### Request for final inspection:

Inspection of all **permanent** erosion control improvements. The "Contractor" shall call Public Works Engineering for final inspections.

# **Appendix B-4**

# **NOTE:** Contact Local Entity Engineer for Current Fees.

Fees:

- City of Fort Collins (Add When Available)
- City of Loveland (Add When Available)
- Larimer County (Add When Available)

# **Appendix B-1**

# **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

# **City of Loveland Reimbursement Forms:**

- Reimbursement Agreement for New Street Construction & Related Exhibits
- Agreement for Incomplete Public Improvements Cash Deposit & Related Exhibits
- Agreement for Incomplete Public Improvements Letter of Credit & Related Exhibits
- Agreement for Incomplete Development Improvements Cash Deposit & Related Exhibits
- Agreement for Incomplete Development Improvements Letter of Credit & Related Exhibits

# REIMBURSEMENT AGREEMENT FOR NEW STREET CONSTRUCTION

**THIS AGREEMENT,** made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_, by and between the CITY OF LOVELAND, COLORADO, a municipal corporation, hereinafter called the "City" and \_\_\_\_\_\_, hereinafter called the "Developer",

# WITNESSETH

**WHEREAS,** the City has required that the Developer provide for and the Developer finds it necessary and desirable to provide for the installation of certain improvements ("Improvements") which are the subject of this Agreement and which Improvements are described in more detail in Exhibit A, attached hereto; and

**WHEREAS,** pursuant to the Reimbursement Policy for New Street Construction adopted by the City ("Policy"), the City and the Developer desire to enter into this Agreement in order for the City to attempt to collect a charge per front foot from the owners of abutting properties prior to the issuance of any building permits for the abutting properties;

**NOW THEREFORE,** in consideration of the mutual covenants contained herein, it is agreed as follows:

# 1. **<u>REIMBURSEMENT.</u>**

It is agreed that the Developer shall have an opportunity to be reimbursed from subsequent future development or re-development of property adjacent to and abutting the Improvements installed by the Developer ("Obligated Property") for a portion of actual costs of the Improvements.

Attached hereto as Exhibit B is a listing of the total certified cost of the Improvements eligible for reimbursement.

Attached hereto as Exhibit C is a description of each Obligated Property and the name, address and telephone number of the owner of each Obligated Property adjacent to and abutting the eligible Improvements. It shall be the Developer's obligation to maintain the accuracy of this Exhibit and to provide the notice required by the Policy.

Attached hereto as Exhibit D is a calculation of the frontage of each Obligated Property and the reimbursement amount due from each Obligated Property based on the certified costs.

For the purpose of providing an opportunity for reimbursement to the Developer, the City agrees, subject to the provisions contained in this Agreement, to attempt to collect certain sums of money as set forth herein, in addition to all other fees and sums collected by the

## City of Loveland Reimbursement Forms

City, from those owners who commence subsequent future development or redevelopment of the Obligated Property prior to the issuance of a building permit on the Obligated Property. Any undeveloped portions, lots, or pieces of property that result from the splitting, subdividing or replatting of any of the Obligated Properties after the date this agreement is recorded are subject to this Agreement. The Developer acknowledges that the issuance of any building permits on any split, subdivided or replatted portion of the Obligated Properties which occurred prior to the date this Agreement is recorded may prevent the applicability of this Agreement to certain portions of the Obligated Properties. The City makes no representations as to the applicability of this Agreement to any portion of the Obligated Properties which may have been split, subdivided, replatted and developed prior to the date this Agreement is recorded.

- a) At, or prior to, the issuance of a building permit for any development or redevelopment within the Obligated Property, the City shall attempt to collect from the applicable owner the reimbursement amount set forth in Exhibit D subject to adjustment as set forth below.
- b) The sum of money paid by each obligated property shall be the amount, as calculated above, multiplied by the ratio of the <u>Engineering News Record (ENR)</u> construction cost index for Denver for the month in which the reimbursement payment is made, divided by \_\_\_\_\_\_, the construction cost index for \_\_\_\_\_\_ when the construction cost was paid by the Developer.
- c) Any fees collected by the City shall be payable to the Developer as reimbursement for the costs of installing the Improvements. Within sixty (60) days of receipt of any fees from the owner(s) of the Obligated Property, the City shall provide written notification to the Developer at \_\_\_\_\_\_\_. The City's obligation to pay the collected fees shall be conditioned upon the Developer making written request to the City Engineer for payment of the fees within one year of their collection by the City. Failure to make such a request shall result in the collected fees becoming the sole property of the City.
- d) The obligations of the City under this Agreement in attempting to assess and collect the reimbursement fees described herein are offered solely as an accommodation to the Developer. Accordingly, the City shall not be liable to the Developer for the City's failure in any fashion to collect the monies specified herein and shall have no obligation to commence litigation for the purpose of attempting to make such collection. In the event the City's attempt to collect such charge, including without limitation the City's withholding of building permits, results in the filing of any claim against the City and/or the commencement of litigation against the City, Developer agrees to pay all costs and fees incurred by the City in defense of the same, including without limitation, reasonable attorneys fees. Developer further agrees to indemnify and hold harmless the City from any damages or awards arising from or relating to any such claim or litigation. Prior to the City being required to litigate any claim under this Agreement, the City may require the Developer to pay to the City cash funds or provide the City other collateral acceptable to the City sufficient to cover the amount of any damages

# City of Loveland Reimbursement Forms

sought in the litigation as well as a reasonable amount to cover the City's anticipated costs and attorneys' fees in the litigation or, if damages are not sought in the lawsuit, then such amount as the City may consider reasonably necessary to ensure payment of all the City's costs and attorneys fees which may result therefrom. Notwithstanding the foregoing, the City shall not commence any litigation to collect any charge under this Agreement without the prior written consent of the Developer.

- e) Payments of fees collected shall be made to the Developer prior to the last day of each year during the term of this Agreement. The Developer's failure to comply with all of the requirements, terms and conditions of the Policy, attached hereto as Exhibit E, including the notice requirements, shall relieve the City of any obligation to impose the fees upon the Obligated Property and to make any payment to the Developer.
- f) In the event that the Developer is in default with regard to any other obligation to the City, the City shall have the right to set off any reimbursement which may be due to the Developer hereunder to satisfy, in whole or in part, any such default.

# 2. **TERM, EFFECT AND INTEGRATION.**

It is expressly understood and agreed that the terms of this Agreement shall be binding upon and inure to the benefit of the heirs, successors, representatives, and assigns of the parties hereto; and that the reimbursement provisions of this Agreement shall be in force and effect only for a period of 10 years from the date of acceptance of the Improvements unless extended by the City Council, or until maximum reimbursement is made prior to expiration of the term of this Agreement.

This Agreement and any rights hereunder may not be assigned without the written consent of the parties hereto, which consent shall not be unreasonably withheld.

Documents attached to this Agreement are:

- 1. Exhibit A Description of Improvements;
- 2. Exhibit B Certified Reimbursement Costs;
- 3. Exhibit C Description of Obligated Property and list of owners;
- 4. Exhibit D Calculation of Reimbursement Amounts;
- 5. Exhibit E Reimbursement Policy for New Street Construction;
- 6. Exhibit F Construction Improvements Map.

This Agreement constitutes the entire Agreement of the parties, and may be altered, amended or revised only by written agreement of the parties hereto.

# City of Loveland Reimbursement Forms THE CITY OF LOVELAND A Municipal Corporation

ATTEST:	City Engineer
City Clerk	
	APPROVED AS TO FORM:
	City Attorney
State of Colorado ) ) County of Larimer )	
Subscribed and sworn by My commission expire	to before me this day of, 20, City Engineer and, City Clerk.
SEAL	
	Notary Public
	, Developer
	By:
	Title:

# ATTEST:

 Corporate Secretary

 State of Colorado

 )

 County of Larimer

 )

 Subscribed and sworn to before me this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 20\_\_\_\_\_, by \_\_\_\_\_\_\_, Corporate \_\_\_\_\_\_, and \_\_\_\_\_\_, Corporate Secretary.

 My commission expires \_\_\_\_\_\_\_.

S E A L

Notary Public

# **EXHIBIT** A

# STREET REIMBURSEMENT AGREEMENT

Description of Improvements:
# **EXHIBIT** A

### STREET REIMBURSEMENT AGREEMENT

Description of Improvements:

Public street construction along North Wilson Avenue of which 1/2 of the center 34' for a length of 1074' is adjacent to the properties of Buck First and Second Additions.



EXHIBIT A, PAGE 1 OF 1

### STREET REIMBURSEMENT AGREEMENT

# Certified Reimbursement Costs:

# PERMANENT PUBLIC STREET IMPROVEMENTS INSTALLED FOR \_\_\_\_\_

Date of City Acceptance for the Completed Street Improvements \_\_\_\_\_

DESCRIPTION OF BASIC CONSTRUCTION AND CERTIFIED COST ELEMENTS:					
QTY	UNIT	ITEM	UNIT COST	EXTENDED COST	
	LF	Curb and gutter installed for the roadway		\$ 0.0	0
	LF	Sidewalk installed along the roadway (within public street right-of-way or pedestrian easement)		\$ 0.0	0
		Accesses constructed onto the roadway (includes street pans, radii curb returns, and/or handicap ramps)		\$ 0.0	0
	CY	Excavation removed for the roadway		\$ 0.0	0
	CY	Fill installed for the roadway		\$ 0.0	0
	SY	Pavement section installed for the roadway (includes layers of asphalt and base course(s))		\$ 0.0	0
	SY	Subgrade prep installed for the roadway		\$ 0.0	0
Cost of permanent drainage facilities installed for the roadway					
Cost of testing materials for construction of the roadway					
Cost of signs, striping, and barricades installed for/on the roadway					
Traffic control costs incurred during and for construction of the roadway					
Actual design costs incurred for the public street improvements					
Actual finance costs incurred for the public street improvements					
Actual administration costs incurred for the public street improvements					
TOTAL	COST OF	THE PERMANENT PUBLIC STREET IMPRO	VEMENTS		

# STREET REIMBURSEMENT AGREEMENT

Letters with Detailed Breakdown of Eligible Fees and Certification of Payment of Eligible Fees

### STREET REIMBURSEMENT AGREEMENT

# Certified Reimbursement Costs:

# PERMANENT PUBLIC STREET IMPROVEMENTS INSTALLED FOR North Wilson Avenue

Date of City Acceptance for the Completed Street Improvements September 15, 1995

DESCRIPTION OF BASIC CONSTRUCTION AND CERTIFIED COST ELEMENTS:					
QTY	UNIT	ITEM	UNIT COST	EXTEN COS	IDED ST
0	LF	Curb and gutter installed for the roadway		\$	0.00
0	LF	Sidewalk installed along the roadway (within public street right-of-way or pedestrian easement)		\$	0.00
0		Accesses constructed onto the roadway (includes street pans, radii curb returns, and/or handicap ramps)		\$	0.00
49	CY	Excavation removed for the roadway	\$5.60	\$	274.40
0	CY	Fill installed for the roadway		\$	0.00
108	SY	9" Hot Bituminous Pavement section installed for the roadway	\$13.35	\$	1,441.80
900	SY	1-1/2" Asphalt Overlay Pavement section installed for the roadway	\$2.45	\$	2,205.00
1015	SY	4" Hot Bituminous Pavement section installed for the roadway	\$6.90	\$	7,003.50
147	SY	Subgrade prep installed for the roadway	\$1.20	\$	176.40
Cost of pe	rmanent d	rainage facilities installed for the roadway		\$	0.00
Cost of testing materials for construction of the roadway			\$	0.00	
Cost of signs, striping, and barricades installed for/on the roadway			\$	0.00	
Traffic control costs incurred during and for construction of the roadway			\$	1,125.00	
Actual design costs incurred for the public street improvements			\$	800.00	
Actual finance costs incurred for the public street improvements			\$	0.00	
Actual administration costs incurred for the public street improvements			\$	0.00	
TOTAL COST OF THE PERMANENT PUBLIC STREET IMPROVEMENTS			\$13	3,026.10	

# STREET REIMBURSEMENT AGREEMENT

July 8, 1998

Mr. Greg Muhonen City of Loveland Community Services 500 East Third Loveland, CO 80537

Re: North Wilson Avenue Improvements in the Emerald Glen Subdivision

Dear Mr. Muhonen:

This letter hereby certifies that all fees owed to Connell Resources Inc. for the eligible North Wilson Avenue improvements (See attached Schedule 4) have been paid in full. The fees were paid by Glen Properties, Inc. with check #1104, dated September 13, 1995.

If you have any questions or need further information, please call me at (970) 223-3151.

Sincerely,

Connell Resources Inc.

# **EXHIBIT C**

# STREET REIMBURSEMENT AGREEMENT

Description of Obligated Property and List of Owners:

# **EXHIBIT C**

### STREET REIMBURSEMENT AGREEMENT

Description of Obligated Property and List of Owners:

Tract A, Buck 1st Addition Assessor's parcel #9504005001 Book: 8800 Page: 7305

Tract A, Buck 2nd Addition Assessor's parcel #9504006001 Book: 8800 Page: 7302

Owner of both properties:

JS Buck & Assoc 813 Marble Dr Fort Collins, CO 80526



EXHIBIT C, PAGE 1 OF 1

# **EXHIBIT D**

# STREET REIMBURSEMENT AGREEMENT

Calculation of Reimbursement Amounts:

			Total
Owner			
Frontage (ft.)			
% of Total			100%
Share of Costs*	\$0.00	\$0.00	\$0.00
City Fee**			
(deduction)			(\$0.00)
Reimbursement			\$ 0.00

\*Amounts subject to collection by the City of Loveland at or prior to issuance of a building permit for any development or re-development of the above described properties. Amounts subject to adjustment as set forth in the Street Reimbursement Agreement item 1(b).

\*\*\$500.00 or 3%, whichever is greater, service charge will be deducted from the reimbursement to the installing developer when the obligated amount is collected.

# **EXHIBIT D**

### STREET REIMBURSEMENT AGREEMENT

Calculation of Reimbursement Amounts:

	Tract A, Buck 1st Addition	Tract A, Buck 2nd Addition	Total
Owner	JS Buck & Assoc.	JS Buck & Assoc.	
Frontage (ft.)	449	625	1074
% of Total	41.81%	58.19%	100%
Share of Costs*	\$5,446.21	\$7,579.89	\$13,026.10
City Fee**			
(deduction)			(\$500.00)
Reimbursement			\$12,526.10

\*Amounts subject to collection by the City of Loveland at or prior to issuance of a building permit for any development or re-development of the above described properties. Amounts subject to adjustment as set forth in the Street Reimbursement Agreement item 1(b).

\*\*\$500.00 or 3%, whichever is greater, service charge will be deducted from the reimbursement to the installing developer when the obligated amount is collected.

# EXHIBIT E

### STREET REIMBURSEMENT AGREEMENT

Reimbursement Policy (Non-Capital Expansion Fee Streets)

<u>General</u>. When any Developer, as a Local Entity-required condition of development, constructs a public street, alley or pedestrian-bike way to serve property through undeveloped areas or areas that may be redeveloped, or constructs a public street, alley or pedestrian-bike way along the perimeter of the property, the entire cost of such construction, including acquisition of all necessary rights-of-way, shall be the responsibility of such person or Developer.

- 1. <u>Front Footage Charge</u>. If the following conditions are satisfied, the installing Developer may enter into a reimbursement agreement with the Local Entity such that, as a condition of approval of subsequent development or re-development of property adjacent to the newly constructed public street, alley or pedestrian-bike way, the Local Entity may collect a front footage charge from the abutting Developer prior to the issuance of any building permits for the abutting property. The front footage charge shall be established by prorating the total amount of original certified costs to the lineal frontage of all properties abutting the constructed improvement.
- 2. <u>Notice of Agreement</u>. The Local Entity shall not attempt to make such collection until the reimbursement agreement is properly prepared and executed and the owners of abutting property have received or reasonably should have received notice of the reimbursement agreement.
- 3. <u>Letter of Intent</u>. Within thirty (30) days of the completion and acceptance by the Local Entity of such improvements, the Developer shall notify the Local Entity in writing of its intent to enter into a proper reimbursement agreement with the Local Entity.
- 4. <u>Full Payment</u>. All costs for the construction of improvements must be fully paid by the Developer before such person shall be entitled to reimbursement under any agreement established hereunder.
- 5. <u>Documentation of Costs and Obligated Properties</u>. After written acknowledgement by the Local Entity of receipt of said written intent to enter into a reimbursement agreement, the Developer shall have sixty (60) days to provide the Local Entity Engineer with copies of the following:
  - a. A letter from the Designer with detailed breakdown of all fees that are directly attributable to the street, alley or pedestrian-bike way improvements eligible for reimbursement and a statement certifying that all such fees have been paid in full.

# **EXHIBIT E**

# STREET REIMBURSEMENT AGREEMENT

- b. A letter from the Developer's Contractor with a detailed breakdown of costs for all improvements eligible for reimbursement and a statement certifying that all such costs have been paid in full.
- c. A letter from the Developer's financing office certifying any financial charges assessed that are eligible for reimbursement.
- d. An accurate map prepared by a licensed Engineer or Surveyor which shows:
  - 1) the location and limits of the eligible street, alley or pedestrian-bike way improvements;
  - 2) the name, address and telephone phone number of the owner of each property abutting the eligible improvements;
  - 3) the frontage of each property (with lineal footage shown);
  - 4) the reimbursement amount due from each property based on the original certified costs, divided by the frontage of all abutting properties, multiplied by the frontage of the individual property;
  - 5) the book, page and reception number from the records of the County Clerk and Recorder or the name of the recorded plat from which the information for each property was obtained; and
  - 6) any other information deemed necessary by the Local Entity Engineer to properly prepare a reimbursement agreement.
- 6. <u>Reimbursement Agreement Forms</u>. After receipt of written notice from the Local Entity Engineer documenting Certified Costs, the Developer shall provide City three signed original Reimbursement Agreement forms to the Local Entity. (Refer to Appendix B-1 of the Larimer County Urban Area Street Standards for Reimbursement Agreement.) Following execution of the agreement by the Local Entity, two signed originals shall be returned to the Developer, who shall record the agreement with the Larimer County Clerk and Recorder.
- 7. <u>Notification of Agreement</u>. After execution and recording of the reimbursement agreement, the installing Developer shall certify, by affidavit, that all owners of properties obligated to provide reimbursement have been notified in writing through certified mail with return receipt requested. The Local Entity shall then cause to be published a public notice listing the properties and reimbursement amounts. The Local Entity shall endeavor to provide notice on future plats of property obligated to provide reimbursement of the

# EXHIBIT E

### STREET REIMBURSEMENT AGREEMENT

recorded agreement, but the failure to provide notice shall not relieve the owner of the platted property of any reimbursement obligation.

- 8. <u>Inflation Adjustment</u>. The amount of the reimbursement assessed by the Local Entity for each adjacent property as it develops shall be based on the certified costs of the improvements plus an adjustment for inflation based on the construction cost index for Denver, Colorado, as published monthly by "Engineering News Record." The Local Entity Engineer's determination concerning total eligible costs shall be final.
- 9. <u>Collection</u>. The Local Entity's obligation to reimburse the Developer shall be contingent upon the Local Entity's actual collection of the front footage charge from the abutting developer. The Local Entity shall have no obligation to reimburse any funds that it fails to collect, for whatever reason, provided that the Local Entity made a good faith attempt to collect such funds.
- <u>Payment</u>. When the front footage charge is collected, the Local Entity shall reimburse the installing developer to the extent of such collection after deducting a service charge of \$500 or three (3) percent of the amount collected, whichever is greater, to cover the Local Entity's legal, engineering and administrative costs.

Funds collected pursuant to a reimbursement agreement shall be paid to such person as identified in the agreement, and if such person cannot be found, to an alternate if designated in the agreement.

11. <u>Limitations</u>. Any right to reimbursement pursuant to this provision shall not exceed a period of ten (10) years from the acceptance by the Local Entity of the street, alley or pedestrian-bike improvements. The Local Entity Governing Body may approve extensions of the reimbursement agreement for additional ten year periods. No such reimbursement shall be made unless the person entitled to reimbursement has fully satisfied their obligations under any other agreements with the Local Entity.

# **EXHIBIT F**

STREET REIMBURSEMENT AGREEMENT

Map:

#### AGREEMENT FOR INCOMPLETE PUBLIC IMPROVEMENTS WITH CASH DEPOSIT AGREEMENT

RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_,200\_\_\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* hereinafter called "Developer"),

WITNESSETH:

WHEREAS, Developer has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40 and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Developer comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permit upon the agreement of the Developer herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Developer mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Developer, and in that regard, Developer will furnish to City a cash deposit.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Developer according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for \*\*\*\* **Subdivision**, as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by Developer by \*\*\*\*\*.

3. Developer agrees to and hereby does submit with this Agreement a certified or cashier's check, acceptable to the City in the amount of \*\*\*\* (<u>\$\*\*\*\*</u>) (Developer's Deposit) which is the estimated cost of satisfaction of the improvement herein described. The City may deposit Developer's Deposit in a City interest bearing account and agrees to hold Developer's Deposit as collateral for Developer's promise to construct the improvements. If Developer does not construct the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, the City shall be entitled to use Developer's Deposit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Developer agrees that it is obligated for the actual cost of constructing the improvements and Developer's Deposit is only collateral for Developer's promise to pay such cost. If Developer constructs the improvements and upon inspection and acceptance of the improvement by the City, the City will refund Developer's Deposit, less any interest earned, to the Developer.

4. Developer acknowledges that time is of the essence of this Agreement. Developer's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Developer breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party, whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Developer, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the Developer's Deposit to City, and provided all other conditions not herein contained have been met by Developer, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

DEVELOPER
-----------

	By:
	Title:
STATE OF COLORADO )	
County of Larimer )	
The foregoing instrument was ackno , 200 by	wledged before me this day of
My commission expires	·
(SEAL)	Notary Public
	Address
	* * * *
CITY OF LOVELAND	ATTEST
By: Title: City Engineer	By: Title: Administrative Specialist
APPROVED AS TO FORM	

Assistant City Attorney

#### EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Public Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	\$
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
Subtotal	\$
+10% Contingency & Inflation	
* Total	\$

\* Estimate Only

Approved by (Initials):

\_\_\_\_\_ Developer

\_\_\_\_\_ City Engineer

Reviewed by:\_\_\_\_\_

#### AGREEMENT FOR INCOMPLETE PUBLIC IMPROVEMENTS LETTER OF CREDIT

#### RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_, 200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* (hereinafter called "Developer"),

WITNESSETH:

WHEREAS, Developer has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40, and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Developer comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permits and certificates upon the agreement of the Developer herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Developer mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Developer, and in that regard, Developer will furnish to City a letter from a bank or other financial institution acceptable to City.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Developer according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for the \*\*\*\* **Subdivision** as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by the Developer by \*\*\*\*.

3. It is estimated that the cost of satisfaction of the improvements herein described will not exceed \*\*\*\*\* (\$\*\*\*\*\*). Developer will furnish City a letter of credit from a bank or other financial institution ("issuer") acceptable to City, guaranteeing that funds in the amount of the aforesaid estimated cost are held by it for the account of Developer for the purpose of securing Developer's promise to make the required improvements. The letter of credit shall strictly comply with Exhibit "B" attached hereto and incorporated herein. In the event that Developer does not complete the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, City shall be entitled to draw down such funds under the letter of credit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Should City not require all funds that it draws to complete the required improvements, it shall refund the balance to Developer. However, nothing herein shall in any way limit the Developer's obligations hereunder, and Developer shall, in any event, remain liable for completion of all requirements herein provided for and for payment for the actual cost of all work and materials utilized in the completion of said improvements, notwithstanding the estimated cost in sentence one of this paragraph.

4. Developer acknowledges that time is of the essence of this Agreement. Developer's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Developer breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to

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complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Developer, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the letter of credit to City, and provided all other conditions not herein contained have been met by Developer, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

#### DEVELOPER

Signature: \_\_\_\_\_

### STATE OF COLORADO) ) ss COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ by \_\_\_\_\_.

My commission expires \_\_\_\_\_\_.

Notary Public

#### CITY OF LOVELAND

ATTEST

By:\_\_\_\_\_ Title: City Engineer

By: \_\_\_\_\_\_ Title: Administrative Specialist

# APPROVED AS TO FORM

Assistant City Attorney

# EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Public Improvements:

		TOTAL
DESCRIPTION OF ITEMS		COST
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
	Subtotal	
	+10% Contingency & Inflation	
	* Total	

\* Estimate Only

\_\_\_\_\_ Developer

\_\_\_\_\_ City Engineer

Reviewed by:\_\_\_\_\_

#### EXHIBIT "B"

### **INSERT FINANCIAL INSTITUTION NAME & LETTERHEAD**

#### IRREVOCABLE LETTER OF CREDIT NO. insert financial institution LOC number

ISSUE DATE:

APPLICANT: Insert name of Developer

BENEFICIARY: City of Loveland 500 East Third Street Loveland, CO 80537

AMOUNT: Insert amount from Exhibit A

EXPIRATION DATE: EXPIRATION DATE MUST BE ONE YEAR FROM ISSUE DATE.

Dear Sir or Madam:

We hereby establish our irrevocable Letter of Credit in your favor in the amount of \$ <u>insert amount</u> <u>from Exhibit A</u>. The purpose of this Letter of Credit is to secure performance of an Agreement for Incomplete Public Improvements for <u>insert subdivision name</u> dated <u>leave blank</u> <u>City will fill in</u> <u>when agreement is signed</u>, 200 between the City of Loveland and <u>insert name of Developer</u>.

You are hereby authorized to draw on sight on **insert name of financial institution**, by drafts, up to the aggregate amount of \$<u>insert amount from Exhibit A</u>. Such total amount may be reduced, at the sole discretion of the City, from time to time, as a result of the completion of a portion of the Incomplete Public Improvements by <u>insert name of Developer.</u>

The sole condition for payment of any draft drawn against this Letter of Credit is that the draft be accompanied by a letter, on the City's letterhead, signed by the City Manager, Public Works Director, or other City designee to the effect that **insert name of Developer** is in default of Developer's obligations pursuant to the Agreement for Incomplete Public Improvements. In the event of wrongful dishonor, we will reimburse the City for all court costs, investigative costs and reasonable attorney fees incurred by the City in enforcing this letter of credit. We further agree that jurisdiction and venue for any legal action enforcing this letter of credit shall be in the District Court of Larimer County, Colorado.

We hereby agree with drawers and endorsers, and bona fide holders of drafts negotiated under this Letter of Credit that the same shall be duly honored upon presentation and delivery of the documents as specified above.

Multiple drafts may be presented.

This Letter of Credit will be automatically extended without amendments for one year from the present, and each future expiration date thereof, unless Issuer delivers written notice within ninety

(90) days prior to any such expiration date to the City of Loveland of its intents not to renew this Letter of Credit. Any such notice shall be in writing and shall be delivered with an acknowledged receipt, either in hand or by certified mail.

This Letter of Credit is not transferable.

This Letter of Credit sets forth in full our understanding, and such undertaking shall not in anyway be modified, amended, amplified, or limited by reference to any document, instrument or agreement referred to herein, except for such certificate and draft(s) referred to herein; and any such reference shall not be deemed to incorporate herein by reference any document, instrument, or agreement except for such certificate and draft(s).

Except so far as otherwise expressly stated herein, this Letter of Credit shall be subject to Article 5 of the State of Colorado Uniform Commercial Code (UCC) and the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500 (UCPDC). To the extent of any conflict between the UCC and the UCPDC, the UCC shall control.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ on behalf of insert name of financial institution.

Name, Title Name of financial institution

On behalf of <u>insert name of Developer</u>, I hereby authorize <u>insert name of financial institution</u> to pay the City of Loveland, all, or a portion of this Letter of Credit upon receipt by <u>insert name of financial institution</u> of the letter described in paragraph 3 above, and waive any claims or defenses which I may have to the payment to the City of Loveland by <u>insert name of financial institution</u>.

Name, Title Authorized Agent of **insert name of Developer** 

#### AGREEMENT FOR INCOMPLETE DEVELOPMENT IMPROVEMENTS WITH CASH DEPOSIT AGREEMENT

RELATING TO THE DEVELOPMENT OF: \*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_,200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\* hereinafter called "Contractor"),

WITNESSETH:

WHEREAS, Contractor has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40 and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Contractor comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permit upon the agreement of the Contractor herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Contractor mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Contractor, and in that regard, Contractor will furnish to City a cash deposit.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Contractor according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for \*\*\*\* Subdivision, as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by Contractor by \*\*\*\*.

3. Contractor agrees to and hereby does submit with this Agreement a cashier's or certified check, acceptable to the City in the amount of \*\*\*\* (<u>\$\*\*\*\*</u>) (Contractor's Deposit) which is the estimated cost of satisfaction of the improvement herein described. The City may deposit Contractor's Deposit in a City interest bearing account and agrees to hold Contractor's Deposit as collateral for Contractor's promise to construct the improvements. If Contractor does not construct the improvements herein described, and perform all matters herein agreed to be performed, by \*\*\*\* to the City's satisfaction, the City shall be entitled to use Contractor's Deposit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Contractor agrees that it is obligated for the actual cost of constructing the improvements and Contractor's Deposit is only collateral for Contractor's promise to pay such cost. If Contractor constructs the improvements and upon inspection and acceptance of the improvement by the City, the City will refund Contractor's Deposit, less any interest earned, to the Contractor.

4. Contractor acknowledges that time is of the essence of this Agreement. Contractor's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Contractor breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party, whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Contractor, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the Contractor's Deposit to City, and provided all other conditions not herein contained have been met by Contractor, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

# CONTRACTOR

	By:
	Title:
STATE OF COLORADO )	
County of Larimer )	
The foregoing instrument was ackno	owledged before me this day of
My commission expires	
(SEAL)	Notary Public
	Address
	* * * *
ATTEST	CITY OF LOVELAND
By: Title: Current Planning Manager	By: Title: Administrative Specialist
APPROVED AS TO FORM	

Assistant City Attorney

#### EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\* **Subdivision** Estimated cost for the following Incomplete Development Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
Subtotal	
+10% Contingency & Inflation	
* Total	

\* Estimate Only

Approved by (Initials):

\_\_\_\_\_ Contractor

\_\_\_\_\_ Current Planning Manager

Reviewed by:\_\_\_\_\_

#### AGREEMENT FOR INCOMPLETE DEVELOPMENT IMPROVEMENTS LETTER OF CREDIT

#### RELATING TO THE DEVELOPMENT OF: \*\*\*\*\*

THIS AGREEMENT, dated this \_\_\_\_\_ day of \_\_\_\_\_, 200\_, between the City of Loveland, Colorado, a Municipal Corporation (hereinafter called "City") and \*\*\*\*\* (hereinafter called "Contractor"),

WITNESSETH:

WHEREAS, Contractor has or intends to apply for building permits and certificates of occupancy ("permit") on property legally described as on Exhibit "A" attached hereto and incorporated herein ("property"); and

WHEREAS, Chapters 16.40, and 18.46 of the Loveland Municipal Code require that certain improvements be made on and in the area of the property, and that the Contractor comply with other conditions and requirements of the City pursuant to said Code; and

WHEREAS, the City is willing to issue said permits and certificates upon the agreement of the Contractor herein set forth, and subject to all requirements, terms and conditions of the ordinances of the City and other applicable laws, rules and regulations; and

WHEREAS, City and Contractor mutually acknowledge and agree that the matters hereinafter set forth are reasonable conditions and requirements to be imposed by City in connection with its granting of said permit, and that such matters are necessary to protect, promote and enhance the public welfare; and

WHEREAS, it is further mutually acknowledged that City is entitled to other assurance that the matters hereinafter agreed to will be performed as agreed by Contractor, and in that regard, Contractor will furnish to City a letter from a bank or other financial institution acceptable to City.

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained, it is agreed as follows:

1. All improvements to be installed, work to be done and other improvements described on Exhibit "A" ("improvements"), shall be completed by Contractor according to the applicable standards, rules and regulations of the City, and in compliance with the approved Final Development Plans for the **\*\*\*\*Subdivision** as on file with the City.

2. Except where a lesser time period is prescribed, all improvements herein described and all matters herein agreed to be performed shall be installed or performed by the Contractor by \*\*\*\*\*.

3. It is estimated that the cost of satisfaction of the improvements herein described will not exceed **\*\*\*\*\*** (**\$\*\*\*\*\***). Contractor will furnish City a letter of credit from a bank or other financial institution ("issuer") acceptable to City, guaranteeing that funds in the amount of the aforesaid estimated cost are held by it for the account of Contractor for the purpose of securing Contractor's promise to make the required improvements. The letter of credit shall strictly comply with Exhibit "B" attached hereto and incorporated herein. In the event that Contractor does not complete the improvements herein described, and perform all matters herein agreed to be performed, by **\*\*\*\*\*** to the City's satisfaction, City shall be entitled to draw down such funds under the letter of credit as it deems appropriate for the purpose of completing the improvements itself or by contract with a third party. Should City not require all funds that it draws to complete the required improvements, it shall refund the balance to Contractor. However, nothing herein shall in any way limit the Contractor's obligations hereunder, and Contractor shall, in any event, remain liable for completion of all requirements herein provided for and for payment for the actual cost of all work and materials utilized in the completion of said improvements, notwithstanding the estimated cost in sentence one of this paragraph.

4. Contractor acknowledges that time is of the essence of this Agreement. Contractor's failure to complete the improvements herein described, and perform all matters herein agreed to be performed, to the City's satisfaction by \*\*\*\*\* shall be deemed a substantial and material breach of this Agreement.

5. In the event that Contractor breaches its obligations under this Agreement, the City shall be entitled to direct and consequential monetary damages, equitable relief, including specific performance, and such other remedies at law or in equity as may be available under applicable law. In the event of litigation relating to or arising out of this Agreement, the prevailing party whether plaintiff or defendant, shall be entitled to recover its costs and reasonable attorneys' fees from the non-prevailing party.

6. This agreement, and the terms, conditions and covenants herein contained, shall be deemed to

2

complement and shall be in addition to the conditions and requirements of the ordinances of the City of Loveland and other applicable laws, rules and regulations. Notwithstanding anything herein contained to the contrary, Contractor, in developing the subject property shall fully comply with all applicable ordinances, rules, regulations, standards and laws.

7. Upon execution of this agreement by the parties hereto and upon submittal of the letter of credit to City, and provided all other conditions not herein contained have been met by Contractor, City agrees to grant the subject permit.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

#### CONTRACTOR

Signature: \_\_\_\_\_

Title:

### STATE OF COLORADO) ) ss COUNTY OF LARIMER)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ by \_\_\_\_\_.

My commission expires \_\_\_\_\_\_.

Notary Public

CITY OF LOVELAND

ATTEST

By:\_\_\_\_\_\_ Title: Current Planning Manager

APPROVED AS TO FORM

By: \_\_\_\_\_\_ Title: Administrative Specialist Assistant City Attorney

# EXHIBIT "A"

Date: \_\_\_\_\_

Summary of requirement for property legally described as: \*\*\*\*\* **Subdivision** Estimated cost for the following Incomplete Development Improvements:

	TOTAL
DESCRIPTION OF ITEMS	COST
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
Subtotal	\$
+10% Contingency & Inflation	
* Total	\$

# \* Estimate Only

\_\_\_\_\_ Contractor

\_\_\_\_\_ Current Planning Manager

Reviewed by:\_\_\_\_\_

#### EXHIBIT "B"

### **INSERT FINANCIAL INSTITUTION NAME & LETTERHEAD**

#### IRREVOCABLE LETTER OF CREDIT NO. insert financial institution LOC number

ISSUE DATE: \*\*

APPLICANT: Insert name of Contractor

BENEFICIARY: City of Loveland 500 East Third Street Loveland, CO 80537

AMOUNT: Insert amount from Exhibit A

EXPIRATION DATE: EXPIRATION DATE MUST BE ONE YEAR FROM ISSUE DATE.

Dear Sir or Madam:

We hereby establish our irrevocable Letter of Credit in your favor in the amount of \$ <u>insert amount</u> <u>from Exhibit A</u>. The purpose of this Letter of Credit is to secure performance of an Agreement for Incomplete Development Improvements for <u>insert subdivision name</u> dated <u>leave blank City will</u> <u>fill in when agreement is signed</u>, 200\_\_\_\_\_ between the City of Loveland and <u>insert name of Contractor</u>.

You are hereby authorized to draw on sight on **insert name of financial institution**, by drafts, up to the aggregate amount of \$<u>insert amount from Exhibit A</u>. Such total amount may be reduced, at the sole discretion of the City, from time to time, as a result of the completion of a portion of the Incomplete Development Improvements by **insert name of Contractor.** 

The sole condition for payment of any draft drawn against this Letter of Credit is that the draft be accompanied by a letter, on the City's letterhead, signed by the City Manager, Public Works Director, or other City designee to the effect that **insert name of Contractor** is in default of Contractor's obligations pursuant to the Agreement for Incomplete Development Improvements. In the event of wrongful dishonor, we will reimburse the City for all court costs, investigative costs and reasonable attorney fees incurred by the City in enforcing this letter of credit. We further agree that jurisdiction and venue for any legal action enforcing this letter of credit shall be in the District Court of Larimer County, Colorado.

We hereby agree with drawers and endorsers, and bona fide holders of drafts negotiated under this Letter of Credit that the same shall be duly honored upon presentation and delivery of the documents as specified above.

Multiple drafts may be presented.

This Letter of Credit will be automatically extended without amendments for one year from the present, and each future expiration date thereof, unless Issuer delivers written notice within ninety (90) days prior to any such expiration date to the City of Loveland of its intents not to renew this Letter of Credit. Any such notice shall be in writing and shall be delivered with an acknowledged receipt, either in hand or by certified mail.

This Letter of Credit is not transferable.

This Letter of Credit sets forth in full our understanding, and such undertaking shall not in anyway be modified, amended, amplified, or limited by reference to any document, instrument or agreement referred to herein, except for such certificate and draft(s) referred to herein; and any such reference shall not be deemed to incorporate herein by reference any document, instrument, or agreement except for such certificate and draft(s).

Except so far as otherwise expressly stated herein, this Letter of Credit shall be subject to Article 5 of the State of Colorado Uniform Commercial Code (UCC) and the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication No. 500 (UCPDC). To the extent of any conflict between the UCC and the UCPDC, the UCC shall control.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_ on behalf of insert name of financial institution.

Name, Title Name of financial institution

On behalf of <u>insert name of Contractor</u>, I hereby authorize <u>insert name of financial institution</u> to pay the City of Loveland, all, or a portion of this Letter of Credit upon receipt by <u>insert name of financial institution</u> of the letter described in paragraph 3 above, and waive any claims or defenses which I may have to the payment to the City of Loveland by <u>insert name of financial institution</u>.

Name, Title Authorized Agent of <u>insert name of Contractor</u>

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Licensing (City of Fort Collins)

# City of Fort Collins Contractor's License & Endorsements

#### **General Information**

- A Right-of-Way Contractor's License is required to perform <u>work of any kind</u> in the public right-of-way.
- An Endorsement to the Right-of-Way Contractor's License is required to perform work in the following categories:
  - Asphalt:Required in order to perform asphalt placement, asphalt patching,<br/>slurry seal, crack seal and other similar asphalt related work.Utility:Required in order to perform work on any utility which is or will be<br/>owned, operated or maintained by the city or any utility which will<br/>connect to and become a part of a city owned utility.Non-Structural:Required in order to construct curb, gutters, sidewalks, cross-pans,<br/>trickle-pans and other similar non-structural concrete work.Structural:Required in order to construct concrete box culverts, inlets,<br/>bridges, reinforced drainage structures and other similar structural<br/>concrete work.

#### What is Required

- Fees: A \$25.00 application fee is required with the submittal of the license application. A \$75.00 licensing fee is required after the license is approved. These are one-time fees, although new fees will be charged if a revoked license is reinstated. \* Please see License Renewals below. \*
- Insurance: A \$1,000,000 certificate of Commercial General Liability insurance is required from an insurance company with a minimum of a "B++" rating. The City of Fort Collins must be listed as <u>both</u> a Certificate Holder and an Additional Insured. \* Please see the attached example for details.\* An original, signed insurance certificate is required for license approval and a faxed copy will **not** be accepted.
- Bond(s): A \$20,000 license & permit bond is required to obtain a Right-of-Way Contractor's License, with an additional and <u>separate</u> \$10,000 license and permit bond for <u>each</u> endorsement. The bonding company must have a minimum rating of "A-" and the bond must be original and signed. A faxed copy will **not** be accepted for license approval.

#### License Renewals

• There is no formal renewal process. A contractor's license will be kept current as long as the bonds and insurance are kept up to date and the Engineering
Department receives original continuation certificates each year. If continuation certificates are not received within 30 days of the bond or insurance expiration date, the license will have to be renewed, and the contractor will be charged the \$25 application fee and the \$75 license fee before being reinstated.

CERTIFICA	ATE OF L	IABIL	ITY IN	SURANCE
Insurance Agency Info				
Contractor Info		Insurance ( (must be ra	Company Name(s ted a minimum o	s) f B++)
Commercial General Liability	Policy #	Start Date	Expiration Date	Each Occurrence must equal a minimum of \$1,000,000
The City of Fort Collins is	listed as an addition	al insured.		
Certificate Holder				
City of Fort Collins Attn: Engineering Dep PO Box 580	artment			
Fort Collins, CO 8052	2-0580		Origina	I Signature

#### This is an example of what is needed on an insurance certificate for a City of Fort Collins Contractors' License to work in the Right of Way.

# ARTICLE XIII. RIGHT-OF-WAY CONTRACTOR'S LICENSE

#### Sec. 15-361. License required.

It shall be unlawful for any person, company, corporation, partnership, joint venture, limited liability company or other association (hereinafter referred to as *person*) (1) to perform or contract to perform work of any kind in the public right-of-way without first obtaining a license to perform such work, or (2) to perform work in any category described in § 15-365 without first obtaining an endorsement as provided therein for the specific category of work sought to be performed. It shall be unlawful for any person to perform or contract to perform work on any utility which is or will be owned or maintained by the city or which will connect to and become a part of a city-owned or maintained utility, whether located in the public right-of-way or in an easement, without first obtaining a license and endorsement to perform such work.

(Code 1972, § 73-127; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-362. Application and fee for license and endorsement.

Applications for a right-of-way contractor's license and endorsement (as provided in § 15-365) shall be made to the City Engineer. The City Engineer is hereby authorized to establish forms for the application and to require any such information and documentation from applicants as may be reasonably necessary to accomplish the purposes of this Article. An application fee shall be established as authorized in Chapter 7.5, Article I of this Code, which fee shall be paid prior to or concurrently with submittal of the application.

(Code 1972, § 73-128; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-363. Bond required.

All license applications shall be accompanied by a license and permit bond executed by a reliable surety company with a rating of "A-" or better. The bond certificate provided to the city shall be an original (not a copy). The bond shall be in the amount of twenty thousand dollars (\$20,000.) with an additional and separate bond in the amount of ten thousand dollars (\$10,000.) for each license endorsement as provided in § 15-365. All bonds shall be continuous, with a minimum cancellation notice of sixty (60) days. In the event a bond is canceled, the license will be immediately revoked and no further work will be allowed to occur; however the bond, even though canceled, must remain effective through the warranty period associated with all previously completed work items.

(Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-364. Insurance required.

All license applications shall be accompanied by an original certificate of commercial general liability insurance insuring the contractor and naming the city as an additional insured against any liability arising out of ownership, use, occupancy or construction of the work and all areas appurtenant thereto with a combined single limit of one million dollars (\$1,000,000.). The limits of said insurance shall not, however, be a limit to the liability of the licensee hereunder. Insurance required shall be with companies qualified to do business in the state with a general policy holder's financial rating of not less than "B++" as set forth in the most current edition of "Bests Insurance Reports" and may provide for deductible amounts as the contractor may deem to be reasonable, but in no event greater than one thousand dollars (\$1,000.). No such policies shall be cancelable or subject to reduction in coverage limits or other modification except after thirty (30) days prior written notice to the city. However, where cancellation of coverage is due to nonpayment of the premium a ten-day written notice to the city is required. The contractor shall not do or permit to be done anything which will invalidate the insurance policies referred to in this Section. Policies described above shall be for the mutual and joint benefit and protection of the contractor and the city. Such policies shall contain a provision that the city, although named as an additional insured, shall nevertheless be entitled to recovery under said policies for any loss occasioned to it, its servants, agents, citizens and employees by reason of negligence of the contractor. Such policies shall be written as primary policies not contributing to and not in excess of coverage which the city may carry.

(Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-365. Licenses and endorsements.

Any person wishing to perform work, regardless of the nature of the work, shall be required to obtain a right-of-way contractor's license prior to performing the work as provided in § 15-361. Additionally, any person wishing to perform work in one (1) of the following categories shall first qualify for, and obtain a license endorsement to perform such work as follows:

#### Endorsements:

Nonstructural

- Asphalt: Required in order to perform asphalt paving, asphalt patching, slurry seal, chip seal, crack seal and other similar asphalt related work.
- Utility: Required in order to perform work on any utility which is or will be owned, operated or maintained by the city or any utility which will connect to and become a part of any city-owned utility.
- Concrete: Required in order to construct curbs, gutters, sidewalks, cross pans, tricklepans and perform other similar nonstructural concrete work.
- Structural Concrete: Required in order to construct concrete box culverts, inlets, concrete underwalk culverts, bridges, concrete drainage structures, and perform other similar structural concrete work.

The City Engineer shall be authorized (1) to determine whether the applicants are qualified to perform the kind of work included under the endorsement(s) being requested, and (2) to issue the license and appropriate endorsement(s) to qualified applicants who fully comply with this Article. (Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-366. Issuance of license and fee.

Upon approval of qualifications by the City Engineer, receipt by the city of an original bond certificate and insurance certificate, purchase of the current edition of all applicable city standards and specifications and payment of the license fee, the applicant will be issued a license and endorsement(s) as applicable. A license fee shall be established as authorized in Chapter 7.5, Article I of this Code, which fee shall be paid prior to or concurrently with issuance of the license. (Ord. No. 180, 1998, § 1, 10-20-98

#### Sec. 15-367. Guarantee of work.

Any person licensed to perform work in the public right-of-way shall guarantee the work for a period of two (2) years or as required in the applicable city standards and specifications which apply to the work performed, whichever is longer. This guaranty shall include all repairs required due to defects in materials or workmanship. This guaranty shall also include defects consisting of settling of trenches or other fills or excavations. The determination of the necessity for such repairs shall be made by the City Engineer, which determination shall be final. If, at any time within the period of the guaranty, the licensee shall fail or refuse to make repairs required by the guaranty, then the city may proceed to cause the repairs to be made and to recover the cost by action against the bond of the licensee.

(Code 1972, § 73-129; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-368. Suspension or revocation of license or endorsements.

The City Engineer may suspend or revoke any license or endorsement issued under this Article upon determining that the licensee:

(1) Has failed to abide by the requirements of this Code, including this Article, relating to work done under the license and/or endorsement.

- (2) Is unqualified to perform the work for which the license or endorsement was issued.
- (3) Has demonstrated a careless, dangerous or destructive approach to the work being performed.
- (4) Has violated provisions of the applicable construction or repair standards or specifications.

Upon taking action to suspend or revoke a license, the City Engineer shall give written notice to the licensee of such action. Such license shall not be in effect again until duly reinstated by the City Engineer, nor shall any refund of the license fee be made for any length of time for which the license has been suspended or revoked. The licensee may appeal the decision of the City Engineer to the City Manager by filing a notice of such appeal with the City Clerk within ten (10) days after the notice is mailed to the licensee. In the event of such appeal, the City Manager shall schedule a hearing on the question, and the action taken by the City Manager at the hearing shall be final.

(Code 1972, § 73-131; Ord. No. 180, 1998, § 1, 10-20-98)

#### Sec. 15-369. Exceptions.

The requirements of this Article shall not apply to:

- (1) City crews performing work in the public right-of-way;
- (2) Any party contracting with the city to perform work in the public right-of-way;
- (3) Utility companies performing work in the public right-of-way using utility company crews (not including contractors for such utility companies); or
- (4) Individual residential property owners who are working within the public right-of-way abutting such residential property.
- (Ord. No. 180, 1998, § 1, 10-20-98)

# Application for Contractor's License to work in the Right-of-Way

#### **Company Information**

Applicant Name:	Company Phone:
Company Name:	Company Fax:
Mailing Address:	
City, State & Zip:	
Insurance Information	
Local Agency Contact:	Local Agency:
Mailing Address:	
Phone:	Fax:
Insurance Company Name:	Policy Number:
Dates of Coverage:	Rating:
Bond Information	
Local Agency Contact:	Local Agency:
Mailing Address:	
Phone:	Fax:
Bonding Company Name:	Bond Number:
Dates of Coverage:	Rating:
By signing this application, the applicant ag In the event the applicant or surety compar in Chapter 15 of the City Code, the Engine applicable endorsements. Applicant agrees to abide by the current Ci conditions, restrictions and/or regulations the	grees to maintain the required bond(s) and insurance in full effect. hy should fail to refuse to perform according to the terms set forth ering Department shall immediately terminate this license and all ity of Fort Collins Standards and Specifications and to any special hat may be imposed by the City Engineer.
Applicant Signature:	Date:

Engineering Approval: \_\_\_\_\_ Date: \_\_\_\_\_

- - -

# Endorsement to Contractor's License for work in the Right-of-Way

Asphalt	Non- Structural Concrete	Structural Concrete Utility
Company Information		
Applicant Name:		Company Phone:
Company Name:		Company Fax:
Bond Information		
Bond Number:	Dates of Covera	ge: Rating:
Other Information		
Years company has been i	n business: Years comp	any has performed this type of work:
Names of two key member	s of company personnel and their y	ears of experience:
1	# yrs	
2	# yrs	
Names of any other munici	palities in which company is curren	tly licensed to perform this type of work:
2		Phone
2		Phone
Has this company ever had	I a license revoked or suspended?	Yes No
If yes, list agency and date	of revocation or suspension:	
Has license been reinstate	d? Y	/es No
Two references (name and	agency) to confirm the quality of co	ompany's work:
1		Phone
2		Phone
Company equipment:		
Applicant Signature:		Date:
Engineering Approval:		Date:

#### Appendix B-2 Licensing (City of Fort Collins Only)

#### RIGHT-OF-WAY CONTRACTORS LICENSE BOND

Bond No.\_\_\_\_\_

#### KNOW ALL MEN BY THESE PRESENTS:

THAT WE, \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, a corporation duly incorporated under the laws of the State of \_\_\_\_\_\_, and authorized to do business in the State of Colorado, as Surety, are held and firmly bound unto the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 in the penal sum of Twenty thousand and 00/100 Dollars (\$20,000), for the payment which we hereby bind ourselves, or heirs, executors and administrators, jointly and severally by these presents.

THE CONDITIONS OF THIS BOND OBLIGATION are such that the Principal has applied for a license as/for

Right-of-Way Contractor in accordance with the requirements of the ordinances of the City of Fort Collins, and

has agreed to hold the City of Fort Collins harmless from any damage by reason of his/her engaging in said

business.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all the duties of Right-of-Way Contractor according to the requirements of the ordinances of the City of Fort Collins and protect the City of Fort Collins from any damage as hereinbefore stated, and guarantee work, as set forth in Sec. 15-367 of the Code of the City of Fort Collins, for a minimum of two years after completion of work, and final acceptance thereof by the City of Fort Collins, and shall fully indemnify and save harmless the City of Fort Collins from all costs and damages which it may suffer by reason of the Principal's failure to honor its obligations as aforesaid, and shall reimburse and repay the City of Fort Collins all outlay and expense which the City of Fort Collins may incur in making good any default, then this obligation shall be null and void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change to the terms of the ordinances of the City of Fort Collins, including Section 15-367 of the Code of the City of Fort Collins or to the standards and specifications of the City of Fort Collins applicable to the work shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change(s).

PROVIDED, FURTHER, this bond may be terminated as to future acts of the Principal upon the giving of sixty (60) days advance written notice by the Surety; said notice to be sent to the Engineering Department of the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 by certified mail.

PROVIDED, HOWEVER, that this bond may be continued at the option of the Surety by the issuance of a noncumulative Continuation Certificate.

This bond becomes	effective on the	day of	,		_, for a period
ending on the	day of		,	·	
IN WITNESS WHE	REOF, this instrument is	executed this	day of	,	
			Principal:		

Name:	
By:	
Title:	

Surety Company:

Name: \_\_\_\_\_\_By: \_\_\_\_\_\_

Attorney-in-Fact

#### Appendix B-2 Licensing (City of Fort Collins Only)

#### ENDORSEMENT BOND

Bond No.\_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS:

THAT WE, \_\_\_\_\_\_, as Principal, and \_\_\_\_\_\_, as Operation duly incorporated under the laws of the State of \_\_\_\_\_\_, and authorized to do business in the State of Colorado, as Surety, are held and firmly bound unto the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 in the penal sum of Ten thousand and 00/100 Dollars (\$10,000), for the payment which we hereby bind ourselves, or heirs, executors and administrators, jointly and severally by these presents.

THE CONDITIONS OF THIS BOND OBLIGATION are such that the Principal has applied for an Endorsement

in accordance with the requirements of the ordinances of the City of Fort Collins, and has agreed to hold the City

of Fort Collins harmless from any damage by reason of his/her engaging in said business.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all the duties of the \_\_\_\_\_\_ Endorsement according to the requirements of the ordinances of the City of Fort Collins and protect the City of Fort Collins from any damage as hereinbefore stated, and guarantee work, as set forth in Sec. 15-367 of the Code of the City of Fort Collins, for a minimum of two years after completion of work, and final acceptance thereof by the City of Fort Collins, and shall fully indemnify and save harmless the City of Fort Collins from all costs and damages which it may suffer by reason of the Principal's failure to honor its obligations as aforesaid, and shall reimburse and repay the City of Fort Collins all outlay and expense which the City of Fort Collins may incur in making good any default, then this obligation shall be null and void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, heregy stipulates and agrees that no change to the terms of the ordinances of the City of Fort Collins, including Section 15-367 of the Code of the City of Fort Collins or to the standards and specifications of the City of Fort Collins applicable to the work shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change(s).

PROVIDED, FURTHER, this bond may be terminated as to future acts of the Principal upon the giving of sixty (60) days advance written notice by the Surety; said notice to be sent to the Engineering Department of the City of Fort Collins, P.O. Box 580, Fort Collins, CO 80522 by certified mail.

PROVIDED, HOWEVER, that this bond may be continued at the option of the Surety by the issuance of a noncumulative Continuation Certificate.

This bond becomes effective on the day of ending on the day of	,, for a period
IN WITNESS WHEREOF, this instrument is executed this	day of,
	Principal:
	Name:
	By:
	Title:
	Surety Company:
	Name:
	By:
	Attorney-in-Fact

Larimer County Urban Area Street Standards – Review Draft January 17, 2007 Adopted by Larimer County, City of Loveland, City of Fort Collins

# **Appendix B-3/Larimer County**

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Permits – Larimer County

- Development Construction Permit
- Temporary Development Construction Permit



Expiration Date \_\_\_\_\_

# **Development Construction Permit**

PROJECT INFORMATION				
Project Name				
Project Location				
Section	Tow	vnship	_Range	
Phase(s) of Phase	Description			
PRINCIPAL CONTACT				
Company		Phone: Office	Cell	
Contact		_ Thone. Onloc	Other	
Address		E-Mail		
//dd/000				
		-		
PERMIT CHECKLIST				
Approved Plan Set	Approval Date _		(review engineer)	
Plat Recorded	Recording Date		(planner)	
Copy of collateral letter	Project Completi	on Date (from Developme	ent Agreement)	
Three signed & stamped copies of a	approved plans provided	to Larimer County Engine	eering	
Signed Development Agreement w	ith Cost Estimate			
FEES (fees charged if preliminary approval b	by BCC is after March 1, 2001,	or admin approval for site plans	s)	
No. of single family units:	x \$150.00	= \$		
No. of duplex units:	x \$ 75.00	= \$		
No. of multi-family units:	x \$ 50.00	= \$		
No. of commercial lots:	x \$400.00	= \$	Total DCP Fees: \$	
- Pavement Impact Fees (requires separate	check from DCP fees)			
• • • • •	· · · · · · · · · · · · · · · · · · ·		Total Pavement Impact Fees: \$	
CONDITIONS OF PERMIT Permit expires sixty days after issuance; if work has Approved as-built drawings must be submitted to a Materials test reports, as per Larimer County stand Colorado registered engineer's certification letter at An additional permit (Right of Way Construction Pe An additional permit (Access Permit) may be required an additional permit (Access Permit) may be reported for failure to comply with all apper this permit is granted expressly subject to the prov Work must be performed in compliance with all apper This permit may be revoked for failure to comply with Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall be Applicant shall be responsible for establishing safe Applicant shall be responsible for establishing safe Applicant shall be responsible for any repairs nece acceptance of the work has been made by the CC Applicant shall be trainer County Inspector is changed. Maplicant shall be responsible for any repairs nece acceptance of the work has been made by the CC Applicant shall hold Larimer County harmless from If subsequent inspection determines that additional Applicant must submit revised drawings and other modify, alter, or deviate from the original approx Engineering Department. In accepting this permit the undersigned, represent that by virtue of his signature the Applicant is bot	s not begun on site prior to expir ind approved by Larimer County lards, must be submitted to and a not inspection reports must be su- ermit) is required for all construct red to tie in to Larimer County ro- isions of the Larimer County Lar blicable Federal, State, and Loca ith the terms of the permit and/ o y damaged Utilities, County Roa fully defended and indemnified rized representative of Larimer C ty procedures sufficient to protec on methods, equipment, and oper r 48 hours in advance of the datu ssary as a result of construction. Jounty. . any and all claims, which may al l corrective measures are necess documents as required for the re ved construction drawings. Any s ting the Applicant, verifies that he not by all the conditions set forth pounty, constitutes written notice t	ation of permit fees may be applie prior to release of collateral. approved by Larimer County prior ibmitted to and approved by Larim ion activities within the Larimer Co ads. I Regulations. r the Larimer County Land Use ard d, or other County properties. against any claim for injury or dam County. t the traveling and general public t erational procedures that will be ut e work will be started and shall not The maintenance responsibility or rise from the construction and mai sary, such corrective measures sh view and approval of the Larimer I uch change in the approved plans e has read and understands all of i herein. o proceed with construction.	d to revised permit within 180 days of issuance. to release of collateral. er County prior to release of collateral. unty Right of Way. and Development Standards. hage to property sustained by reason of the exercise from any and all harm during construction. lized and obtain the County's concurrence. ify the Larimer County Inspector a minimum of 12 h f work repairs shall be an obligation of the applicant intenance of the Applicants development covered by all be completed within 30 days of notification. County Engineering Department in the event that the shall not be constructed without the written approva- its provisions; that he has the authority to sign for ar	of and use of this permit by nours in advance if this date for two years after final y this permit. e applicant whishes to al of the Larimer County ad bind the Applicant; and
Permit Approved Larimer County	Date	App	plicant Signature	Date
Final Inspection Approved Larimer County	Date	Арр	olicant Printed Name	
Warranty Inspection Approved Latimas Occurs	Deta		a	
	Date	110		
As-builts received and reviewed	by	App	plicants Address	
Engineer's certification received and	I reviewed by	Apr	plicants Address	
Material test results received and rev	viewed by	Арг	plicants Phone Number	



Expiration Date \_\_\_\_\_

# **Temporary Development Construction Permit**

PROJECT INFORMATION					
Project Name					
Project Location					
Section	Τον	nship	Range		
Phase(s) of Phase	Description				
PRINCIPAL CONTACT					
Company		Phone: Office	e	Cell	
Contact		Fax _		Other	
Address		E-Mai	il		
SCOPE OF WORK ALLOWED U	NDER TEMPORARY	DEVELOPME	NT CONSTRUCTI	ON PERMIT	
Work performed under this tempo	rary permit shall be lin	nited to:			
FEES (fees charged if preliminary approval	by BCC is after March 1, 2001, o	or admin approval for	r site plans)		
No. of single family units:	x \$150.00	= \$		_	
No. of duplex units:	x \$ 75.00	= \$			
No. of multi-family units:	x \$ 50.00	= \$			
No. of commercial lots:	x \$400.00	= \$		Total DCP Fees: \$	
Pavement Impact Fees (requires separate	check from DCP fees)				
			Total P	avement Impact Fees: \$	
CONDITIONS OF PERMIT					
This temporary permit shall be valid for only the w Permit expires sixty days after issuance; if work ha	ork described above. No further was not begun on site prior to expira	ork shall be performed ation of permit fees ma	d prior to the issuance of a f ay be applied to revised perr	Il Development Construction Permit. nit within 180 days of issuance.	
Approved as-built drawings must be submitted to a Materials test reports, as per Larimer County stan	and approved by Larimer County   dards, must be submitted to and a and inspection reports must be su	prior to release of colla approved by Larimer Co bmitted to and approve	ateral. ounty prior to release of col	ateral.	
e elerade regiotered engineer e contineation letter e	ermit) is required for all constructi	on activities within the	Larimer County Right of Wa	V.	
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ	red to tie in to Larimer County roa	ads.	, 0		
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w	ired to tie in to Larimer County roa visions of the Larimer County Lan plicable Federal, State, and Local ith the terms of the permit and/o	ads. d Use Code. l Regulations. r the Larimer County L	and Use and Development	Standards	
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall b	ired to tie in to Larimer County roa visions of the Larimer County Lar. plicable Federal, State, and Loca i/ith the terms of the permit and/ ou y damaged Utilities, County Road > fully defended and indemnified a	ads. d Use Code. I Regulations. r the Larimer County L d, or other County prop against any claim for in	Land Use and Development perties. njury or damage to property	Standards.	s permit by
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply w Applicant shall be responsible for any repairs to at Larimer County and its officers and agents shall b Applicant and applicants actions pursuant theret This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing soft	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/ or y damaged Utilities, County Roas a fully defended and indemnified a , virized representative of Larimer C thy procedures sufficient to protect	ads. I Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. the traveling and gen	Land Use and Development perties. ijury or damage to property	Standards. sustained by reason of the exercise of and use of this	permit by
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply v Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall bo Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing saft Applicant shall advise the Larimer County of construct Applicant shall advise the Larimer County Inspect	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca <i>i</i> th the terms of the permit and/o y damaged Utilities, County Road e fully defended and indemnified a b vized representative of Larimer C sty procedures sufficient to protec on methods, equipment, and ope or 48 hours in advance of the date	ads. d Use Code. l Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. t the traveling and gen rational procedures the work will be started a	Land Use and Development perties. njury or damage to property eral public from any and all at will be utilized and obtain nd shall notify the Larimer (	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. ounty Inspector a minimum of 12 hours in advance i	s permit by f this date
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An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply v Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall bo Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing saft Applicant shall be responsible for any repairs next Applicant shall be responsible for any repairs next acceptance of the work has been made by the C Applicant shall hold Larimer County Inspect is changed. Applicant shall hold Larimer County harmless from If subsequent inspection determines that additions Applicant must submit revised drawings and other modify, alter, or deviate from the original appro Engineering Department. In accepting this permit the undersigned, represent that by virtue of his signature the Applicant is bo This permit, when signed and issued by Larimer C	ired to tie in to Larimer County roa visions of the Larimer County Lar plicable Federal, State, and Loca vith the terms of the permit and/ o y damaged Utilities, County Roa- e fully defended and indemnified i b. vized representative of Larimer C aty procedures sufficient to protec- ion methods, equipment, and ope or 48 hours in advance of the date assary as a result of construction. ounty. 1 any and all claims, which may a a l corrective measures are necess documents as required for the re ved construction drawings. Any s ting the Applicant, verifies that he und by all the conditions set forth ounty, constitutes written notice to	ads. d Use Code. Regulations. r the Larimer County L d, or other County prop against any claim for in ounty. t the traveling and gen rational procedures that work will be started and The maintenance resp rise from the constructi sary, such corrective m view and approval of the uch change in the appiration the started and underst herein. b proceed with construction of the construction of	Land Use and Development perties. ijury or damage to property eral public from any and all at will be utilized and obtain and shall notify the Larimer Co ponsibility of work repairs sh ion and maintenance of the leasures shall be completed he Larimer County Enginee roved plans shall not be cor tands all of its provisions; th action.	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. ounty Inspector a minimum of 12 hours in advance i all be an obligation of the applicant for two years afte Applicants development covered by this permit. within 30 days of notification. ing Department in the event that the applicant whishe structed without the written approval of the Larimer C at he has the authority to sign for and bind the Applica	s permit by f this date r final es to county ant; and
An additional permit (Right of Way Construction P An additional permit (Access Permit) may be requ This permit is granted expressly subject to the pro Work must be performed in compliance with all ap This permit may be revoked for failure to comply Applicant shall be responsible for any repairs to an Larimer County and its officers and agents shall b Applicant and applicants actions pursuant therett This permit is not valid until signed by a duly auth Applicant shall be responsible for establishing safe Applicant shall avise the Larimer County of construct Applicant shall be responsible for any repairs nec acceptance of the work has been made by the C Applicant shall hold Larimer County harmless from If subsequent inspection determines that addition Applicant must submit revised drawings and other modify, alter, or deviate from the original appro Engineering Department. In accepting this permit the undersigned, represer that by virtue of his signature the Applicant is bo This permit, when signed and issued by Larimer C	ired to tie in to Larimer County roz visions of the Larimer County Lar plicable Federal, State, and Loca vith the terms of the permit and/ o ny damaged Utilities, County Roa- e fully defended and indemnified : prized representative of Larimer C sty procedures sufficient to protec- ion methods, equipment, and ope or 48 hours in advance of the date assary as a result of construction. Younty. I any and all claims, which may a al corrective measures are necess documents as required for the re ved construction drawings. Any s thing the Applicant, verifies that he jounty, constitutes written notice to	ads. d Use Code. Regulations. r the Larimer County L d, or other County propagainst any claim for in ounty. t the traveling and gen rational procedures tha work will be started and The maintenance resp rise from the constructi ary, such corrective m view and approval of th uch change in the appu- the heas read and underst herein. p proceed with constru-	and Use and Development perties. ijury or damage to property eral public from any and all at will be utilized and obtain nd shall notify the Larimer C ponsibility of work repairs sh ion and maintenance of the easures shall be completed he Larimer County Enginee roved plans shall not be cor tands all of its provisions; th action.	Standards. sustained by reason of the exercise of and use of this harm during construction. the County's concurrence. ounty Inspector a minimum of 12 hours in advance i all be an obligation of the applicant for two years afte Applicants development covered by this permit. within 30 days of notification. ing Department in the event that the applicant whishe structed without the written approval of the Larimer C at he has the authority to sign for and bind the Applica	s permit by f this date r final es to county ant; and

Applicant Printed Name

Title

Applicants Address

Applicants Address

Applicants Phone Number

# **Appendix B-3/Loveland**

# **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Permits – City of Loveland

- Development Construction Permit Application
- Development Construction Permit
- Right-of-Way Work Permit
- Agreement for Right-of-Way
- Grant of Easement
- Grant of Temporary Turnaround Access
- Encroachment Permit
- Resolution for Eminent Domain (Example)
- Approval of Traffic Control Plan
- Application for Building Permits
- Grading, Excavation and Fill Permit
- Permit to Move a Building
- Erosion Control Procedures



# DEVELOPMENT CONSTRUCTION PERMIT APPLICATION

CITY OF LOVELAND

	Application Number:	
	Application Date:	
FOR CITY USE ONLY	Permit Application Fee:	
	Received by:	
	Construction Coordination Meeting Date:	

**INSTRUCTIONS:** 

- 1. Complete this form and attach all necessary documents.
- 2. If you have any questions or need additional information, contact the Public Works Department Transportation Development Review Engineering Division at (970) 962-2501.
- 3. Submit the Application and pay the Permit Fee at the Public Works Department Transportation Development Review Engineering Division Counter, which is located at 500 East 3rd Street, Ste 300.

#### **PROJECT INFORMATION:**

Project Name (as approved by the City):

Project A.K	.A. (Marketing name if o	different from Projec	ct Name):
Project Location:			
Property Owner (A	the time of this permit i	issuance):	
Individual N	ame:		
Company N	ame:		
Address:			
Phone num	per(s):		
Offi	ce:		
Cell	:		
Fax	:		
Email:			—
Applicant/Project I person responsible project):	<b>Manager</b> (The primary for all matters reference	contact person for cing "the Developer	all matters regarding this project, and the r" in the Development Agreement for the the development agreement for the development agreement agreement for the development agreement agreem
Individual N	ame:		

Í Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	_
Cell:	
Fax:	
Email:	_

**Project Engineer** (A Colorado licensed professional engineer who is the civil engineer, the person responsible for the design of this project, responsible for certification that improvements are constructed in accordance with approved plans, responsible for making revisions to plans with City approval and for providing record drawings):

Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	-
Fax:	
Email:	

**Developer** (The party or parties referenced in the Development Agreement who are responsible for the Developer's obligations contained in the Agreement – add additional names below):

Individual Name:		
Company Name:		
Address:		
Phone number(s):	:	
Office:		
Cell:		
Fax:		
Email:		

General Contractor (The contractor in overall charge of the public infrastructure construction):

Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	

If you have no General Contractor, list all other contractors below.

Grading contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Utility contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	

Concrete contractor for flat work:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Concrete contractor for structures:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Paving contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Landscape contractor:	
Individual Name:	
Company Name:	
Address:	
Phone number(s):	
Office:	
Cell:	
Fax:	
Email:	
Other contractors and parties involved in the project:	

#### SUBMIT THE FOLLOWING ITEMS WITH A COMPLETED APPLICATION FORM:

- 8<sup>1</sup>/<sub>2</sub>"x11" copy of a Vicinity Map
- Mylar and copies of the approved Public Improvement Construction Plans for the project
- **Proposed Project Schedule**
- Project quantities and cost estimate for all of the public improvements to be constructed. This information must be submitted in the format shown on the attached form titled "Project Quantities and Cost Estimate Sheet." The estimate shall be prepared and stamped by a Professional Engineer. These quantities and costs are also to be submitted in an electronic spreadsheet format.
- Traffic control plan(s) for the project
- Right-of-Way work permit from the Traffic Division
- Certificate of Insurance
- Copy of approved Development Agreement (if applicable)
- Copies of any Easements for the project
- Proposed haul routes shown on a City map (if applicable)
- Shop drawings (if applicable)
- . Other:

**CONSTRUCTION COORDINATION MEETING:** A construction coordination meeting to discuss plans and special requirements for your project is optional for all development projects. If held, the people required to attend the meeting are the Project Manager, Project Engineer, Developer, Architect/Land Planner and General Contractor (if no General Contractor, representatives for each of the contractors expected to work on this project). A construction coordination meeting will only be held at the request of the Applicant.

People to attend: List the people's names and their respective title for those who will attend the construction coordination meeting:

Name	Title

ESTIMATED COST OF INFRASTRUCTURE IMPROVEMENTS: Provide the estimated value of all public infrastructure improvements that will be constructed and accepted by the City to own and maintain. The estimate shall be in the same format as the attached sheet titled "Project Quantities and Cost Estimate Sheet."

Public infrastructure estimated cost: \$

I certify that the information on this permit application along with the required additional submittals are true and correct to the best of my knowledge, and that in filing this application, I am acting with the knowledge, consent, and authority of the owners of the property (including all owners having legal or equitable interest in the real property, as defined in Section 1.04.020 of the City Code; and including common areas legally connected to or associated with the property which is the subject of this application) without whose consent and authority the requested action could not lawfully be accomplished. Pursuant to said authority, I hereby permit City officials to enter upon the property for purposes of inspection and, if necessary, to enter upon such property to perform work required of the applicant if the applicant were to fail to perform the required work.

Applicant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# PUBLIC IMPROVEMENTS OPINION OF COSTS

### **Erosion Control**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Stockpile Topsoil	CY			
Straw Bales	Ea			
Inlet Protection	Ea			
Silt Fence	LF			
Sediment Trap	Ea			
Vehicle Tracking Pad	Ea			

## **Street Improvements**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
	Lump			
Clearing and Grubbing	Sum			
Removal of Structures and Obstructions	Ea			
Subgrade Preparation	SY			
Excavation	CY			
Borrow	CY			
Fill	CY			
Rock Excavation	CY			
Filter Material	CY			
Lime Treatment	SY			
Asphalt Patching	Tons			
Asphalt Pavement	Tons			
Base Course	Tons			
Concrete Pavement	SY-IN			
Geo-textile	SY			
Riprap	CY			
Survey Monuments	Ea			
Adjust Manholes	Ea			
Adjust Valves	Ea			
Adjust Monuments	Ea			
Median Cover Material (Concrete)	SY			

#### Structures

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Bridge Structure	Ea			
Culverts	Ea			
Guardrail	LF			
Railing (Pedestrian)	LF			
Railing (Traffic)	LF			
Headwalls	Ea			

## Pedestrian and Bikeway Facilities

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Sidewalk Grading	SY			
4-Inch Thick Sidewalk	SY			
6-inch Thick Sidewalk	SY			
Directional Curb Ramp	SY			
Corner Curb Ramp	SY			
Mid Block Ramp	SY			
Concrete Bikeway	SY			
Sidewalk Chase	Ea			
Curb & Gutter Grading	LF			
Curb & Gutter – Type II	LF			
Curb & Gutter – Type I	LF			
Glue-down Curb	LF			

### Street Lighting – Local & Minor Collector Streets in Loveland (City Limits Only)

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost
Standard Pedestrian Light	Ea			
Standard Street Light	Ea			

### Traffic Signals, Signing & Striping

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Standard Street Signs	Ea			
Standard Sign Posts	Ea			
Standard Regulatory Signs	Ea			
Standard Speed Limit Signs	Ea			
Latex Paint (4 inches)	LF			
Latex Paint (8 inches)	LF			
Latex Paint (12 inches)	LF			
Latex Paint (18 inches)	LF			
Latex Paint (24 inches)	LF			
Epoxy Pavement Marking (4 inches)	LF			
Epoxy Pavement Marking (8 inches)	LF			
Epoxy Pavement Marking (12 inches)	LF			
Epoxy Pavement Marking (18 inches)	LF			
Epoxy Pavement Marking (24 inches)	LF			
Preformed Tape for Symbols & Crosswalks	LF			
Preformed Thermoplastic	SF			
Traffic Signals	Ea			

#### Work Zone Traffic Control

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Traffic Control	LS			

#### **Storm Drainage Facilities**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Grading	SY			
Inlets	Ea			
Manholes	Ea			
Pipe (Material Type – Size)	LF			
Trickle Channel (width)	LF			

#### **Removal and Repair**

		Unit	Estimated	Item
Public Improvement Item	Units	Cost	Quantity	Cost
Asphalt Patching	SY			
Concrete Sidewalk R&R	SY			
Concrete Curbwalk R&R	LF			
Milling	SY			
Asphalt Removal	SY			

#### **Construction Surveying/Staking**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

#### **Material Testing**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

#### **Record Drawings**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost
•				

#### **Construction Management**

Public Improvement Item	Units	Unit Cost	Estimated Quantity	Item Cost

The units presented here are intended to assist the Developer in providing consistent units and quantities for review by the Local Entities. The Local Entity will approve unit costs used to determine the Opinion of Costs. There may be additional items that are not shown. The Developer should show each of those items, with their units, unit prices, quantities, and item cost. Separate summaries shall be provided for phases when applicable. In addition, separate summaries shall be provided for adjacent, on-site and off-0site public improvements.



# **DEVELOPMENT CONSTRUCTION PERMIT**

Permit	Number: <u><i>00-00</i></u>	Issuance Dat	e: 00/00/00
Project	t Name: Project A.K.A.:		
Project	t Location:		
Permit	tee:		
City an	d developer contacts:	See attached Exhibit "A" for names a persons for this project.	and phone numbers of all contact
Fees:	Permit Application Fee	(paid at the time of application)	\$
Develo	Amount of security depo to be constructed as sh	<b>pproved security:</b> osited with the City to guarantee the cor own on the approved plans for the deve	mpletion of all public improvements elopment. \$

Form of security deposited with the City:

#### PERFORMANCE REQUIREMENTS OF THIS PERMIT:

- 1. The Permittee shall be responsible to require their Project Engineer to incorporate into all design drawings and specifications the certification of all materials testing by an Engineer. The Permittee shall have an Engineer prepare revised design drawings and secure City approval for all revisions to the Utility Plans and related documents. The Permittee shall have an Engineer represent, as required by the City in the Development Agreement, that the improvements are constructed in conformance with the approved Utility Plans and the standards and specifications of the City. The Permittee shall provide record drawings prepared by an Engineer prior to the City's acceptance of the constructed public improvements. (All reference above to the terms "Project Engineer" and "Engineer" shall mean a Professional Engineer licensed in Colorado.)
- 2. All contractors who perform work on this project must be bonded and licensed in conformance with City requirements.
- 3. Construction time restrictions:
- 4. The applicant understands that additional permits may be required for this development project and the applicant shall secure those permits directly from the issuing departments.

Development Construction Permit (3/1/01)

- 5. This permit, along with a complete set of all approved plans and documents for this project (utility plans, site plan, landscape plan, development agreement, soils report, pavement design, traffic study, drainage report, plat easements and any other official documents), shall be kept on the development site available for use by City staff doing inspections.
- 6. Permit Expiration (in accordance with Chapter 6 of the Larimer County Urban Area Street Standards):
  - a. If construction has not begun within sixty (60) days from the date of issuance of this permit, this permit shall expire and the applicant will <u>forfeit the permit fee</u> paid for this permit, whereupon the applicant must re-apply for a new permit.
  - b. In addition, this permit shall expire one year from the date of issuance. The applicant may apply for an extension by reapplication at least two weeks prior to the expiration date. Such application shall contain information sufficient to justify the granting of the extension. An extension may be granted for up to six months.
- 7. Building permits and certificates of occupancy will only be issued when all conditions contained in the Development Agreement and Section 16.40.010 of the City Code are met. If the Development Agreement does not specify times for completion of public improvements, or if there is no Development Agreement, then the improvement requirements specified in Section 16.40.010 of the City Code shall apply, which provides that construction of all improvements shall be required prior to the time of issuance of the first building permit.
- 8. Acceptance by the City of the public improvements shall be after (1) final inspection has been conducted by the City; (2) punch list items from the final inspection are completed and accepted by the City; and (3) required certifications from the licensed professional engineer that improvements are completed to City standards, specifications and approved Utility Plans; and the record drawings have been received and accepted by the City.
- 9. The warranty on street improvements is for two (2) years from the date of initial acceptance by the City of the completed improvements, in accordance with Section 24.3 of the Larimer County Urban Area Street Standards, as applicable.
- 10. The Public Works Inspector must be notified at least twenty-four (24) hours prior to any planned construction on this project. All required perimeter silt fencing and other erosion/sediment control best management practices (BMP's) that can be installed prior to construction must be in place and inspected by the Public Works Inspector before any land disturbing activity begins.
- 11. No work (including grading) shall be started in State Highway right-of-way until a permit is issued by the Colorado Department of Transportation to allow such work to begin.
- 12. Other conditions:

#### Permittee's acknowledgement signature:

By signing this permit, I acknowledge that I am acting with the knowledge, consent, and authority of the owners of the property (including all owners having legal or equitable interest in the real property, as defined in Section 1.04.020 of the City Code; and including common areas legally connected to or associated with the property which is the subject of this application) without whose consent and authority the requested action could not lawfully be accomplished. Pursuant to said authority, I hereby permit City officials to enter upon the property for purposes of inspection and, if necessary, to enter upon such property to perform work required of the applicant if the applicant were to fail to perform the required work. I also acknowledge that I have read this permit document with all its requirements and conditions, and I agree to all of the terms and conditions so stated in this permit.

Date

Approval for issuance:

City Engineer Approval

Permit Issuance Date

# EXHIBIT "A"

### DEVELOPMENT CONSTRUCTION PERMIT LIST OF PROJECT CONTACT PERSONS

PROJECT NAME:

#### **Developer's Contact Persons:**

Applicant/Project Manager:

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

#### **Project Engineer:**

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

#### Developer:

\_

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

#### **General Contractor:**

Office:	
Cell:	
Pager:	
Fax:	
E-mail:	

#### **City Staff Contact Persons:**

**Transportation Development Review Engineer:** 

City of Loveland 500 East 3rd Street Loveland, CO 80537

Phone Numbers:

Office:	
Fax:	(970) 962-2904
E-mail:	

#### **Public Works Inspector:**

City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: 970-Cell: 970-Pager: 970-Fax: (970-962-2508 E-mail:

#### Storm Water Engineer:

Kevin Gingery Senior Civil Engineer City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3571 Fax: (970) 962-3400 E-mail: gingek@ci.loveland.co.us

#### Water/Wastewater Engineer:

Rod Hamilton Civil Engineer City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3712 Fax: (970) 962-3400 E-mail: hamilr@ci.loveland.co.us

#### Water/Wastewater Construction Inspector:

Joe Bocson Construction Inspector City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3725 Cell: (970) 962-3725 Cell: (970) 962-3400 E-mail: bocsoj@ci.loveland.co.us

#### Power:

Kathleen Porter Field Engineer Supervisor City of Loveland 200 North Wilson Avenue Loveland, CO 80537 Phone Numbers: Office: (970) 962-3561 Fax: (970) 962-3400 E-mail: portek@ci.loveland.co.us

#### **Current Planner:**

Greg George Planning Manager City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: 970-962-2521 Fax: (970) 962-2904 E-mail: georgg@ci.loveland.co.us

#### **Traffic Operations:**

Bill Hange Traffic Engineer City of Loveland 105 West 5th Street Loveland, CO 80537 Phone Numbers: Office: (970) 962-2528 Fax: (970) 962-2907 E-mail: hangeb@ci.loveland.co.us

#### **Development Construction Permit Coordinator:**

Diana Montgomery Community Services Department Transportation Development Review Engineering Division City of Loveland 500 East 3rd Street Loveland, CO 80537 Phone Numbers: Office: (970) 962-2501 Fax: (970) 962-2904 E-mail: montgd@ci.loveland.co.us

### CITY OF LOVELAND TRAFFIC OPERATIONS 01-20-2000 RIGHT-OF-WAY WORK PERMIT REGULATIONS

ALL work done on City of Loveland right-of-way shall have an approved right-of-way permit prior to commencement of the work. This includes work done off the street/highway including sidewalks and parkways, driveway approaches, curb and gutter, etc.

Contractors apply for a right-of-way permit from the city of Loveland Traffic Operations office located at 105 West 5th Street, Loveland. Permits will NOT be issued until a traffic control plan has been submitted and approved by Traffic Operations. The city requires forty-eight (48) hours for approval of the permit prior to the start of work.

Traffic control firms will NOT set out signage until they have received an approved copy of the right-of-way permit and traffic control plan. Traffic control will be set up according to the time and stipulations on the permit. There can be no variation from this regulation – without prior approval by the Loveland Traffic Operations office. If traffic control on any project is found to be in violation of the permit issued, city inspectors will shut the project down and all traffic control will be removed. Repeated violations could result in a ban from work in the city of Loveland rights-of-way.

The city of Loveland right-of-way work permit form has been revised. It is now a one page, two sided form. Certain items have been changed or subtracted, and new stipulations added. PLEASE READ THE NEW FORM CAREFULLY. If you have any questions you should contact our office.

# TRAFFIC CONTROL PLANS SUBMITTED

CHECK LIST:

- 1. Plans must show:
- a) transition or taper lengths
- b) street names and location of work
- c) north arrow
- d) distances between warning signs, cones, barricades, etc
- e) types of devices must be labeled and listed
- f) street and lane widths, flow line to flow line or edge of pavement to edge of pavement
- g) divided highway (medians) must have dual signings
- h) whether there is a state highway permit
- i) posted speeds
- j) if arrow boards are required
- k) if message boards are required
- 1) if affected properties have been given 48 hours notice
- m) if any "special" signs are required
- n) if emergency services and school districts have been notified of closures

# CITY OF LOVELAND RIGHT-OF-WAY WORK PERMIT

PERMIT NO.: DATE OF APPLICATION:							
APPLICANT'S							
NAME.							
COMPANY							
NAME.							
ADDRESS: CITY:							
ADDRESSCH11							
PHONE ( )							
EMERGENCY PHONE()   EAX							
1110NE.()							
DATE:							
DATE							
If exact date(s) are unknown at the time of application, applicant must notify the city 24 hours prior to start of work or							
when inspection is requested so that it can be noted on the permit. If project goes past completion date, applicant must							
obtain approval from the city.							
WUKK SHE							
If a State Highway, a CDOT permit must be obtained prior to this permit.							
STREET & NUMBER/OR LEGAL							
DESCRIPTION:							
Is this a City of Loveland Project: Vas No. City Project Managar's Name							
<u>Is uns a City of Loveland Project</u> . TesNo <u>City Project Manager's Name.</u>							
If the city project was bid with the specific department taking responsibility for permit fees,							
the application must be initiated by that department. The TCP, Contractor's insurance							
requirements, and transfer of funds form must be submitted before the issuance of the permit.							
— TYPE OF WORK							
Excavation Type: Open							
Cut·* Boring							
Description of							
Work							
Dimensions: Length: Width: Area: sf Davement							
Dimensions. LenguiwiduiAreasii avement							
Deptil							
Koauway Sulface.							
Aspnait:Uoncrete:Uravei:Uther:							
Purpose of							
Project: water:Sewer:Telephone:Electric:Gas:Other:							
*City of Loveland regulations call for flow fill to backfill trench. Asphalt thickness =							
existing thickness plus 1" when patching.							
CONCRETE FLATWORK							
Remove and Replace:New							
Remove and Replace:New Placement:Other:							
Remove and Replace:     New       Placement:     Other:       Sidewalk:     If   Curb & Gutter:     If   C. G. & S.							

TRAFFIC CONTROL PLAN								
TCP approved for date(s) and time								
only								
TCP provided								
by								
Notes								
PERMIT FEE:								
\$30.00       Application and Inspection Fee for Excavation and/or Flat Work         Open cut area (sf) multiplied by \$2.50 - \$7.50 if paved within the last 5 years         TOTAL PERMIT FEE								
Contractor states that he has read and understands the regulations printed on the backside of this application.								
Certified Traffic Engineering Rep/Date Applicant's Signature/Date								

<u>APPLICANT CERTIFIES BEFORE SIGNING PERMIT THAT ALL THE FOLLOWING</u> <u>CONDITIONS ARE UNDERSTOOD:</u>:

1. IN ACCORDANCE WITH CITY OF LOVELAND ORDINANCE, ANY AND ALL WORK DONE ON STREETS, CURB & GUTTER, SIDEWALKS, AND PARKWAYS, REQUIRES A RIGHT-OF-WAY PERMIT. THE CITY REQUIRES A FORTY-EIGHT (48) HOURS NOTICE FOR APPROVAL OF THE PERMIT.

2. ANY WORK DONE ON A STATE HIGHWAY WITHIN THE LIMITS OF THE CITY OF LOVELAND REQUIRES BOTH A COLORADO DEPARTMENT OF HIGHWAYS PERMIT AND A CITY OF LOVELAND RIGHT-OF-WAY PERMIT. THE CDOT PERMIT MUST BE OBTAINED FIRST AND PRESENTED AT THE TRAFFIC DEPARTMENT OFFICES WHEN APPLYING FOR THE CITY RIGHT-OF-WAY PERMIT. THE CITY OF LOVELAND WILL NOT ISSUE A RIGHT-OF-WAY PERMIT WITHOUT DOCUMENTATION FROM THE STATE.

3. A COPY OF THE RIGHT-OF-WAY PERMIT MUST BE KEPT ON THE CONSTRUCTION SITE AT ALL TIMES.

4. ALL AFFECTED PROPERTY OWNERS/RESIDENTS ALONG WITH ALL EMERGENCY SERVICES AND SCHOOL DISTRICT; WILL BE NOTIFIED AT LEAST 48 HOURS PRIOR TO ANY LANE OR ROAD CLOSURE UNDER THIS PERMIT.

5. APPROVED CERTIFICATE OF INSURANCE , OR BOND EQUAL TO THE VALUE OF THE WORK DONE, IS IN FILE WITH THE CITY OF LOVELAND TRAFFIC OPERATIONS OFFICE.

6. APPLICANT WILL CALL FOR UTILITY LOCATES BEFORE DIGGING.

7. APPLICANT WILL CALL FOR AN INSPECTION 24 HOURS IN ADVANCE. LEAVE A DETAILED MESSAGE AT 962-2640.

ALL FOREGOING PROVISIONS HAVE BEEN READ AND UNDERSTOOD AND AGREED TO. CONTRACTOR WILL COMPLY WITH ALL CITY ORDINANCES, STATE LAWS, AND PROVISIONS REGARDING SUCH CONSTRUCTION AND ACTIVITIES PURSUANT TO THIS PERMIT. AGREEMENT FOR RIGHT-OF-WAY

THIS	AGREEMENT	FOR	RIGHT-OF-WAY	("Agreement")	s made	and	entered	into	this
	day of		, 200	by and betwee	n				
	and								

## WITNESSETH:

WHEREAS, \_\_\_\_\_\_ is the contract purchaser of a portion of that certain real property comprising approximately \_\_\_\_\_\_ acres situated in the City of Loveland, Larimer County, Colorado, legally described in Exhibit "A" attached hereto ("Property");

WHEREAS, \_\_\_\_\_\_ is the owner of real property legally described in Exhibit "B" attached hereto which is adjacent to the Property ("Right-of-way Area");

WHEREAS, the City of Loveland requires \_\_\_\_\_\_ to obtain a Right-of-way from \_\_\_\_\_\_ across the Right-of-way Area for the extension of \_\_\_\_\_\_\_\_\_\_. : and

WHEREAS, \_\_\_\_\_\_\_ is willing to dedicate, and \_\_\_\_\_\_\_ is willing to purchase such a Right-of-way upon the terms and conditions set forth herein below.

NOW, THEREFORE, in consideration of the premises, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. Upon receipt by \_\_\_\_\_\_ of Final Development Plan and Development Agreement approval from the City of Loveland for development of the Property, \_\_\_\_\_ shall grant a Right-of-way for the extension of \_\_\_\_\_\_ Street across the Right-of-way Area ("Right-of -Way"). Such grant shall be made in the standard form utilized by the City of Loveland for such purposes at that time.

(\_\_\_\_) days of the date on which the Right-of-way is granted and the second installment shall be due and payable twelve (12) months thereafter.

3. This Agreement is entered into, and shall be interpreted in accordance with, the laws of the State of Colorado.

4. This Agreement shall be binding upon, and shall inure to the benefit of, the parties hereto and their respective heirs, successors and assigns.

5. This Agreement sets forth the entire understanding of the parties with respect to the matters addressed herein, and may only be modified by a written amendment signed by all of the parties.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement or caused it to be executed as of the date first written herein above.

(Company or individual)

By: <u>Title:</u>

### **DEED OF DEDICATION**

KNOW ALL MEN BY THESE PRESENTS, that the undersigned Grantor(s), for good and valuable consideration, receipt of which is hereby acknowledged, do(es) hereby sell, grant and convey unto the City of Loveland, a Colorado municipal corporation, the following described parcel of land situate in the County of Larimer, State of Colorado, towit:

SEE ATTACHED EXHIBITS "A" and "B"

with all its appurtenances and warrant(s) the title to the same, free and clear of all liens and encumbrances, subject to reservations, agreements and restrictions of record, and existing easements, if any.

The above described property is to be used for street and utility purposes, which purposes shall include, but not be limited to, streets, sidewalks, curbs, gutters, utility lines, structures, equipment, apparatus and poles.

Acceptance of this conveyance by the City of Loveland, Colorado, shall not impose upon said City any obligation for the opening, widening, installation, improvement or maintenance of the above described property for any purpose, which obligation shall arise, if at all, only by separate action of the Loveland City Council.

Signed this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 200\_\_\_.

Grantor(s):

STATE OF COLORADO ) ) ss

COUNTY OF LARIMER

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_, by

Witness my hand and official seal.

)

Notary Public

My commission expires \_\_\_\_\_

ATTORNEY'S CERTIFICATE

I, \_\_\_\_\_\_, an attorney licensed to practice law in the State of Colorado, certify, that I have examined title to the above described land dedicated to the City of Loveland, Colorado, and that the parties executing the dedication are owners thereof in fee simple, and the dedicated land is free and clear of all liens and encumbrances.

So sworn this \_\_\_\_\_\_ day of \_\_\_\_\_\_, 200\_\_\_\_.

Attorney at Law, #\_\_\_\_\_

# **EXHIBIT "A"** (Legal Description)


## EXHIBIT "B" (Map)

### **GRANT OF EASEMENT**

THIS INDENTURE, made this \_\_\_\_\_\_ day of 200\_\_\_\_by and between \_\_\_\_\_\_ as party of the first part and the CITY OF LOVELAND, COLORADO, a municipal corporation, hereinafter referred to as "City".

#### WITNESSETH:

**FOR GOOD AND VALUABLE CONSIDERATION,** the receipt of which is hereby acknowledged, first party has this day bargained and sold, and by these presents does bargain, sell, convey a, transfer and deliver unto the City, its successors and assigns, an easement and right-of-way in, over and across the real estate hereinafter described, including the perpetual right to enter upon said property at any time that it may see fit, and to construct a pedestrian way across and through the lands hereinafter described and to repair, replace, relocate, inspect, and operate said "pedestrian way" provided, however, that City shall restore the ground surface to its prior condition after disturbing the same. The term "pedestrian way" as used herein shall mean equipment and structures associated therewith.

The easement and right-of-way hereby granted, situated in Larimer County, Colorado is described as follows:

Exhibit "A" attached hereto and incorporated herein.

TO HAVE AND TO HOLD said easement and right-of-way unto the City, its successors and assigned forever.

The first part does hereby covenant with the City that it is lawfully seized and possessed of the real property above described, that it has a good and lawful right to convey the easement and right-of-way herein granted, that the said easement and right-of-way is free and clear of all encumbrances, and that it will forever warrant and defend the title thereto against lawful claims to all persons whomsoever.

**IN WITNESS WHEREOF**, the first party has executed this Grant of Easement the day and year first above written.

First Party	Attest:	
	Secretary	
By:	SEAL	
Name, Title		
STATE OF COLORADO )		
) ss		
County of Larimer )		
The foregoing instrument was acknowledged before me this	day of	2
of 2002, by		•
My commission expires:		
(SEAL)		
	Notary Public	

EXHIBHT "A" (Legal Description)

P.L.S.

Stamp

#### **GRANT OF TEMPORARY TURNAROUND ACCESS**

	THIS INDENTURE, made this	day of	,
200	, by and between		as
their in	terest may appear, as party of the first part, an	d the CITY OF LOVELAND, COL	ORADO, a
munici	pal corporation, hereinafter referred to as "Cit	ty", WITNESSETH:	

FOR GOOD AND VALUABLE CONSIDERATION, the receipt of which is hereby acknowledged, first party has this day bargained and sold, and by these presents does bargain, sell convey, transfer and deliver unto the City, its successors and assigns, a temporary turnaround access, in, over and across the real estate hereinafter described, including the perpetual right to enter upon said property at any time that it may see fit, and to use a temporary turnaround for vehicles provided however, that the City shall restore the ground surface after installation of the temporary turnaround to its prior condition after disturbing same. This easement will be null and void upon acceptance by the City of the extension of the roadway which negates the need for the temporary turnaround, to the approval of the City Public Works Street Inspector.

The temporary turnaround access easement hereby granted, situated in Larimer County, Colorado, is described as follows:

### SEE TEMPORARY TURNAROUND ACCESS EXHIBIT "A"

TO HAVE AND TO HOLD said temporary turnaround access easement unto the City, its successors and assigns forever.

The first party does hereby covenant with the City that it is lawfully seized and possessed of the real property above described, that is has a good and lawful right to convey the temporary turnaround easement herein granted, that the said temporary turnaround access easement is free and clear of all encumbrances, and that it will forever warrant and defend the title thereto against lawful claims of all person whomsoever. IN WITNESS WHEREOF, the parties hereto have set their hands and seals the day and year first above written.

### DEVELOPER

By: \_\_\_\_\_

Title: \_\_\_\_\_

STATE OF COLORADO	)
	) ss
County of	_)

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_ by \_\_\_\_\_.

Witness my hand and seal. My commission expires:\_\_\_\_\_\_.

Notary Public

(S E A L)

Address

#### Page 1

### CITY OF LOVELAND ENCROACHMENT PERMIT APPLICATION

DATE:
ATTENTION:
TOTAL PAGES:
PLEASE REFAX THIS FORM WITH COMMENTS WITHIN TWO (2) WEEKS OF RECEIPT TO:
PHIL LINDGREN, ASSOCIATE TRAFFIC ENGINEER
CITY OF LOVELAND TRAFFIC
1-9/0-962-2907 FAX TELEPHONE: 1-970-962-2516
ENCROACHMENT PERMIT APPLICATION FOR:
TYPE OF STRUCTURE:
LEGAL DESCRIPTION OF PROPERTY:
APPROVED?
COMMENTS.

### RESOLUTION #R-53-2001 OF THE COUNCIL OF THE CITY OF LOVELAND ESTABLISHING A POLICY FOR THE EXERCISE OF THE CITY'S EMINENT DOMAIN POWERS IN CONJUNCTION WITH THE DEVELOPMENT OF PRIVATE PROPERTY

WHEREAS, the City of Loveland (the "City"), as a home rule municipality, is authorized under Article XX, Sections 1 and 6 of the Colorado Constitution to purchase and hold real property and, within or without its territorial limits, to acquire interests in such property for public use by right of eminent domain; and

WHEREAS, the City's need to acquire real property generally arises in the context of the City's own capital projects; and

WHEREAS, the City has, by ordinance, established a policy of requiring the developers of private property to design and construct certain off-site public improvements that are needed to offset the impacts that the proposed developments will have upon the City's transportation system, utilities, and other public facilities; and

WHEREAS, this policy of having development "pay its own way" frequently results in the construction of public infrastructure at no cost to the City that not only benefits particular developments but also serves an important public purpose and benefits the community at large; and

WHEREAS, these off-site improvements often necessitate the acquisition of easements or rights-of-way by developers to be dedicated to the City and/or other publicly owned or publicly regulated utility agencies; and

WHEREAS, developers are sometimes unable to proceed with development projects because of their inability to obtain these necessary easements or rights-of-way by agreement with the property owner; and

WHEREAS, the City Council believes that some of these property acquisitions that are necessary for the installation of public infrastructure should be supported, if necessary, by the City's exercise of its eminent domain powers, because of the public purpose and benefit involved in such acquisitions; and

WHEREAS, for the foregoing reasons, the City Council wishes to establish the guidelines provided below to help staff identify situations in which the City's use of its eminent domain powers may be appropriate in conjunction with the development of private property.

# NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF LOVELAND as follows:

Section 1. That the City Manager, in reviewing requests from private developers for the City's exercise of its eminent domain powers, shall review such requests and present for Council's consideration proposed real property acquisitions through the use of eminent domain when the following circumstances exist:

- (a) There is a sufficient public purpose to justify the acquisition by eminent domain;
- (b) The eminent domain proceedings are not being commenced primarily to advance a private interest or private use;
- (c) The developer has considered, and presented to the City, alternative designs for the project to alleviate or minimize the need for the proposed easement or right-of-way;
- (d) The developer has pursued all reasonable options to obtain the easements and/or rights-of-way by private agreement and those efforts have been unsuccessful;
- (e) The improvements for which the easements or rights-of-way are needed will be utilized by more than one person, partnership or other entity and are necessary to connect the proposed development with existing infrastructure, such as transportation, water, sewer, stormwater or other utilities;
- (f) The developer has entered into an agreement with the City, satisfactory in form and substance to the City Manager and City Attorney, that sets forth the parties' respective rights and obligations related to the eminent domain proceedings, including, without limitation, a provision obligating the developer to pay all costs of the property acquisition, including all City costs related to said proceedings; and
- (g) The improvements for which the easements or rights-of-way are needed have been identified on an adopted public infrastructure master plan, or are otherwise defined as a City capital improvement which may financed, in part, by capital expansion fees as set forth in the Loveland Municipal Code.

Section 2. Any such proposed eminent domain action shall be closely reviewed by the City Council to ensure that the primary purpose of acquiring the real property in question is public in nature and that the acquisition of the same is necessary in the public interest, notwithstanding any incidental private benefit that may be conferred upon the developer submitting the condemnation request to the City.

Section 3. The discretion to determine whether the criteria set forth in Section 1 above have been met shall be vested solely in the City Council. Nothing herein shall be construed as limiting, or imposing additional conditions upon, the City's ability to exercise its powers of eminent domain as authorized in the Colorado Constitution and statutes, and the ordinances and Charter of the City. Passed and adopted at a regular meeting of the City Council held this <u>/9</u> day of June, A.D. 2001.



Pro time Mayor

.

APPROVED AS TO FORM:

Assistant City Attorney

### Date:

### **ENCROACHMENT PERMIT REVIEW ROUTING LIST:**

Please return to:	Jane E. Conklin, Engineering Technician Loveland Traffic Operations 105 West 5 <sup>th</sup> Street Loveland, CO 80537 Telephone: 962-2535 FAX: 962-2907
NAME OF APPLIC	ANT:
WORK LOCATION	J:
ENGINEERING:	Signature/Date
LIGHT AND POWI	ER:Signature/Date
STREETS:	Cianatana /Data
Comments:	Signature/Date
WATER & WASTE	WATER:Signature/Date

# NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF LOVELAND as follows:

Section 1. That the City Manager, in reviewing requests from private developers for the City's exercise of its eminent domain powers, shall review such requests and present for Council's consideration proposed real property acquisitions through the use of eminent domain when the following circumstances exist:

- (a) There is a sufficient public purpose to justify the acquisition by eminent domain;
- (b) The eminent domain proceedings are not being commenced primarily to advance a private interest or private use;
- (c) The developer has considered, and presented to the City, alternative designs for the project to alleviate or minimize the need for the proposed easement or right-of-way;
- (d) The developer has pursued all reasonable options to obtain the easements and/or rights-of-way by private agreement and those efforts have been unsuccessful;
- (e) The improvements for which the easements or rights-of-way are needed will be utilized by more than one person, partnership or other entity and are necessary to connect the proposed development with existing infrastructure, such as transportation, water, sewer, stormwater or other utilities;
- (f) The developer has entered into an agreement with the City, satisfactory in form and substance to the City Manager and City Attorney, that sets forth the parties' respective rights and obligations related to the eminent domain proceedings, including, without limitation, a provision obligating the developer to pay all costs of the property acquisition, including all City costs related to said proceedings; and
- (g) The improvements for which the easements or rights-of-way are needed have been identified on an adopted public infrastructure master plan, or are otherwise defined as a City capital improvement which may financed, in part, by capital expansion fees as set forth in the Loveland Municipal Code.

Section 2. Any such proposed eminent domain action shall be closely reviewed by the City Council to ensure that the primary purpose of acquiring the real property in question is public in nature and that the acquisition of the same is necessary in the public interest, notwithstanding any incidental private benefit that may be conferred upon the developer submitting the condemnation request to the City.

Section 3. The discretion to determine whether the criteria set forth in Section 1 above have been met shall be vested solely in the City Council. Nothing herein shall be construed as limiting, or imposing additional conditions upon, the City's ability to exercise its powers of eminent domain as authorized in the Colorado Constitution and statutes, and the ordinances and Charter of the City. Passed and adopted at a regular meeting of the City Council held this <u>/9</u> day of June, A.D. 2001.



Pro time Mayor

.

APPROVED AS TO FORM:

Assistant City Attorney

CITY OF LOVELAND TRAFFIC OPERATIONS 105 W. 5 <sup>TH</sup> ST., LOVELAND, CO 80537 (970) 962-2535 FAX: (970) 962-2907
DATE:
APPROVAL OF TRAFFIC CONTROL PLAN SUBMITTAL
PLAN SUBMITTED BY
FAX NODATE SUBMITTED
LOCATION SUBMITTED FOR
CONTRACTOR/ENTITY SUBMITTED FOR
DATES T.C.P. IS NEEDED
NOTES:
TRAFFIC CONTROL PLAN IS:       APPROVED         APPROVED       NOT APPROVED         IF NOT APPROVED FOLLOWING CHANGES / CORRECTIONS / ADDITIONS /         DELETIONS MUST BE MADE AND THE PLAN RE-SUBMITTED TO CITY OF         LOVELAND TRAFFIC:
Plan clean/legible
Transition or Taper Lengths
Street Names (Location of work)
North Arrow
Type of device
Street and lane widths, flowline / flowline, or edge of pavement / edge of pavement
Divided Highway/Dual Signage (Medians)
State Highway Permit
Posted Speed
Arrow Boards Required
Notification of Affected Properties
Notification of Emergency Services/School District
Special Signs Needed
Special Instructions:
RIGHT-OF-WAY PERMIT NUMBER FROM CITY OF LOVELAND

Authorized Representative/City of Loveland Traffic Operations

# **City of Loveland** Application for Building Permits Building Division \* 500 E 3rd St \* Loveland, CO 80537 General Information (970)962-2505 \* Inspection Line (970)962-2100 \* TDD (970)962-2620 \* FAX (970)962-2904

Address:		an the transmission of the second		Lot Size	e:		sf
Lot: Block:	: Subdivision	n:				5	
Owner Name:				Phon	e:		
Address:					(7)		
Contractor Name:	(Street)	(City)	) Jicense Numbe	(State) er: Ph	(Zip ( one:	Code)	<u>_</u> _
🗆 Residential 🛛	Non-Residential		□ New Build	ing 🗆 Alter	ration	🗆 Addit	ion
Proposed Use:	Existing Use:	Building Height:	Constructio ft. Type:	n Occupa Group:	ncy	Occupant Load:	
Number of Units:	Number of Stories:	Number of Bedrooms:	·	Number of Bathrooms: Full-	3/4	- 1/2	-
Fireplace? Gas Logs? Y N # Y N	Type of Heat: Gas Electric	Electric Servi Size:	ce Amps	Water Meter Size:	inch	Number Electric:	of Meters Water:
Garage (Detached / Attached) sf	Basement (sf) Fin Unfin	1st Fin	Floor (sf) Unfin	2nd Floor (s Fin Unfin	f)	3rd F Fin	loor (sf) Unfin
Carport sf	Porch sf (Roof? Y N)	Deck	sf (Roof? Y N)	Storage si	f (Proposed	d Use:	) .
Foundation Plans?  □ Recei	ved 🛛 At Issuance				Valua	ations	
Master Plan Number:	□ Full Permi □ Ftg. & Fnd	t 🗆 Trai in. 🗆 Traf	ffic Impact Study fic Worksheet	Total Valuation \$			
Describe Work/List Options:				Electrical Subcontractor		Valuation \$	
				Mechanical Subcontractor		Valuation \$	
				Plumbing Subcontractor		Valuation \$	
I certify this application is corre ordinances, state laws and build	ct. I agree to perform the work d	escribed accordin	g to plans and specif	fications submitted and	approved.	I agree to comp	ly with all city
Signature		Date	Recei	ved By	Da	ite	_
	*	** Office	Use Only *	**			
Staff Comments:				Application	Inform	nation	
and Standard (1999) All Angeler (1997) All Angeler (1997) All Angeler (1997)			LID No.:		<b></b>	F	Total
			Zoning:	Fees:			
			Insp. Area:	Date:		<u> </u>	1997 - 1997 -
			SR No.:				•
Dunung Ciliciai:			variance No.:	Аррисацой	rumper:	ing and a set of the state of the set of the	

Ref: "Adequate" Community Facilities Data Form

Rev. 08/99



#### **GRADING, EXCAVATING** AND FILL PERMIT

The city of Loveland has adopted Chapter 15 of the Loveland Municipal Code through which construction practices and building codes are administered. The grading, excavating and fill provisions are contained in the building code. The purpose of these guidelines is to safeguard life, limb, property and the public welfare by regulating the movement of dirtwork on private and surrounding property.

#### **Exemptions from this permit include:**

- >Grading in isolated, self-contained areas where there is no danger to public or private property.
- >Excavation activity when it is part of a project requiring a building permit (review and approval will be part of the building permit approval process).

For a complete list of exceptions, refer to the currently adopted building code.

Permit applications may be obtained at the Development Center, Building Division or contact (970) 962-2505.

#### **Application information must include:**

>Name and address of the property owner and applicant. >Legal description and address of the property.



>Vicinity map showing important physical features such as creeks and streams, etc. >Three (3) sets of construction documents which indicate property boundaries, location of structures on the property or within 20 feet of the property, location of the excavation site, existing and proposed final contours of the site, detailed plans showing provisions for on site stormwater detention and runoff.

>Completion of the following ancillary documents to be completed with each grading permit application is required:

U.S. Army Corp of Engineers Pre-Construction Notification (PCN) and a copy of 404 Permit and/or correspondence from the Corp.

State of Colorado General Permit Application, Stormwater Discharge Permit and a copy of permit acceptance letter from the State.

Colorado Department of Public Health & Environment Air Pollutant Emission Notice-Dust Control Plan-and-Application for emission permit and copy of permit acceptance letter from the State.

#### **Plan Review and Permit Fees**

Fees for both the plan review and permit are established in accordance with the most currently adopted building code and per the Table on the reverse of this sheet. To compute these fees, the total number of cublic yards of material involved as well as valuation of the project is needed.

#### Inspections

The City of Loveland will inspect the site during the review and during the construction process as well as after the project is complete.



### APPLICATION FOR A PERMIT TO MOVE A BUILDING

On Streets, Alleys and Other Public Ways in the City of Loveland

Date: \_\_\_\_\_

#### A. OWNER AND BUILDING INFORMATION

Owner of Building:			Type of Building:		
Size of Building:	Length:	Width:	Ht.:	Loaded Ht.:	
Present Location:					
To Be Moved To:			Date/Tim	e of Move:	
Route to be Used:					

#### **B. BUILDING MOVER INFORMATION**

Name of Mover:	PUC License No.:
Type of Insurance Coverage/Amount Carried:	
Insurance Company:	Date Insurance Filed with City Clerk:

#### C. NOTIFICATION OF CITY DEPARTMENTS AND UTILITY COMPANIES (see attached list):

City Department/ Utility Company	Person Coordinating	Est'd Cost to City Dept./Utility Co.	Comments (i.e. any further notice, meeting places/times)
City of Loveland Water and Power Dept.			
City of Loveland Police Department			Call dispatch prior to move at 667-2151.
U.S. West Communications, Greeley			
Public Service Company, Fort Collins			
Comcast Communications Longmont			
Poudre Valley REA, Fort Collins			1 day notice prior to move.
City of Loveland Engineering Division, Traffic Engineer			

D. If the date/time of move changes or at the time of application the date/time is unknown, it is the mover's responsibility to notify all the above agencies. The mover assumes all responsibility for damages resulting from the moving of the building in the City of Loveland. A FAX copy of the permit is acceptable in order to get agencies signatures, but we require the permit to have the mover's original signature on it.

Mover: \_\_\_\_\_

City Engineer Approval:

#### **EROSION CONTROL PROCEDURES**

Erosion Control is required for any of the following operations: (1) The new construction of 3plex or larger residential or non-residential buildings and/or all non-residential building additions. (2) Land development earth work for subdivisions.

### (1) Building Construction - Grading and Building Permit Application:

At Permit Application the "Applicant" shall submit an Erosion Control Plan to the Building Division.

Routing and Review requires 15 Working Days: Two Copies of Plan Required The Building Division routes one plan to Public Works Stormwater Engineering (Kevin Gingery @ 962-3571) at the Service Center for review & comments. Stormwater Engineering will contact the "Applicant/Contractor" if revisions are required. The other plan is routed to Public Works Engineering.

#### (2) Land Development Earth Work:

Earth Work may begin once the "Contractor" has installed an accepted Erosion Control Plan and been issued a Grading Permit by the City of Loveland.

#### Routing and Review:

An Erosion Control Plan is required to be submitted with the final construction plans for public improvements. The Community Services Planning Division routes the plans to Public Works Stormwater Engineering (Kevin Gingery @ 962-3571) at the Service Center for review & comments. Stormwater Engineering will contact the "Applicant" if revisions are required. Stormwater Engineering also contacts Public Works Engineering once the plan is accepted.

#### Field Installed Erosion Control:

The accepted Erosion Control Plan is installed at the work site. Once installation is complete the "Contractor" calls Public Works Engineering Two-Working-Days in advance for an inspection, (Dave DeBaere @ 962-2510). The Public Works inspector will inspect and list the inspection results on the AS-400 (the City's Computer System) and contact the "Contractor".

Acceptance: Once Erosion Control measures have been properly installed in the field. The Public Works Engineering Inspector will release that portion of the requirement for a grading and/or building permit.

#### Erosion control NOT properly installed:

The Public Works Engineering Inspector will notify the "Contractor" of what is required to correct the plan.

#### Permit Issued:

The Public Works Engineering Inspector will perform random inspections of temporary erosion control during construction. The "Contractor" is required to maintain temporary erosion control measures during construction, if temporary erosion control measures are not properly maintained the "Contractor" will be subject to a "Stop Work Order".

#### Request for final inspection:

Inspection of all **permanent** erosion control improvements. The "Contractor" shall call Public Works Engineering for final inspections.

# **Appendix B-4**

# **NOTE:** Contact Local Entity Engineer for Current Fees.

Fees:

- City of Fort Collins (Add When Available)
- City of Loveland (Add When Available)
- Larimer County (Add When Available)

# Appendix C

City of Fort Collins Streetscape Design Standards and Guidelines



# Streetscape Standards Fort Collins

LARIMER COUNTY URBAN AREA STREET STANDARDS | APPENDIX C







# **Streetscape Standards**

February 26, 2013



Community Development and Neighborhood Services Planning Division 281 North College Avenue Fort Collins, CO 80524 970-221-6376

fcgov.com/cityplanning

For additional copies, please download from our website, or contact us using the information above.

# **Acknowledgements**

### **City Council**

Karen Weitkunat, Mayor Kelly Ohlson, Mayor Pro Tem, Dist. 5 Ben Manvel, District 1 Lisa Poppaw, District 2 Aislinn Kottwitz, District 3 Wade Troxell, District 4 Gerry Horak, District 6

### Planning & Zoning Board

Gino Campana Jennifer Carpenter John Hatfield Kristin Kirkpatrick Brigitte Schmidt Andy Smith Butch Stockover

### **Project Staff Team**

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# SECTION 1 Purpose and Intent

Based on the City of Fort Collins' vision to create a vibrant, world class community, these standards set forth a coordinated approach to the design and management of streets as visually appealing public spaces that contribute to Fort Collins' distinct identity.

The term "streetscape" generally encompasses the visual and pedestrian environment of a street. These streetscape standards involve parameters for tree-lined streets and sidewalks, other landscaping along street edges, and landscaped medians in arterial streets.

In addition to plantings, streetscapes may also encompass various urban design elements in certain settings. Examples include special curb treatments and median edges, low planter walls and landscape walls, railings, bollards, planter pots, stone features, public art, pylons, specialty lighting, signal and light pole treatments, specialty paving, transit stops and furnishings, and the like.

Every streetscape project involves its own context and constraints. Still, there is a need for standards to set the bar for level of quality and investment. These standards provide a framework for programming, budgeting, designing, maintaining, and renovating various incremental projects as part of a whole approach. Exact details must then be adapted to fit and function with the unique context and constraints which exist in every project. The context and constraints include existing conditions that are expected to remain for the long term, and future change planned or envisioned by the City.

# SECTION 2 Applicability & Use

These standards apply to all projects involving streetscapes in the City right-of-way including:

- Private development projects.
- City capital projects.
- Any other miscellaneous maintenance and renovation projects and efforts.

Private development and public capital projects may involve construction of new streets, and/or changes to existing streets.

The standards are intended to be used by:

- Staff, in the design and management of City streetscapes over time.
- Landscape architects and designers.
- Developers and decision makers in the development review process.
- Property owners, where plans and activities involve streetscapes.
- Citizens, City Councils, and staff, in discussions involving streetscape issues.

# SECTION 3 Project Plan Submittal and Review

Streetscape projects that are part of development applications follow a standard City development review process, which will include collaboration with staff on streetscape design.

City capital projects involving streetscapes are reviewed administratively by interested City departments in an internal process of collaboration and routing of plans.

### 3.1

### STREETSCAPE PROJECT DESCRIPTION REQUIRED

For streetscapes to be successful, it is important for City staff in multiple departments to have a clear understanding of the design intent, assumptions, and the needs for maintenance, monitoring, and replacements of plants or other components.

A project description is needed to supplement technical project plans. The purpose is to prompt designers and staff to record the whole story of the streetscsape project.

# **3.1.1 Streetscape Project Description required.**

All streetscape projects involving landscaping and urban design elements shall include a Streetscape Project Description developed by City staff in collaboration with any project consultants, upon completion of design. The description shall:

- Be concise and avoid technical jargon.
- Include relevant commentary in addition to objective facts and information.
- Describe the design intent, assumptions, and maintenance and renovations that will be needed over time to realize the design intent.
- Note all aspects of the project from initial grading and soil preparation, to irrigation systems, to planting and establishment procedures, to management and maintenance.
- Note outstanding issues that need to be monitored over time.

Examples of topics to be addressed include:

- Reasons and concepts for all project decisions including planting, irrigation, mulches, boulders, hardscape, and urban design elements.
- Plant species needing pruning or trimming, specific weeding control practices, annual clean-up, dividing or periodic replacing to achieve the intent.

- Plant species with a limited track record in streetscapes that warrant monitoring.
- Mulches that need replenishing or clean-up.
- Urban design features that may need touch ups, replacements, stocking of parts, or other maintenance and renovations.
- Any other information useful for future understanding and management of the streetscape.

### 3.1.2 Project Statement File.

Staff shall maintain Project Statements for streetscapes on file.

# SECTION 4 All Streets

The following standards apply to all street classifications city-wide, except where specific areas have applicable planning documents that set forth alternative standards tailored to the area.

### 4.1

### **STREET TREES**

Rows of street trees along street edges are the fundamental, unifying element of continuity in city streetscapes.

Street trees can be considered as multi-functional public infrastructure that:

- Defines the street as distinct space, providing a unifying framework for abutting developments.
- Provides canopy shading along streets and sidewalks to reduce glare and summer heat build-up.
- Provides a buffer between pedestrians on the sidewalk and vehicles in the roadway.
- Provides space for streetlights and signs, and for snow storage in winter.



Street trees in an arterial parkway.

### 4.1.1 Tree planting in parkways.

Wherever the sidewalk is separated from the curb in accordance with the *Larimer County Urban Area Street Standards*, rows of canopy shade trees shall be planted in the parkway at 30 to 40 foot intervals, centered between the curb and the sidewalk.



Street trees in a local street parkway.

# **4.1.2** Species groupings within tree rows.

To the extent reasonably feasible, street tree rows in landscape areas, whether inside or outside of the sidewalk, shall be in groupings of three, five, or more of a single species. The intent is to provide a degree of species diversity within a deliberate, repeating design pattern.

Designers are encouraged to arrange changes in species to reflect roadway conditions, such as open stretches of roadway between access points, stretches approaching intersections and driveways, and/or changes in adjoining land use.



# 4.1.3 Street trees in sidewalk cutouts.

If a project involves a new sidewalk that must be attached to the curb due to unique constraints or context, then the sidewalk width shall be wide enough to incorporate planting cutouts with tree grates to the maximum extent feasible.

- To the maximum extent feasible, such sidewalks shall be 12-15 feet wide with cutouts at least 25 square feet at 30- to 50-foot spacing. Larger cutouts with more than 25 square feet are encouraged.
- In all cases, trees in sidewalk cutouts shall be located at least 8 feet away from buildings and offset from building entrances.
- If such an attached sidewalk has an abutting landscape area, then 8 feet shall be the minimum width in which canopy trees shall be provided in sidewalk cutouts.
- The minimum area of any sidewalk cutouts shall be 16 square feet, using 4x4-foot tree grates. Larger cutouts with more than 16 square feet of area are encouraged, for example 4x6-foot or 4x9-foot tree grates, to support tree health.



8-foot sidewalk with 4'x4' tree grates, where there is an abutting landscape area.

- The soil surface in a sidewalk cutout shall be level with the bottom of the sidewalk slab. Trees shall then be planted with the top of the root ball 1-2 inches above the soil surface.
- All tree grates shall be installed per manufacturer's instructions.
   Frames shall be set in a true, flat plane to prevent rocking of the grate. The grate or a template shall be set in the frame before concrete is poured to ensure the final installation is square and flat.
- Grates shall be of a pedestrian-safe ADA-compliant style with slot openings 3/8-inch or less.
- A spacing interval up to 50 feet shall be permitted for street trees in grates where abutting commercial buildings face the street with no intervening vehicle use area between the street and the building.

# 4.1.4 Tree planting outside of sidewalks where existing constraints preclude parkway tree planting or sidewalk cutouts.

Where a sidewalk is attached to the curb and is less than 8 feet in width, canopy shade trees shall, to the extent reasonably feasible, be established in an area ranging from 3 to 7 feet behind the sidewalk at 30 to 40 foot intervals. This standard shall also apply where unusual constraints preclude tree planting in a parkway.

Any such planting will typically require coordination with abutting property owners.

# 4.1.5 Adjustment of spacing intervals.

The Director or the City Forester may approve or require larger or smaller spacing intervals to better fit the growth habits of different street tree species, for safe use of the street or sidewalk, and to better fit with existing trees or other existing conditions unique to the location.

### 4.1.6 Overhead power line conflicts.

Ornamental trees may be planted in substitution of the canopy shade trees where overhead lines and fixtures prevent normal growth and maturity.



Examples of street trees outside of sidewalks.

### 4.1.7 Spacing from driveways.

No tree shall be planted closer than 8 feet from any driveway or alley.

### 4.1.8 Tree separation from utilities.

Landscape and utility plans shall be coordinated. Following are the minimum dimension requirements for the most common tree/utility separations.

- 40 feet between canopy shade trees and streetlights. Fifteen (15) feet between ornamental trees and streetlights.
- 10 feet between trees and water or sewer lines.
- 4 feet between trees and gas lines.
- 4 feet between trees and underground electric lines shall be provided to the extent reasonably feasible.

Exceptions to these requirements may occur where utilities are not located in their standard designated locations, as approved by the City Forester or the Director. Tree/utility separations shall not be used as a means of avoiding the planting of required street trees.



Tree separations from streetlights and driveways.
#### 4.2 PARKWAY LANDSCAPING - TURF-TYPE GRASS

Turf-type grass in parkways provides a multi-functional solution for landscaped edges along city streets of all classifications. Two main types of turf-type grasses may be used in Fort Collins streetscapes: cool-season turfgrasses, and warm-season native shortgrasses. Cool-season turfgrasses include improved varieties of Kentucky Bluegrass, Tall Fescue, Perennial Ryegrass, and Wheatgrasses. Warmseason native shortgrasses include improved varieties of Buffalograss and Blue Grama.

Efficiently irrigated, mowed coolseason turfgrass provides a living green edge to city streets over a long growing season. The green edge, along with street trees, is a unifying element that helps define City streets as continuous spaces, in conjunction with street trees.

Cool-season turfgrass can be a sustainable, functional landscape solution consistent with "xeriscape" and "water-wise" landscaping principles. These principles recognize cool-season turfgrass as an appropriate use of water in high visibility, multifunctional, high-use areas, and parkways typically fit that description. Cool-season turfgrass can be reasonably drought tolerant, depending on the species and improved variety. Problems resulting from periods of neglect are relatively easy to correct, and the turf rarely, if ever, needs replacement.

Non-gardeners and typical commercial crews can readily maintain cool-season turfgrass. It naturally inhibits weeds, and mowing is an efficient way to control weeds that do occur. It works well in conjunction with street trees with tolerance for shading. In winter, dormant turf is easy to keep tidy and trash-free. It tolerates foot traffic better than any other living ground cover.



Turfgrass parkways provide continuity and multiple functions.

Blue Grama and Buffalograss have very low irrigation and mowing needs. They are active and green for a shorter season than cool-season turfgrasses, but have an attractive straw color when dormant. They can offer a beautiful alternative to cool-season turfgrasses with their fine textures and soft gray-green color. They require full sun and significant weed control to maintain a high quality appearance in city landscapes. They do not tolerate shady spots, high levels of foot traffic, or overwatering. They are not as competitive with weeds, and weeds stand out in contrast to the texture and color of the grasses.

#### 4.2.1 Requirements.

Section 5 includes parkway landscaping standards for Arterial Streets. Section 6 includes parkway landscaping standards for Collector and Local Streets.

#### 4.3

#### PARKWAY LANDSCAPING -ALTERNATIVES TO TURF-TYPE GRASS

Mulched planting beds can be an acceptable alternative solution to turfgrass for parkway landscaping in some situations.

This alternative typically requires less water than cool-season turfgrass. With appropriate plant selection and proper maintenance it can offer seasonal interest and add character. While maintenance needs can be less frequent than a cool-season turfgrass mowing regime, they can be more complex and occasionally more timeconsuming as weeding, trimming, mulching and replacing materials are important to keep the plantings healthy and attractive.



Mulched planting bed in the parkway limits water use and can provide visual interest.

#### 4.3.1 Where Appropriate.

Alternatives to irrigated turfgrass can be an appropriate choice for property owners abutting collector and local streets, depending on whether the parkway is governed by an approved Development Plan. Alternatives can also be appropriate for arterial street projects in special plan areas that have recommended alternatives.

#### 4.3.2 Requirements.

Section 5 includes parkway landscaping requirements for Arterial Streets. Section 6 includes parkway landscaping requirements for Collector and Local Streets.

# SIGHT DISTANCE TRIANGLES AT INTERSECTIONS

Sight distance generally refers to the line of sight from a driver at an unsignalized intersection to approaching vehicles that the driver needs to see in order to safely enter traffic.

#### 4.4.1 Requirements.

A visual sight distance triangle, free of any structures or landscape elements shall be maintained at street intersections and driveways, as required in Figure 7-16 in the Larimer County Urban Area Street Standards.

Deciduous trees may be permitted to encroach into the clearance triangle provided that the lowest leaves shall be at least six (6) feet from grade and are spaced so that they do not obstruct line of sight.



Site Distance Triangle concept.

#### LOW IMPACT DEVELOPMENT -STORMWATER MANAGEMENT

In a "Low Impact Development" (LID) approach to streetscapes, landscaped parkways and medians are depressed rather than raised, to help manage stormwater runoff closer to the source. Depressed landscape areas are designed with special soil mixes, corresponding plantings, and other design techniques to infiltrate and filter runoff, instead of concentrating and conveying all runoff to centralized detention and treatment facilities.

The City's Stormwater Criteria Manual, which governs the management of stormwater in the city, describes design, plant selection, and maintenance techniques applicable to streetscapes.

#### 4.5.1 LID encouraged.

LID techniques and technologies are encouraged whenever the drainage patterns and the infrastructure allows for such measures to be used.

### **4.5.2 Low Impact Development streetscape projects.**

In any streetscape where a Low Impact Development approach is used, Streetscape Standards shall be adapted or modified as needed per the Stormwater Criteria Manual.



Illustration of LID concepts in a parkway.



#### Illustration of LID concepts in a parkway.

-Can be power washed to clean -Drops below incoming flow line



Illustration of LID median concept with street runoff directed to a depressed median with a flush band instead of curb and gutter.



Illustration of LID median concept with street runoff directed to a depressed median with special curb and gutter inlets.

### SECTION 5 Arterial Streets

The city's arterial streets are complex and expensive public infrastructure, combining virtually all utility and transportation systems of the city. Besides the functional needs for traffic and utilities, a pervasive theme throughout the City's Comprehensive Plan is the importance of streets as public space. As high-visibility public space, arterials create first impressions, are experienced by all residents on a daily basis, and play a large role in determining the character and conveying the civic intention of the City of Fort Collins.

Arterial streetscapes vary widely, from the Downtown core, to suburban residential areas, to the Natural Areas in the Poudre River valley.



Downtown core.



Suburban residential area.



Poudre River valley.

Some arterials are distinguished by the inclusion of medians along street corridors and in roundabouts. Besides managing traffic, medians provide very high-visibility space for landscaping, and provide a refuge for pedestrians crossing the road. Medians can humanize the scale of a wide street, and add beauty and civic identity. They are a highly visible mainstay of urban design, and thus are a major aspect of the City's streetscape efforts.



Medians in a roundabout.

#### ARTERIAL STREETSCAPES MAP

The Arterial Streetscapes Map recognizes differences between various arterials throughout the city. It indicates where a "Standard Arterial Streetscape" approach should apply, and where other corridor segments and gateway intersections warrant their own tailored approach to streetscape design and management.

The map works in conjunction with design standards in the following chapters to guide investment in streetscapes throughout the city.

### The types of Arterial Streetscapes and Gateways are:

- Standard Arterial Streetscapes.
- Enhanced Travel Corridors.
- Special Planning Areas.
- Streetscapes constrained by Existing Development.
- Gateway Intersections.
- Community Entrance Gateways (at Interstate 25).



#### ARTERIAL STREETSCAPE DESIGN: STANDARD ARTERIAL STREETSCAPES - MEDIANS

The primary focus of "Standard Arterial Streetscapes" is on medians, including the medians in roundabouts.

Median standards emphasize mixed plantings of perennials, grasses, shrubs, and tree groupings, with a mulched ground surface. The intent of these standards is to reflect Fort Collins' western regional character with regionally-specific plants suited to the harsh roadway environment. Planting compositions must include:

- Varied plant forms, textures, and foliage in addition to flowers.
- Coordinated, repeating groupings of plants to form an overall pattern.
- Accent groupings to add detail and variation within the overall pattern.
- Related elements such as mulches and boulders.



Illustration of standard arterial median landscaping approach.

#### 5.2.1 Median width measurements.

All references to median widths are from face of curb to face of curb.

#### 5.2.2 Median grading.

The ground surface in landscaped medians shall be crowned with a high point in the center, with slopes not to exceed 7:1 or approximately 14 percent. This standard shall not apply where a median has a cross slope due to opposing traffic lanes and curbs having different elevations, such that a crown may not be feasible.

### 5.2.3 Median grading in roundabouts.

The ground surface in center medians in roundabouts shall be crowned with slopes not to exceed 7:1 or approximately 14 percent. The intent of this standard is to increase the visual prominence of landscaping, and work in conjunction with planting and hardscape elements to achieve yearround screening of visibility across the roundabout to a height of at least 4 feet.

### **5.2.4 Median planting general approach.**

Tree groupings and mixed plantings of other plant types shall be established and maintained in medians.

This standard shall not apply in the following situations:

• Trees shall not be planted in medians less than seven feet wide.

• Medians less than three feet wide shall be paved rather than planted.

#### 5.2.5 Median tree groupings:

- Canopy shade trees, ornamental trees, and evergreen trees shall be planted in groups of three, five, or more to the extent reasonably feasible. Open intervals shall be provided between the groups.
- Open intervals between tree groups shall constitute 30-60% of the length of a given median. These percentages are intended to convey a general proportion rather than a precisely measured formula.
- Determination of the open intervals shall be based on the design intent and growth assumptions for trees over a given time frame.
- Where median length allows, repetition of tree groupings is encouraged.

### 5.2.6 Tree separation from median edges.

Separation of trees from concrete edges shall be provided by designers as needed based on assumptions for growth and pruning over a given time frame. The following minimum separations shall be provided for tree types as listed in Exhibit List of Recommended Plants:

Large canopy trees - 2.5 feet.

Ornamental trees - 1.5 feet.

Large evergreen trees - 7 feet.

Small evergreen trees - 5 feet.

# 5.2.7 Evergreen tree setbacks from face of curbs.

Evergreen trees shall be set back from the face of curbs:

Large evergreen trees - 9 feet.

Small evergreen trees - 7 feet.

# 5.2.8 Staggered median tree groupings if space permits.

Tree groupings shall be staggered rather than aligned in straight rows, where median width permits a stagger of at least 2 feet.

Example plan view of a median showing tree groupings.

#### 5.2.9 Mixed plantings.

Mixed plantings of perennials, ornamental grasses, shrubs, and shrubby trees shall be planted and maintained to cover at least 75% of the median area within 5 years, based on assumptions for growth and maintenance of plants by the designer.

- Mixed plantings shall be composed of groups of at least 3 plants per group, with each group composed of a single species.
- Mixed plantings shall be composed for understory conditions at tree groupings, and open conditions in intervals between tree groupings.
- Mixed plantings shall be arranged in an informal pattern rather than formal rows or geometrically-shaped groupings. The informal pattern shall include coordinated, repeating groupings of plants in an overall composition, rather than random placement. Plantings shall be designed and maintained to span the full width of the median at maturity.
- Mixed planting standards apply to all medians 3 feet wide or wider.



Mixed planting in a newly planted median.



This – informal pattern, but with repeated groupings to create an overall order in the design pattern.



Not This – formal, geometric pattern of massed plantings. While this kind of design pattern is not the "Standard Arterial Streetscape" approach, it may be appropriate for special planning areas.

### 5.2.10 Mixed plantings – two options for intensity.

Two options for mixed plantings shall be permitted:

- Perennial Garden Style.
- Shrub Garden Style.

Perennial Garden Style: This option emphasizes the maximum degree of planting intensity, color, and variety, with perennials used for the full length of a median. This results in a higher number of different plant groupings and a higher total number of plants to achieve the required 75% plant coverage.

Shrub Garden Style: This option allows the use of larger shrubs and shrubby trees to achieve the required 75% coverage with a lower number of different plant groupings and lower total number of plants.

### 5.2.11 Perennial Garden Style requirements.

An average of at least 4 groupings of perennial or ornamental grasses, and 3 groupings of shrubs per 250 square feet shall be planted and maintained. Groupings shall be composed of single species with at least 3 plants.



Illustration of Perennial Variety Style mixed planting, with open areas and tree groupings.

### 5.2.12 Shrub Garden Style requirements.

An average of at least 3 groupings of shrubs per 250 square feet shall be planted and maintained. Groupings shall be composed of single species with at least 3 plants.

In open areas at the ends of medians at intersections, at least 4 perennial or ornamental grass groupings and 3 shrub groupings shall be planted and maintained, with emphasis on color and/or texture over a long growing season.



Example of a mixed shrub planting with regionally adapted species (not a streetscape).





Plan view illustrations comparing perennial variety concept (on the left) and shrub variety concept (on the right).

#### 5.2.13 Decision on options.

The option to be used in any project shall be approved by the Director based on consideration of the relative importance of a given median to community image, intensity of adjacent land uses, the width and length of the median, and City budget considerations. In general, the Perennial Garden Style is more appropriate in higher-activity, mixeduse areas. The Shrub Garden Style is generally more appropriate in residential and other lower-activity areas.

### 5.2.14 Median noses and narrow ribbons - planting.

Median areas 3-7 feet wide shall be planted with low mixed planting under 30 inches in height.

## 5.2.15 Plants and mulches in conjunction.

Plant groupings shall be designed in association with either cobble mulch or organic mulch. Plants selected to feature green leaves and flowers are generally complemented by organic mulch, while stone mulch can detract from their effects. Stone mulch can complement evergreens, other plants selected to feature distinct forms or textures, and xeric plants with greygreen foliage.

When mulches are mixed, the patterns shall be in sweeping curves, and not rectangular blocks or strips along the edge.

#### 5.2.16 Mulches.

Organic mulch shall be used, either solely or in combination with stone mulch to add visual interest with a design pattern. Organic mulch shall be undyed shredded woody material. If a combination is used, the pattern shall be designed in conjunction with plant groupings, and the pattern shall span the full width of the median rather than dividing the median lengthwise into linear strips or lining the edge of the median.



This - mulch pattern spans the median in a sweeping curve.



Not this – mulch pattern in linear strips.



This – mulch pattern in sweeping curves designed with the direction of travel in mind.





Not this – mulch pattern in blocks.

Stone mulch, if used, shall consist of 2-4-inch stone combined with groupings of 4-12 inch or larger stone hand placed as accents for visual interest and to separate abutting organic and stone mulches. Larger stone shall be placed first, to be embedded, mingled, and settled with the smaller stone rather than loosely dumped.



Stone mulch placement example.

#### 5.2.17 Boulders.

Boulders may be used to structure and complement plant groupings. They shall be designed and placed in deliberate groupings in association with the planting and mulch design pattern, and any low walls or slopes. They shall be placed prior to planting and mulching, and slightly sunk into the ground, to be embedded and mingled with mulches and plantings. Permitted boulders shall be tan Masonville sandstone quarry blocks, rounded river boulders, or weathered moss rock boulders. Boulder selection shall be based on continuing an established theme, or establishing a theme where none exists.



Tan Masonville sandstone quarry blocks.



Rounded river boulders as part of a whole design approach to plantings and mulches.

### 5.2.18 Median hardscape – edges and paving.

Hardscape treatments depend on different median widths and different contexts throughout the city, and shall comply with the following requirements:

A. In median areas that are at least 7 feet wide, a double curb edge shall be installed where a project includes 1) a new median, or 2) an existing median that lacks splash blocks or has splash blocks that warrant replacement. The purpose of this standard is to provide additional depth for planting areas, space for maintenance personnel, an additional correction barrier for vehicles leaving the roadway, and a visual design that complements the curb and gutter. Where a median tapers to less than 7 feet, the upper curb shall return across the median to enclose the upper landscape area.





Illustration of double curb.

The following exceptions to the double curb shall apply:

 Sloped concrete splash blocks with integral tan tint and exposed aggregate finish shall be permitted in lieu of a double curb if a median project is located in a street segment or area of the city where existing splash blocks have a previously established theme and are expected to remain for a long term.



Sloped splash block design.



Sloped splash block design: existing Standard Arterial Streetscape corridors throughout the city include extensive segments with existing sloped concrete splash blocks, per a former standard.

- 2) Where a median is less than 7 feet wide, the edge shall be a standard 6-inch curb with no double curb or splash block.
- B. Median areas under 3 feet wide shall be paved rather than planted. Paving shall be rectangular concrete or brick pavers set on a concrete base.



Rectangular pavers set in a herringbone pattern.

The following exception to pavers shall apply: where existing tan exposedaggregate concrete median paving establishes a prevailing theme, it shall be permitted for paving of medians under 3 feet wide.



Tan exposed-aggregate concrete median paving.

Median area 7 feet or wider – mixed planting and ornamental trees to provide a sense of pedestrian scale. Double curb continues to crosswalk.

Narrow median area 3-7 feet wide – mixed planting, no trees, standard curb.

Narrow median area under 3 feet wide – pavers, standard curb.

#### 5.2.19 Roundabout planting and hardscape:

Roundabout medians in Standard Arterial Streetscape areas shall be developed and maintained with tree groupings and mixed plantings in the Perennial Variety Style, with boulders and a mulched ground surface. Landscape walls may be included to reinforce the pattern and provide year-round structure for plantings.

Apron paving and any special curbs shall be designed for visual interest with tinted, textured concrete, pavers, or similar material.

Design of each individual roundabout shall be unique unless multiple roundabouts are related in a pair or group as part of a single traffic management project. Design elements include planting themes, plant species, apron paving, and other hardscape details.





Illustrations of roundabout landscaping approach with mixed planting, boulders, mulch and hardscape patterns all designed in conjunction. Lower graphic shows the inclusion of landscape walls.

#### ARTERIAL STREETSCAPE DESIGN: STANDARD ARTERIAL STREETSCAPES - PARKWAYS

The City maintains most arterial street parkways, with exceptions in a limited number of situations where other arrangements are made with another entity. Turfgrass provides a range of benefits as a solution to arterial street parkways as described in Section 4. The benefits describe are relevant for all street classifications, but are particularly relevant for arterials which form a continuous city-wide framework of public space.

#### 5.3.1 Irrigated Turfgrass.

Parkways in Standard Arterial Streetscapes shall consist of irrigated turfgrass and street tree plantings as described in Chapter 4. Appropriate irrigation shall be provided to maintain health of plantings with efficient use of water.



Arterial street parkway.

#### 5.4

#### ARTERIAL STREETSCAPE DESIGN: ENHANCED TRAVEL CORRIDORS (ETC'S)

Standard Arterial Streetscape standards may or may not be adequate and appropriate for design and maintenance of these corridors, depending on unique circumstances in each ETC.

These arterial corridors are intended to evolve as a framework that incorporates and supports high frequency transit with special emphasis on walkability and bicycling.

#### 5.4.1 Tailored streetscape approach.

For streetscape projects where previous ETC plans do not define a streetscape approach, the Standard Arterial Streetscape standards in Section 5.2 shall be considered as the minimum requirement for the level of quality and investment.

Design and maintenance shall then be adapted to unique circumstances in each corridor as appropriate, based on study of and response to:

- 1. Guiding policies for ETC's.
- 2. Established precedents in the corridor that are consistent with the vision and policies for ETC's.

Examples of permissible design variations include:

3. Planting patterns to reinforce the pattern of transit facilities.

- 4. Hardscape elements edge treatments, paving, planters, and the like, particularly where related to transit stops and shelters.
- 5. Urban design amenities in a coordinated program, particularly including paving, furnishings, and structures at transit stops and shelters.

In all cases, design shall include repeating elements to create a theme for the corridor and avoid clutter of unrelated elements.

#### 5.5

#### ARTERIAL STREETSCAPE DESIGN: OTHER SPECIAL PLANNING AREAS

Special planning areas have subarea plans, corridor plans, or other planning documents that recognize their unique context and character. The level of specific direction for streetscapes varies among the plans.

These areas warrant their own distinctive streetscapes with tailored design and maintenance characteristics, rather than the Standard Arterial Streetcape.

#### 5.5.1 Tailored streetscape approach.

For streetscape projects where plan documents are not definitive, the Standard Arterial Streetscape standards in Section 5.2 shall be considered as the minimum requirement for the level of quality and investment, and may be considered as a reference for design. Design and maintenance shall then be adapted by project designers and staff based on study of and response to the context and any established precedents that are consistent with the vision and policies for the area, and are thus expected to remain.

Examples of permissible design variations on the Standard Arterial Streetscape include:

- 6. Distinct patterns of trees and other plant groupings.
- 7. Signature plant species.
- 8. Hardscape elements edge treatments, paving, low planter walls or landscape walls, and the like.
- 9. Urban design amenities such as paving, street furnishings, and transit stop shelters or other themed structures in a coordinated program.

In all cases, design shall include repeating elements to create a theme for the area and avoid clutter.



Custom-tailored streetscape with parkway and median details as part of a whole planning approach to a street segment in Campus West.

#### ARTERIAL STREETSCAPE DESIGN: CONSTRAINED CORRIDORS AND SEGMENTS

These are arterial corridors and segments where the Standard Arterial Streetscape is not feasible due to physical constraints of existing development. Typically, both parkways and medians are constrained.



Example of a constrained arterial (East Prospect).

#### 5.6.1 Tailored streetscape approach.

Streetscape projects in these areas shall incorporate aspects of a Standard Arterial Streetscape to the extent reasonably feasible. The allocation of available space and the compromises on each component of the street shall be determined on a project-by-project basis.

The most important aspects to consider in the streetscape approach are safe sidewalks and street trees as described in Chapter 4.

#### 5.7

#### ARTERIAL STREETSCAPE DESIGN: GATEWAY INTERSECTIONS

These intersections are exceptional locations where the Standard Arterial Streetscape should be augmented with additional intensity of streetscape development in any capital projects. These locations warrant the highest level of investment for design, construction and maintenance.

The intent is to highlight entryways into the city, and also edges of districts within the city. The locations consist of intersections, whether signalized or roundabouts, extending outward as appropriate to include medians associated with the intersection.

#### 5.7.2 Components.

Streetscape projects at gateway intersections shall be enhanced with a coordinated program of components including at least four of the following:

- Plantings of annual flowers in beds or large pots.
- Railings or low walls.
- Bollards.
- Pedestrian lighting/ other specialty lighting.
- Columns, pylons or other urban design structures.
- Signal or light pole treatments.
- Color themes in repeated components.
- Special paving.

• Sculpture or other public art in addition to the components listed above.



Examples of enhanced gateway components – annual flowers, planter pots on plinths, railings, pedestrian lights, public art pylons, and tinted concrete paving.



Example of a median approaching a gateway intersection incorporating themed railings mingled with plant groupings.



#### ARTERIAL STREETSCAPE DESIGN: COMMUNITY ENTRANCE GATEWAYS (I-25)

Interstate 25 interchanges act as major community entrances, in conjunction with the arterial streets leading into Fort Collins from the interchanges.

Future improvements to the interchanges are expected to include gateway design features to reinforce the community entrance role.

Design and management of any such interchange improvements, and and arterial streetscapes near the interchanges, may present opportunities for coordination.

For example, any interchange gateway features may be appropriate to extend westward along a segment of the arterial streetscape. If such features are not appropriate to be extended, they may still influence, or be influenced by, the character of the arterial streetscape.



Example of enhanced gateway components at an I-25 Interchange, including stone walls and a themed planting design.



### SECTION 6 Collector and Local Streets

#### 6.1

#### PARKWAY LANDSCAPING

Streetscapes on collector and local streets typically consist of parkways only. The primary intent for parkway landscaping is to provide a setting for street trees, and work in conjunction with street trees for a number of purposes:

- Define streets as the framework of public space within which individual properties fit.
- Contribute to the attractiveness and visual interest of the street edge.
- Mark the transition from public to private space.
- Blend public interests in street infrastructure with interests of abutting property owners who are required to maintain these parkways by City Code.

#### 6.1.1 Two approaches.

Two main approaches to landscaping parkways are permitted in collector and local streets: turf-type grasses, and mulched planting beds. Pros and cons of each are discussed in Section 4. In both approaches, appropriate irrigation shall be provided to maintain health of plantings with efficient use of water. In developments where there is no development plan that specifies parkway landscaping, the owner of the property abutting the parkway may select either approach, regardless of any Homeowner Association covenants that may apply to the development, and shall be responsible for the installation and maintenance of the parkway landscaping in accordance with Section 24-42 of the City Code.

## 6.1.2 Approved development plans govern.

In developments with approved landscape plans, the parkway landscaping must be in accordance with the plan.

A Homeowners Association (HOA), or a property owner with notice to and opportunity for comment from the HOA, may request a Parkway Landscaping Amendment to an approved plan for parkway landscaping. Such a request by a property owner shall be limited to the parkway strip abutting the lot of the property owner and shall be reviewed by the Director in accordance with Section 2.2.10(D) of the Land Use Code.

## 6.1.3 New development landscape plans.

Where a developer desires to offer nonturf grass options to homeowners, the landscape plan shall contain notes and drawings specifying options for non-turf ground cover plantings, with consistent mulch and a recommended plant palette.

#### 6.1.4 Turf-type grass.

Turf-type grass shall be permitted, including both cool-season turfgrasses and warm-season native shortgrasses as discussed in Section 4. The choice of grass species and variety can make a major difference in water use needs, ease of establishment, survival of the grass, weeding, mowing, and renovation requirements.



Cool-season turfgrass parkway congruent among properties along the street, and also congruent with adjoining landscaping.

#### 6.1.5 Mulched planting beds.

Non-turf ground cover plantings shall be permitted, including mulched planting beds and ground cover plantings. With an understanding of plant selection and proper irrigation and maintenance, these plantings can provide seasonal interest with little water required.

Property owners are encouraged to incorporate choices that provide a degree of congruence with neighboring properties in terms of mulches and character of plantings.



Mulched planting bed with a perennial garden in a parkway.



Combination of turf and planting beds in parkway areas.

## 6.1.6 Requirements for non-turf ground cover plantings:

- A. Landscaping shall be designed, installed and maintained so that at least 50% of the area shall be covered with live plant material within 3 years from installation.
- B. Plant materials shall be under 2 feet tall if within 5 feet of a driveway and under 3 feet tall in other areas. Owners are encouraged to select plants that maintain these height limits with little or no pruning.

- C. Plant materials must not obscure the line of sight for traffic or obstruct the sidewalk. Plantings of any height that obstruct the line of sight or cause safety concerns may be required to be kept trimmed to a lower height or removed so visibility is provided/maintained.
- D. No fences or thorny/prickly plant material are allowed.
- E. In mulched planting beds, the soil surface shall be 2-3 inches below the curb and sidewalk to allow for mulch to be contained. To avoid clutter, no additional timbers, concrete products, plastic or metal

edging, or similar material shall be included.

- F. Exception: if edging is needed to keep turfgrass out of mulched areas, perpendicular to the street, such edging shall be flush or within 1 inch of the ground surface, so it is not a visible element.
- G. Plant materials and mulch must be kept off the street and sidewalk.
- H. Avoid cutting tree roots if converting an established turf parkway to a planting bed. Within a tree's dripline, minimize grade change to protect the tree roots.



*This* – organic mulch, healthy plants, and stepping stones if needed.



Not this – gravel that is not congruent with any other portions of the streetscape, dead plants, weeds, concrete products, and exposed fabric prevent this parkway from contributing to the street as attractive public space.

### SECTION 7 Maintenance Standards

The purpose of this Section is to foster a consistent, high quality appearance for all streetscapes, whether maintained by the City, its agents, or by private developers, businesses, or individuals.

Given the high visibility of city streetscapes, the public is able to observe maintenance practices in the field as well as the results of that maintenance. The public perception of a well-maintained landscape is promoted by practices which benefit the health of the landscape materials and achieve a neat, well-cared for appearance. Quality maintenance is a function of workmanship, funding, knowledge, and technique. These standards attempt to ensure that all streetscapes are cared for in a manner which reflects the high esteem that citizens have for these important public spaces. Generally, all landscaping shall be maintained in a healthy condition throughout the growing season. A neat and attractive appearance is essential. Irrigation systems, structures, and sidewalks shall be maintained to represent the original integrity of the design and installation.

#### 7.1

#### TREE MAINTENANCE AND MANAGEMENT REQUIREMENTS

#### 7.1.1 Separate standards document.

A separate document, The City of Fort Collins Tree Management Standards and Best Management Practices, contains the City's standards for planting and maintenance for all trees in the public rights-of-way and apply whether the work is performed for the City contractually, by the City, or by private entities or individuals. Exceptions to the standards and practices require written approval of the City Forester.

#### 7.1.2 Permits for tree work.

A permit must be obtained from the City Forester before any planting, pruning, removal, or destruction of any tree or shrub within the public right-ofway of any street or sidewalk. Businesses performing this work must be licensed by the City. No tree shall be cut back in such a manner that its health will be impaired or it creates an unsafe condition. An exception to this rule may occur to provide emergency relief of an immediate danger to persons or property. Any such emergency procedures must be reported promptly to the City Forester with plans for completion or follow-up work submitted for approval. See the City of Fort Collins Tree Management Standards and Best Management Practices for details on acceptable pruning practices.

#### 7.2

#### MAINTENANCE RESPONSIBILITIES

Maintenance responsibilities vary among different street types, and also with specific circumstances of abutting properties.

### **7.2.1** Maintenance responsibilities standards and requirements:

A. Street trees located on the City right-of-way are the responsibility of the City Forestry Division to
manage, maintain, and replace on all streets, regardless of who maintains the surface.

- B. Exception: some streetscape projects include a warranty period for establishment of newly planted trees in which the project is responsible.
- C. Medians in arterial streets shall be maintained by the City.

Exception: some streetscape projects include a warranty period for establishment of median landscaping in which the project is responsible.

- D. Parkway landscaping on Collector and Local streets shall be maintained by the adjacent property owner in accordance with City Code.
- E. Parkway landscaping on arterial streets shall be the responsibility of the City if there is no individual, organization, or homeowners' association that prefers to maintain them, or that can be fairly allocated the maintenance responsibility based on their unique benefit .
- F. The following four other different scenarios for planting and continuing maintenance are possible depending on circumstances:
- The developer installs the landscape and the City takes responsibility for tree maintenance after a warranty period for full tree establishment during which time specific obligations are met. The surface (turfgrass, other plantings, mulches, irrigation) must continue to be

maintained by the developer, homeowners' association, or other responsible party.

- 2) The developer installs the landscape and after meeting obligations during the first two years, the City takes responsibility for both tree and surface maintenance.
- The landscape is part of a Capital Improvements Project and a contractor does the landscape work. The City is responsible for tree maintenance and may or may not be responsible for surface maintenance.
- Adopt A Median -- the City encourages homeowners' associations, business groups, and other civic groups to take part in the Adopt-A-Median program. Contact the City Parks Division at 221-6660 for further information.

#### 7.3

ACCEPTANCE OF NEW ARTERIAL STREETSCAPE PROJECTS FOR CITY MAINTENANCE

# **7.3.1** Streetscape installed to City standards.

Any new streetscape landscaping not designed and installed to these standards may be rejected by the City Parks Division for inclusion in its maintenance program. Developers and City capital projects shall notify the City Parks Division and conduct a walkthrough with Parks and Forestry Division staff at the end of the warranty period. Any defects in the landscaping or irrigation system shall be corrected by the project that installed the streetscape.

#### 7.4

# GENERAL MAINTENANCE STANDARDS

#### 7.4.1 Trash.

Trash shall be removed on a regular basis.

#### 7.4.2 Turf-type grass.

Cool-season turfgrasses shall be maintained at a 3-inch cut during the growing season. Trimming shall be concurrent with mowing, to match height of open turf, around mowing obstructions such as trees, curbs, and vacuum breakers. Turfgrass shall be edged concurrent with mowing when needed to prevent growth over edges. Visible clippings shall be removed from sidewalks and streets.

Buffalograss and Blue grama shall be maintained at a maximum height of 12 inches.

#### 7.4.3 Shrubs.

Shrubs shall be pruned as needed to: 1) achieve the design intent; 2) remove dead or diseased branches; and 3) support plant health and vigor. Dead shrubs shall be removed and replaced immediately. Shrubs shall not extend over the curb or sidewalk.

#### 7.4.4 Perennials.

Perennials shall be deadheaded and trimmed throughout the growing season as appropriate for the design intent for each species. Depending upon design intent, perennials and ornamental grasses shall be cut back in late fall or early spring prior to new growth. Dead perennials shall be removed immediately and replaced per the design intent.

#### 7.4.5 Annuals.

Planting of annuals in the spring shall be in designated annual flower beds. Annuals shall be regularly deadheaded of spent blooms. Annuals shall be removed in the fall after the first hard freeze.

#### 7.4.6 Mulch.

Mulch shall be replenished as needed to maintain complete coverage of the soil surface with a depth of 2-4 inches, with careful placement and reduced depth as needed underneath plants to avoid burying leaves or tender stems.

#### 7.4.7 Weeds.

All landscaped areas shall be kept free of weeds and invasive grasses that are not part of the design intent. Weeding may be done manually or by the use of herbicide and or pre-emergent. The use of any restricted herbicides or soil sterilants is prohibited. In accordance with Best Management Practices, the effectiveness of the herbicide shall be monitored.

### SECTION 8 Irrigation Standards

Proper watering systems help achieve City goals and citizen expectations for public spaces. Irrigation of parkway and median plant material is necessary to maintain a quality appearance and long term health of streetscape plantings.

It is the City's intent to be a good steward of water resources consistent with "xeriscape" and "water-wise" principles related to social, environmental, and economic sustainability.

All irrigation systems will be designed to meet the needs of each unique landscape by following best management practices and up-to-date technology. Without proper irrigation design and maintenance, good stewardship of the landscapes is not achievable.

#### 8.1

#### **IRRIGATION SYSTEM DESIGN**

#### 8.1.1 General design standards.

Irrigation design and installation shall comply with the following general standards:

- A. Irrigation design shall be done by a certified irrigation designer unless otherwise approved by the Parks Department.
- B. Irrigation system design and installation shall be monitored,

inspected, and approved by the City Parks Division. Irrigation systems shall be installed and maintained so that irrigation equipment will not spray onto any streets, walkways, or features and structures that could be damaged by water.

- C. The irrigation system must comply with the International Plumbing Code and with the City of Fort Collins Electrical Code.
- D. Any deviation in taps from the approved construction plans must be approved by City of Fort Collins Utilities prior to installation. Any water service line shall be coordinated with City of Fort Collins Utilities.
- E. Any deviation in layout of the irrigation system from the approved construction plans must be reviewed and approved by the City Parks Division prior to or during installation.
- F. The irrigation system shall be designed to provide full coverage and matched precipitation rates.
- G. Lateral piping shall be sized based on flow demands in gallons per minute (gpm); with velocities not to exceed 5.5 feet per second.
- H. Xeriscape principles shall be utilized in the design of the irrigation system.

- All designs shall meet the industry's Best Management Practices from the Irrigation Association and ALCC (Associate Landscape Contractors of Colorado).
- J. Newly installed irrigation systems shall be subject to water audits.
- K. The minimum distribution uniformity for spray heads shall be .55; for rotor heads it shall be .65; for stream rotors it shall be .75; and for impact heads it shall be .65.
- L. Design considerations shall include: 1) shrub and perennial beds are to be zoned separately from turf areas; 2) sloped areas will have separate zoning for heads at the higher elevations from those at the lower elevation; 3) areas with different exposures are to be zoned separately; and 4) In-head check valves are to be used for all areas adjacent to walkways and at the bottom of berms and pond areas.
- M. Xeric irrigation and drip systems come in a wide variety of configurations. The correct application shall be approved for each landscape design by the City Parks Department.
- N. Trees planted in non-turf irrigated landscape areas require short-term and long-term irrigation and should be on individual or separate zones. Supplemental emitters shall be installed on top and around the root ball for short term health. Perimeter irrigation of the root ball shall be installed for long term and permanent irrigation.

- O. The contractor shall install the saddle for the PVC or AC pipe.
- P. The backflow prevention device and water meter shall meet the City of Fort Collins standards, and the flow meter shall be *Data Industrial*.
- Q. A curb stop shall be installed between the meter pit and the backflow prevention device for isolation purposes. The curb stop shall be sleeved from the valve to grade and covered with a round valve box.
- R. A blowout tube no larger than ¼" shall be placed between the meter pit-curb stop and the back flow prevention device. The injection port on the blow out tube shall be sweated on, attaching a female adapter with a threaded brass plug.
- S. A blowout tee shall be installed immediately downstream of the backflow prevention device.

### 8.2

#### MATERIALS STANDARDS

#### 8.2.1 Pipe:

- A. Copper shall be type K rigid conforming to ASTM Standard B88.
- B. Mainline shall be Class 200 PVC, NSF approved. If 3 inches or larger, use ringtite pipe.
- C. Laterals shall be Class 200 PVC, NSF approved.

- D. No laterals shall be smaller than 1-inch pipe.
- E. Trickle tubing shall be weather and UV resistant material.
- F. Polyethylene drip pipe shall be NSF approved, SDR pressure-rated pipe, only as approved for drip applications.
- G. Funny pipe shall be used only for pop-up spray heads, and shall be compatible with the elbows needed for the sprinkler heads.
- H. Lateral fittings shall be Schedule
  40, Type 1, PVC solvent-weld, with
  ASTM Standards D2466 and D1784.
- Copper or cast bronze fittings, soldered or threaded per installation details shall be used for all copper pipe.
- J. Mainline fittings shall be ductile iron for 3-inch and larger pipe; and shall be PVC Schedule 80 for smaller pipe.
- K. Sleeving shall be ductile iron or PVC pipe under all paved surfaces. Sizes shall be a minimum of two sizes larger than the pipe being sleeved, but shall in no case be smaller than 2-inch diameter pipe.

#### 8.2.2 Valves:

A. Remote control zone valves shall be electrically operated, appropriate for the water supply, with manual bleed device and flow control stem. Valves shall have a slowopening and slow-closing action for protection against surge pressure. Brand and model shall be Rainbird PE Series Remote Control Valves, scrubber option with self cleaning screen unless City specifies other brand and model.

- B. Valves used for two-wire system shall be properly grounded per manufacturers recommendation.
- C. Drip valves, bubbler valves, and micro-spray valves shall be accompanied by pressure-reducing devices matched with recommended filters to assure proper operation and reduced failure of such equipment.
- D. Isolation gate valves shall be Kennedy 1571X or Matco #100M, able to withstand a continuous operating pressure of 150 psi. Clear waterway shall be equal to full diameter of pipe. Shall be opened by turning square nut to the left (wheel opening is unacceptable).
- E. Manual drain valves shall be ¾-inch ball valve with tee handle, Watts #B-6000, or approved equal.
- F. Quick coupler valves shall be 1-inch brass, *Rainbird* #5RC units with rubber cover. Supply 1-inch brass key for *Rainbird* 55K.
- G. Spears True Union ball valves shall be installed upstream of the remote control zone valve. Equivalent substitutes shall be accepted.
- H. Valve boxes shall have matching locking cover which shall be *Carson, Pentex* or approved equal.

Box sizes shall be as specified to house one valve per box.

#### 8.2.3 Control System:

- A. Controllers shall have smart controller technology and shall be approved by the Parks Department. The number of stations shall include two extra stations for possible future use. The controller box shall be weather tight and vandal resistant with locking exterior disconnect. One *Eicon* pigtail or compatible remote controller pigtail shall be used for each 12 stations.
- B. The Control System Enclosure shall be *Hofman* Model A242408LP with A24P24 steel panel, Model A-FK1208 floor stand kit and AL-2BR lock kit, or approved equal.
- C. The surge protection shall be an 8foot copper grounding rod, #4 solid copper wire, grounding buss receptacle, ground terminal strip and *Irritrol* SPD-587 surge protector per manufacturer's specifications and details.
- D. The master valve shall be normally opened.
- E. Control wiring shall be #14 solid copper direct burial UF or PE cable, UL approved, or larger, per system design and manufacturer's recommendations.
- F. Five-wire systems shall have a consistent color scheme throughout: Red = live; White = ground; Black, Blue and Green = extra.

- G. If two-wire systems are used, approved shielded wire or manufacturers recommended wire shall be used.
- H. Approved wire connectors and water-proofing sealant shall be used to join control wires to zone valve wires. The wire connectors shall be what each specific manufacturer recommends. Twowire systems shall use manufacturers specified wire per warranty provisions.

#### 8.2.4 Sprinkler heads.

All sprinkler heads shall be of the same manufacturer as specified on the plans, marked with the manufacturer's name and model in such a way that materials can be identified without removal from the system. The City will specify brands and models to match other equipment in use in public systems in the vicinity. Gear driven rotor heads shall be *Hunter* or approved equal. Pop-up spray heads shall be Hunter, *Rainbird*, or approved equal. All heads should have pressure regulating device integrated in them to maintain proper operating pressure. They also shall have anti water draining valves to avoid water waste when not in operation. (Example: Rain Bird 1804 PRS/SAM heads. A minimum of 4" pop-up is required.)

#### 8.3 INSTALLATION PREPARATION

#### 8.3.1 Utility locates.

Locate all utilities prior to trenching and protect from damage. Required calls shall include, but are not limited to the following: City Parks Division, 221-6660, for locates and 1-800-922-1987 for utility locates within the City of Fort Collins. Contact other utilities as required.

#### 8.3.2 Preliminary inspection.

The Contractor shall inspect tap and any existing irrigation system, as applicable, prior to work.

#### 8.4

#### **INSTALLATION PROCEDURES**

## 8.4.1 Water service connections (taps):

- A. Forty-eight hours prior to connection, the contractor shall contact the City of Fort Collins Water Utilities, at 221-6700 to schedule the work for water taps and inspections. A minimum two weeks prior notice shall be given to the Water Meter Shop, 221-6759, for installations which will require meters and/or backflow devices larger than 2 inches.
- B. The contractor shall be responsible for excavation, connection to corporation stop at the water main, providing and installing the saddle for the PVC or A.C. pipe, making the connection to the existing water service, backfill and

compaction, and pavement / shoulder / surface treatment replacement as needed. Soldered joints or fittings are permissible above grade or inside a vault. No solder, sealants, fluxes, pipe dope, and other materials shall contain any lead. All taps and installations are subject to approval and inspection by the City of Fort Collins Water Utilities. Install meter as specified in a precast vault. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with the City of Fort Collins Utilities.

- C. The contractor shall install a winterization assembly downstream of the meter vault a minimum of 6 feet away from the outside of the meter vault on the copper pipe.
- D. Copper pipe shall be soldered so that a continuous bead shows around the joint circumference. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.

#### 8.4.2 Pipe trenching:

- A. Install pipe in open-cut trenches of sufficient width to facilitate thorough tamping/ puddling of suitable backfill material under and over pipe.
- B. Trenches shall be as straight as possible, but when a bend of 20 degrees or more is necessary, proper fittings shall be used to reduce stress on the pipe.

- C. Trench depths for mainlines shall be a minimum of 24 inches deep from top of pipe to finished grade.
- D. Trench depths for laterals shall be a minimum of 16 inches deep from top of pipe to finished grade.

#### 8.4.3 Sleeving:

- A. Wires shall be in separate sleeves from pipe, and shall be 2-inch minimum size pipe.
- B. Sleeves shall have traceable marker tape on upper side and both ends for future locates.
- C. Sleeves shall be installed at a depth which permits the encased pipe or wiring to remain at the specified burial depth.
- D. Boring for sleeving shall not be permitted unless an obstruction in a pipe path cannot be moved, or pipe cannot be re-routed.
- E. Any mainline installed in existing sleeves at a greater depth than adjacent pipe shall have a manual drain valve at each end if the sleeve is longer than 20 feet, or at one end if the sleeve is less than 20 feet.
- F. Sleeves shall be installed so ends extend past edge of curb, gutter, sidewalk, bikepath or other obstruction, a minimum of 2 feet.
- G. Sleeves shall be marked with an "x" chiseled in walk (or other surface) directly over the sleeve location.

- H. Sleeves shall be laid to drain at minimum grade of 5 inches per 100 feet.
- 1. Sleeves shall be bedded in 2 inches of fill sand and covered by 6 inches of fill sand.
- J. Sleeves installed for future use shall be capped at both ends.
- K. Sleeving shall not have joints unless necessary due to length of sleeving run. If joints are necessary, only solvent welded joints are allowed.
- L. Compaction of backfill for sleeves shall be 95% of Standard Proctor Density, ASTM D698-78. Use of water (puddling) around sleeves for compaction, is prohibited.

#### 8.4.4 Pipe installation:

- A. Teflon tape shall be used on all threaded joints; only Schedule 80 pipe may be threaded.
- B. Reducing of pipe size shall be done with reducing insert couplings, at least 6 inches beyond the last tee of the larger pipe.
- C. PVC lateral pipe shall be snaked from side to side within the trench.
- D. Cut pipe ends shall be cut square and deburred. Pipe ends shall be cleaned before using primer and solvent cement. Pipe ends shall be joined in a manner recommended by manufacturer and in accordance with accepted industry practices. Joints shall cure for 30 minutes

before handling, and 24 hours before allowing water in the pipe.

- E. Backfill shall be free from rubbish, stones larger than two 2-inch diameter, frozen material and vegetative matter. Backfill shall not be placed in freezing weather. If backfill material is rocky, the pipe shall be bedded in 2 inches of fill sand covered by 6 inches of fill sand.
- F. After puddling or tamping, all trenches shall be left slightly mounded to allow for settling.
- G. Backfill shall be compacted to proper densities depending on whether the surface area over the line will be paved or landscaped.

#### 8.4.5 Thrust blocks:

- A. Thrust blocks shall be installed where PVC mainline 2.5 inches or larger changes direction over 20 degrees.
- B. Thrust blocks shall consist of a minimum of one cubic foot of concrete.
- C. No concrete shall be allowed to remain on pipe joints.
- D. Wiring shall be placed away from thrust blocks to avoid contact with concrete.

#### 8.4.6 Valve installation:

- A. Valves shall be installed at least 12 inches from, and aligned with, with adjacent walls or paved edges.
- B. Automatic Remote Valves shall be installed so that valves are accessible for repairs. Make electrical connections so as to allow pigtail so solenoids can be removed from the valve with 24 inches (minimum) slack to allow the ends to be pulled 12 inches above ground. The zone wire should be coiled. Flush completely before installing the valve. Thoroughly flush piping system under full head of water for three minutes through furthest valve, before installing heads.
- C. The top of the valve box shall be flush with the finish grade.
- D. The valve assembly shall include the ball valve and union per detail for ease of maintenance and repair.
   Valves shall be installed in valve boxes per details.
- E. Quick couple valves shall be installed in 10-inch round locking valve boxes. Valves shall be flush completely before installation. Thoroughly flush the piping system under a full head of water for three minutes through the furthest valve.
- F. Isolation gate valves shall be installed in the valve box.
- G. Valve boxes shall be branded with the following codes: "SV" and the controller valve number per as-built plans for all remote control valves; "DV" for all drain valves; "GV" for

all isolation valves; "DRGV" for all drip system isolation valves; "QC" for all quick coupling valves; "WA" for all winterization assemblies; "FM" for all flow meter assemblies; and "MV" for all master valve assemblies. Use a branding iron stamp with 3-inch high letters.

- H. Valve boxes shall NOT rest on mainlines. Brick or other noncompressible material shall be used per details.
- Valves shall be installed in boxes with adequate space to access valves with ease. Valves shall not be too deep to be accessible for repairs. A 3-inch depth of ¾-inch washed gravel shall be placed in the bottom of each valve box with enough space to fully turn valve for removal per detail.
- J. Six-inch valve boxes shall be limited to wire splices, drip end caps, and drains.

#### 8.4.7 Head installation:

- A. Heads shall be set plumb and level with the finish grade. In sloped areas, heads shall be tilted as necessary to provide the full radius spray pattern.
- B. Lateral lines shall be flushed before installing heads. Thoroughly flush the piping system under a full head of water for three minutes through the furthest head, before installing the heads. Cap the risers if a delay of head installation occurs.

- C. Pop-up heads along walks and bikeways shall be bedded in a 6 inch layer of sand under the base of the head. Heads that border sidewalks and curbs shall be 1-1 <sup>1</sup>/<sub>2</sub> inches from the concrete.
- D. Nozzles appropriate for best performance shall be installed.
- E. Nozzles and radius of throw shall be adjusted to minimize overspray onto hard surfaces.

#### 8.4.8 Electrical connections:

- A. New connections shall be approved through the City of Fort Collins Electric Utilities. Call 221-6700 to obtain power information and request connection. Actual connection to transformer or other power source will be done by the City of Fort Collins Electric Utilities. Work shall be coordinated and scheduled by calling 221-6700.
- B. All work other than actual connection, including access to the transformer box where applicable, shall be supplied by the contractor.
- C. All materials shall be provided by the contractor. When working near any City electric facility, prior coordination and approval is required.

#### 8.4.9 Controller Installation:

A. Controllers shall be installed in an above-ground location suitable to prevent vandalism and provide protection from adverse weather conditions, and per City direction.

- B. All exposed wiring to and from the controller shall be encased in galvanized metal conduit.
- C. Exterior controllers to be installed on a 6-inch thick concrete pad.
- D. Controllers shall be installed per City direction and manufacturers specifications. Surge protection, grounding rods and other accessory components shall be included as specified.
- E. Wire markers shall be attached to the ends of control wires inside the controller unit. Label wires with the identification number of the remote control valve activated by the wire.

#### 8.4.10 Wiring:

- A. Wiring shall comply with City of Fort Collins Electrical Code.
- B. The power source shall be brought to the controller via a ground fault receptacle installed within the controller casing.
- C. Control wires shall be strung as close as possible to the mainline, consistently along and slightly below one side of the pipe.
- D. A minimum loop of 24 inches shall be left at each valve and controller, and at each splice, at the ends of each sleeve, at 100-foot intervals along continuous runs of wiring, and changes of direction of 90 degrees or more.

- E. Band wires together at ten (10) foot intervals with pipe wrapping tape.
- F. Install common ground wire and one control wire for each remote control valve. Multiple valves on a single control wire are prohibited. Install three extra wires, as specified, to the furthest valve on the system and/or each branch of the system.

#### 8.5

#### TESTING

#### 8.5.1 Testing requirements:

- A. All tests shall be run in the presence of staff from the City Parks Division. Schedule all tests a minimum of forty-eight hours in advance. Repeat any failed tests until full acceptance is obtained.
- B. An operational test shall activate each remote control valve from the controller.
- C. The contractor shall replace, adjust or move heads and nozzles as needed to obtain acceptable performance of the system as directed by staff.
- D. The contractor shall replace defective valves, wiring or other appurtenances to correct operational deficiencies.

### 8.6 COMPLETION SERVICES

## 8.6.1 Requirements upon completion of construction:

- A. When project construction is complete, the contractor shall request a punchlist inspection for construction acceptance from the City Parks Division.
- B. The system shall be demonstrated to staff from the City Parks Division.
- C. Product ordering information shall be provided to City Parks Division staff including model numbers, sizes and styles for all components.
- D. Electronic as-built drawings shall be provided.
- E. Two sets of as-built drawings shall be provided, showing the system as installed with each sheet clearly marked **"As-built Drawings"**, the name of the project, and all information clearly provided.
- F. The as-built drawings provided shall consist of one set of reproducible mylars, no larger than 24" x 36", and one set of all sheets reduced to 11" x 17", with each station color coded, and each sheet plastic laminated.
- G. A completed backflow test for the backflow prevention device shall be provided by a licensed backflow tester.

H. All excess materials, tools, rubbish and debris shall be removed to leave a cleaned-up site.

## **8.6.2 Warranty and maintenance period:**

- A. A two-year warranty and maintenance period provided by the contractor shall begin upon construction acceptance by the City Parks Division.
- B. The system shall be maintained in optimal working condition for the duration of the period between construction acceptance and final acceptance. Periodic adjustments shall be made to achieve the most effective and efficient application of water.

#### 8.6.3 Final acceptance:

- A. The contractor shall schedule a final acceptance inspection by the City Parks Division at least thirty days before the end of the one-year maintenance period.
- B. The contractor shall provide operating keys, servicing tools, test equipment, warranties/guarantees, maintenance manuals, and the contractor's affidavit of release of liens. Submittal of all these items must be accompanied by a transmittal letter and delivered to the City Parks Division offices (delivery at the project site is not acceptable.)

**C.** The yearly backflow test report on the backflow device shall be submitted to the City Parks Division.

#### 8.7

#### GUARANTEE/WARRANTY AND REPLACEMENT

#### 8.7.1 Requirements.

For the period following construction acceptance notice by the City, and prior to final acceptance, all irrigation materials, equipment, workmanship and other appurtenances are to be guaranteed and warranted against defects. Settling of trenches or other depressions, damages to structures or landscaping caused by settling and other defects shall be corrected by the contractor at no cost to the City. Repairs shall be made within seven days of notification by the City Parks Division. The guarantee and warranty shall apply to all originally installed materials and equipment, and to replacements made during the guarantee/warranty period.

### SECTION 9 Fine Grading And Soil Preparation Standards

#### 9.1

#### **GENERAL STANDARDS**

Soil preparation is a crucial part of streetscape landscaping success. Individual projects may require specially tailored soil preparation, beyond the scope of these minimum standards, for sustainable health of specialized plantings.

#### 9.1.1 Soil testing.

Soils tests conducted by the CSU Soils Lab must be completed and submitted to the City for review; and recommendations in the lab reports shall be followed in all cases. Generally this will include soil amendment and fertilizer recommendations; and in some cases, complete replacement of topsoil may be required.

#### 9.1.2 Topsoil required.

If a landscape area is undisturbed, topsoil shall be stripped to a 6-inch depth, or to topsoil depth as determined by field inspection. Stockpile and re-spread stripped topsoil over landscape areas after rough grades are established. If the site has been disturbed, or sufficient topsoil is not available, topsoil shall be imported to achieve six 6-inch depth in all landscaped areas.

### 9.2

#### SUBMITTALS

#### 9.2.1 Soil Amendments.

Submit a representative sample and written confirmation from the supplier of soil amendment material composition including: percent organic matter, salts, nutrient composition and trademark.

#### 9.2.2 Topsoil.

Submit a representative sample and written confirmation from supplier of material composition including: percent organic matter, salts, and nutrient composition.

#### 9.3

#### **MATERIALS STANDARDS**

#### 9.3.1 Soil Amendment.

Premium 3, by A-1 Organics, or an approved equal high quality composted material containing a minimum of 50% organic matter shall be required for all soil amendment. The mixture shall be free from clay subsoil, stones, lumps, plants or roots, sticks, weed stolons, seeds, high salt content and other materials harmful to plant life. The compost shall be coarsely ground with an even composition and have an acidity in the range of pH 5.5 to pH 7.0. All material shall be sufficiently composted such that no original source material used is recognizable.

#### 9.3.2 Topsoil.

Topsoil must be taken from a well drained, arable site and shall be reasonably free of subsoil, stones, clods, sticks, roots and other objectionable extraneous matter or debris. No stones or other materials over 2 inches in size shall be allowed. Topsoil shall contain no toxic materials and have an acidity in the range of pH 5.5 to pH 8.5.

#### 9.3.3. Fertilizer.

Triple superphosphate with a chemical analysis of 0-46-0 shall be incorporated into soil along with soil amendment.

#### 9.4

#### **ROUGH GRADING OPERATIONS**

#### 9.4.1 Utility locates.

All utilities shall be located prior to trenching and shall be protected from damage. Required calls shall include, but are not limited to the following: 221-6660 for Parks Division locates and 1-800-922-1987 for utility locates.

## 9.4.2 Acceptance of rough grading by other contractors.

The landscape contractor shall inspect and confirm that any rough grading from other contractors is per approved plans, and allows for 6-inch minimum depth of topsoil and specified soil amendments.

#### 9.4.3 Clearing and grubbing.

The contractor shall grub and remove unsuitable woody and rock material present in the surface grade.

#### 9.4.4 Maintain drainage.

The contractor shall take precautions to accommodate proper drainage and flow during and after grading and soil preparation.

9.4.5 Kill weeds.

Apply herbicide to areas where noxious weed beds have been established and / or where seed mix is to be planted. Herbicide must be applied by certified contractors at the rate recommended by the manufacturer after proper notification has been done in accordance with the chemical applicator's standards.

#### 9.4.6 Rip planting areas.

Rip to 8-inch depth with agriculture subsoiler in all areas to receive plantings. Remove all objects greater than 2 inches in diameter.

#### 9.5

#### FINISH GRADING OPERATIONS

## 9.5.1 Topsoil placement shall include the following procedures:

- A. Spread 6 inches of topsoil over the entire landscaped area and grade to smooth and even lines. Establish swales and drainage as required per plans.
- B. Evenly distribute soil amendment at rate of 3 cubic yards per 1,000 square of area, or 1-inch depth over the entire area to be prepared. Modify the rate if a soil test recommends otherwise. Till amendments into top 6 inches of soil. Compact to a firm, but not hard density (80% of Standard Proctor Density at 2% optimum moisture). Evenly distribute triple superphosphate fertilizer at the rate of 15 pounds per 1,000 square feet. Modify the type and rate if a soil test recommends otherwise.

C. Trim finish grade elevations adjacent to paved areas to one inch below pavement finish grade.

### SECTION 10 Grass Seeding Standards

#### 10.1

#### **GRASS SEEDING**

#### 10.1.1 Seed Mixes.

Seed mixes shall be approved by the City Parks Division based on the activity to take place, planned irrigation method and maintenance to be performed in the area being seeded.

#### 10.1.2 Pre-approved Dryland Mix.

For temporary or permanent unmowed and non-irrigated areas, the following mix shall be permitted:

45% Blue Grama, 25% Buffalograss (treated), and 30% Little Bluestem.

#### 10.1.3 Pre-approved turfgrass mix.

For irrigated, mowed areas, the following mixes shall be permitted: 1) a blend of five turf type dwarf Tall Fescues, or 2) a mix of Kentucky Bluegrass varieties and up to 15% Perennial Rye.

#### 10.1.4 Submittals.

Certificates showing State, Federal or other inspection showing source and origin shall be submitted.

#### 10.1.5 Seed quality.

Seed shall be of fresh, clean, new crop seed composed of the varieties approved by the City with tested minimum percentages of purity and germination clearly labeled on the package. All seed shall be at least 99.9% free of *Poa annua* and all weeds.

#### 10.1.6 Mulch for seeded areas.

Mulch depends on the slope of the seeded area as follows:

- A. For slopes 30% and less, native grass straw without weed seed and consisting of grasses as specified for the seeded application shall be used.
- B. For slopes 30% and greater: Hydromulch using Weyerhauser "Silva-Fiber" mulch or approved equal shall be used. The mulch shall not contain any substance which might inhibit germination or growth of grass seed. The mulch shall be dyed a green color to allow metering of its application.

#### 10.1.7 Tackifier.

*Teratack III,* or approved equal shall be used.

#### 10.1.8 Netting.

For slopes greater than 30%, *Soil Saver* jute netting or approved equal shall be used. Netting shall be stapled with No. 11 gauge steel wire forged into a 6-inch long U-shape, and painted for visibility in mowed areas.

#### 10.1.9 Fertilizer.

Fertilizer. Fertilizer with a formula of 18-46-0 shall be used on all areas to be seeded. Apply 8 pounds per 1,000

square foot of seeded area and rake lightly into top 1/8 inch of soil just prior to seeding operation.

#### 10.1.10 Inspection.

The contractor shall inspect finish grade and trim where needed to obtain finish grades of one inch below adjacent pavements. Verify positive drainage away from all structures. Verify or complete removal of rock and debris larger than one inch from all areas to be seeded.

#### 10.1.11 Weather for seeding.

Seed shall not be sown in windy weather or when ground is frozen or otherwise untillable.

#### **10.1.12** Methods for seeding:

- A. A brillion type drill or hydraulic seeding methods may be used. Drill the seed in a manner such that after surface is raked and rolled, the seed has 1/4-inch of cover.
- B. Hydraulic seeding shall be used in areas that are not accessible for machine methods. A hydraulic pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure shall be used. The equipment shall have an acceptable pressure gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimating the volume used or remaining in the tank. Do not seed and mulch in the same operation.

#### 10.1.13 Seeding rates.

The following rates of application shall apply:

- A. Dryland Mix 12 pounds pure live seed per acre.
- B. Irrigated Mix 9 pounds pure live seed per acre for the Tall Fescue blend, or 4 pounds pure live seed for the Kentucky Blue/Perennial Rye mix.

## **10.1.14** Mulching operations for native grass mulch.

Mulch shall be applied at a rate of two 2 tons per acre within 24 hours after seeding.

#### 10.1.15 Hydromulching operations.

Wood cellulose fibers shall be evenly dispersed by agitatation in water. When sprayed uniformly on the soil surface, the fibers shall form a blotterlike ground cover that readily absorbs water and allows infiltration to the underlying soil. Cellulose fiber mulch shall be added with the proportionate quantities of water and other approved materials in the slurry tank. All ingredients shall be mixed to form a homogenous slurry. Using the color of the mulch as a metering agent, spray apply the slurry mixture uniformly over the seeded area. Apply with tackafier used at a rate of 120 pounds per acre. Unless otherwise ordered for specific areas, fiber mulch shall be applied at the rate of 2,000 pounds per acre. Hydraulic mulching shall not be performed in the presence of free surface water resulting from rains, melting snow or other causes.

#### 10.1.16 Mulch netting operations.

Mulched areas over 30% slope shall be stabilized with netting. If the contractor fails to net and subsequent soil erosion occurs, the contractor shall re-establish the finish grade, soil preparation, seed bed, and apply netting at no cost to the City.

#### 10.1.17 Watering.

Immediately after seeding and mulching, water the seeded area slightly to a depth of 2 inches, but with care so that no erosion takes place and no gullies are formed. Water lightly two times per day and keep the seeded area moist until turf is established. Sloped areas shall be hand watered until turf is established to prevent erosion. Water these areas more often but for shorter periods of time.

#### 10.1.18 Clean up.

All hydromulch and other mulch materials shall be removed from all plant materials, fences, concrete and other areas except for the seed bed.

## **10.1.19** Protection of seeded areas for establishment.

The contractor shall provide and install barriers as required to protect seeded areas from pedestrian and vehicular damage. Signage shall be provided if needed.

### EXHIBIT A List of Recommended Plants

The list below contains recommended plant species for streetscapes. This list will be monitored by staff as part of an ongoing program with periodic updates based on evaluation of success of plantings over time.

Designers of individual streetscape projects may propose plants not on the list based on the design intent for the particular project.

### List of Recommended Plants

Last Amended 11.8.2012

	Comments
	Key: CO native status as determined by USDA Plants Database
Canopy Shade Trees	
Acer negundo - Boxelder 'Sensation'	
Catalpa speciosa - Northern Catalpa	Tolerant of alkaline soils; holds a strong dominant leader; male tree so no boxelder bugs
Celtis occidentalis - Northern Hackberry	
<i>Gleditsia triacanthos v. inermis -</i> Honeylocust 'Imperial,' 'Shademaster', 'Skyline'	Wrap young trees
Gymnocladus dioicus - Kentucky Coffeetree 'Espresso'	
Quercus buckleyi - Texas Red Oak	Many seed sources, not predictably cold hardy
Quercus macrocarpa - Bur Oak	Slow growing
Quercus muehlenbergii - Chinkapin Oak	
Quercus robur - English Oak, Skymaster	
Quercus shumardii - Shumard Oak	From a northern source
<i>Tilia americana -</i> American Linden 'Boulevard', 'Frontyard', 'Legend', 'Sentry'	Do not use in along roads that are treated with deicing salts
<i>Tilia cordata</i> - Littleleaf Linden 'Chancellor', 'Dropmore', 'Greenspire', 'Norlin', 'Olympic', 'Prestige', 'Shamrock'	Do not use in along roads that are treated with deicing salts
<i>Tilia x euchlora -</i> Redmond Linden	Do not use in along roads that are treated with deicing salts
<i>Tilia x flavescens -</i> Glenleven Linden	Do not use in along roads that are treated with deicing salts
Ulmus davidiana - David Elm	
Ulmus japonica x U. wilsoniana – Elm 'Accolade', 'Triumph'	Use in smaller quantities
Ornamental Trees	
Acer grandidentatum - Wasatch Maple	
Acer tataricum - Tatarian maple 'Hot Wings', 'Pattern Perfect'	
Crataegus crusgalli - Thornless Cockspur Hawthorn	
<i>Malus sp.</i> - Crabapple 'Adams', 'Profusion', 'Radiant', 'Spring Snow', 'Thunderchild'	Spring Snow' has some limited fireblight problems.
<i>Pyrus calleryana -</i> Flowering Pear 'Aristocrat', 'Capital', 'Chanticleer', 'Cleveland Select', 'Redspire'	
Quercus gambelli - Gambel Oak	
Quercus alba x robur – Oak 'Crimson Spire'	
Syringa reticulata - Japanese Tree Lilac 'Ivory Silk'	

	Comments
Large Evergreen Trees	
Picea Pungens - Blue Spruce 'Fat Albert', 'Baby Blue Eyes'	Sensitive to salt.
Pinus nigra - Austrian Pine	Only use in wide medians.
Small Evergreen Trees	
Juniperus scopulorum - Rocky Mountain Juniper 'Cologreen', 'Moonglow', 'Wichita Blue'	
Juniperus monosperma - Oneseed Juniper	Very low water use
<i>Picea pungens</i> - Dwarf Blue Spruce 'Sester', 'Globosa', 'Montgomery'	
Pinus mugho - Mugo Pine 'Tannenbaum'	
Shrubby Trees/Large Shrubs	
Acer grandidentatum - Bigtooth Maple	
Quercus gambelli - Gambel Oak	
Cercocarpus ledifolius - Curlleaf Mountain-Mahogany	
Xanthoceras sorbifolia - Yellowhorn	
<i>Rhus glabra, R. glabra cismontana</i> - Smooth Sumac, Rocky Mountain Smooth Sumac	
Deciduous Shrubs	
Amelanchier alnifolia - Regent Serviceberry	
Amorpha canescens - Leadplant	Deadhead
Amorpha nana - Dwarf Leadplant	Deadhead
Aronia arbutifolia - Red Chokeberry	
Aronia melanocarpa - Chokeberry, Dwarf Iroquois Beauty	
Artemisia tridentata - Tall Western Sage	
Atriplex canescens - Fourwing Saltbush	
Caragana pygmaea - Pygmy Peashrub	
Caragana rosea - Rose Peashrub	
Ceratoides lanata - Winterfat	
Cercocarpus ledifolius - Curl Leaf Mountain Mahogany	Can grow to be quite large with too much water
Cercocarpus ledifolius intricatus - Little Leaf Mountain Mahogany	
Cercocarpus montanus - True Mountain Mahogany	
Chamaebatiaria millefolium - Fernbush	Deadhead
<i>Chrysothamnus nauseosus nauseosus -</i> Dwarf Blue Rabbitbrush	Gets large with irrigation

Chrysothamnus nauseosus albiculatus - Tall Blue RabbitbrushChrysothamnus nauseosus graveolens - Green RabbitbrushChrysothamnus nauseosus graveolens - Green RabbitbrushShear back after blooming, prune out dead wood annuallyCaryopteris incana - Blue Mist SpireaShear back after blooming, prune out dead wood annuallyCaryopteris x clandonensis - Dark Knight SpireaUsed on Harmony projectCotoneaster apiculatus - Cranberry CotoneasterUsed on Harmony projectCotoneaster horizontalis - Rock CotoneasterCotoneaster horizontalis - Rock CotoneasterCytisus scoparius 'Burkwoodii' - Red Burkwoodii BroomEphedra equisetina - Bluestem Joint FirEphedra equisetina - Bluestem Joint FirEphedra viridis - Mormon TeaEuonymus alatus 'Compactus' - Dwarf Burning BushFallugia paradoxa - Apache PlumeLigustrum vulgare 'Lodense' - Lodense PrivetPhysocarpus monogynus - Mountain NinebarkPhysocarpus opulifolius - NinebarkPotentilla fruticosa - PotentillaPotentilla fruticosa - PotentillaEntitio One of David		Comments
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Potentilla fruticosa davurica "Prairie Snow" - Prairie Snow Potentilla	Potentilla fruticosa davurica 'Prairie Snow' - Prairie Snow Potentilla	
Potentilla fruticosa 'Yellow Gem' - Yellow Gem Potentilla	Potentilla fruticosa 'Yellow Gem' - Yellow Gem Potentilla	
Prunus besseyi 'Pawnee Buttes' - Creeping Western Sand Cherry	<i>Prunus besseyi 'Pawnee Buttes' -</i> Creeping Western Sand Cherry	
Rhus aromatica'Gro-low' - Fragrant Dwarf Sumac Needs ample space	Rhus aromatica'Gro-low' - Fragrant Dwarf Sumac	Needs ample space
Rhus glabra cismontana - Rocky Mountain Sumac      Needs ample space	Rhus glabra cismontana - Rocky Mountain Sumac	Needs ample space
Rhus trilobata 'Autumn Amber' - Creeping Three-leaf Sumac	Rhus trilobata 'Autumn Amber' - Creeping Three-leaf Sumac	
Ribes aureum - Golden Currant	Ribes aureum - Golden Currant	
Ribes cereum - Wax Currant	Ribes cereum - Wax Currant	
Rosa x var Shrub RoseRemove deadwood each spring, many will continue blooming if deadheaded.	Rosa x var Shrub Rose	Remove deadwood each spring, many will continue blooming if deadheaded.
Spiraea nipponica - Snowmound Spirea	Spiraea nipponica - Snowmound Spirea	
Spiraea thunbergii - Mellow Yellow Spirea	Spiraea thunbergii - Mellow Yellow Spirea	
Spiraea x vanhouttei - Vanhoutte Spirea	Spiraea x vanhouttei - Vanhoutte Spirea	
Symphoricarpos occidentalis - Snowberry	Symphoricarpos occidentalis - Snowberry	
Symphoricarpos orbiculatus - Red Coralberry	Symphoricarpos orbiculatus - Red Coralberry	
Symphoricarpos x chenaultii - 'Hancock' Coralberry	Symphoricarpos x chenaultii - 'Hancock' Coralberry	
Syringa meyeri - Dwarf Korean Lilac      Looks best when deadheaded after blooming	Syringa meyeri - Dwarf Korean Lilac	Looks best when deadheaded after blooming
Syringa patula 'Miss Kim' - Miss Kim Dwarf Lilac    Looks best when deadheaded after blooming	Syringa patula 'Miss Kim' - Miss Kim Dwarf Lilac	Looks best when deadheaded after blooming

	Comments
Evergreen Shrubs	
Juniperus chinensis - Chinese Juniper	
Juniperus communis - Common Juniper	
Juniperus horizontalis - Creeping Juniper	
Juniperus monosperma - Oneseed Juniper	
Juniperus scopulorum - Rocky Mountain Juniper	
Picea pungens - Globe Spruce	
Pinus mugo - Mugo Pine	
Evergreen (Broad-leafed)	
Arctostaphylos uva-ursi - Kinnikinnick	
Arctostaphylos x coloradoensis panchito - Panchito Manzanita	
Euonymus kiautschovicus - Manhattan Euonymus	
Yucca filamentosa - Adam's needle Yucca	
Yucca glauca - Soapweed	
Ornamental Grasses	
Boutelous gracilis - Blue Grama Grass	Winter interest; cut back in spring
Bouteloua gracilis - Blonde Ambition' Blue Grama Grass	
Deschampsia caespitosa - Tufted Hair Grass	
Festuca ovina glauca - Blue Fescue	
Pennisetum alopecuroides - Fountain Grass	This acts more like an annual
Schizachyrium scoparium - Little Bluestem	
Sorghastrum nutans - Indiangrass	
Perennials	
Achillea filipendulina 'Parker's Variety' - Tall Yellow Yarrow	Deadhead
Achillea 'Moonshine' - Moonshine Yarrow	Deadhead
Asclepias tuberosa - Butterfly Weed	
Agastache 'Coronado Red' - Coronado Red Hyssop	Do not cut back until spring to promote overwintering
Agastache cana 'Sonoran Sunset' - Sonoran Sunset Hyssop	Do not cut back until spring to promote overwintering
Agastache rupestris - Sunset Hyssop	Do not cut back until spring to promote overwintering
Artemisia frigida - Fringed Sage	
Artemisia schmidtiana - Silver Mound Sage	Cut back in mid-summer when sprawls

	Comments
Artemisia versicolor - Sea Foam Sage	
Coreopsis verticillata 'Zagreb' - Coreopsis	Grows well in rocky, well drained soil
Echinacea purpurea - Purple Coneflower	Deadhead, if too much irrigation, will get root fungus
Echinacea purpurea 'White Swan' - White Coneflower	Deadhead, if too much irrigation, will get root fungus
<i>Erigeron speciosus var. macranthus -</i> Aspen Fleabane, Aspen Daisy	
Gailardia aristata - Native Blanket Flower	Short lived
Geranium cinereum - 'Ballerina' Cranesbill	
Geranium dalmaticum - Compact Rose Cranesbill	Alpine and rock gardens, does not seed out
Geranium endressii - 'Wargrave Pink' Pink Cranesbill	Attractive to pollinators
Geranium himalayense 'Plenum' - Birch Double Cranesbill	Very showy
Geranium x 'Johnson's Blue' - Blue Cranesbill	
Geranium sanguineum - Bloody Cranesbill	
Hemerocallis spp Daylily	Deadhead, cut back in late fall
Hesperaloe parviflora - Red False Yucca	Needs good drainage, don't use bark mulch around crown, marginal hardiness
Lavandula angustifolia - Lavender	Shear back after bloom, can have winter dieback
Liatris punctata - Gayfeather, Dotted Blazing Star	
Liatris spicata 'Floristan Violet' - Purple Gayfeather	
Linum flavum 'Compactum' - Yellow Flax	
Lychnis coronaria - Rose Compion	Bennial, reseeds aggressively
Oenothera macrocarpa - Missouri Primrose	Self sows
Penstemon pinifolius - Pineleaf Penstemon	Shear back after bloom
Penstemon strictus - Rocky Mountain Pentstemon	Deadhead
Persicaria affinis - Himalayan Border Jewel	
Rudbeckia fulgida 'Goldsturm' - Black-Eyed Susan	Other varieties may live longer
Salvia pachyphylla - Mojave Sage	Marginal hardiness, needs excellent drainage
Sedum 'Autumn Joy' - Stonecrop	
Groundcovers	
Alyssum montanum - Mountain Basket of Gold	
Callirhoe involucrata - Winecups	Self sows. Cut back after first flush of blooms to promote new growth
Ceratostigma plumbaginoides - Plumbago	Can die out in winter
Euonymus fortunei - Euonymus	Invasive in some states
Polygonum reynoutria - Fleeceflower	Considered invasive in many states; plant where it can be contained

### **NOTE:** Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

City of Fort Collins Master Street Plan Questions and Answers City of Fort Collins "Master Street Plan" City of Loveland "2020 Street Plan" City of Loveland "2020 Capital Improvements Plan"

#### **City of Fort Collins Master Street Plan Questions & Answers**

#### 1. What is the Master Street Plan?

The Master Street Plan (MSP) is a map-based representation of the City of Fort Collins' long-range vision of its major street network. First implemented and adopted in 1981, the Master Street Plan is intended to reflect the functional class (the category of roadway, e.g. Arterial, Collector, etc.) of existing and planned roadways in the City of Fort Collins. The Master Street Plan also helps to guide the development of the future street system for the City and its Urban Growth Area (UGA). The MSP depicts major roadways only, focusing on Major Arterial, Arterial, Minor Arterial, and some key Collector streets. Other Collector streets and all Connector and Local-level streets are not represented on the MSP. It is important to note that the MSP is <u>not</u> a detailed engineering document and does not provide precise locations for new streets; it is a planning tool that represents general, conceptual-level alignments and connections only. The actual locations of new streets shall be determined by the City Engineer.

#### 2. What Does the Master Street Plan Do?

As specified in the City's Land Use Code and in City Ordinance No. 228, 1998, S. 92, 12/15/98,

"All development plans shall provide for or accommodate the streets and transportation facilities identified on the Master Street Plan that are associated with the development plan." (LUC 3.6.1 b)

and

"Streets on a project development plan or subdivision plat shall conform to the Master Street Plan where applicable. All streets shall be aligned to join with planned or existing streets. All streets shall be designed to bear a logical relationship to the topography of the land. Intersections shall be at right angles unless otherwise approved by the City Engineer." (LUC 3.6.2 a)

This mandates that new development or redevelopment activities' impacts to the street network shall comply with the City's design standards for the category of roadway specified in the MSP. These standards include criteria such as, but not limited to, right-of-way widths, roadway width, medians, parkways, bicycle facilities and sidewalk dimensions. This requirement helps ensure that the future vision of the City's street network is achieved and helps to preclude costly, and in some instances, irreversible impacts to the City's long-range infrastructure.

#### 3. Does the Master Street Plan Ever Change?

The MSP is monitored regularly to evaluate progress and accuracy. It is amended to reflect development trends, approved developments, changes in alignment, planning and

policy changes, and specific sub-area plans. Amendments are presented to the Transportation Board and the Planning and Zoning Board for recommendation of approval prior to presentation to the City Council for adoption.

#### 4. Why Was the Master Street Plan Created?

The City's Land Use Code refers to the rationale for creating the Master Street Plan:

"*Establishment of the Master Street Plan*. In order to accomplish the purposes of this Land Use Code, the location and ultimate functional classification of necessary arterial and collector streets and other transportation facilities have been established on a map entitled "City of Fort Collins Master Street Plan," dated August 20, 1996, as amended, which map is hereby made a part of this Land use Code by reference..." (LUC 3.6.1 a)

The MSP was created based upon a multi-modal vision of Fort Collins' future transportation system. Closely tied to other City and regional plans, the MSP incorporates the following set of assumptions:

- Regional transportation demand management programs will reduce regional singleoccupant vehicle travel by 10%
- The City of Fort Collins will also pursue local transportation demand management programs designed to reduce single-occupant vehicle travel within the City
- The City of Fort Collins will continue to improve transit service as well as facilities for walking and bicycling
- The land use basis is the adopted "preferred land use plan" (*City Plan*, March 1997)
- The MSP will be monitored to evaluate its progress

The MSP uses the *City Structure Plan* as the land use basis for the street system. Based on the urban form described by this plan, travel behavior data was input to a computer traffic forecast model to help create the MSP network. Environmental concerns, Development Review Guidelines, City Street Design Standards and Level of Service (LOS) criteria were also incorporated into the design of the MSP.

The MSP is designed to achieve the following results:

- A significant shift in travel behavior, with more trips shifting away from singleoccupant travel into transit, walk and bicycle, and multi-occupant vehicle travel modes
- A reduction of growth in daily Vehicle Miles Traveled (VMT)
- A roadway LOS no lower than level D (on a scale of A to F, with F representing the poorest of conditions) within the City's major activity centers
- Attainment of City air quality objectives

(Source: City of Fort Collins Transportation Master Plan, 1997)

In addition to these purposes, the Master Street Plan also serves to identify those streets which qualify for Federal and State funding for general urban projects. These streets also qualify for disaster assistance in times of disaster.

#### 5. Questions? Contact Mark Jackson, Transportation Planner, 416-2029.



#### ADOPTED BY COUNCIL: MARCH 17, 1981 APPROVED REVISION: MARCH 2, 2004



#### CITY OF FORT COLLINS GEOGRAPHIC INFORMATION SYSTEM MAP PRODUCTS These map products and all underlying data are developed for use by the City of Fort Collins for its internal purposes only.

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The City disclaims, and shall not be held liable for any and all damage, loss, or liability, whether direct, indirect, or consequential, which arises or may arise from these map products or the use thereof by any person or entity.

Note: Other collector and local streets not shown will be developed in accordance with adopted sub-area, corridor, and neighborhood plans of the city.

Streets and Arterials outside of GMA are shown for contextual purposes only and are not part of the Master Street Plan. The City of Fort Collins is not fiscally responsible for these improvements.




# Appendix E – Standard Notes, Approval Blocks, Checklists

# **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

- E-1-FC/Lar General Notes City of Fort Collins and Larimer
- E-1-Lov General Notes City of Loveland
- E-2 Construction Notes
- E-3 Signature Block
- E-4-FC Checklist City of Fort Collins
- E-4-Lov Checklist City of Loveland
- E-5 Stop Work Orders
- E-6 Criteria for Scanable Quality Mylars

# Appendix E-1-FC/Lar

# **General Notes (City of Fort Collins and Larimer County)**

Submissions shall include a General Notes sheet. Please contact the Local Entity Engineer for current General Notes. The following General Notes are provided as a guideline for the Local Entities as noted. Include these notes on the plan as follows:

- Include only the notes that apply to the project
- Preserve note numbers given below

1. All materials, workmanship, and construction of public improvements shall meet or exceed the standards and specifications set forth in the *Larimer County Urban Area Street Standards* and applicable state and federal regulations. Where there is conflict between these plans and the specifications, or any applicable standards, the most restrictive standard shall apply. All work shall be inspected and approved by the Local Entity.

2. All references to any published standards shall refer to the latest revision of said standard, unless specifically stated otherwise.

3. These public improvement construction plans shall be valid for a period of three years from the date of approval by the Local Entity Engineer. Use of these plans after the expiration date will require a new review and approval process by the Local Entity prior to commencement of any work shown in these plans.

4. The engineer who has prepared these plans, by execution and/or seal hereof, does hereby affirm responsibility to the Local Entity, as beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the Local Entity Engineer shall not relieve the engineer who has prepared these plans of all such responsibility. Further, to the extent permitted by law, the engineer hereby agrees to hold harmless and indemnify the Local Entity, and its officers and employees, from and against all liabilities, claims, and demands which may arise from any errors and omissions contained in these plans.

5. All sanitary sewer, storm sewer, and water line construction, as well as power and other "dry" utility installations, shall conform to the Local Entity standards and specifications current at the date of approval of the plans by the Local Entity Engineer.

6. The type, size, location and number of all known underground utilities are approximate when shown on the drawings. It shall be the responsibility of the Developer to verify the existence and location of all underground utilities along the route of the work before commencing new construction. The Developer shall be responsible for unknown underground utilities.

7. The Engineer shall contact the Utility Notification Center of Colorado (UNCC) at 1-800-922-1987, at least 2 working days prior to beginning excavation or grading, to have all registered utility locations marked. Other unregistered utility entities (i.e. ditch / irrigation company) are to be located by contacting the respective representative. Utility service laterals are also to be located prior to beginning excavation or grading. It shall be

the responsibility of the Developer to relocate all existing utilities that conflict with the proposed improvements shown on these plans.

8. The Developer shall be responsible for protecting all utilities during construction and for coordinating with the appropriate utility company for any utility crossings required.

9. If a conflict exists between existing and proposed utilities and/or a design modification is required, the Developer shall coordinate with the engineer to modify the design. Design modification(s) must be approved by the Local Entity prior to beginning construction.

10. The Developer shall coordinate and cooperate with the Local Entity, and all utility companies involved, to assure that the work is accomplished in a timely fashion and with a minimum disruption of service. The Developer shall be responsible for contacting, in advance, all parties affected by any disruption of any utility service as well as the utility companies.

11. No work may commence within any public storm water, sanitary sewer or potable water system until the Developer notifies the utility provider. Notification shall be a minimum of 2 working days prior to commencement of any work. At the discretion of the water utility provider, a pre-construction meeting may be required prior to commencement of any work.

12. The Developer shall sequence installation of utilities in such a manner as to minimize potential utility conflicts. In general, storm sewer and sanitary sewer should be constructed prior to installation of the water lines and dry utilities.

13. The minimum cover over water lines is 4.5 feet and the maximum cover is 5.5 feet unless otherwise noted in the plans and approved by the Water Utility.

14. A State Construction Dewatering Wastewater Discharge Permit is required if dewatering is required in order to install utilities or water is discharged into a storm sewer, channel, irrigation ditch or any waters of the United States.

15. The Developer shall comply with all terms and conditions of the Colorado Permit for Storm Water Discharge (Contact Colorado Department of Health, Water Quality Control Division, (303) 692-3590), the Storm Water Management Plan, and the Erosion Control Plan.

16. The Local Entity shall not be responsible for the maintenance of storm drainage facilities located on private property. Maintenance of onsite drainage facilities shall be the responsibility of the property owner(s).

17. Prior to final inspection and acceptance by the Local Entity, certification of the drainage facilities, by a registered engineer, must be submitted to and approved by the Stormwater Utility Department. Certification shall be submitted to the Stormwater Utility Department at least two weeks prior to the release of a certificate of occupancy for single family units. For commercial properties, certification shall be submitted to the Stormwater Utility Department at least two weeks prior to the release of any building permits in excess of those allowed prior to certification per the Development Agreement.

18. The Local Entity shall not be responsible for any damages or injuries sustained in this Development as a result of groundwater seepage, whether resulting from groundwater

flooding, structural damage or other damage unless such damage or injuries are sustained as a result of the Local Entity failure to properly maintain its water, wastewater, and/or storm drainage facilities in the development.

19. All recommendations of the final drainage and erosion control study (name of the study and date) by (Engineering Firm) shall be followed and implemented.

20. Temporary erosion control during construction shall be provided as shown on the Erosion Control Plan. All erosion control measures shall be maintained in good repair by the Developer, until such time as the entire disturbed areas is stabilized with hard surface or landscaping.

21. The Developer shall be responsible for insuring that no mud or debris shall be tracked onto the existing public street system. Mud and debris must be removed within 24 hours by an appropriate mechanical method (i.e. machine broom sweep, light duty front-end loader, etc.) or as approved by the Local Entity street inspector.

22. No work may commence within any improved or unimproved public Right-of-Way until a Right-of-Way Permit or Development Construction Permit is obtained, if applicable.

23. The Developer shall be responsible for obtaining all necessary permits for all applicable agencies prior to commencement of construction. The Developer shall notify the Local Entity Engineering Inspector (Fort Collins - 221-6605) and the Local Entity Erosion Control Inspector (Fort Collins – 221-6700) at least 2 working days prior to the start of any earth disturbing activity, or construction on any and all public improvements. If the Local Entity Engineer is not available after proper notice of construction activity has been provided, the Developer may commence work in the Engineer absence. However, the Local Entity reserves the right not to accept the improvement if subsequent testing reveals an improper installation.

24. The Developer shall be responsible for obtaining soils tests within the Public Rightof-Way **after** right of way grading and all utility trench work is complete and prior to the placement of curb, gutter, sidewalk and pavement. If the final soils/pavement design report does not correspond with the results of the original geotechnical report, the Developer shall be responsible for a re-design of the subject pavement section or, the Developer may use the Local Entity's default pavement thickness section(s). Regardless of the option used, all final soils/pavement design reports shall be prepared by a licensed Professional Engineer. The final report shall be submitted to the Inspector a minimum of 10 working days prior to placement of base and asphalt. Placement of curb, gutter, sidewalk, base and asphalt shall not occur until the Local Entity Engineer approves the final report.

25. The contractor shall hire a licensed engineer or land surveyor to survey the constructed elevations of the street subgrade and the gutter flowline at all intersections, inlets, and other locations requested by the Local Entity inspector. The engineer or surveyor must certify in a letter to the Local Entity that these elevations conform to the approved plans and specifications. Any deviations shall be noted in the letter and then resolved with the Local Entity before installation of base course or asphalt will be allowed on the streets.

26. All utility installations within or across the roadbed of new residential roads must be completed prior to the final stages of road construction. For the purposes of these standards, any work except c/g above the subgrade is considered final stage work. All service lines must be stubbed to the property lines and marked so as to reduce the excavation necessary for building connections.

27. Portions of Larimer County are within overlay districts. The *Larimer County FloodPlain Resolution* should be referred to for additional criteria for roads within these districts.

28. All road construction in areas designated as Wild Fire Hazard Areas shall be done in accordance with the construction criteria as established in the Wild Fire Hazard Area Mitigation Regulations in force at the time of final plat approval.

29. Prior to the commencement of any construction, the contractor shall contact the Local Entity Forester to schedule a site inspection for any tree removal requiring a permit.

30. The Developer shall be responsible for all aspects of safety including, but not limited to, excavation, trenching, shoring, traffic control, and security. Refer to OSHA Publication 2226, *Excavating and Trenching*.

31. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority. (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.

32. Prior to the commencement of any construction that will affect traffic signs of any type, the contractor shall contact Local Entity Traffic Operations Department, who will temporarily remove or relocate the sign at no cost to the contractor; however, if the contractor moves the traffic sign then the contractor will be charged for the labor, materials and equipment to reinstall the sign as needed.

33. The Developer is responsible for all costs for the initial installation of traffic signing and striping for the Development related to the Development's local street operations. In addition, the Developer is responsible for all costs for traffic signing and striping related to directing traffic access to and from the Development.

34. There shall be no site construction activities on Saturdays, unless specifically approved by the Local Entity Engineer, and no site construction activities on Sundays or holidays, unless there is prior written approval by the Local Entity.

35. The Developer is responsible for providing all labor and materials necessary for the completion of the intended improvements, shown on these drawings, or designated to be provided, installed, or constructed, unless specifically noted otherwise.

36. Dimensions for layout and construction are not to be scaled from any drawing. If pertinent dimensions are not shown, contact the Designer for clarification, and annotate the dimension on the as-built record drawings.

37. The Developer shall have, onsite at all times, one (1) signed copy of the approved plans, one (1) copy of the appropriate standards and specifications, and a copy of any permits and extension agreements needed for the job.

38. If, during the construction process, conditions are encountered which could indicate a situation that is not identified in the plans or specifications, the Developer shall contact the Designer and the Local Entity Engineer immediately.

39. The Developer shall be responsible for recording as-built information on a set of record drawings kept on the construction site, and available to the Local Entity's Inspector at all times. Upon completion of the work, the contractor(s) shall submit record drawings to the Local Entity Engineer.

40. The Designer shall provide, in this location on the plan, the location and description of the nearest survey benchmarks (2) for the project as well as the basis of bearings. The information shall be as follows:

Benchmarks—Local Entity survey.
B.M.Number\_\_\_\_\_,Elev.=\_\_\_\_\_,
Description .

41. All stationing is based on **centerline/flowline (insert proper word)** of roadways unless otherwise noted.

42. Damaged curb, gutter and sidewalk existing prior to construction, as well as existing fences, trees, streets, sidewalks, curbs and gutters, landscaping, structures, and improvements destroyed, damaged or removed due to construction of this project, shall be replaced or restored in like kind at the Developer's expense, unless otherwise indicated on these plans, prior to the acceptance of completed improvements and/or prior to the issuance of the first Certificate of Occupancy.

43. When an existing asphalt street must be cut, the street must be restored to a condition equal to or better than its original condition. The existing street condition shall be documented by the Local Entity Construction Inspector before any cuts are made. Patching shall be done in accordance with the Local Entity Street Repair Standards. The finished patch shall blend in smoothly into the existing surface. All large patches shall be paved with an asphalt lay-down machine. In streets where more than one cut is made, an overlay of the entire street width, including the patched area, may be required. The determination of need for a complete overlay shall be made by the Local Entity Engineer and/or the Local Entity Inspector at the time the cuts are made.

44. Upon completion of construction, the site shall be cleaned and restored to a condition equal to, or better than, that which existed before construction, or to the grades and condition as required by these plans.

45. Standard Handicap ramps are to be constructed at all curb returns and at all "T" intersections.

46. After acceptance by the Local Entity, public improvements depicted in these plans shall be guaranteed to be free from material and workmanship defects for a minimum period of two years from the date of acceptance.

47. The Local Entity shall not be responsible for the maintenance of roadway and appurtenant improvements, including storm drainage structures and pipes, for the following private streets: (list).

48. Approved Variances are listed as follows: (Plan set must have a list of all applicable variances for the project).

# **Appendix E-1-Lov**

# **General Notes - City of Loveland**

Submissions shall include a General Notes sheet. Please contact the Local Entity Engineer for current General Notes. The following General Notes are provided as a guideline for the Local Entities as noted. Include these notes on the plan as follows:

- Include only the notes that apply to the project
- Preserve note numbers given below

General Notes shall be shown on this sheet. Typical General Notes required by the Local Entity are as follows:

1. All materials, workmanship, and construction of public improvements shall meet or exceed the standards and specifications set forth in the *Larimer County Urban Area Street Standards* and applicable state and federal regulations. Where there is conflict between these plans and the specifications, or any applicable standards, the most restrictive standard shall apply. All work shall be inspected and approved by the Local Entity.

2. The Developer is specifically cautioned that the location and/or elevation of existing utilities, as shown on these plans, is based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied upon as being exact or complete. The Engineer shall contact the Utility Notification Center of Colorado (UNCC) at 1-800-922-1987, at least 2 working days prior to beginning excavation or grading, to have all registered utility locations marked. Other unregistered utility entities (i.e. ditch / irrigation company) are to be located by contacting the respective representative. Utility service laterals are also to be located prior to beginning excavation or grading. It shall be the responsibility of the Developer to relocate all existing utilities that conflict with the proposed improvements shown on these plans.

3. No work may commence within any improved public Right-of-Way until a Right-of-Way Permit or Development Construction Permit is obtained, if applicable. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority, (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.

4. The Developer shall be responsible for obtaining all necessary permits for all applicable agencies. The Developer shall notify the Local Entity Engineer at least 2 working days prior to the start of any earth disturbing activity, or construction on any and all public improvements. If the Local Entity Engineer is not available after proper notice of construction activity has been provided, the Developer may commence work in the Engineer absence. However, the Local Entity reserves the right not to accept the improvement if subsequent testing reveals an improper installation.

5. The engineer who has prepared these plans, by execution and/or seal hereof, does hereby affirm responsibility to The City of Fort Collins, as beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the City Engineer shall not relieve the engineer who has prepared these plans of all such responsibility. Further, to the extent permitted by law, the engineer hereby agrees to hold harmless and indemnify the City, and its officers and employees, from and against all liabilities, claims, and demands which may arise from any errors and omissions contained in these plans.

6. All utility installations within or across the roadbed of new residential roads must be completed prior to the final stages of road construction. For the purposes of these standards, any work except c/g above the subgrade is considered final stage work. All service lines must be stubbed to the property lines and marked so as to reduce the excavation necessary for building connections.

7. The Developer shall coordinate and cooperate with the Local Entity, and all utility companies involved, with regard to relocations, adjustments, extensions and rearrangements of existing utilities during construction, and to assure that the work is accomplished in a timely fashion and with a minimum disruption of service. The Developer shall be responsible for contacting, in advance, all parties affected by any disruption of any utility service as well as the utility companies.

8. No work may commence within any public storm water, sanitary sewer or potable water system until the Developer notifies the utility provider. Notification shall be a minimum of two (2) working days prior to commencement of any work. At the discretion of the water utility provider, a pre-construction meeting may be required prior to commencement of any work.

9. The Developer shall be responsible for protecting all utilities during construction and for coordinating with the appropriate utility company for any utility crossings required.

10. The type, size, location and number of all known underground utilities are approximate when shown on the drawings. It shall be the responsibility of the Developer to verify the existence and location of all underground utilities along the route of the work before commencing new construction. The Developer shall be responsible for unknown underground utilities.

11. When applicable, the Developer shall have onsite at all times, each of the following:

- The Notice of Intent (NOI)
- Best Management Practices (BMP) maintenance folder
- Up to date Stormwater Mangement Plan (SWMP) that accurately represents current field conditions
- One (1) signed copy of the approved plans
- One (1) copy of the appropriate standards and specifications
- A copy of any permits and extension agreements needed for the job.

12. The Developer shall be responsible for all aspects of safety including, but not limited to, excavation, trenching, shoring, traffic control, and security. Refer to OSHA Publication 2226, Excavating and Trenching.

13. If, during the construction process, conditions are encountered which could indicate a situation that is not identified in the plans or specifications, the Developer shall contact the Designer and the Local Entity Engineer immediately.

14. All references to any published standards shall refer to the latest revision of said standard, unless specifically stated otherwise.

15. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority. (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.

16. The Developer is responsible for providing all labor and materials necessary for the completion of the intended improvements, shown on these drawings, or designated to be provided, installed, or constructed, unless specifically noted otherwise.

17. The Developer shall be responsible for insuring that no mud or debris shall be tracked onto the existing public street system. Mud and debris must be removed by the end of each working day by an appropriate mechanical method (i.e. machine broom sweep, light duty front-end loader, etc.) or as approved by the Local Entity street inspector.

18. The Developer shall be responsible for recording as-built information on a set of record drawings kept on the construction site, and available to the Local Entity's Inspector at all times.

19. Dimensions for layout and construction are not to be scaled from any drawing. If pertinent dimensions are not shown, contact the Designer for clarification, and annotate the dimension on the as-built record drawings.

20. The Developer shall comply with all terms and conditions of the Colorado Permit for Storm Water Discharge, the Storm Water Management Plan, and the Erosion Control Plan.

21. All structural erosion control measures shall be installed, at the limits of construction and at areas with disturbed soil, on- or off-site, prior to any other ground-disturbing activity. All erosion control measures shall be maintained in good repair by the Developer, until such time as the entire disturbed areas is stabilized with hard surface or landscaping. To mitigate erosion, the Developer shall use standard erosion control techniques described in the Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices, as published by the Urban Drainage and Flood Control District (UDFCD).

22. The Developer shall sequence installation of utilities in such a manner as to minimize potential utility conflicts. In general, storm sewer and sanitary sewer should be constructed prior to installation of the water lines and dry utilities.

23. There shall be no site construction activities on Saturdays, unless specifically approved by the Local Entity Engineer, and no site construction activities on Sundays or holidays, unless there is prior written approval by the Local Entity.

24. The Designer shall provide, in this location on the plan, the location and description of the nearest survey benchmark for the project as well as the basis of bearings. The information shall be as follows:

25. Benchmark—Loveland's 1995 Level Net survey.

26. B.M.Number\_\_\_\_\_,Elev.=\_\_\_\_\_,

27. Description\_\_\_\_\_

28. Upon completion of construction, the site shall be cleaned and restored to a condition equal to, or better than, that which existed before construction, or to the grades and condition as required by these plans.

29. Existing fences, trees, streets, sidewalks, curbs and gutters, landscaping, structures, and improvements destroyed, damaged or removed due to construction of this project shall be replaced or restored in like kind at the Developer's expense, unless otherwise indicated on these plans.

30. Overlot grading construction must comply with the State of Colorado permitting process for "storm water discharges associated with construction activity." Contact the Colorado Department of Public Health & Environment, Water Quality Control Division, phone (303) 692-3500.

31. A State Construction Dewatering Wastewater Discharge Permit is required if dewatering is required in order to install utilities or before water is discharged into a storm sewer, channel, irrigation ditch or any waters of the United States.

32. The Developer is responsible for field locating and verifying elevations of all existing sewer mains, water mains, curbs, gutters and other utilities at the points of connection shown on the plans, and at any utility crossings prior to installing any of the new improvements. If a conflict exists and/or a design modification is required, the Developer shall coordinate with the engineer to modify the design. Design modification(s) must be approved by the Local Entity prior to beginning construction.

33. After acceptance by the Local Entity, public improvements depicted in these plans shall be guaranteed to be free from material and workmanship defects for a period of two years from the date of acceptance.

34. These public improvement construction plans shall be valid for a period of three years from the date of approval by the Local Entity Engineer. Use of these plans after the expiration date will require a new review and approval process by the Local Entity prior to commencement of any work shown in these plans.

35. Paving shall not start until a soils report and pavement design is accepted by the Local Entity Engineer and subgrade compaction tests are taken and accepted by the Local Entity Engineer.

36. The Developer shall be responsible for obtaining soils tests within the Public Rightof-Way after right of way grading and all utility trench work is complete. If the final soils/pavement design report does not correspond with the results of the original geotechnical report, the Developer shall be responsible for a re-design of the subject pavement section or, the Developer may use the Local Entity's default pavement thickness section(s). Regardless of the option used, all final soils/pavement design reports shall be prepared by a licensed Professional Engineer. The final report shall be submitted to the Inspector a minimum of ten (10) working days prior to placement of base and asphalt. Placement of base and asphalt shall not occur until the Engineering Division approves the final report.

37. All road construction in areas designated as Wild Fire Hazard Areas shall be done in accordance with the construction criteria as established in the Wild Fire Hazard Area Mitigation Regulations in force at the time of final plat approval.

38. Portions of Larimer County are within overlay districts. The Larimer County FloodPlain Resolution should be referred to for additional criteria for roads within these districts.

39. Standard Handicap ramps are to be constructed at all curb returns and at all "T" intersections.

40. All stationing is based on centerline of roadways unless otherwise noted.

41. The Local Entity shall not be responsible for the maintenance of roadway and appurtenant improvements, including storm drainage structures and pipes, for the following private streets: (list).

42. Approved Variances are listed as follows: (Plan set must have a list of all applicable variances for the project)

## Appendix E-2

## **Construction Notes**

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

#### A. Standard Grading and Erosion and Sediment Control Construction Plan Notes

- 1. The erosion control inspector must be notified at least twenty-four (24) hours prior to any construction on this site.
- 2. There shall be no earth-disturbing activity outside the limits designated on the accepted plans.
- 3. All required perimeter silt and construction fencing shall be installed **prior** to any land disturbing activity (stockpiling, stripping, grading, etc). All other required erosion control measures shall be installed at the appropriate time in the construction sequence as indicated in the approved project schedule, construction plans, and erosion control report.
- 4. At all times during construction, the Developer shall be responsible for preventing and controlling on-site erosion including keeping the property sufficiently watered so as to minimize wind blown sediment. The Developer shall also be responsible for installing and maintaining all erosion control facilities shown herein.
- 5. Pre-disturbance vegetation shall be protected and retained wherever possible. Removal or disturbance of existing vegetation shall be limited to the area(s) required for immediate construction operations, and for the shortest practical period of time.
- 6. All soils exposed during land disturbing activity (stripping, grading, utility installations, stockpiling, filling, etc.) shall be kept in a roughened condition by ripping or disking along land contours until mulch, vegetation, or other permanent erosion control BMPs are installed. No soils in areas outside project street rights-of-way shall remain exposed by land disturbing activity for more than thirty (30) days before required temporary or permanent erosion control (e.g. seed/mulch, landscaping, etc.) is installed, unless otherwise approved by the Local Entity.
- 7. In order to minimize erosion potential, all temporary (structural) erosion control measures shall:
  - a. Be inspected at a minimum of once every two (2) weeks and after each significant storm event and repaired or reconstructed as necessary in order to ensure the continued performance of their intended function.

- b. Remain in place until such time as all the surrounding disturbed areas are sufficiently stabilized as determined by the erosion control inspector.
- c. Be removed after the site has been sufficiently stabilized as determined by the erosion control inspector.
- 8. When temporary erosion control measures are removed, the Developer shall be responsible for the clean up and removal of all sediment and debris from all drainage infrastructure and other public facilities.
- 9. The contractor shall clean up any inadvertent deposited material immediately and make sure streets are free of all materials by the end of each working day.
- 10. All retained sediments, particularly those on paved roadway surfaces, shall be removed and disposed of in a manner and location so as not to cause their release into any waters of the United States.
- 11. No soil stockpile shall exceed ten (10) feet in height. All soil stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing. Any soil stockpile remaining after thirty (30) days shall be seeded and mulched.
- 12. The stormwater volume capacity of detention ponds will be restored and storm sewer lines will be cleaned upon completion of the project and before turning the maintenance over to the Local Entity or Homeowners Association (HOA).
- 13. City Ordinance and Colorado Discharge Permit System (CDPS) requirements make it unlawful to discharge or allow the discharge of any pollutant or contaminated water from construction sites. Pollutants include, but are not limited to discarded building materials, concrete truck washout, chemicals, oil and gas products, litter, and sanitary waste. The developer shall at all times take whatever measures are necessary to assure the proper containment and disposal of pollutants on the site in accordance with any and all applicable local, state, and federal regulations.
- 14. A designated area shall be provided on site for concrete truck chute washout. The area shall be constructed so as to contain washout material and located at least fifty (50) feet away from any waterway during construction. Upon completion of construction activities the concrete washout material will be removed and properly disposed of prior to the area being restored.
- 15. To ensure that sediment does not move off of individual lots one or more of the following sediment/erosion control BMPs shall be installed and maintained until the lots are sufficiently stabilized, as determined by the erosion control inspector, (Within Loveland GMA and City Limits Only).
  - a. Below all gutter downspouts.
  - b. Out to drainage swales.
  - c. Along lot perimeter.
  - d. Other locations, if needed.

- 16. Conditions in the field may warrant erosion control measures in addition to what is shown on these plans. The Developer shall implement whatever measures are determined necessary, as directed by the City/County.
- 17. A vehicle tracking control pad shall be installed when needed for construction equipment, including but not limited to personal vehicles exiting existing roadways. No earthen materials, i.e. stone, dirt, etc. shall be placed in the curb & gutter or roadway as a ramp to access temporary stockpiles, staging areas, construction materials, concrete washout areas, and/or building sites.
- 18. Add notes to reflect the stormwater runoff control plan of the individual development.

### **B.** Street Improvements Notes

- 1. All street construction is subject to the General Notes on the cover sheet of these plans as well as the Street Improvements Notes listed here.
- 2. A paving section design, signed and stamped by a Colorado licensed Engineer, must be submitted to the Local Entity Engineer for approval, prior to any street construction activity, (full depth asphalt sections are not permitted at a depth greater than 8 inches of asphalt). The job mix shall be submitted for approval prior to placement of any asphalt.
- 3. Where proposed paving adjoins existing asphalt, the existing asphalt shall be saw cut, a minimum distance of 12 inches from the existing edge, to create a clean construction joint. The Developer shall be required to remove existing pavement to a distance where a clean construction joint can be made. Wheel cuts shall not be allowed unless approved by the Local Entity Engineer in Loveland.
- 4. Street subgrades shall be scarified the top 12 inches and re-compacted prior to subbase installation. No base material shall be laid until the subgrade has been inspected and approved by the Local Entity Engineer.
- 5. Ft. Collins only. Valve boxes and manholes are to be brought up to grade at the time of pavement placement or overlay. Valve box adjusting rings are not allowed.
- 6. When an existing asphalt street must be cut, the street must be restored to a condition equal to or better than its original condition. The existing street condition shall be documented by the Inspector before any cuts are made. Cutting and patching shall be done in conformance with **Chapter 25**, **Reconstruction and Repair**. The finished patch shall blend smoothly into the existing surface. The determination of need for a complete overlay shall be made by the Local Entity Engineer. All overlay work shall be coordinated with adjacent landowners such that future projects do not cut the new asphalt overlay work.
- 7. All traffic control devices shall be in conformance with these plans or as otherwise specified in M.U.T.C.D. (including Colorado supplement) and as per the Right-of-Way Work Permit traffic control plan.

- 8. The Developer is required to perform a gutter water flow test in the presence of the Local Entity Inspector and prior to installation of asphalt. Gutters that hold more than <sup>1</sup>/<sub>4</sub> inch deep or 5 feet longitudinally, of water, shall be completely removed and reconstructed to drain properly.
- 9. Prior to placement of H.B.P. or concrete within the street *and* after moisture/density tests have been taken on the subgrade material (when a full depth section is proposed) or on the subgrade and base material (when a composite section is proposed), a mechanical "proof roll" will be required. The entire subgrade and/or base material shall be rolled with a heavily loaded vehicle having a total GVW of not less than 50,000 lbs. and a single axle weight of at least 18,000 lbs. with pneumatic tires inflated to not less that 90 p.s.i.g. "Proof roll" vehicles shall not travel at speeds greater than 3 m.p.h. Any portion of the subgrade or base material which exhibits excessive pumping or deformation, as determined by the Local Entity Engineer, shall be reworked, replaced or otherwise modified to form a smooth, non-yielding surface. The Local Entity Engineer shall be notified at least 24 hours prior to the "proof roll." All "proof rolls" shall be preformed in the presence of an Inspector.

### C. Traffic Signing and Pavement Marking Construction Notes

- 1. All signage and marking is subject to the General Notes on the cover sheet of these plans, as well as the Traffic Signing and Marking Construction Notes listed here.
- 2. All symbols, including arrows, ONLYS, crosswalks, stop bars, etc. shall be pre-formed thermo-plastic.
- 3. All signage shall be per Local Entity Standards and these plans or as otherwise specified in MUTCD.
- 4. All lane lines for asphalt pavement shall receive two coats of latex paint with glass beads.
- 5. All lane lines for concrete pavement should be epoxy paint.
- 6. Prior to permanent installation of traffic striping and symbols, the Developer shall place temporary tabs or tape depicting alignment and placement of the same. Their placement shall be approved by the Local Entity Engineer prior to permanent installation of striping and symbols.
- 7. Pre-formed thermo-plastic applications shall be as specified in these Plans and/or these Standards.
- 8. Epoxy applications shall be applied as specified in CDOT Standard Specifications for Road and Bridge Construction.
- 9. All surfaces shall be thoroughly cleaned prior to installation of striping or markings.
- 10. All sign posts shall utilize break-away assemblies and fasteners per the Standards.

- 11. A field inspection of location and installation of all signs shall be performed by the Local Entity Engineer. All discrepancies identified during the field inspection must be corrected before the 2-year warranty period will begin.
- 12. The Developer installing signs shall be responsible for locating and protecting all underground utilities.
- 13. Special care shall be taken in sign location to ensure an unobstructed view of each sign.
- 14. Signage and striping has been determined by information available at the time of review. Prior to initiation of the warranty period, the Local Entity Engineer reserves the right to require additional signage and/or striping if the Local Entity Engineer determines that an unforeseen condition warrants such signage according to the MUTCD or the CDOT *M and S Standards*. All signage and striping shall fall under the requirements of the 2-year warranty period for new construction (except fair wear on traffic markings).
- 15. Sleeves for sign posts shall be required for use in islands/medians. Refer to **Chapter 14, Traffic Control Devices**, for additional detail.

#### **D.** Storm Drainage Notes

- 1. The City of Fort Collins shall not be responsible for the maintenance of storm drainage facilities located on private property. Maintenance of onsite drainage facilities shall be the responsibility of the property owner(s).
- 2. All recommendations of the final drainage and erosion control study (name of the study and date) by (Engineering Firm) shall be followed and implemented.
- 3. Prior to final inspection and acceptance by The City of Fort Collins, certification of the drainage facilities, by a registered engineer, must by submitted to and approved by the Stormwater Utility Department. Certification shall be submitted to the Stormwater Utility Department at least two weeks prior to the release of a certification shall by submitted to the Stormwater Utility Department at least two weeks prior to the release of a certification shall by submitted to the Stormwater Utility Department at least two weeks prior to the release of a certification shall by submitted to the Stormwater Utility Department at least two weeks prior to the release of any building permits in excess of those allowed prior to certification per the Development Agreement.

#### E. Waterline Note

1. The minimum cover over water lines is 4.5 feet and the maximum cover is 5.5 feet unless otherwise noted in the plans and approved by the Water Utility.

Page E-2-5

Appendix E-3 Signature Review Block for Public Improvements Construction Plans NOTE: Appendix Forms and Information are for Reference Only. Contact Local							
(For City of Loveland Only)							
REVIEWED BY							
CITY OF LOVELAND – TRANSPORTATION ENG	NEERING DIVISION						
BY:	DATE:						
CITY OF LOVELAND – WATER/WASTEWATER ENGINEERING DIVISION							
BY:	DATE:						
CITY OF LOVELAND – FIRE DEPARTMENT							
BY:	DATE:						
CITY OF LOVELAND – ELECTRICAL ENGINEERI	NG DIVISION						
BY:	DATE:						
CITY OF LOVELAND – CURRENT PLANNING DIV	/ISION						
BY:	DATE:						

#### CITY OF LOVELAND – STORM DRAINAGE ENGINEERING DIVISION

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

The City of Loveland review constitutes compliance with the City's Development Standards, subject to these plans being stamped, signed, and dated by the professional engineer of record. Review by the City does not constitute approval of the plan design. Errors in the design or calculations remain the responsibility of the engineer of record.

This review does not constitute review/approval of any private on-site improvements which may be shown. These plans are intended to be for city review of public improvements adjacent to the property. Construction of on-site private improvements cannot commence until all required traffic worksheet or study(s), final development plan(s), special review(s), and building permit(s) are complete, approved and on file with the City of Loveland.

(For Larimer County Only)

Reviewed by:

#### LARIMER COUNTY ENGINEERING

DATE

The Larimer County review constitutes compliance with these Standards. Review by the county does not constitute approval of the plan design.

This review does not constitute review/approval of any private on-site improvements which may be shown. These plans are intended to be for county review of public improvements adjacent to the property. Construction of on-site private improvements cannot commence until all required traffic worksheet or study(s), final development plan(s), special review(s), and building permit(s) are complete, approved and on file with Larimer County.

# Appendix E-4

# **City of Fort Collins**

**Requirements for Utility Plans** 

PROJECT PLANNER:

DESIGN ENGINEERING FIRM:

**DEVELOPER:** 

All applications for final development plans **must** include final development plan documents ("Utility Plans"). The standards for these Utility Plans are set forth in Division 3.3 of the City of Fort Collins Land Use Code, these Standards, and as further noted in this appendix.

THIS LIST PROVIDES THE DESIGN ENGINEER INFORMATION TO HELP HIM/HER DETERMINE WHAT THE CITY OF FORT COLLINS EXPECTS TO SEE ON DRAWINGS SUBMITTED FOR REVIEW AND APPROVAL. THIS LIST IS <u>NOT</u> INTENDED TO BE ALL-INCLUSIVE AND SHALL NOT, IN ANY WAY, OVERRIDE OR SUPERCEDE THE STANDARDS SET FORTH IN THE CITY OF FORT COLLINS LAND USE CODE AND/OR THE LARIMER COUNTY URBAN AREA STREET STANDARDS MANUAL. ADDITIONAL INFORMATION MAY BE REQUIRED ON SPECIFIC PLAN DESIGNS AND IS NOT INTENDED TO RELIEVE THE DESIGN ENGINEER OF THEIR OBLIGATION TO UTILIZE GOOD ENGINEERING PRACTICES.

The two "check list" columns to the left of the Utility Plan requirements below are provided for the convenience of both City staff and the Developer's Engineer. The columns are organized as follows:

(1) The first column, "Applicant Validation," is provided as a check list for the applicant to ensure that all required items are addressed within the Utility Plans.

(2) Upon submittal, City staff will check off the items in the second column to ensure that all the required items are included within the Utility Plans.

PLEASE NOTE: All items with an arrow (►) are items required prior to public hearing. All items without an arrow will be required during final compliance.

N/A	Applicant Validation	aludad	Staff Check			
<u>IN/A</u>	<u> </u>	<u>iciuded</u>		I.	Cover	Sheet
					A. ►	Preamble title of "Utility Plans For"
					B. ►	Legal description below the project name
					C. ►	Vicinity map including project location, nearest two Arterial Streets, existing street system, street names for collector and Arterial Streets, City limit lines, north arrow and major public facilities
	<u> </u>				D. ►	Index to all sheets contained within the Utility
					-	The summer date (month and user) under the
					E.	legal description
					F.	General Construction Notes, and if applicable, CDOT General Construction Notes (see attached <b>Appendix E-2</b> ) placed on left side of sheet
	<u> </u>				G. ►	Project Bench Marks referencing the City of
						For Comins datum
					Н.	Reference to the updated or current soils investigation report
					I.	Stamp and signature of a licensed Civil Engineer registered in the State of Colorado (on approved final development plan documents) in accordance with State Statutes and Board Rules.
					J.	The following statement is annotated on the Cover Sheet: <i>I</i> hereby affirm that these final construction plans were prepared under my direct supervision, in accordance with all applicable City of Fort Collins and State of Colorado standards and statutes, respectively; and that I am fully responsible for the accuracy of all design, revisions, and record conditions that I have noted on these plans.
	<u> </u>				K. ►	Typical street section(s) provided for each
						street type being proposed. Sections include appropriate horizontal and vertical dimensions and cross slopes, type of curb and gutter and any deviations from standards. See <b>Figures 7-1F thru 7-13F</b> . (These sections may also be located on the plan/profile sheets or a separate sheet within the utility plan set.)
					L.	The names, addresses, phone numbers for the Developer(s), Owner(s), and Consultant Engineer are provided.

	Applica <u>Validatio</u> N/A	<b>nt</b> on Included	Staff Check		
				М.	Indemnification Statement provided and annotated as follows: These plans have been reviewed by the Local Entity for concept only. The review does not imply responsibility by the reviewing department, the Local Entity Engineer, or the Local Entity for accuracy and correctness of the calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed in any reason as acceptance of financial responsibility by the Local Entity for additional quantities of items shown that may be required during the construction phase.
			I	l. Gradii	ng, Drainage & Erosion Control Plan
_	<u></u>			A. ►	Drainage report submitted
_	<u></u> _			B. ►	Existing and proposed contours provided at 2' (min.) intervals and labeled.
-	<u></u>			C. ►	Contours extended a minimum of 50' offsite and tie into existing contours.
_				D.	Finish grade elevations provided for streets, lot corners, and finish floors/top of foundation of buildings for all lots.
_				E.	This statement provided: "The top of foundation elevations shown are the minimum elevations required for protection from the 100-year storm.
	<u></u>			F. ►	Drainage arrows are provided and show positive drainage to streets or to an approved drainage facility.
				G.	Phasing of development and construction of all public improvements. All public improvements within each phase stand alone. Phases separated by a thick, ghosted line and identified by either numbers or letters.
_				Н.	Temporary and long term erosion control devices are provided and labeled.
				I. ►	Revegetation methods and specific notes are provided.
			<u> </u>	J. ►	If the project proposes any construction in a floodplain, please pick up the separate "Preliminary Floodplain Submittal Requirements" available at the Stormwater Utility.

Applican Validation	t <u>1</u>	Staff Check				
<u>N/A</u>	Included		III.	Overa	ll Utility	Plan Sheet(s)
				Α.	Streets	
					1. ►	R.O.W., property lines and easements with dimensions and labels.
					2. ►	Cross-pans
					3. ►	Access ramps
					4. ►	Curb and gutter
					5. ►	Sidewalks
					6. ►	Driveway locations
					7. ►	Medians, including flowline and lip of gutter
					<b>8.</b> stop, mo	General location of signs (speed, onument, etc.)
				В.	Phasing construct public stand a ghosted or letters	lines of development and ction of all public improvements. All improvements within each phase lone. Phases separated by a thick, line and identified by either numbers s.
				C.	Water F	acilities Mains with sizes
					2. ►	Fire hydrant locations
					3. ►	Valves
					4.	Meter pits and curb stops
					5. ►	Manhole locations
					6. ►	Show service locations at preliminary, except for single family uses.
					7.	Waterline lowerings
					8.	Dimensioning of manholes and cleanouts from the centerline of the roadways.
<u></u>				D.	Sanitary 1. ►	/ Sewer Facilities Mains with sizes
					2. ►	Manhole locations and numbering
					3.	Length of segments between manholes
					4.	Type of pipe
					5.	Slopes

<b>Applicant</b> Validation		Staff Check					
<u>Vandation</u> <u>N/A</u>	Included	CHECK					
					6.	Clean-outs	
					7. ►	Show services at preliminary, except for single family uses.	
				E.	Storm Se	ewer Facilities	
					1. ►	General layout of stormsewers, channels and swales.	
					2. ►	Manhole locations	
					3. ►	Junction structures	
<u></u>					4. ►	Clean-outs	
					5. ►	Type of pipe	
					6. ►	Sizes	
					7. ►	Slopes	
					8. ►	Length of segments between manholes	
					9.	Subdrains (where applicable)	
					10. ►	Manhole numbering	
				<b>F.</b> ►	Existing 150' bey	features shown for a minimum of ond the project limits	
<u></u>				G. ►	Propose utilities.	d utility connections with existing	
			IV.	Street	Plan and	Profile Sheets (Horizontal Alignment)	
				<b>A.</b> ►	<ul> <li>Largest possible curve radii used on Arte and Major Arterial roadways. Minim curve radii used only where necessary. S Table 7-3.</li> </ul>		
				B. ►	Minimum See <b>Tab</b>	n tangent lengths at intersections. I <mark>e 7-3.</mark>	
<u></u>				C. ►	Crossing	streets intersect at 90° (minor	
					street ca	n vary ±10°).	
				D. ►	Angle of departure of streets at intersect do not exceed 10° for the length of required tangent.		
				E. ►	Minimum provided	tangent between reverse curves . See <b>Table 7-3.</b>	
				<b>F.</b> ►	Broken-b length e See <b>Tab</b>	pack curves are separated by a qual to 2 times the tangent length. <b>le 7-3.</b>	
<u></u>				<b>G.</b> ►	Compou (Larger r	nd curves: ratio value of $\leq$ 1.5 adius divided by the smaller radius).	

	<b>Applicant</b>		Staff Chack			
N/A	<u>vandation</u> It	ncluded	<u>Check</u>			
				I. ►	Minimu deflectio	m centerline arcs for curves with on angles 10° or less. See <b>Table 7-5</b> .
	_			J.	Horizon crest cu	tal curves do not begin at the top of a rve or the bottom of a sag curve.
				K. ►	Tapers	and transitions: Refer to Chapter 8
				L. ►	Sight of Shown distance	distance triangles and easements: on all plan & profile sheets. Sight e easements dedicated on the Plat.
				M. ►	Minimu Table 7	m Local Street widths provided per '-1 and are consistent with the TIS.
	_			N. ►	Access Crossw length. Facilitie	ramps and crosswalks provided. alk lengths are a maximum of 56' in See Chapter 16, Pedestrian es Design and Technical Criteria.
				0. ►	Minimu provide	m of one mid-block access ramps d at all "T" intersections.
	<u></u>	<u></u>		P. ►	Comple	te horizontal alignment includes, but
					is not intersec storm d	limited to: centerline of roads, ting streets, driveway locations, and rainage facilities.
				Q. ►	Existing lines, e dimensi	and proposed Property and/or ROW easements and/or tracts provided, oned, and labeled clearly.
				R.	Existing phantor	utilities and structures (shown as n line) included: Storm sewer and appurtenances
					2.	Fence lines and gates
	<u></u>				3. ►	Water lines and appurtenances
	<u></u>				4. ►	Ditches and swales
					5. ►	Electric lines and appurtenances
					<u>6.</u> ►	Curbs and gutters
					7. ►	Sanitary Sewer lines and appurtenances
					8. ►	Pavement limits
					9. ►	Telephone lines and appurtenances
					<b>10.</b> ►	Bridges and/or culverts
	_				11. ►	CATV lines and appurtenances
	<u></u>	<u></u>			<u>12.</u> ►	Guardrails
					13.	Signs
	<u></u>	<u></u>			<u>14.</u> ►	Gas lines and appurtenances

1	Applicant	Staff Chaole		
$N/\Delta$	Included	CHECK		
			S.	Station, critical elevation, and dimension of all existing and proposed utility and/or drainage structures provided.
			Т.	Intersections show construction and lane details for new and existing facilities for a minimum of 150' beyond the limits of construction.
		V.	Street	t Plan and Profile Sheets (Vertical Alignment)
	<u></u>		A. ►	Maximum grades for streets comply. See Table 7-3.
			B. ►	Maximum grades of cul-de-sacs are 3.0%.
	·		C.	Continuance of profile and ground lines for all Local and Collector Streets that dead end (excluding cul-de-sacs) shown for 500' beyond the proposed construction.
			D.	Continuance of profile and ground lines for Arterial Streets shown for 1000' beyond the proposed construction.
			E. ►	Minimum crest and sag curve lengths for street classifications. See <b>Figures 7-17 and</b> <b>7-18</b> . Lengths must meet or exceed these minimums.
			F.	Crest curves: street centerline, curb and gutter designed with vertical curves. See <b>Table 7-3</b> .
			G.	Sag curves: street centerline and flowline designed with a vertical curve (see exception below). See <b>Figure 7-18 and Table 7-3</b> .
			н.	Sag Curves: For grade changes <1.0%: gutter flowlines at low points are <u>not</u> designed with vertical curves, but must meet the minimum .5% grade into the inlet.
			I.	Sag Curves: For grade changes >1.0%: both street centerline and curb and gutter are designed with vertical curves, but a minimum flowine grade of .5% must still be maintained.
			J. ►	Single point grade breaks do not exceed 0.40%, except at inlets where min .5% grade into the inlet is required.
			K. ►	Series of grade breaks meet the vertical alignment criteria for the design speed of the roadways.
			L. ►	Minimum centerline and flowline grade for streets is 0.50%.
			М.	Minimum flowline grade for cul-de-sacs is 1.0%.

Applicar Validatio	nt on	<b>Staff</b> Check			
<u>N/A</u>	Included	<u></u>		N.	Minimum desirable grade around curb returns is 1.0%. Minimum allowable grade around curb returns is 0.50%.
				Ο.	Curb return profiles (except medians) are provided.
				P. ►	Centerline profiles through intersections
					provided.
				Q.	Flowline profiles provided on both sides of all streets (Final compliance).
				<b>R.</b> ►	Centerline profiles provided for all streets (Preliminary).
				S. ►	Proposed (solid line type) and existing (dashed line type) ground lines provided and labeled.
				T. 🕨	All proposed and existing vertical curves and grade breaks are dimensioned (Preliminary)/ stationed and labeled clearly (Final compliance).
			VI.	Cross	Slopes
				Α.	Minimum cross slope of new streets is 2.0%.
				В.	Minimum cross slope of any reconstruction or overlay is 1.5%.
				C.	Maximum allowable cross slope on all new streets is 3.0%.
				D.	Maximum allowable cross slope on any reconstruction or overlay of existing roadways is 4.0%.
				Е.	Street modifications (widening, turn-lane, etc): the widened portion is within the stated limits and is not less than the existing cross slope.
				F.	When tying to existing cross slopes: Curb and gutter or centerline shall be designed such that the when the existing pavement is overlaid it results in a straight line cross slope grade that meets standards.
				G.	Cul-de-sacs: See Figure 7-19.
			VII.	Design	Speed
	<u> </u>			A. ►	Roadways are designed according to their proper design speed. See <b>Table 7-3</b> .
			VIII.	Curb Retu	rn Radii

A. Curb return radii used in accordance with Table 8-2.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_

\_\_\_\_\_

	Applicant Validation		Staff Check			
<u>N/A</u>	<u></u> <u>I</u> 1	ncluded			В.	Minimum desirable flowline grade around
	_				2.	curb returns is 1%.
					C.	Minimum allowable flowline grade around curb returns is 0.50%.
				IX.	Media	ans
	_				Α.	Provided as stated on Figures 7-1F thru 7- 13F.
					B. ►	Width of medians are no less than 4' wide.
					C. ►	Turn Lane and Access: Left-turn lanes (where warranted) designed using criteria contained in <b>Figures 8-2, 8-3 &amp; 8-11</b> .
					D. ►	Landscaped medians include drainage facilities to handle sprinkler runoff and nuisance flows. Refer to Appendix C.
	_				E. ►	Median(s) are designed with keyed curb or curb with outfall gutters (if gutters are not needed to handle drainage), or medians are designed with curb with inflow gutters (if gutters are needed to handle drainage).
					F. ►	Nose of median(s) located such that vehicle turning movements comply with vehicle tracking templates.
					G. ►	Transition points of medians do not have "angle points". A 100' minimum radius with minimum arc length of 50' is used at transition locations.
					H. ►	Permanent structures within medians are a minimum of 5' from the closest travel lane.
	_				I. ►	Pedestrian refuge areas are provided in the noses of medians. See Chapter 16, Pedestrian Facilities Design and Technical Criteria.
	_				J.	Profiles shall be provided for all areas of inflow curb and gutter. Profiles or adequate spot elevations, dimensions and any other information necessary for review and construction shall be provided for all medians.
				X.	Cul-de	-sacs
					A. ►	Provided only on Local Streets. See Figures 7-19 & 7-21.
					B. ►	Maximum length of 660' (1320' max.) if fire sprinkler systems are installed in structures.
					C. ►	Minimum radii used. See Figure 7-19.

NT/A	Applicant Validation	ala da d	Staff Check			
<u>N/A</u>	<u>11</u>	<u>iciuded</u>		XI.	Eyeb	rows
					<b>A.</b> ►	Provided only on Local Streets. See Figure 7-23.
					B. ►	Spaced in conformance with the requirements in Chapter 9, Access Requirements and Criteria.
				XII.	Dead	-end Streets
					A. ►	Temporary dead-end streets provided <b>only</b> on streets that do not have direct access from adjoining property.
	_				B. ►	Temporary turnarounds with a minimum radius of 50' provided for permitted dead-end streets. See Figure 7-26.
	_				C.	Temporary access easements dedicated on the Plat.
				XIII.	Drive	ways
	_				Α.	Where curb cuts are provided, concentrated runoff from adjoining properties does not discharge across the sidewalk.
			<u> </u>		B. ►	Spacing of curb cuts conform to spacing requirements. See Figure 9-1 and Table 7-3
					C.	Drive approaches slope toward the street.
					D. ►	Driveways intersect streets at $90^{\circ} \pm 10^{\circ}$ for a minimum of 25' measured perpendicular to the street from the curb edge or EOA.
					E. ►	All access/driveway approaches are paved with Portland cement from the street to the ROW.
						1. SF Residential Approaches
	_			<u>.</u>		a. ► Minimum width of driveway(s) is 12' and the maximum width is 24'. See Standard Drawings 706 and 707.
	<u> </u>		<u>.</u>	_		b. ► Sidewalks are continuous
						Standard Drawing 1601.
	_					c. When pedestrian accessible driveways are required in lieu of mid-block access ramps, the slope of the driveway is ≤ 1:12 and spaced at 300' intervals on both sides of the street.

App Vali	dation	Staff Check					
N/A	Included	CHECK					
<u>-                                    </u>					2.	High Vo	olume Driveway
						a►*. [	Priveways accessing Arterial
							Section 9.3.2.4 shall conform
						v	vith Standard Drawing 707.
						b►*. N	Aaximum width is 36°. If wider,
						ir	hound and outbound traffic.
					2 🕨	Multi E	amily Dwolling Unit
					Drive	ways	anniy Dwennig Onit
						<mark>Minimur</mark>	n width of driveway(s) is 24'.
						Minimur	n of 28' for driveways serving
						of 36'.	
			XIV.	Grad	ing In 7	The ROV	V
				А.	Maxin is 4:1	num slop	e for all areas within the ROW
				в	Maxin	num sla	one outside of the ROW
				Ξ.	affect	ing public	c improvements is 4:1.
				C	Retai	nina wa	lls provided where slopes
				0.	excee	ed 4:1.	Retaining walls designed in
					accor	dance wi	th Chapter 11, Structures.
				р	Minim	um slon	es in non-roadway areas is
				В.	2.0%		co in non roadway areas is
			VV	Sub	drains		
			Αν.	Sub-	ul allis		
				Α.	Engin	eered su	b-drain systems meet criteria
					Set to	rth in Sec	ction 7.7.3
				В.	Hydro	logic st	udy submitted if criteria in
					Section	on 5.6.1.	A. is met or sub-drains are
					neede	ed for bas	sements.
			XVI.	Cross	s-pans		
				А.	Cross	-pans ac	ljacent to Local Streets are a
					minim	um of 6'	wide and <sup>7</sup> / <sub>8</sub> " deep.
				В.	Cross	-pans ad	liacent to Collector Streets are
					a min	imum of a	B' wide and 1 <sup>1</sup> / <sub>8</sub> " deep.
				c	Cross	nane ad	iscent to Arterial Streets are a
				0.	minim	um of 10	' wide and $1\frac{1}{2}$ ' deep.
				_			
				D.	MID-D in wid	lock cros th and 1 <sup>3</sup>	s-pans are a minimum of 12 <sup>°</sup>
				Ε.	Minim	um grad	e of cross-pans are 0.50%.
				F.	Paver	nent tra	nsitions approaching cross-
					pans	designed	d using the design speeds in
					Figur	e 7-3 an e 7-27 ar	a meet the requirements of nd Standard Drawing 710.

<b>Appl</b> i Valid	<b>icant</b> ation	Staff Check			
<u>N/A</u>	Included			G.	Spot elevations provided as shown on <b>Figure 7-27</b> .
			XVII.	Inlets	
				A. ►	Inlets are not located within the curb returns.
			XVIII.	Bus Ba	iys
				A. ►	Bus bays are 11' wide.
				B. ►	Bus bays are constructed with concrete in
					accordance with Chapter 22, Construction Specifications.
				C. ►	Bus bays shall be designed in accordance with Section 7.9 and <b>Standard Drawing</b> 711.
			XIX.	Interse	ections
				A. ►	Travel lanes are aligned through intersection(s) (a 2' shift is allowed in hardship cases only).
				B. ►	Intersections cross at 90° ±10°.
				C. ►	Horizontal alignment of streets thru intersections are designed in accordance with <b>Table 7-3.</b>
				D. ►	Exclusive left-turn lanes provided where required. See Section 8.2.5, Exclusive Left Turn Lanes.
				E. ►	Exclusive right-turn lanes provided where required. See Section 8.2.6, Exclusive Right Turn Lanes.
				<b>F. ►</b>	Adequate turning radii used for each type of intersection. See Section 8.2.8, Turning Radius.
			_	G. ►	ROW is dedicated as shown on Figure 8-12.
				H. ►	Additional ROW dedicated for right and left turn lanes.
				I. ►	Sight distances comply with Figure 7-16.
				J. ►	Street grades approaching intersections shall be between 0.50% (min.) and 4.0% (max) for a distance equal to the tangent length of the street classification. See <b>Table 7-3</b> )
	<u> </u>	<u></u>		K. ►	Profile grades within the intersection do not exceed 3%
			XX.	Genera	al Requirements
				Α.	Phased improvements shown clearly.

	Applicant Validation		Staff Check		
<u>N/A</u>	Inclu	ided	CHEEK		
				В.	Phases within the project limits stand alone and do not leave necessary improvements to future projects.
	<u> </u>			<b>C.</b> ►	Design of State streets meet the
					requirements presented in the State Highway Access Code Manual.
	<u></u>		<u></u>	D. ►	North arrows and the appropriate bar/graphic scale(s) are provided.
				E. ►	Existing features adjacent to this development are shown in a ghosted or alternate line weight.
				F.	The City's signature block is provided in the lower right corner of each sheet contained within the utility plan set. Each signature block measures $3\frac{1}{2}$ " high by $4\frac{1}{2}$ " wide.
				<b>G.</b> ►	Ditch company approval block is provided.
				H. ►	Water and Sanitary District approval block is provided.
				I.	County approval block is provided.
				J.	CDOT approval block is provided.
				K. ►	Title block is provided on each sheet of the utility plan set and includes the project name, sheet name, engineer's name, address, telephone number and fax number, sheet numbering, and revision block.
	<u> </u>			L. ►	The utility plans correlate with the Site and
					Landscape Plans
				М.	Spot elevations at all intersections provided as shown on <b>Figures 7-27 and 7-28</b> .
		<u></u> _		<mark>N. ►</mark>	Proposed construction within the Property boundary drawn with solid lines and existing features shown with hidden or dashed lines.
				0.	Stations and elevations provided at all PC's, driveway intersections and roadway intersections in both plan and profile views.
				Ρ.	Flowline curve table provided on each plan and profile sheet that includes radius, angle, arc length, and tangent length.
				Q.	Centerline stationing is the standard and shall be used except at cul-de-sacs, where flowline stationing is used (Station equations provided.), unless approval to use flowline stationing is given.
				<b>R.</b> ►	Street names provided on all sheets.
				<b>T.</b> ►	All easements shown in the plan views.

	Applicant Validation		Staff Check						
<u>N/A</u>	<u>vandation</u> <u>I</u>	ncluded	Cheek						
				U	I. ► Ma Pa inc	atch-lines p ige num cluded.	provided in both ber, station	plan and pr and elev	ofile. ation
	<u> </u>			v	7. Th 1.	e scale of ► Hor	all sheets are as <mark>izontal -</mark> 1" = 20	follows: <mark>', 30', 40', c</mark>	o <mark>r 50'</mark>
					2.	Ver	<b>tical -</b> 1" = 5' or 1	<mark>10'</mark>	
					3.	► Ove	erall Plan - 1" = 1	100'	
				v	V. ► All lim are	private ir nited to, ro e clearly sh	nprovements, in adways, drivewa nown and labeled	cluding bu lys, utilities, d as such.	t not , etc.
				X	<mark>. ► A</mark> ide ide pa	legend entifying rticular she	is provided of the symbols eet.	ו each s used on	sheet that
		<u></u>		Y	′. ► Ke sh an	ey map is j eets (for u d profile sl	provided on the tility plans having neets).	plan and p 3 or more	rofile plan
				XXI. ►	Street Ci <mark>street)</mark>	ross Sectio	ns <mark>(Preliminary =</mark>	typical for	each
				Δ	L Cru Cc intr co an ad	oss secti ollector S ervals. Cr nditions w existing justed whe	ons for Arteria treets are pro ross also require arrant the need street). The in ere site topograp	I Streets ovided at d where sp (i.e. widenin nterval may hy is unique	and 50' becial ng of y be e.
					1. Cr	Inform	nation Provid	ed on o	each
					01	a. ►	Curb & gutter,	existing(f)	and
						propo	sed(*)		
						<mark>b.</mark> ► propo:	Roadway surfa sed	ce, existing	and
						<mark>c.</mark> ► propo	Sidewalk, e sed	existing	and
	<u></u>					<mark>d.</mark> ► propos	Cross slopes, sed(*)	existing(f)	and
						e. 🕨	ROW, existing a	and propose	<mark>ed</mark>
	_					f.	Side slopes, proposed, 15' proposed ROW	existing beyond	and the
						g.	Stations		
						<b>h.</b> center	Proposed f line elevations	lowline	and
						i.	Utility crossings		
						j. 🕨	Dimensions		

	Applicant Validation		Staff Check			
<u>N/A</u>	<u>vandation</u> 	<u>ucluded</u>	<u></u>			<b>k.</b> Areas of overlay, milling, pavement removal and/or reconstruction
				XXII.	Plat	
					<b>A.</b> ►	Maintenance Guarantee, Repair Guarantee, Notice of Other Documents notes.
		<u></u>			B. ►	Planning & Zoning Board/Hearing Officer certification statement (to be signed at final compliance).
					<mark>C. ▶</mark>	Surveyor certification statement (to be signed at final compliance)
					D. ►	Statement(s) of land ownership
					E. ►	Statement(s) of ownership and/or maintenance of all tracts.
					<b>F.</b> ►	Statement(s) of the dedication of any easements, ROW, tracts, and other public areas.
	_	<u></u>			<mark>G.</mark> ►	Vicinity Map: Project location, nearest 2 Arterial Streets, street names, City limits, major public facilities.
	_				Н.	Curve data complete for all curves.
					I. ►	2 ties to aliquot corners.
		<u></u>			J. ►	All existing and proposed easements and ROW clearly defined.
					K. ►	Adjoining properties labeled.
					L. ►	Scale, graphic scale, north arrow, date of preparation, complete title w/ location.
					M. ►	Boundary legal description closes.
					N. ►	Lot lines.
					0. ►	Designation of areas subject to flooding, including floodplain, floodway, and product corridors. (Elevation Datum must be referenced to City of Fort Collins datum.)

## **Appendix E-4**

## **City of Loveland**

## **Requirements for Public Improvements - Construction Plans**

**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Project Name:\_\_\_\_\_

All applications for final subdivision plans must include final construction plans for public improvements. The standards for these plans are set forth in Section 16.20.090 of the Municipal Code, these Standards and as further noted in this appendix.

The two "check list" columns to the left of the construction plan requirements below are provided for the convenience of both staff and the Developer's Engineer. The columns are organized as follows:					
(1)	The first column, "Applicant Validation," is provided as a check list for the applicant to ensure that all required items are addressed within the construction plan set.				
(2)	Upon submittal, city staff will check off items in the second column to ensure that all the required items are included within the construction plan set.				

Applicant Validation						
<u>N/A</u>	Included	Staff Check				
I.	Title S	heet				
			A. Construc	Preamble title of "Public Improvements ction Plans".		
			B. marketir subordir	The legal name of the addition or subdivision (the ng name may be used on the plans, but must be nate to the subdivision name).		
			C. applicab etc. (See	Signature review blocks for City and other le entities, i.e., ditch company, C.D.O.T., County, Appendix E-3)		
			D.	Index to all sheets in the plan set.		
			E. (includin 1995 Le	The character type and position of benchmark ng elevation) must reference the "City of Loveland vel Net Survey.		
			F. map mu area. 1"	Vicinity map, scale and north arrow. The vicinity st be updated to show all approved projects in the =		
			G. Notes, & attached	General Construction Notes, Street Construction & Water/Sewer and Storm Drainage Notes (see Appendix E-1).		
			H. (on final State Sta	Stamp and signature of licensed Civil Engineer approved sets of plans) in accordance with current atutes and Board Rules.		
<u>N/A</u>	Included	Staff Check				
------------	----------	------------------------	--	---	---	
I.	Overal	ll Utility Layout Plan	sheet(s)			
			A.	Streets		
				1.	R.O.W. and easements.	
				2.	Cross-Pans.	
				3. flowline)	Curb and gutter (lines depicting lip and ).	
				4.	Walk, (attached or detached).	
				5. flowlines flowline.	Medians, (line depicting both s), if an outfall gutter then show lip and	
				6. location.	Signs (speed, stop, warning) general	
				7. associate	Other roadway signs or devices d with phasing or dead end streets.	
			B. pull boxe the futur	Provide 3 es at inters re.	3" P.V.C. schedule 40, 36" deep with ections that will be signalized now or in	
			C. of all Pu phasing each pha heavy da or letter.	Include I blic Impro shall be 10 ase shall sta ark lines, a	Phasing of development and construction ovements. Minimum development ) lots; All public improvements within and alone. Phase lines shall be shown by Il phases shall be identified by number	
			D. bends, a mains ar Standard	Water Da airvacs, blo and services and for furth	istribution System Valves, hydrants, woffs, lowering, crossings, sizes of all . See Water/Wastewater Development er requirements.	
			E. subdrain mains ar Standard	Sanitary s (where a nd services ls for furth	Sewer System MH, C.O.'s, services, pplicable), crossings and sizes of all . See Water/Wastewater Development er requirements.	
			F.	Storm D	rain System	
				1.	MH, junction structures	
				2.	Inlets / catch basins	
				3.	Storm sewer pipes	
				4.	Detention Pond Outlet Structures	
				5.	Waterways	

<u>Applica</u>	nt Validation		
<u>N/A</u>	Included	Staff Check	
			G. Street Lighting Show all public street lights in conformance with Chapter 15 of these Standards.
II.	Grad	ing, Drainage & So	edument/Erosion Control Plan & Report
		A.	A Grading, Drainage and Sediment/Erosion Control Report done in accordance with the City of Loveland Storm Drainage Criteria Manual.
			B. Existing and proposed contours in a minimum of two foot intervals.
			1. Show contours extending a minimum of 50' off-site, and tying into existing contours.
			2. Finish grade elevations for streets, lot corners, and finish floor grades or alternately top of foundation of buildings shown for all lots.
			C. This statement: The top of foundation elevations shown are the minimum elevations required for protection from the 100 year storm. The lowest opening elevations shown are at least one foot above the 100 year storm elevation of adjacent streets, channels, ditches, swales, or other drainage facilities. Minimum finished floor elevations above 100-year water surface in streets, channels, ditches, swales, or other drainage facilities, as illustrated by a master grading plan are to be shown.
			D. Plans to have positive drainage to streets (showing drainage arrows across lots) or to an approved discharge facility.
			E. All drainage improvements are to be designed to include all necessary improvement details on the detail sheet.
			F. Cross-check front lot elevations with plan & profile sheets for continuity. Also check for elevations and datum match where streets will meet an adjoining subdivision, especially when the adjoining street is designed but not built.
			G. Show phase lines. If phasing is proposed after the construction plans are signed, the consultant must revise the plans to show the phase lines.
			H. Criteria:
			1. Minimum of 1.5% profile grade on grass and a maximum side slope of 4:1. If special circumstances warrant a steeper cross slope, it will be evaluated on a case-by-case basis.
			2. If rear lot drainage distance is greater than 300' and provides less than 2% profile

			grade, a concrete trickle channel or an under drain must be provided.
			3. Drainage outlets and ending pans typically should have some type of erosion protection indicated. Example: If rip-rap is to be used, details should include size of rock D-50 and dimensions of placement, length, width, depth.
			I. Inlets/catch basins, fire hydrants and utility poles are not to be constructed where they would conflict with handicap ramps, or be a hazard to traffic. Maintain a 2' minimum clearance from flowline.
			J. A final drainage report must be accepted by the storm water utility.
			K. Include Phasing of construction & development if phasing is desired.
<u>Applic</u> <u>N/A</u>	ant Validation Included	Staff Check	
IV.	Street Pla	n & Profile	
			A. Minimum local street widths is per Table 4.1 and 4.2 .(unless project is a PUD or a waiver or variance is approved).
			B. Profile grades:
			1. See Table 4.2 for maximum grades. Minimum grade allowed is 0.5%.
			2. Street grades within 100' of an approaching intersection shall be a maximum grade of 4%.
			3. Maximum grade through the intersection is 3%.
			<ul> <li>a. 10' min. length for each segment prior to a grade break. 2% max. algebraic difference between segments for Collectors and Arterials. 4% max. grade break on local streets. This is to provide a smooth ride through the intersection.</li> </ul>
			b. Provide flow line grades for intersections with cross-pans. Check the grades for correctness. Make sure they drain.
			c. Provide the percent grade for all curb returns at intersections.
			C. Vertical curve is required when the algebraic difference in grades is >1.0% except flowline grades in sumps.

<u>Applica</u>	ant Validation		
<u>N/A</u>	Included	Staff Check	
			1. Check actual grades and length for accuracy and correctness.
			2. All K-values shall be noted on the profile view; minimum K-values shall be in accordance with design speed. Minimum K=45 for crest vertical curve unless circumstances warrant less than 45 (K=L/Alg. Difference in grades)
			3. All proposed streets to match with existing streets and adjacent topography/projects. Show the existing streets profile and topography grade and where the proposed will match it. Existing street and topography grades are to be shown for an adequate distance beyond the proposed improvements to facilitate a smooth transition.
			4. Check stationing of plan and profile for errors in design and/or discrepancies between the two. Keep the street names the same. (Don't change names of streets at intersections.)
			D. Tapers:
			1. When shifting an entire directional stream of traffic the taper length $(L) = WS$ for design speeds of >45mph; and L=WS2/60 for design speeds of <40mph; and for turning bay tapers L=WS/3. (L=length of transitional taper section in feet, W=width of lateral lane shift in feet, S=design speed in m.p.h.)
			E. Access ramps shall be constructed at all corners of street intersections, including one ramp opposite from corners of tee intersections. It is recommended by the Handicap Advisory Committee that access ramps be installed midblock when blocks exceed 600 feet in length street.
			F. Inlets/catch basins, fire hydrants, utility poles and electric appurtenances are not to be constructed where they would conflict with handicap ramps.
			G. Provide 3" P.V.C. schedule 40, 36" deep with pull boxes at intersections that will be signalized now or in the future. Includes 90° sweeps.
			H. Show all raised medians and include all details for construction. Show interior median treatment and design. (i.e., trees, sprinklers, pavement, rock, splash pan, etc). Trees shall not block signing. See Standard Drawing 4-9.

	Applicant	Staff
	Validation	Check
<u>N/A</u>	Included	

I. Gutter cross pans are not to be designed to cross arterial or major collector streets. Gutter pans widths are as follows:

Width	Intersection Type
6'	Local-Local
8'	Local-Collector
8'	Collector-Collector
10'	Local-Arterial
10'	Arterial-Collector
12'	midblock on local street
30'	midblock on collector street

J. Gutter pans or concrete edge protection may be constructed in place of curb and gutter within industrial zoned areas.

1. Minimum 4' compacted fill to be placed between back edge of concrete edge protection or gutter and top of slope of roadside ditch.

K. Minimum curb radii at intersections will be as follows (measured to flow line):

	Local	Collector	Arterial
Local	15'	20'	30'
Collector	20'	25'	30'
Arterial	30'	30'	35'

Note: As per state highway regulations, a minimum of a 50' flow line radius is required when an arterial street intersects a state highway, unless otherwise approved through traffic engineering.

L. Verify written easements are received for any required easements not dedicated on the final plat. Check the easements for accuracy and check that all roadway improvement (i.e., curb and gutter, walk, etc.) are located within dedicated public ROW or pedestrian easements when applicable.

M. Identify the numeric phasing designation and the physical limits of each construction phase.

1. Type III barricades or 3-rail fence with "End of Road" sign, and any related pre-warning signs at all deadends of roads and sidewalks. For detail see Part

IV, 4.6.b.

2. Secondary access provided for dead ends of length  $\geq$  400' shall be all weather surface, 20' wide, 6'' minimum thickness of Class 5 or 6 ABC or recycled HBP.

3. 50' outside radius all weather turn around at deadend roadways longer than 150'.

<u>Applica</u> N/A	ant Validation	Staff Check		
<u></u>	mondood			
			N.	Roadway Geometrics
				1. Cross-pans
				1a.Centerline radius data.
				2. Design Speed/Posted Speed
				3. Street intersections at right angles, max. skew = 10°
				4. $F_L$ to $F_L$ dimensions.
				5. R.O.W. dimensions and curve data.
				6. Curb return radius data.
				7. Profile grades, in percent.
				8. Vertical curve data (including K-values, length, etc.)
				9. Curb and gutter radius data.
				10. Centerline profile and $F_L$ profile on both sides of roadways as required (i.e., curves, intersections, etc.)
				11. Label 100' stations and show 50' stations.
			O. sight d crest v	Document on the plans that there is sufficient istance for all movements at intersections, and on ertical curves on arterial streets.
			P. 3.3.4. <i>A</i>	Existing utilities and structures per Section 5 of these Standards.
v.	Street C	ross-sections.		
			А.	Cross Sections
				1. Surveyed cross-sections in 50' intervals are required on all arterial streets. Cross-sections will also be required on other streets and driveways if special conditions warrant it (i.e., widening of existing streets). The interval frequency may be adjusted where warranted due to unique site topography. The use of aerial photography is not acceptable.
				2. Check cross slopes for a minimum of 1.5% and a maximum of 4%. Refer to Part IV, Section 4.3.1.b.
				3. Check cuts and fills on all proposed streets. Catch points vs. R.O.W. line. Too much

of either may result in slopes which overrun the R.O.W. In this case, a construction easement will be required.

<u>Applica</u>	ant Validation		
<u>N/A</u>	Included	Staff Check	
			4. Information to be shown on each cross section.
			a) Curb and gutter, existing and proposed.
			b) Roadway surface, existing and proposed.
			c) Sidewalk, existing and proposed.
			d) Pavement, base and subgrade thickness, existing and proposed.
			e) Cross grades, existing and proposed.
			f) R.O.W., existing and proposed.
			g) Easements, existing and proposed.
			h) Sideslopes, existing and proposed.
VI.	Striping	Plan	
			A. SIGNING & STRIPING PLANS ARE REQUIRED on all streets classified minor collector and greater. Major Collector and Arterial street signing and striping plans shall have a minimum scale of 1"=30' and shall be per M.U.T.C.D. and the City Standards.
			1. Bike lanes w/symbols and dimensions (7' min. adjacent to curb and gutter, 5' min. adjacent to travel lanes w/o curb and gutter.)
			2. Travel lanes w/dimensions for all tapers, angle points, turning bays, medians, symbols, etc.
			3. Location of all existing and proposed signs (i.e., no parking/bike lane, stop, speed, warning, etc.)
			4. R.O.W., easements. (All traffic control devices must be located within right-of-way or easements.)
			5. All street improvements (i.e., curb and gutter, walk, asphalt, etc.) w/dimensions.

Applicar	nt Validation	Staff Check		
<u>11/74</u>	Included	<u>Otan Oneck</u>		
			6 F 10	6. Layout data/geometrics to all angle points, end points, symbol locations, and sign locations.
			7 " ta b ti	7. Add note to signing and striping sheet: "The layout of all signing and striping using 3-M temporary tape at a minimum of 50' spacing shall be approved by the City Street Inspector prior to the installation".
			8 c	8. Preformed thermo-plastic for arrows, cross walks, bike symbols, etc.
VII.	Sanitary	Sewer Plan and Profile		
			A. I if phasing i Standards f	Include Phasing of construction and development is desired. See Water/Wastewater Development for further requirements.
VIII.	Storm Se	ewer Plan and Profile		
			A. C all storm dr	Check to make sure water tight joints are used on lrainage pipes underneath roads.
			B. I if phasing i	Include Phasing of construction and development is desired.
			C. T lines of the designed fo	The profiles must include the hydraulic grade e storm event that the storm sewer is being for.
			D. C storm sewe	Check to make sure there is a profile for each er and culvert being proposed.
IX.	Utility De	etails		
			A. A standardize the Plans, i	All improvements that have not been ed are required to be fully designed and shown in including the following items:
			1 f	1. Curb inlets and outlets (to have grates for sidewalks).
			2	2. Irrigation boxes.
			3	3. Drainage structure inlets and outlets.
			4	4. Bridges.
			5	5. Drainage pans.
			6	6. Retaining structures.
			B. A by the appr	All standardized improvements shall be depicted propriate City Standard Detail Drawing.

<u>Applica</u>	ant Validation		
<u>N/A</u>	Included	Staff Check	
			C See Water/Wastewater Development Standards
			for further requirements.
X.	Typical	Pavement Cross-Se	ctions & Street Improvement Details
	- 5 P		
			A. Pavement sections are to be designed using a soil investigation report as a basis for design, or by using the City's default values as found in Part IV, Table 4.3.
			1. This design will include:
			a. Methods of stabilizing the subgrade. The most common method is to scarify to a minimum depth of six inches and re-compact to a uniform minimum of 95% relative density as determined by AASHTO T-99.
			b. Thickness of the aggregate base course. Compacted to 95% in accordance with T-180.
			c. Thickness of asphalt pavement.
			2. "Default pavement design" may be chosen vs. a full pavement design based on a soils report. The default pavement design is based on the following coefficients.
			a. Aggregate Base Course (A.B.C.) strength coef. = $0.11$ per inch, unless R Value tests are submitted which show R values > 78.
			b. Pavement Grading "C" & "G" Hot Bituminous pavement strength coefficient =0.44 per inch.
			c. The minimum sums of the coefficients for the default pavement design are listed below:
			Pavement ThicknessStreet Clarification WSN(full depth HBP)Local2.225.5"Minor Collector2.977.0"Major Collector3.488"2-lane Arterial4.089.5"4-lane Arterial4.5110.5"6-lane Arterial4.7711"
			d. Show the min/max lift thickness for Grading "SX" HBP =1.5" and 2.5" respectively.

<u>Applica</u>	ant Validation			
<u>N/A</u>	Included	Staff Check		
				<ul> <li>e. Show the min/max lift thickness for Grading "S" HBP =2" and 3" respectively.</li> <li>f. Show the min/max lift thickness for Grading "SG" HBP =3" and 5" respectively.</li> <li>g. Minimum allowable pavement thickness shall be as shown</li> </ul>
			B. recommen ground wa of the met water area appropriat	in Table 10-1. Soils/Subsurface investigation report to ad methods of stabilizing the subgrade when ater is within 3' of the pavement section. Details hods of construction of the roads, in high ground as, shall be shown and described in the e typical cross-section.
			C.	Standard Details
				1. Access ramp.
				2. Gutter pan.
				3. Curb and gutter (vertical or driveover).
				4. Sidewalk (detached or attached).
				5. Elevated sidewalk crossings at driveway (detached walk only).
				6. Monolithic curb and gutter/walk (driveover or vertical).
				7. Commercial drive approach (flared or radius).
				8. Residential drive approach (flared or radius).
				9. Curb chase.
				10. Crown transition.
				11. Industrial edge protection.
			D. speed hun	Non Standard Details – construction detail (i.e., np, traffic circles, etc.)
			E.	Street Construction Notes (See appendix I-B)

 Applicant Validation

 N/A
 Included
 Staff Check

# XI. Signing and Striping Details

			A.	Signing	(include N	IUTCD de	esignations):
				1.	Standard	Details	
					a. sleeve in	4" diame concrete.	ter cutout/PVC
					b.	Sign pos	t and stub.
					c. numbers	Street na	me sign and block
					d. closure s	Type III ign (road	barricade with or sidewalk).
					e.	No parki	ng sign spacing.
					f.	Speed lin	nits.
					g. plans for flashers,	With sch X-walks, etc.	ool zones. Routing stop signs, school
					h.	No signs	in sidewalks.
					i.	Install be	chind attached walk.
			B.	Striping:			
				1. markings preforme bars).	Size and details for all pavement gs. (Latex paint for lane lines, and ned thermoplastic for all symbols and		
					2.	Details	
						a.	Arrow, only, arrow
						b. arrow	Diamond, bike,
						c. (crosswa	Intersection detail lk, stop bar)
						d. Style)	Crosswalk. (Denver
XII.	Landscap	e Plan					
			A.	Include the following in the Landscape Plan:			
				1. Show all public median treatments (i.e., plants, groundcover, subdrains, etc.)			

<u>Applic</u> <u>N/A</u>	ant Validation Included	Staff Check	
			2. Show all proposed public tree lawn treatments.
			3. Show all existing mature vegetation.
			4. Annotate intersection sight distance triangles and horizontalcurve stopping sight distance triangles on all proposed streets.Private easements may be needed which restrict installation of certain landscape material.
			5. All proposed and existing water, wastewater, storm drainage facilities, including laterals, services, meterpits, hydrants, blowoffs, airvacs, etc. Clearances of 10' to any tree and 5' to any shrub must be maintained for all proposed and existing facilities.

# **Appendix E-5**

## City of Fort Collins - Engineering Inspection STOP WORK ORDER



**NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Job location:

I have inspected this structure and these premises and have found the following violations of City laws.

You are hereby notified that no more work shall be done until the above violations are corrected.

Date

Inspector

The above signed certifies that a copy of this order was posted on the premises and duly served upon the below signed.

Acknowledged:

Date

# DO NOT REMOVE THIS TAG

Please contact the Engineering Department at 281 North College Avenue, (970) 221-6605

# Appendix E-6

# City of Fort Collins Engineering Department Electronic Document Criteria

# **NOTE:** Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

#### 1.1.1 GENERAL INFORMATION

In 2000, the City of Fort Collins Engineering Department began converting all Engineering documents into electronic images. The initial conversion included documents such as Subdivision Plats, Utility Plans, Site and Landscape Plans, and Building Elevation Plans. The Colorado Public Records Act states that electronic images must be of a manor and scale to accurately reproduce the original and be of high quality and usable for the customer. To ensure all documents submitted and added to the Engineering Department Document Management System adhere to this act, this set of basic criteria has been developed.

This document is not intended to cover every possible situation that may arise. If you have questions regarding these criteria, please contact the Engineering Department Document Retrieval System Team Leader.

#### 1.1.2 General Submittal Criteria

All final submittals for development projects and City capital projects are required to conform to the criteria set out in this document. This includes all development and capital projects within the jurisdiction of Fort Collins, including those projects soon to be annexed within the Growth Management Area boundaries.

All information shall be clear, concise and legible for final document acceptance. A visual evaluation will be performed on every plan sheet submitted. All sheets, or portions of sheets, found not in conformance with these criteria will be returned to the submitter for correction and resubmittal.

#### 1.2 SUBMITTAL CONTENT REQUIREMENTS

- 1.2.1 General Requirements
  - Adhesive material on mylar shall not be allowed.

- All sheets shall be uniform in contrast, scale, and proportionality to ensure readability.
- An enlarged diagram or detail sheet shall be provided when the details, including short lines, dimensions, and text cannot be clearly shown or read in the body of the plans.
- If an area is congested with a lot of detail, the text information should be located in an open area and referenced back to the point of origin.
- All non-black color will be rejected.
- CAUTION: Photocopied mylars of poor quality will be rejected.

### 1.2.2 Text and Lettering

The readability of text, lettering and numeric symbols is often obscured when the proportionality between the character and line weight is in conflict. We encourage a design approach that adjusts line weight to the size of the lettering. Smaller text, particularly text that is next to a line, symbol, or other text, is generally unreadable when plotted with a heavier line weight. Therefore these criteria require a proportional line weight to character or letter size to prevent "bleeding" or poor readability.

- The minimum recommended character and/or letter shall be equivalent to a height of 2 mm and a line weight of .25 mm.
- Uppercase lettering is preferable, however, lower case lettering is allowable as long as proper proportionality is used.
- No text, symbols, and/or lines shall be placed on top of other such information to impair readability.

## 1.2.3 Lines

Line weights have significant impact upon the quality of images. When lines are too thick or close to other information the readability is compromised.

- A minimum recommended grayscale color for any information depicting existing features shall be 252.
- Lines indicating existing facilities and utilities shall be dashed.
- Lines throughout a document shall not be inserted through text, symbols, or numbers. A line should be broken to ensure readability of information.
- 1.2.4 Shading and Hatching Patterns

When using shading or a hatching pattern to identify areas, the text and other information is often unreadable due to the darkness of the shading or when the thickness of a hatch pattern obscures the underlying information.

- No text, symbols, numbers or other information shall be covered by shading or hatching patterns.
- 1.2.5 Scale

An appropriate scale shall be used for all engineering drawings and details. Refer to the Larimer County Urban Area Street Standards, Section 3.2.7.

#### 1.3 FIGURES/EXAMPLES

Arrows are provided to draw attention to the specific detail and are not tied to specific words in the caption description.

#### 1.3.1 GOOD EXAMPLES



Figure 1.3.1 A – Good overall layout; text is readable; no lines through text or symbols; reduced clutter by using arrows; average proportionality on text.

LINE	DIRECTION	DISTANCE
L1	S 34'37'43" E	34.00'
EL1	N 74'17'10" E	26.69'
EL2	N 15'42'50" W	14.05
EL3	N 0017'05" W	14.23
EL4	N 90'00'00" E	/30.24'
EL5	S 89'50'00" E	/ 17.00'





Figure 1.3.1 C – Good line/text usage; line is broken to insert text.



Figure 1.3.1 D – Good hatch pattern; pattern cleared for text.

#### 1.3.2 – Poor Examples



Figure 1.3.2 A – Poor overall layout; lines through text; text unreadable; line weight is too thick in some areas; hatching obscures text.



Figure 1.3.2 B – Poor proportionality with text and pen weight; thick lines, hatching conflict with text ; text/numbers without reference point.



Figure 1.3.2 C – Poor hatching/text; poor proportionality of text and pen weight; poor text style; lines through text.



Figure 1.3.2 D – Poor use of lines through text; text going in opposite directions; loss of lines and information; poor proportionality between text and pen weight.



Figure 1.3.2 E – Poor use of shading; poor proportionality of text and line weight; difficult to read.



Figure 1.3.2 F – Poor examples of text quality; poor proportionality of text and pen weight; unreadable.

# Appendix F - Fort Collins Traffic Operations Manual

# **NOTE:** Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Fort Collins Traffic Operations Manual (City of Fort Collins Only) Appendix F - Fort Collins Traffic Operations Manual

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 Adopted by Larimer County, City of Loveland, City of Fort Collins

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Appendix F - Fort Collins Traffic Operations Manual

Traffic Control Devices - Section 1-1

#### General

Traffic control devices will be installed on all new streets accepted by the city for maintenance as set in these STANDARDS AND SPECIFICATION.

#### Work Area Traffic Control - Policy

Traffic Operations has the responsibility to assure public safety within the right-of-way within the City of Fort Collins city limits. All traffic control plans are submitted to the Transportation Department for approval or modifications. All traffic control plans include vehicular, pedestrian, and bicycle movement and safety within the project.

Upon approval of a traffic control plan by Traffic Operations, a contractor/developer and/or City department can set up traffic control and work zone safety devices within the city limits and upon the right-of-way. The contractor/developer and /or City departments are responsible for setting the devices as per the approved traffic control plan.

Traffic Operations will periodically monitor job sites to assure that all devices are set according to an approved plan and are in a satisfactory order for the safety of the public.

If a deficiency is found upon review of the work sites by Traffic Operations, they will notify the agency (contractor/developer and/or City Department) of said deficiency. Depending on the situation, if the deficiency is not corrected within due and reasonable time, Traffic Operations will notify the traffic control company under contract with the City of Fort Collins to correct the deficiency. The cost of traffic control and/or work zone safety devices will be the responsibility of said contractor/developer and/or City department.

#### Traffic Control Plans - Policy

All City Departments, contractors and/or developers are to submit a traffic control plan for all projects within the right -of-way and adjacent to, within the city limits of the City of Fort Collins.

Failure to submit a traffic control plan by said City department, contractor and/or developer for any project would be subject to denial of work and removal from the right-of-way.

#### Traffic Construction Policy for Developers

This policy has been developed to set procedures for traffic construction relating to certificate of occupancy releases, as well as recouping the cost for this work. Notices and payment from developers will be required before work is scheduled. Standard forms have been developed and must be submitted before traffic construction takes place. These forms are available at the City's Traffic Operations Department.

The attached schedules and requirements are made part of this policy. Traffic Operations will attempt to reduce the time upon request. The developer can choose to have all the

work completed by a qualified City traffic contractor. Approved plans will be required, and charges for review and inspection City time will be billed.

NOTICE OF WORK FORM

DATE

I am hereby requesting that the City of Fort Collins Department of Transportation prepare a cost estimate and partial billing for signage, pavement marking, and traffic signal work for or caused by my development known as \_\_\_\_\_\_\_ I have enclosed four sets of development plans, including block numbers, in order to perform this work. I understand that costs are estimates, and may change upon final construction. I will accept the cost related to all traffic work, including any changes. My present schedule for your construction would be \_\_\_\_\_\_\_ 1986. Signature\_\_\_\_\_\_ Position\_\_\_\_\_\_ Company\_\_\_\_\_\_ Address\_\_\_\_\_\_ Phone

Received:

REQUEST OF WORK FORM

DATE

I am hereby requesting construction of signage, pavement marking, and traffic signals for all/part of my development known as \_\_\_\_\_\_ I have enclosed a map of the area of work, and have instructed the other contractors that this work will begin in weeks. I understand that I will receive final billing for this area, and construction will not begin until two weeks after the City receives payment, weather permitting. I understand no refund will be due me for any of this work.

Signature\_\_\_\_\_

Position\_\_\_\_\_

Company\_\_\_\_\_

Address

Phone\_\_\_\_\_

Received:

#### TRAFFIC OPERATIONS RELEASE TO OBTAIN CERTIFICATE OF OCUPANCY FORM

All materials and payments have been received for part/all of \_\_\_\_\_\_\_ Construction is completed or scheduled shortly. This is to serve as a release for traffic items concerning certificate of occupancy within this area.

cc Building Inspection

Sign Standard - Section 1-2

#### Street Name Sign

Street name signs will be furnished by the Contractor or Developer and will be installed by the City, or a private contractor to be inspected and approved by the Traffic Operation Department. Sufficient signs and posts will be provided to allow installation one corner of each intersection and will have white letters on a green background in conformance with following dimensions:

Intersection TypeSign Blank SizeLetter HeightLocal/Local6" x 36" or 6' x 30"4" Street Name or 2" Suffix St., Ave., etc.SignalizedIlluminated Signs, see 722.02 See 722.02All Other9" x 42" or 9" x 48"6" Street Name or 3" Suffix St., Ave., etc.

#### Illuminated Signs

Internally illuminated street name signs will be furnished by the Contractor or Developer and will be installed by the City. Signs will be NU Art Lighting and Manufacturing Co. NAIM series or Ameron. Signs will be provided to allow installation on each traffic signal mast arm at each intersection. Sign lettering shall be in the ten-inch (10") upper case letters series "C". The use of the series "B" letters is permissible where limited breath and stroke widths are required for design purposes. Suffixes are to be five-inch (5") upper case letters. Lettering for supplementary to indicate the type of street or section shall be at least four inches (4") where a two-line application is desired or three inches (3") where a three-line application is desired.

#### **Borders**

The sign shall have no border.

## Spacing

One line with equal spacing between each word relative to end of blanks.

# **Two Inch (2") Arrow Heads**

Arrows are to M.U.T.C.D. standards as illustrated in the Standard Highway Sign Handbook.

#### Color

Letters and numbers are to be white on a green background face. Sign panel is to consist of 3M Engineering Grade Green. The colors shall not fade when exposed to an accelerated test of ultraviolet light equivalent to five years of outdoor exposure.

## **Illumination Source**

The entire surface of the sign panel shall be evenly illuminated. The illumination source shall be fluorescent lamps, powered for low temperature operation. There shall be separate ballast for each fluorescent lamp. Photoelectric controls are required and shall

be the "hail resistant" type and of the load intended. The reflectors shall have a minimum reflectance of 85%.

# **Final Layout**

Final layout and lettering details are to be submitted to the City before fabrication

Stop/Yield Signs

Stop signs will be installed at locations designated by the Traffic Engineer. Stop signs/yield signs will be mounted on the same support posts as street name signs where possible.

Other Signs

Speed limit signs, school signs, and crosswalk signs will be installed at locations designated by the City Traffic Engineer.

Sign Supports

All supports or posts will conform with specifications to Cold Rolled Carbon Steel Sheets, Commercial Quality, ASTM Designation A-366. The cross section will be square and consist of ten (10) gauge or Twelve (12) gauge steel (0.135 U.S.S. Gauge or 0.105 U.S.S. Gauge) carefully rolled to size and continuously welded at the corner and will conform to the following side dimensions:

Total Sign Area Side Dimensions 1-3/4" x 1-3/4 1-3/4" x 1-3/4

The finished members will be straight and will have a smooth, uniform finished. It will be possible to telescope consecutive sizes of tubes freely with a minimum amount of play. All holes and cut-off ends will be free from burrs. Seven-sixteenth inch (7/16") diameter holes will be punched on one inch (1") centers on all sides of the tube. All posts will be weather protected by galvanizing. Posts will be formed from cold rolled steel strip, which has been zinc coated and is commercial quality (1.25oz) conforming to ASTM Specification A-525.

Traffic Signing Standard - Section 1-3

General

The Traffic Engineer shall determine what type and where to install controls based on standard engineering practices and the MUTCD. These controls shall include traffic control signs, street name signs, delineators, permanent barricades and pavement markings.

#### Working Hours

All work within public ROW shall begin after 8:00a.m and shall terminate, clear of public ROW before 4:00p.m. Monday though Friday, unless variations to these time limits are granted or required by the Traffic Engineer.

#### Traffic Control

Precautions shall be taken to insure that proper traffic control measures are provided for safe and convenient movement of public traffic on public roadways while working in or adjacent to the roadways.

#### Materials

All items used in the fabrication, manufacturing and installation of traffic control signing and pavement markings in the City of Fort Collins shall be manufactured in the United States with domestic materials and parts. Domestic materials and parts are those which are melted, east, formed, shaped, drown extruded, forged, fabricated, or otherwise processed in the United States, using raw material produced in the United States.

#### Variance Requirements

The Responsible Party shall acquire a City traffic control permit prior to installation of any signs. The permit shall constitute City authorization for the Responsible Party to install official traffic controls on pubic ROW.

#### Inspection

After installations, the signing Responsible Party shall notify the Traffic Engineer. The Traffic Engineer shall then inspect all installations and notify the Responsible Party of any corrections needed. The Traffic Engineer shall make a second inspection at the time of the final walk-through of all public ROW improvements. The Responsible Party must correct all signing problems.

#### Relocation

The Responsible Party is responsible for the removal and relocation of all existing traffic signs on public ROW affected by the approved project.

#### Sign Fabrication

All standard control and street name signs are to be fabricated on .080/5052 H 38alodized aluminum blanks with standard radius corners.

All traffic control signs and metro street name signs are to be fabricated using 3M Company Engineer Grade reflective sheeting. Street name signs shall be fabricated with 3M Company Engineering Grade reflective sheeting.

All traffic control sign faces are to be screened in conformance with methods prescribed by 3M Company using 3M inks. No substitutions shall be allowed unless approved by the Traffic Engineer before fabrication in writing.

All standard signs, except street name signs, shall be fabricated to conform exactly to the detailed in the latest Standard Highway Signs Manual as published by the U.S. Department of Transportation/Federal Highway Association.

All street name signs shall be fabricated in accordance with City Standard and Specifications.

All signs shall be fabricated with new materials. Used or reconditioned sign blanks, outdated sheeting, and/or precut letters or numbers shall not be used.

#### Sign Installation

All signs shall be installed in strict conformance with part II of the latest edition of the Manual on Uniform Traffic Control Devices and revisions. All signs are to be mounted on either the approved City Breakaway supports, or cantilever aluminum stand off light pole side mounts, or banded to street light poles.

- Control signs must be either banded to street light poles as determined by the Traffic Engineer, or mounted directly onto a breakaway support.
- Mounting of signs to breakaway supports shall be accomplished by use of drive rivets, except back to back street name signs shall be mounted using five-sixteenths (5/16) of an inch plate nut and bolt arrangement.

Assembly of the breakaway supports to the anchor shall be by using a corner bolt or a drive rivet, or by using a (5/16-18) bolt.

The Responsible Party shall, prior to installing sign support bases, contact all utility agencies, including U.S. West, Public Service, United Power, Cable Company and the City of Fort Collins Utilities, to locate any buried service, and to avoid damage when the base is installed.

All signal multiple sign installations shall be on TELESPAR 16F 10 or equal and ten foot (10') support assemblies. All sign support bases for standard sign installations shall be TELESPAR No. 20F 12 or equal and thirty (30) inches long installed so that four inch (4") plus or minus one-half inch (1/2") protrudes above ground level.

All supports for standard sign installations shall be installed so that a minimum of six inches (6") is inside of support base and the sign height conforms to MUTCD. All sign supports for standard sign installations shall meet or exceed the following specifications:

- The cross section of the post shall be square tubing formed of twelve (12) gauge steel.
- Tubing seam shall be welded in such a manner that the weld or flash shall not interfere with the telescoping of the tubing.
- Support tubing size shall be one and three quarters inch (1-3/4"), U.S.S. twelve (12) gauge, with the weight of 2.06 pounds per lineal foot.
- The length of each post shall be as specified and have a permissible length tolerance of plus or minus one-quarter inch (1/4").

- The finished post shall be straight and shall have a smooth uniform finished.
- It must be possible to telescope a one and one-half inch (1 1/2") by one and one-half (1 1/2) O.D. post into a one and three-quarter inch (1 1/2") by one and three-quarter (1 3/4) O.D. post.
- It must be possible to telescope a one and three-quarter inch (1 3/4") by one and three-quarter inch (1 3/4") O.D. post into a two inch (2") by two inch (2") O.D. post.
- The outside tolerance at all sides at all corners must be as followed:
- For one and one-half inch (1 1/2") by one-half inch (1 1/2") O.D. plus or minus .006 inch
- For one and three-quarter inch (1 1/2) by one and three-quarter (1 3/4) O.D. plus or minus .008 inch
- For two inch (2") inch by two (2) O.D. plus or minus .008 inch
- The wall thickness must fall between a plus .011 inch and a minus .008 of U.S.S. twelve (12) gauge.
- The maximum twist permissible in three foot (3') lengths for a standard one and three quarter inches (1 3/4") by one and three-quarter inch (1 3/4) sign support is .062 inch.
- The maximum tolerance in square's for one and three quarter inch (1 3/4") by one and three quarter inch (1 3/4") supports is plus or minus .010 inch.
- A maximum tolerance in straightness of one-sixteenth (1/16) of an inch in three (3) feet is permissible.
- All supports must be given a double outer finish. The first outer finish is galvanized.

The following specifications must be met:

- Each square steel tube support must be hot dipped galvanized, ASTM a-525 coating, designation G90, or given a triple coated protection by in-line application of a hot dipped galvanized zinc per AASHTO M-120 followed by a chromate conversion coating.
- Tensile strength of 7500psi
- Impact resistance to not less than one hundred and sixty (160) pounds
- Hardness of eighty-seven (87) shore D Durometer
- Flexibility of one hundred (180) degrees bend over one quarter inch diameter mandrel without caking or loss of adhesion
- Dielectric strength of one thousand (1000) v/mil at ten (10) mils

Application of final outer finish shall be accomplished by the following process:

- Pre-treating is required to remove all grease, rust and dirt and then a thin coat of iron or zinc phosphate must be applied. This pretreatment is required to provide maximum adhesion and long term corrosion protection.
- The powdered resins are applied to the cold support tubing through a electrostatic gun. The support must then be baked in order to fuse the finish to the surface.
- The outer finish must have a minimum thickness of (2) miles.
- Before any of the other final finishes being applied, all plastic protective coating shall be removed.

Sign Maintenance

It is the responsibility of the Responsible Party to maintain all required signs after installation until the City has officially granted the initial acceptance of the adjacent ROW improvements. Signs installed under this standard shall be maintained during the development construction period in two manners.

The Responsible Party shall repair signs damaged, which do not constitute an immediate hazard to the public, within a responsible time, not to exceed ten working days after responsible Party has been notified.

Sign damages that constitute an immediate hazard to the public shall be repaired or replaced by City forces. The Responsible Party shall be responsible of the cost of repairs and or replacement.

# Sign Standards - Section 1-4

General

All signing shall be in accordance with the following design criteria.

Design Criteria

- All signs shall conform to current M.U.T.C.D. Standards and Colorado Supplement.
- All signs shall be installed on Unistrut Telespar type perforated posts with anchors at proper height as per current M.U.T.C.D Standards.

Sign backing shall be as followed:

- All signs shall be .80 aluminum.
- All signs shall be mounted with City approval vandal proof bolts or rivets.

Unistrut Telespar type posts shall meet or exceed the following:

- Posts –1 inch x 1 inch, 12 gauge, ASTM Specification No. A446, Grade A, drilled on 1 inch centers.
- Anchors 2 inch x 2 inch, 12 gauge, ASTM Specification No. A446 drilled on 1-inch centers.
- All posts and anchors shall be galvanized to ASTM Specification A525 coating designation G90.
- All sign shall be minimum engineer grade reflective sheeting, seven (7) year guarantee or approved equal.
- Street name signing dimension and lettering shall conform to Standard Detail S-35 and S-36.

Traffic Signals - Section 2-1

**General Provisions** 

These specifications for traffic signals supplement the roadway design specifications and shall govern the materials used and the installations of traffic control signals.

Construction of traffic signal systems shall be done in accordance with these Standards and Specifications, the latest edition of MUTCD for Streets and Highways, the latest revision of the Colorado Supplement thereto, and in conformity with the details as shown on the traffic signal plans.

The Responsible Party shall have an IMSA Certified Traffic Signal Level II Technician on- site during the period and splicing and/or termination of writing for head and controller installation, and shall provide the Traffic Engineer with a copy of the Technician's certification prior to the start of work.

#### Conditions of Materials Furnished

All items furnished shall be new state-of-art equipment and materials. The Responsible Party shall submit a list of equipment and materials, which are proposed to be installed to the Traffic Engineer for approval, before Responsible Party ordering such materials. Each item shall be identified by the trade name, size, and catalog number.

All traffic control equipment installed in the controller cabinet shall be products from the same manufacturer, or fully compatible if equipment from more than one manufacturer is used. At existing traffic signal installations being rebuilt, all traffic control equipment furnished by the Responsible Party shall be compatible with any existing equipment to be retained.

The traffic signal installation shall include all traffic control equipment necessary to provide the sequence of operations as shown on the plans. The Responsible Party shall furnish and install any additional control equipment required to provide the sequence of operation shown on the traffic signal plans.

The Responsible Party shall furnish all labor, tools, equipment and incidentals necessary to complete the project in an efficient manner.

The Responsible Party shall furnish a guarantee from the supplier/manufacturer for all equipment provided. These guarantees shall be delivered to the Traffic Engineer before final payment to the Responsible Party.

## Definitions - Section 2-2

General

Whenever special engineering terms and words are used in these Standards and Specifications, or in other contact documents, the intent and meaning shall be as defined in the Transportation and Traffic Engineering Handbook, ITE, latest edition.
#### **Regulations and Codes**

In addition to the requirements of the plans, these Standards and Specifications and the Special Provisions, all items shall conform to the requirements of the NEC, hereinafter referred to as the code, Rules for Overhead Electrical Line Construction of the Colorado Public Utilities Commission; standards of ASTM, ANSI, and any local ordinance which may apply.

Wherever reference is made to any of the standards mentioned above, the reference shall be construed to mean the code, order, or standard that is in effect on the date of advertisement for bids.

#### **Required Documents**

Upon completion of the work, Responsible Party shall submit as built drawings or corrected plans and/or additional data required by the Traffic Engineer to detail all construction changes. This shall include but not be limited to writing, cable, location, and depth of conduit and modifications to original cabinet writing.

The Responsible Party shall submit two (2) sets of schematic wiring diagrams to the Traffic Engineer for the traffic signal controller, the signal installations light circuits, and all auxiliary equipment, including units and values of each component used in the cabinet. The diagrams shall show in detail all circuits and components. Such components shown thereon shall be identified by name or number and in such a manner as to be readily interpreted.

All diagrams, plans and drawings shall be prepared using graphic symbols shown in ANSI Y32.2, A Graphic Symbols for Electrical and Electronic Diagrams. One copy of the controller cabinet diagram and the intersection and phase diagram, as approved by the Traffic Engineer shall be placed in a heavy plastic envelope with side opening, and placed inside of each controller cabinet prior to the initial acceptance of the project.

#### Schedule of Work and Working Conditions

The Responsible Party shall provide constant attention to the work necessary to facilitate the progress thereof, and shall cooperate with the Traffic Engineer, City inspectors, and other Responsible Party's in every way possible. At the end of each working period, all excavations shall be barricaded and/or covered to provide safe pedestrian and vehicular passage.

At points where the Responsible Party's operations are adjacent to properties of railway, telegraph, telephone, power companies, cable television, water, sanitary or storm sewer lines, where any damage would result in considerable expense, loss or inconvenience, work shall not commence until all arrangements necessary for the protection thereof have been made.

The Responsible Party shall cooperate with all underground and overhead utility line owners for any removal or relocation that is necessary, so that these operations may

progress in a reasonable manner, duplication of work shall be reduced to a minimum, and services rendered by those shall not be unnecessarily interrupted.

In case of an accidental breakage or another cause of interruption to water or utility services, the Responsible Party shall promptly notify the proper authority and shall cooperate with the authority in restoration of service. If water service is interrupted, repair work shall be continuous until the service is restored. Work shall not be undertaken around fire hydrants until approved by the local fire authority. If any damage is caused to the following: sidewalks, curbs, gutters, Portland cement concrete, asphalt concrete pavement, underlying material, lawns and plants by the Responsible Party's operations, which are not itemized in the plan to be removed, shall be replaced or reconstructed at the Responsible Party's expense. Using the same kind or equal quality of material as used originally and that meet the satisfaction of the Traffic Engineer.

Disposition of Keys and Instruction Manuals When the project is complete, two (2) keys for each controller cabinet and Police Panel shall be delivered to the Traffic Engineer. The Instruction Manual for the controller shall be left inside the controller cabinet.

Maintaining Existing Traffic Signal Operations Existing traffic signals shall be kept in effective operation for the benefit of the traveling public by the city.

At intersections where power to all signals must be turned off, the city shall furnish a Fort Collins police officer. The Responsible Party must request a police officer at least forty-eight (48) hours prior to the time the officer is needed. Requests for Fort Collins police officers must be made through the Traffic Engineer.

The above does not apply to intersections which are completely closed to all traffic due to construction.

The Responsible Party shall maintain a minimum of two (2) three section (red, yellow, green) traffic signal heads for each approach. In the event that temporary signals are necessary to maintain the minimum signal display, the responsible Party shall be responsible for furnishing all materials, equipment, tools, and labor necessary to install and maintain the temporary signals. The Traffic Engineer prior to installation must approve temporary signals. The Responsible Party shall maintain any temporary signal installed. The City shall furnish electrical energy for operation of a temporary signal. The Traffic Engineer must approve timing and phasing of the temporary signal.

### Field Test of Equipment

Prior to completion of work, the Responsible Party shall make the following tests on all traffic signal circuits, in the presence of the Traffic Engineer and the controller representative, if a new controller is used:

- Each circuit shall be tested for continuity.
- Each circuit shall be tested for grounds.
- An insulation resistance test shall be made on each circuit between the circuit between the circuit and the ground. The insulation resistance shall not be less than the values specified in the provisions of the NEC.
- Prior to functional testing of a new signal system (new location), the signal shall be run on flash cycle for a minimum of two (2) days and a maximum of four (4) days prior to turn on.
- A functional test shall be made which demonstrates that every part of the system functions as specified herein. The functional test for each traffic signal system shall consist of at least five (5) days of continuous satisfactory operation. If unsatisfactory performance of the system develops, the conditions shall be corrected and the test shall be repeated until five (5) days of continuous, satisfactory operation is obtained.
- Functional test shall start on any working day except Monday or the day preceding a legal holiday.
- During the test period, the city shall provide the electrical energy and repair any damage caused by public traffic. All other maintenance shall be the Responsible Party.

### Final Equipment Turn-On

Turn-on of new or modified signal systems shall be made only after all traffic signal circuits have been thoroughly tested.

All louvers, hoods and signal heads shall be directed to provide maximum visibility. Initial turn-on shall be between 9:00 a.m. and 2:00 p.m. and the Traffic Engineer must be present. Only, unless otherwise specified. Prior to turn-on, all equipment as shown on the plans shall be installed and operable. This includes pedestrian signals, pedestrian push buttons, vehicle detectors; and Opticom. The Traffic Engineer must approve any exceptions to this.

All components of the system must be complete and in operational condition to the satisfaction of the Traffic Engineer prior to the final turn-on.

### General

The installation of traffic control devices and street lighting shall comply with all applicable portions of the CDOT Standard Specifications for Road and Bridge Construction, the Manual on Uniform traffic Control Devices and those accepted plans. These STANDARDS AND SPECIFICATIONS and any other requirements determined by the City Engineer will apply to all materials supplied and methods and procedures of work.

## Policies - Section 2-3

Procedure for Master Computer Failure

• Determine down time of master computer (expected long term)

- Notify supervisor of master computer status
- Notify police department of situation (may need assistance at major intersections)
- Notify administration/secretarial of condition (for the purpose of answering calls)
- Send traffic personnel to troubled areas upon Notification by police department of administration. (if large area is affected request assistance from other departments)
- If needed, remove master computer off line from local Intersections (disable traffic control to prevent erroneous data Commands from being sent to the local controllers)
- Notify police department of situation to inform Traffic Operations of any problem areas.
- Continue communication to administration/secretarial of conditions. (To answer questions that may be called in and any problem area.)
- Notify department head (first line supervisor needs to notify department head of Status and the length of the time master computer will be disabled).

### Preventive Maintenance Test

The purpose of the Preventative Maintenance Program is to provide a thorough inspection of each Traffic Signal/Pedestrian Crossing and Controlled School Zone with in the city of Fort Collins. The emphasis is put on self detection methods of finding faults and malfunctions and assuring all faults and malfunctions are corrected in a timely manner. There is also emphasis placed on testing that all equipment at such location does function as it was designed and placed at that location.

The signal division has a Preventive Maintenance Program now in effect. This program provides the basic services that are suggested by the Manual on Uniform Traffic Control Devices. The department provides properly skilled maintenance on an annual and biannual basis that will minimize the interruption of signal operation due to equipment failure, and also increase public safety and reduce liabilities within the city of Fort Collins. The following is a list of the annual and bi-annual inspections that take place:

Traffic Signal Operations Test - Six Month Check (bi-annual)

- Controller Cabinet
- Controller
- Conflict Monitor
- All Timings
- Amplifiers (Loop)
- Pedestrian Buttons

Optics Cleaning and Inspection - Twelve Month Check (annual)

- Inspect heads for stress cracking
- Inspect lens, visors, reflectors, insulators for defects
- Replace parts where needed or document future needs
- Clean lens and reflectors for maximum lumination
- Adjust head angle if needed
- Tighten all hardware

Underground Inspection - Twelve Month Check (annual)

# • Inspect pull boxes

- Inspect ground rod connections
- Inspect loop lead in connections
- Check pole grouting

Visual Appearance Check - Twelve Month Check (annual)

- Inspect visually entire intersection
- Wash pole and controller cabinets
- Repaint or touch up where needed
- Re-caulk controller cabinets

Opticom Optic Cleaning and Inspection - Six Month Check (bi-annual)

### • Clean Lens

- Drive Test
- Card Test

### Preventive Maintenance Program

Traffic Signal Operations Test - Six Month Check (bi-annual)

- Controller Cabinet
- Controller
- Conflict Monitor
- All Timings
- Amplifiers (Loop)
- Pedestrian Buttons

Optics Cleaning and Inspection - Twelve Month Check (annual)

- Inspect heads for stress cracking
- Inspect lens, visors, reflectors, insulators for defects
- Replace parts where needed or document future needs
- Clean lens and reflectors for maximum lumination
- Adjust head angle if needed
- Tighten all hardware

### Underground Inspection - Twelve Month Check (annual)

### Inspect pull boxes

- Inspect ground rod connections
- Inspect loop lead in connections
- Check pole grouting
- Visual Appearance Check Twelve Month Check (annual)
- Inspect visually entire intersection
- Wash pole and controller cabinets
- Repaint or touch up where needed
- Re-caulk controller cabinets

This program would cover all aspects of the signalized intersection including electronic operations, visibility of the signal faces, wiring underground for proper connections, and the total appearance of the traffic signal system.

### Maintenance Program

The City of Fort Collins has been extremely fortunate to be able to upgrade nearly every traffic signal in the traffic signal system. Ninety percent of all -the City's traffic control equipment is ten years old or newer. In the same time period, the City installed a state-of-the-art master computer. With the new equipment, we have made substantial gains in the level of service we provide for the citizens of Fort Collins.

In addition to the upgrading of existing traffic signals, we have added a number of new traffic signals. This puts our total number of signalized intersections at 146, with an additional 35 mid-block pedestrian crossings and flashing school zones, as of 1999.

The signal division has a basic maintenance program in effect. This program provides some of the basic services that are suggested by the Manual on Uniform Traffic Control Devices. We provide properly skilled maintenance, available without undue delay, for all emergency calls, including lamp failures, on a 24-hour basis. We also respond to citizen complaints without undue delay. We repair or replace detector loops as soon as possible, (weather permitting) as well as providing adequate stand-by equipment to minimize the interruption of signal operation due to equipment failure.

The Traffic Signal Division has developed a preventive maintenance program, based on a four-point preventive maintenance test and inspection procedure.

This program will increase public safety and reduce tort liabilities, reduce the probability of signal malfunctions, and improve the appearance of the traffic signal system.

### Warrants for Left Turn Phases

The City of Fort Collins has adopted a simple test to determine whether the left turns from an approach need a protected phase because of the magnitude of the traffic volume is to calculate the unprotected green time, which would be required. The following procedure can be used for this.

- 1. If the traffic counts available are for less than an hour, use the actual volumes, however, if they cover a period of an hour or more, multiply these volumes by 1.1 to 1.3 to account for random fluctuations.
- 2. Assume a reasonable cycle length.
- 3. Determine the number of cycles in the period under consideration.
- 4. Reduce the left turn volume by 1 to 1.5 vehicles times the number of cycles in the period under consideration to account for left turns that will clear an the yellow signal.

- 5. Determine the critical lane volumes per cycle for both the left-turns and the opposing through-movement.
- 6. Add the per cycle left turn volumes and the through volumes together and multiply by 3 seconds to obtain the needed unprotected green time necessary to accommodate the left-turns
- 7. If the needed green time is available in the cycle, taking into account all other needed phase greens and clearances, a protected left turn phase is not needed to satisfy traffic demand. It should not be used unless there is a accident problem or an obviously likely accident problem which would be prevented by protecting the left turns. If the analysis is being conducted with a view to removing an existing left turn phase, the left turn phase should be retained unless the needed unprotected green time is 85 percent or less of that which can be made available under unprotected operation.

### Phase Change Intervals

The City of Fort Collins Transportation Division has adopted the following method to calculate the timing of the YELLOW AND ALL RED INTERVALS on the traffic signal system we are responsible to maintain and operate.

The equation that we are adopting is stated in the Traffic Control Devices Handbook Part IV, Equation 4-3; on page 4-102.

Phase Change Interval	
<b>X</b> 7	

v	W + L
CP = t + 2a + -64.4g,	 + V

CP = nondilemma change period (yellow plus all-red), seconds

t = perception-reaction time, nominally 1 second

V = approach speed, feet per second (85th % or posted speed limit)

g = percent grade (positive for upgrade, negative for down- grade)

a = deceleration rate, nominally 10 feet per second/second

W = width of intersection, feet

L = length of vehicle, feet (normally 20 feet)

Because the total change period consists of both a yellow change and an all red clearance interval. It is suggested that the 'yellow change interval be equal to the first two terms of the equation rounded up to the next 1/2 second, but no less than 3 seconds and no greater than 5 seconds.

The last term of the equation is the suggested all red intersection clearing time, where:

- W is the width of the intersection in feet, measured from the upstream stop bar or crosswalk to the down stream edge of pavement or flow line.
- L is the length of the clearing vehicle, normally 20-ft.

• V is the approach speed in fps and should take into account slow-moving vehicles if they are significant at some locations.

This criteria shall be applied to the through movements only, left-turn movements will be kept constant: 3 seconds of yellow change interval and 2 seconds of an all red clearance interval. The reason for this is due to the random approach speeds and the distances of the turning radius.

This policy, we believe will provide for a safer operation of traffic signals due to the fact that the all-red clearance interval will, be of sufficient duration to permit traffic to clear the intersection before conflicting traffic movements are released.

Operations of Protected/Permissive Left Arrows

The City of Fort Collins Transportation Division has implemented a policy regarding the operation of traffic signals as they pertain to protected/permissive left turn arrows.

The Division will provide a protected/permissive left-turn arrow when the established left-turn warrants have been met. The operation of these left-turn arrows shall be vehicle actuated, so as not to serve the arrow when there are no vehicles present. The Division will also provide a back up Protection operation. The Back-Up-Protection operation will assure that the left-turn arrow will only operate at the beginning of the associated through movement, and as long as the through movement green rests in green, there will be adequate gaps to make a left turn in the permissive portion provided.

### Traffic signal operation study

The traffic signal operation study can generally be described as providing ongoing services to improve the traffic signal system within the City of Fort Collins by optimizing signal operations, examining leading/lagging left-turn phases at selected intersections, and reviewing flashing operation at various intersections during the nighttime.

The following is an outline of the study procedure:

Step 1. Create a Traffic Signal Database

- Collect turning movement counts (AM, NOON & PM PEAKS)
- Collect existing geometric conditions at Signalized Intersections.
- Collect A.D.T. Volumes for each intersection approach
- Use accident history along with A.D.T.'s to generate accident ratios per million vehicles
- Access to all existing timing plans, Time of Day, Cycle Lengths, Splits, Vehicle & Pedestrian Clearance times, Minimum Greens and Phasing Schemes

With this base of data it is possible to define operational characteristics of the traffic signal system and answer questions such as:

# • Where are the high accident Intersections?

• What Arterial roadways have similar characteristics to aid in grouping?

Step 2. Using Highway Capacity Manual (Signals) Software

• Create signal files using above data base for (AM, NOON & PM PEAKS)

With this software it is possible to look at Basic Level of Service based on Delay. Also, potential geometric improvements. Saturation Flow Rates will also be generated to be used with other Programs.

Step 3. Create and Analyze Sub-groups, Networks, and Sub-Network Files

• Using Passer II-90 Software generate group arterial analysis files for (AM, NOON & PM PEAKS)

With this program it is possible to look at various Cycle Lengths, Bandwidths, Stops and Delay with relationship to the Arterial groups. We also compared the Measures Of Effectiveness (M.O.E.) of various phasing schemes: Leading, lagging or combinations of Leading and Lagging; Skipping Arrow Phases when the volume is >50 V.P.H.

Step 4. Use Transit 7F Database FOP, Network, or Sub-Network

• Using some Bandwidth Constraints that were illustrated with the Passer Model generate Network M.O.E.'s to Optimize Cycle Length, Splits & Offsets for (AM, NOON & PM PEAKS).

Using Transit 7F we were able to move from the Arterial type of Optimization to more of a Network approach and bring the whole system together. At this point we have generated Timing Plans with acceptable Phasing Schemes, Bandwidth Constraints, Pedestrian Needs and System Needs, and are ready to implement the Optimized Traffic Signal Timing Plans.

Step 5. Gather "Before" Traffic Flow Information

- Using a moving vehicle run analysis program, build a Data Base of Test Runs using the Moving Vehicle Approach and the average vehicle technique.
- Do Before Studies for (AM, NOON & PM PEAKS) for all arterial under consideration.

With the MVRAP Program, Distance Measuring Computer and a test vehicle set-up with Lap Top Computer interface these studies can be performed easily. The program out-put gives the M.O.E.'s Average Speed, Stops, Delays and Fuel Consumption.

Step 6. Implement New Timing Plans

• In implementing new timing plans it is important to establish a systematic approach, one that takes into consideration the implementation and fine-tuning processes.

Step 7. Fine Tuning the New Timing Plans

• Perform drive through studies, using test vehicle and MVRAP. Compare MOE's and Speed Profile to Time Space Diagrams. Observe approach vehicle stacking on all

approaches. Make adjustments where possible and where needed with out compromising your established goals and system needs.

### Step 8. Gather "After" Traffic Flow Information

• After timing plans have been implemented, fine tuned and accepted, it is time to make your final analysis to see what if any improvements have been made. Again We will use the moving vehicle approach to give us an Arterial System Performance Evaluation and establish a New Base of Data to monitor, adjust and fine tune your current timing plans.

After weekday timing plans are completed for (AM, NOON & PM PEAKS) other plans may need to be developed for, Saturdays, Sundays, seasonal changes, and special events.

### Step 9. Get Ready to Start Again

### **Construction Account Policies**

Construction projects shall be estimated and account numbers assigned before any construction monies shall be spent. The estimates shall include labor cost, equipment operation cost, equipment replacement cost, material cost, and overhead. The equipment replacement and overhead cost shall be kept separate from normal accounting areas. The intent is that equipment replacement shall be carried over year after year and even though they might be shown in surplus revenues and not usable except for equipment replacement.

The equipment maintenance, labor, and material for each project are for each supervisor to use at his discretion. The estimates should agree with the final billing, although if project changes (decreases in work) happen the supervisor is responsible in seeing that the costs do not over run the final billing. The costs are based on actual cost determined from like previous projects.

The funds acquired are expected to pay for labor, equipment operation and maintenance, and all material needed to do the construction. Since certain costs, such as equipment maintenance involved with a blown engine, could use all funds available for one construction project, the supervisor should be aware of these costs and use funds accordingly.

Upon completion of the project, a final bill shall be processed. Any funds remaining shall be placed in a holding account. Use of these funds shall be approved by the Traffic Engineer or whomever he designates. The intent of any cost saving acquired by any project is these funds will be used by the division doing the construction since these savings are due to charges of labor or equipment which was used on the project and not fully charged to the project.

### **Construction Vehicles**

In order to maintain cost, our vehicles shall be broken into two separate areas for billing purposes. The supervisors shall be responsible, through the construction accounts, to pay for all costs associated with all equipment used exclusively for construction. The vehicle used for maintenance and operation shall be paid out of our normal budget. A list of all equipment, classifying their billing area, shall be made each May in order to budget for that equipment. Any construction, which can not be afforded through the construction accounts, shall be sold before the end of the year.

# **Signs and Pavement Markings**

Maintenance Equipment

- T204 Pick-up (signs)
- T205 Pick-up (paint)
- T231 Pick-up (large paint machine)
- SP230 Small Paint Machine
- NP201 Trailer
- NP231 Compressor
- NP235 Hydroblaster
- NP229 Post Puller
- Pioniar (post driver)
- Fabrication Machine (2)
- Paint Conditioners (2)
- Hacksaw
- Grinder
- Traffic Counters
- 1400 Watt Generator
- Cata-Quik Machine
- NP263 Duel Axle Utility Trailer (wire trailer)

### Maintenance

- T224 GMC 1 Ton Van with Bucket
- T229 GMC 1 Ton Pick-up

Maintenance Test Equipment:

## **Tecktronics O-Scope**

- Mitchell Controller Tester
- Digital Volt-OHM-Meter
- CONSTRUCTION
- T218 1/2 Ton Ford Pick-up
- T208 2 Ton Ford Dump Truck
- T289 I Ton Ford Lift Truck SP215/NP200
- Series 30 Ditch Witch with Trailer
- SP230 Ingersoll Rand Air Compressor
- SP Concrete Saw
- NP231 Saw Trailer
- Allied Air Tool (hole, hog)
- Case Viber Max (tamper)
- NP263 Duel Axle Utility Trailer (wire trailer)

# Traffic Control Devices - Section 2-4

### General

Traffic control devices will be installed on all new streets accepted by the City for maintenance as set in these STANDARD SPECIFICATIONS.

Traffic Control Signals

## **Regulations and Code**

Electrical equipment will conform to the CDOT Standard Specifications for Road and Bridge Construction. In addition to requirements of the accepted plans, all material and work will conform to the requirements of the NEC and these STANDARDS AND SPECIFICATIONS.

### Inspection

The Traffic Engineer will make inspection of all material and work. All material delivered to the site will be subject to inspection, prior to or during installation, as deemed necessary by the Traffic Engineer. The Traffic Engineer may request samples of certain materials from the factory or warehouse for testing purposes prior to delivery on the site. Material, which has been rejected by the Traffic Engineer, will not be delivered to the work site. Failure by the Traffic Engineer to note faulty material or workmanship during progress of the work will not relieve the Contractor of his responsibilities for removing and/or replacing faulty materials at his own expense if any such materials are found at a later date.

Any work within the public right-of-way will require two working days (twenty-four; 24) hours-prior notice to the City Engineer by the Contractor or Developer.

## **Equipment Lists and Drawings**

The Contractor will submit to the City for review and acceptance a listing of all materials and equipment, which will be used in the work. The list will include the name of the manufacturer, size and catalog number of unit, and will be supplemented by other required data including detailed scale drawings and wiring diagrams of any nonstandard or special equipment and of any purposed deviation from accepted plans. If required by the City Engineer, the Contractor will provide samples of materials proposed for use.

All equipment listings and drawings will be submitted to the City Engineer for review and acceptance. The Contractor will perform no labor until the City Engineer has accepted all details and plans in writing to the Contractor.

All applicable portions of Section 141.00, Protection of Public and Utility Interests and Section 1042.00, Protection of Existing Structures and Utilities, of these STANDARDS AND SPECIFICATIONS shall apply.

The Contractor will furnish all materials, equipment and labor needed to install and maintain temporary traffic signals during progress of the work. All intersections presently signalized will be kept in operation until the new signal equipment is properly

installed and ready for operation. If in opinion of the Traffic Engineer this is not possible because the installation of new equipment is in the same location as existing equipment, the Contractor will not proceed with any work which will cause the present equipment to become inoperative until he has all necessary replacement equipment on hand.

Existing traffic signals will be kept in operation except when shut down due to changing over and connecting to new equipment. Work will be performed so that signal's will be in operation at the close of each day s work, over weekends, and during times when the Contractor is not working. When a signal is shut down, the Traffic Engineer will be notified in writing two working days (forty-eight [48]) hours in advance of the proposed shut down.

# **Coordination with Other Agencies and Contractors**

It will be made that the Contractor coordinate his conduit work with all other utility companies with the city.

# Maintenance

The contractor will maintain the work during construction and until the work is accepted by Traffic Operations. Maintenance will constitute continuous and effective work prosecuted day by day, with sufficient equipment and personnel to complete the work in the shortest time and least disruptive manner.

## Traffic Signal Conduits and Pull Boxes - Section 2-5

Conduit

## General

All conductors will be run in conduit, except when run in metal poles. Conduit will be the rigid PVC type conforming to these STANDARDS AND SPECIFICATIONS. Conduit runs shown on the accepted plans are tentative as to routing and may be changed, as directed by the Traffic Engineer, to avoid underground obstructions. Any change in location from those shown on the plans will require the prior approval of the Traffic Engineer and must be accurately recorded on as-built drawings in accordance with Section 161.00, construction Plan Requirements of these STANDARDS AND SPECIFICATIONS.

Excavations for conduit will be two inches (2") wider than the outside diameter of the conduit. Backfilling of the conduit trenches will be accomplished in accordance with all applicable portions of Section 1050.00, Trenching Backfilling and compacting, of these STANDARDS AND SPECIFICATIONS. A nylon pull string will be left in each conduit run for any future pulling of conductors. When trenching in pavement, the cut in the pavement will be to as city Specification for Patching and Repair.

## Materials

Rigid PVC conduit will be Schedule 40, type 2, as specified in NEC, and will be manufactured as high-impact type conforming to industry standards and commercial standard No.CS-207-60. Each length of conduit and all PVC fittings (expansion joints,

coupling adapter, etc.) Will bear the label of Underwriter s Laboratories, Inc. Conduit will be the size or sixes indicated on the accepted plans.

Rigid PVC conduit will be cut with a hacksaw and all ends squared and trimmed after cutting to remove rough edges. Connections will be the solvent weld type except where the connection is made to a steel conduit, in which case the coupling will be threaded on the metal conduit side.

Solvent weld joints will conform to the PVC manufacturer's recommendation. Rigid PVC conduit will be used only for underground installations; all conduits used above ground will be the rigid-galvanized-steel type.

A bare or green #10 AWG copper conductor will be run continuously in all conduit used for traffic signal circuits. This wire will be used for bonding and grounding purposes. Existing underground conduit that is incorporated into a new system will be cleaned and blown out with compressed air.

## Installation

Conduit will be laid to a depth of not less than thirty inches (30") below the curb grade roadway construction. Conduit under railroad tracks will not be less than forty-two (42") below the bottom of the tie, and/or as specified by railroad code. It will be the responsibility of the Contractor to obtain clearance from the Railroad Company prior to doing any work within the boundaries of the railroad right-of-way. The minimum size of conduit to be used will be shown on the accepted plans or as required on the wire layout sheets. Conduit smaller then three-fourths inch (3/4") electrical trade size will not be used unless otherwise specified on the accepted plans, except that grounding jumpers at service points may be enclosed in one-half inch (1/2") conduit.

It will be the option of he Contractor to use at his own expense larger size conduit if desired. Where larger size conduit is used, it will be used for the entire length of the run from outlet to outlet. No reducing couplings will be permitted in any conduit run. Conduits terminating in poles, cabinets, or pedestal bases will extend a maximum of four inches (4") and a minimum of two inches (2") above the foundation vertically, or will be sloped toward hand holes in poles or base opening where transformer bases are used.

Conduit entering pull boxes will terminate a minimum of one inch (1") and a maximum of three inches (3") inside the box wall and two inches (2") minimum of four inches (4") maximum above the bottom and will be sloped to facilitate convenient pulling of the wires or cables. Conduit entering through the side of a pull box will be located near the sides and ends of the box in order to leave the major portion of the box clear. Conduits will enter freely through boxes for allowance of expansion and contraction. Conduit required to be terminated, stubbed, and plugged will be shown on the plans as directed by the traffic engineer. All conduit ends will be capped with standard conduit caps until the wiring is started. When caps are removed, the threaded ends will be provided and approved insulated metal ground bushings. The location of all ends of conduit for future electrical circuits in curbs or structures will be marked by a Y, which is at least three

inches (3") high, cut into the face of a curb, gutter, or wall directly above the conduit. These locations shall be shown on the "as built" drawings in accordance with Section 161.00, Construction Plan Requirements, of these STANDARDS AND SPECIFICATIONS.

Conduit bends, except for factory bends, will have a radius of not less than six -(6) times the inside diameter of the conduit. Where factory bends are not used, conduit will be bent without crimping or flattening, using the longest radius practicable. Conduit entering without crimping or flattening, using the longest radius practicable conduit will be bent without crimping or flattening, using the longest radius practicable. Conduit entering controller cabinets will be packed with duct seal after wiring is installed to prevent the entrance of gases. Existing underground conduit to be incorporated into a new system will be cleaned with a mandrel and blown out with compressed air.

Conduit bends in all PVC conduit will be made to conform to all appropriate sections of the NEC or local codes governing bending radius and number of bends allowed, as applicable, for rigid conduit.

At many locations on the City's streets, it is desirable to have conduit installed for future use. When PVC conduit is specified, a galvanized, 12 -gauge sheet metal plate twelve inches (12") square will be placed over each conduit end. Each end will be capped with PVC caps. Where a cap is indicated on the plans, a standard non-corrosive cap will be installed.

Conduit termination within a foundation will extend from two inches (2) to four inches (4) above the foundation vertically, and be installed in such a way that it will slope towards the hole opening. All galvanized rigid conduit terminations within pull boxes will be fitted with insulating bushings to prevent chafing of wire on exposed edges.

All conduit ends will be capped with standard conduit caps until wiring is started. When caps are removed, threaded ends will be protected with approved insulated metal ground bushing or insulated bushings is the conduit run is not extended from the threaded end and sealed by duct seal material.

Traffic Signal Conduit

## General

Underground utility information shown in the plans is for information only. The Responsible Party is responsible for field locating and verifying utility information before starting installation of underground conduit runs.

Responsible Party shall cooperate, as directed by the Traffic Engineer with any other Responsible Party under contract to the City.

Electrical conduit shall be installed in accordance with the applicable requirements described in the latest revision of the CDOT A Policy on the Accommodation of Utilities on Colorado ROW, as amended.

Larger size conduit can be used, at the Responsible Party's option and own expense. Where larger size conduit is used, it shall be for the entire length of the run from outlet to pull box or from pull box to pull box. No reducing coupling shall be permitted in any conduit run.

When specified, conduits shall be installed under existing pavement by jacking or drilling operations. Where plans show that existing pavement is to be removed, jacking the conduit shall not be required. Jacking or drilling pits shall be kept a minimum of two (2) feet clear of the edge of the pavement whenever possible. Water shall not be permitted as an aid in jacking or drilling operations.

Conduits shall be of the rigid plastic (PVC) type or of the galvanized rigid steel (GRC) type conforming to the plans and these specifications. Conduit runs shown on the plans are tentative as to routing and may be changed as directed by the Traffic Engineer to avoid underground obstructions. In the event of any change from the location shown on the plans, accurate records shall be incorporated into the as built drawings shall be submitted to the Traffic Engineer.

All conduit installation shall include the installation of marking tape laid in the backfilled trench at a depth not more than eight (8) inches or less than four (4) inches below finished grade. Heavy gauge polyethylene film 0.004 0 tape, with legend "Caution Buried Electric Line Below," shall be used. Where tape length ends and conduit run continues, lapping of not less that six (6) inches shall be provided. No glue or adhesive shall be allowed to join separate tape sections.

# Nonmetallic Conduit (PVC)

Rigid PVC conduit shall be Schedule 40, Type 2 and shall be manufactured of highimpact PVC, and shall conform to industry standards and commercial standards No.CS-207-60. Each length of PVC conduit and all of the various PVC fittings (coupling, adapter, etc.) shall bear the label of UL or be approved by the Traffic Engineer. The conduit shall be of the size or sizes shown on the plans or indicated in these specifications.

Rigid PVC conduit shall be cut with a hacksaw and all ends shall be squared and trimmed after cutting to remove rough edges. All connections shall be of solvent weld type except where PVC is to be connected to a steel conduit, in which case the coupling or adapter shall be threaded on the steel conduit side.

Solvent weld joints shall be made in accordance with the PVC manufacturer's recommendations. Rigid PVC conduit shall only be used for underground installations; all conduit used above ground shall be of the rigid-galvanized steel type.

# Galvanized Rigid Conduit (GRC)

Steel conduit and fitting shall be rigid galvanized steel and shall be uniformly and adequately zinc-coated by the hot- dipped process conforming to ASTM Designation A153. Joints shall be set up tight with squared ends. Fastenings shall be secured and of a type appropriate in design and dimensions for the particular applications. Couplings, connectors and fittings shall be approved types specifically designed and manufactured for the purpose. Fittings shall be installed to provided a good electrical ground throughout the conduit system. The interior and exterior of a six (6) inch sample cut from a center of a standard length of a conduit, when tested in accordance with the applicable portion of ASTM Designation A239, shall not show a fixed deposit of copper after four (4) one (1) minute immersions in the standard copper sulphate solution. The interior of the rigid conduit shall have a continuous coating of lacquer or enamel. Each length shall bear the label of UL and shall conform to appropriate articles of the NEC.

The end of al metallic conduits shall be threaded and well-reamed to remove burr and rough edges. Field cuts shall be made together for the full circumference. Slip joints or running threads shall not be permitted for coupling conduit. When a standard coupling cannot be used, weather proofed threaded three-piece union shall be used. All three-piece unions must be threaded; non-threaded couplings shall not be accepted.

The threads on all conduits shall be well painted with a good quality lead or rustprevented paint before couplings are made up. All couplings shall be tightened until the ends of the conduits are brought together so that a good electrical connection shall be made throughout the entire length of the conduit run. Conduit stubs caps and exposed threads, as well as any point along the surface of the conduit that has been injured in handling and installation, shall be painted with good quality asphalt bituminous or other paint suitable for the purpose.

# **Installation Methods**

Conduit sizes and locations shall be as shown on the plans. Conduits shall be stubbed and capped for future use where shown on the plans or where specified in these specifications.

Extending underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

Conduits terminating in poles, cabinets or pedestal bases shall extend a maximum of three (3) inches and minimum of two (2) inches above the foundation vertically, and shall be sloped toward handholds in poles or base openings where transformer bases are used. Conduit entering pull boxes shall terminate a minimum of three (3) inches above the bottom of the box.

Ninety (90) degree long radius elbows shall accomplish all conduit ends. Where two (2) or more conduits meet, all ninety (90) degree long radius elbows shall be bought together in the center of the pull box or cabinet foundation. Conduit shall only enter thought the

bottom of a pull box. All galvanized rigid conduit termination within pull boxes shall be fitted with an end coupling as well as insulation bushings to prevent chafing of wire.

Conduits required to be terminated, stubbed and plugged shall be as show non the plans and as directed by the Traffic Engineer. All conduit ends shall be capped with standard conduit caps.

The location of all ends of conduit for future electrical circuits under curb, gutters, sidewalks, or structures shall be marked by a "y" at three (3) inches high, cut into the face of the curb, gutter or structure directly above the conduit.

All metal type conduit ends shall be threaded and shall be capped with standard pipe caps until conductors are in place. When caps are removed, the threaded ends shall be provided with conduit bushings. Non- metallic type conduit ends shall be capped with a standard PVC cap until conductors are in place.

Conduit under railroad tracks shall not be less than forty-two (42) inches below the bottom of the ties and/or as specified by railroad code. It shall be the responsibility of the Responsible Party to obtain clearance from the Railroad Company prior to performing any work within the boundaries of the railroad ROW. The minimum size of conduit to be used shall be shown on the plans.

Conduit installed outside of the traveled portion of the roadway and out of future roadway areas shall be laid as follows: maximum depth of thirty (30) inches and a minimum depth of twenty-four (24) inches.

# **Excavation and Back filling**

The excavations required for the installation of conduit shall be performed in such a manner as to avoid unnecessary damage to streets, sidewalks, and landscaping and other improvements. Trenches shall not be excavated wider than necessary for the installation of the electrical appurtenances. Excavation shall not be performed until immediately before installation of conduits. The material form the excavation shall be placed in a position not to cause damage or obstruction to vehicular or pedestrian traffic or interfere with surface drainage. Trenches outside the traveled portion of the roadway shall be backfilled with a granular material as approved by the Traffic Engineer, in six (6) inch lifts and each lift compacted. Trenches within the roadway area shall be backfilled with CDOT approved slurry.

Excavations in the street or highway shall be performed in such a manner that not more than one (1) traffic lane is restricted in either direction at any time, unless otherwise permitted by the Traffic Engineer. A minimum of one (1) lane of traffic must be kept open for each direction at all times.

Trenches shall be made with a Rockwell or other machine capable of cutting a narrow trench (four (4) inches) so as to allow traffic to pass over it prior to backfilling. The

machine shall be equipped with shields to direct the soil downward and away from passing vehicles, workers and pedestrians.

Excavation at intersections being reconstructed or improved shall be excavated and backfilled before other improvements are completed as so to not require the repair or replacement of newly installed sidewalks, curbs and gutters, pavement or landscaping.

The one and one-half (1-1/2) inch PVC conduit for system sampling detectors as shown on the plans shall be handled in the following manner:

The trench for this item shall be backfilled with the same material that was removed and shall be compacted and shaped to match the surrounding surface. Standard backfilling of trenches across paved roadways, bike paths and sidewalks shall be filled with CDOT approved slurry mix.

Prior to backfilling, the Traffic Engineer shall inspect the trench, conduit and tape placement. Under no circumstances shall the trench be filled without inspection and approval.

Pull Boxes

## General

Pull box locations shown on the plans are approximate. The Traffic Engineer shall determine the exact location in the field, for long runs. They shall be spaced not over one hundred fifty (150) feet apart from each other.

It shall be the opinion of the Responsible Party, to install additional pull boxes desired to facilitate its work, at the expense of the Responsible Party.

Pull boxes shall be a Quazite type concrete fiberglass reinforced of a size approved by the Traffic Engineer, or as approved by the Traffic Engineer. Pull boxes must have lids with the words "Traffic Signal" printed on them.

## Installation

Pull boxes shall be at least two sizes. Pull boxes used for loop detectors on sampling stations shall be a minimum of 13.5 inches wide by 20.5 inches long by 20.5 inches long by twelve (12) inches deep. Pull boxes used at all junctions of roadway conduit crossing and at the controller cabinet shall be a minimum of twenty and one-eighth (20 1/8) inches wide by fifteen (15) inches deep. Use of two (2) pull boxes in place of the larger one shall not be permitted. Steel type pull boxes shall be of similar may be approved by the Traffic Engineer.

All pull boxes shall be or equal to the "Composolite" by Quazite. Enclosure and covers shall be concrete gray color and rated for no less than five thousand (5,000) lbs. Over a ten (10) inch by ten (10) inch area and tested to a temperature of minus fifty (-50) degrees Fahrenheit. Material compressive strength shall be no less than eleven thousand (11,000) psi.

Where practical, pull boxes shown in the vicinity of curbs and gutters shall be placed along the side of the foundations as shown on the plans. The cover of the pull box shall be installed level with the finish grade. The bottom of all boxes shall rest on firm ground with twelve (12) inches of three-quarter (3/4) inch to two (2) inch river run rock below pull box for drainage.

Pull boxes installed in a sidewalk must be tied into the sidewalk to prevent the boxes from being pushed down below the top of the sidewalk.

Pull box-special shall be a water valve stem type pull box made of cast-iron or steel. The pull box shall have the capability of accepting riser rings for future overlays. The lid shall have the word "Traffic" cast into lid.

Care shall be taken during backfill compaction to prevent collapse of the tube.

At least two (2) inches of slack for both feed and loop wire is to be provided so that all testing and splicing can be done outside of the pull box.

Pull box lid is to be sealed watertight by caulking after the loops have been installed, tested and accepted by the city.

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Cable and Conductors - Section 2-6
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### General

Cable and conductors will conform to the applicable specifications of the IMSA and to those specifications shown on the accepted plans or as approved by the Traffic Engineer.

All wire furnished to or for the city will carry the label of the Underwriters Laboratories, Inc. This label will be present on each reel, coil or container of wire unless otherwise specifically approved by the Traffic Engineer.

Insulated conductor will be shipped in splice-free continuous lengths, in cartons or on new-bolted-type non-returnable reels plainly and indelibly marked with the name of the manufacturer, net weight, size (AWG) and length of the wire. ABSOLUTELY NO SPLICES OF ANY KIND WILL BE PERMITTED IN THE WIRE. A heavy covering of cardboard or burlap will be used to protect the wire and reels, during shipment and handling.

### Multi-conductor Cable

Where multi-conductor cable is required, IMSA Specification 19.1 polyethyleneinsulated, polyvinyl chloride- sheathed signal cable will apply, except that the conductors will be stranded. Conductor color-coding will conform to Table II of IMSA specification 19.1 for unpaired conductor cables. Color-coding for tracers will run spiral and be impregnated into the conductor insulation.

# **Installation Methods - Wiring**

Wiring will conform to appropriate articles of the NEC and NEMA code. Wiring within cabinets, junction boxes, etc., will be neatly arranged and laced. Flaxsoap, or other approved lubricants, may be used for inserting conductors in conduit. No splices of cable will be permitted in the conduit, which is outside of pull boxes, splice boxes, standard or pedestals.

In all signal designs, separate conduits will be shown for separate low voltage and high voltage conductors on the plane. Signal conductors must be run conduits separate from the low voltage detector lead-in or from the telephone interconnection.

Signal Conductor Type wire will not be used for wiring signal heads.

All loop detector wires will be pulled continuously for the full extent of the run from loop detectors to the cabinet with no splicing allowed in the runs. The Contractor will perform his pulling operation in a manner so as to facilitate pulling the wire in continuous runs.

Required tags will be furnished and installed by the Contractor at cabinet locations, at pull boxes, and at terminating pints, or as directed by the Traffic Engineer. A permanent tag of fiber or PVC will be used for tagging all wires. Tags will be marked as indicated on the wire layout sheets and will indicate the direction of the run and pole number of other locations of identified as spare with appropriate numbers as shown on the layout sheets. The ends of the spare wires will be pulled into the terminal compartment or cabinet.

All wiring between the controller and the signal faces will be done with multi-conductor cable. The individual conductor will be 14 gauge stranded copper wire. Separate multi-conductor cables for each signal phrase will be run around the intersection and marked with colored phasing tape at the controller and at each splice point in the pull boxes and pole bases.

Unused conductors will be folded back on the cable and securely taped.

Connections to Signal Heads, Pushbuttons, and Traffic Controllers All cable wires will be secured to screw-type terminals in the traffic Signal Heads, pedestrian pushbuttons, and the traffic controller. The connectors will be the shadetongue type and affixed to the conductors using a tool designed specifically for the connection of the connectors to the conductors.

# Wire Splicing

Splices will only be made in pullboxes or pole bases. All splices made in pull boxes will be bundled together, and the bundle and all exposed conductors will be joined with a wire nut.

All splices of individual conductors will be soldered and connected with appropriately sized wire nuts and taped in bundles with electrical tape covering the wire nuts to the point where the outer insulation of the multi-conductor cable was cut. Loop detector and lead-in wire will run continuously from the loop detector to the controller terminals without splicing.

The electrical service connections will be made by the City of Fort Collins Light and Power. The Contractor will furnish two conductor 6-gauge wire from the controller to the pull box, leaving two (2) extra of wire in the pull box. The Contractor will be responsible for coordinating the service connection with all Utility Agencies.

# Wire Bonding and Grounding

Metallic cable sheaths, conduit, metal poles and pedestals will be bonded to form a continuous and effectively grounded system. Bonding jumpers will be # 10 AWG copper wire, or larger, as required. Grounding of conduit and neutral at the service point will be # 8 AWG copper wire or larger, as required. At each controller, a ground rod (electrode) will be installed. Each ground rod will be a one-piece solid rod of the copper-weld type, a minimum of one-half inch (1/2) in diameter and eight feet (8") in length. This rod will be driven into the ground to a minimum depth of seven (7) feet below the surface. The ground wire will be completely spliced together at the aforementioned termination point and will tie into the neutral bar at the service facility, load center cabinet, or control cabinet, to become a true and functioning common bond.

Conductors, Cables, and Loop Detectors

# **Installation and Identification**

Aerial cable shall be installed where specified on the plans and secured to messenger cable with cable tie or rings. No self-supported cable shall be installed unless that cable is specifically designed for the purpose. Drip loops shall be provided on all conductors where they enter pole weather heads or signal heads.

Conductors shall be permanently identified as to function. Identification shall be placed on each conductor, or each group of conductors comprising a signal phrase, in each pull box and near the end of terminated conductors.

Identification shall be by bands fastened to the conductors in such a manner that they shall not move along the conductors.

All cables and conductors not shown on the plans as aerial cable or imbedded loop detector shall be installed in conduit unless installed in poles, pedestals or mast arms.

## Codes

Grounds and bonding wire, straps, and electrodes shall conform with NEC Article 250.

Wiring and splices shall conform to appropriate article of the code. Wiring within cabinets, junction boxes, etc. shall be neatly arranged and shall be laced within cabinets.

Conductors shall be stranded, tinned copper wire, rated at six hundred (600) volts and individually insulated with heat stabilized polyethylene. Conductors and cables shall conform to specifications 19-1 of the IMSA.

# **Bonding and Grounding**

Metallic cable sheaths, conduit, metal poles and pedestals shall be made mechanically and electrically secure to form a continuous system and shall be effectively grounded. Bonding and grounding jumpers shall be a bare copper wire or copper strap of the same cross sectional area, No. 8 American Wire Gauge (AWG), for all systems. Sheath for detectors shall be grounded on control cabinet only, the order end of the sheath shall be taped and left ungrounded.

Bonding of poles and pedestals shall be by means of connecting to the ground rod a bonding strap attached to an anchor bolt or a three-sixteenth (3/16) inch or larger brass or bronze bolt installed in the lower portion of the shaft.

A ground electrode shall be installed at each control box. Each ground electrode shall be one-piece copper-weld rod of five-eighths (5/8) of an inch diameter and eight (8) feet in length, driven to a depth of at least eight (8) feet below the surface of the ground (top of rod flush with ground or top of cabinet base).

The ground terminal of controller shall be connected to the ground rod with a No. 8 AWG bare copper wire with an approved ground rod clamp.

# Wire Splices

Splices in underground systems shall be hermetically sealed. All splices shall be waterproofed by dipping the splice into Scotchkote after splice has been made and circuit checked.

# **Installation Method**

Sufficient signal light conductors shall be provided to perform the functional operation of signal system. Additional conductors for service interconnect, etc., shall be provided as noted on the plans.

Signal light conductors shall conform to the Red-Yellow-Green color sequencing with different colored tracers for each phase provided. Three (3) spare conductors per through-phase shall be provided throughout the signal light circuit. All signal light cable conductor shall have individual terminal lugs for connection to terminal strips.

When conductors and cables are pulled into the conduit, the ends of all these conductor and cables shall be taped to exclude moisture and shall be so kept until the splices are made or terminal appliances attached. Ends of spare conductors shall be taped to exclude moisture.

Powdered soapstone, talc, or other approved lubricant shall be used in placing conductors in conduit. One-half (1/2) inch nylon pull rope shall be installed in all new conduit and all existing conduit where a cable is added or an existing cable is replaced. At least two (2) feet of pull rope shall be doubled back into the conduit at each termination.

Five (5) feet of slack shall be left for each conductor at each support pole and two (2) feet of slack at each pull box containing cable connections. Splicing of cable shall not be permitted in the conduit or outside of pull boxes, standards or at the handhold location in pedestals.

Multi-conductor cable shall be spliced and insulated to provide a watertight joint to prevent absorption of moisture by the cable.

# **Span Wire Cables**

All span wire cables shall conform to CDOT Standards, including tether cables. Aluminum cables shall not be allowed.

Loop Detectors

## General

Loop detectors shall be installed in the configuration shown on the plans. The Traffic Engineer shall determine actual layout. A complete installation consists of a conductor loop or group of loops installed in saw cuts in the roadway, lead-in Beldon cable and a sensor unit with power supply installed in the traffic signal controller cabinet.

Low voltage signal circuits shall have no more than one splice in each detector sensing circuit. Cable sheath for detectors shall be grounded in control cabinet only; the other end of the sheath shall be taped and ungrounded.

All loops are to be made using duct-type wire, 14THHN copper stranded inside a one half (1/2) inch O.D. Polyethylene jacket or a one half (1/2) inch O.D. PVC jacket.

# **Installation Method**

The saw cut shall be made one half (1/2) inch wide and minimum of three (3) inches deep. The slot shall be as straight as possible and shall not vary more than one-half (1/2) inch when checked with a ten-(10) foot straightedge.

Saw cuts shall be blown free of standing water and debris with compressed air. The cut shall be as dry as possible prior to placement of wire.

After saw cut is cleaned from debris, the wire shall be placed in the loop by pushing it in the slot with a blunt non-metallic object. A screwdriver or other sharp tools shall not be

used. Care shall be used to avoid abrading or damaging the installation.

One continuous length of wire shall be used for each loop from the pull box around the loop with the specified number of turns and back to the pull box. There shall be three (3) twists per foot in the loop wire when puling the wire though the conduit into the box.

After the loops are properly seated, they shall be tested for continuity and proper loop inductance. The loop slot shall then be sealed with a high-grade sealant. Sealant shall be a one-part formula only 3M Sealant or approved equivalent), made specifically for sealing traffic loops. This sealant shall remain permanently flexible and be non-shrinking to assure maximum protection after installation.

The loop detector wires shall be spliced to the shielded lead-in cable in the pull box and pulled into the controller cabinet via the shortest possible distance using existing conduit. A minimum of three (3) shall be provided in the controller cabinet for attachment to the detector amplifier. Each detector cable shall be clearly labeled in the cabinet, identifying phase relationship and approach leg.

A minimum one and one-half (11/2)-inch conduit shall be placed under the curb and into a pull box to accommodate detector loop wires. Conduit shall have a drain "T and Weep Hole" at the lowest point of the run under the curb to facilitate drainage. Conduit may be "pushed" or trench-laid, depending on conditions at projects site and upon approval from the Traffic Engineer. Special traffic-type lop pull boxes in the roadway shall be installed at the locations shown on the traffic signal plans.

## **Detector Lead-in**

All detector lead-in cable shall consist of two (2) No. 14 AWG copper conductors with each conductor insulated with high molecular weight, heat stabilized, colored polyethylene. The conduits shall be a twisted pair (Beldon 8720) and shall be protected with a shield of tinned copper-brass or aluminum-polyester. A No. 16 AWG minimum, stranded tinned copper ground wire shall be provided. He cable shall be provided with a chromedvynal outer jacket with a minimum thickness of thirty-seven (37) mils, suitable for use in conduit or for direct burial when used in conjunction with magnetic or magnetometer detector.

Sampling station detection shall be through separate lead-ins for each lane of detection. Sampling stations shall not consist of loops tied together and run into the controller on a single lead-in pair.

## **Alternative Round Loop Detector Configurations**

As a alternative to the six (6) foot by forty (40) foot rectangular shaped loop detectors, two (2) six (6) foot round loop detector configuration may be proposed by the Responsible Party.

A plan of the alternative loop detector configurations and pull box locations shall be prepared by the Responsible Party for approval by the City prior to installation. If proposed, the six-(6) foot round traffic loop detector cable shall conform to the following specifications:

The Responsible Party shall core drill a round traffic signal loop to be six (6) feet in diameter x .500 inches width x 3.0 inches in depth. A saw cut shall be provided to the appropriate pull box within fifty (50) feet. The saw cut shall be .250 inches in width x 3.5 inches in depth.

All cuts shall be washed cleaned. Water and slurry shall be vacuumed out, leaving a clean and dry loop area. A performed loop wire made of Detecta -Duct Traffic Signal loop wire or approved equivalent shall be stacked in the cuts and secured from footing. All cuts shall be sealed with a high grade sealant. Sealant shall be one part formula only made specifically for sealing traffic signal loops.

A performed loop shall consist of three (3) six (6) foot diameter turns of loop wire, laid one loop on top of the of the other and glued so each loop remains in place. The tails in the loop that run to the pull box shall be approximately fifty (50) feet.

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Signal Hardware - Section 2-7
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General

Signal equipment shall be manufactured in the United States using domestic materials and be designed to operate from a one hundred fifteen (115) volt sixty (60) cycle single-phase source.

All traffic signal equipment shall be designed to operate between an ambient temperature of minus forty (-40) degrees Fahrenheit to plus one hundred sixty-five (+165) degrees Fahrenheit, with relative humidities up to ninety-five (95) percent.

All signal faces installed prior to final turn-on of the system shall be covered to clearly indicate that the signal is not operational. The covering shall be over the entire head and shall be securely fastened. No adhesive used to secure the head covering shall touch any part of the head or mounting assembly.

Adjustable face vehicle traffic control signal heads and associated equipment shall conform to the general specification and definitions contained in the latest issue of Technical Report No. 1, prepared by ITE and as shown on the plans.

Adjustable face pedestrian signal heads and associated equipment shall conform to the general specifications and definitions contained in the latest issue of Technical Report No. 5, prepared by ITE and as shown on the plans.

All exterior parts of die cast aluminum pedestrian signal heads requiring paint shall be painted Federal Highway (yellow) for standard installation. All polycarbonate type

vehicular signal heads shall be colored Federal Highway (yellow) for standard installation.

All signal hardware to be furnished under this bid shall be of standard design and manufacture. No special fittings and/or components shall be used or furnished which are not shelf type items by the manufacturer and/or vendor.

Traffic signal lamps shall conform to the general specifications and definitions contained in the latest issue of Technical Report No. 6, prepared by ITE. Lamps shall be rated for operation at 120V AC. Lamp wattages shall be sixty-nine (69) watts for all eight (8) inch traffic signals and one hundred and fifty (150) watts for all twelve (12) inch traffic signals. All twelve-(12) inch yellow arrows and clamshell pedestrian heads shall be one hundred and sixteen (116) watt bulbs. LED's will be encouraged.

All vertical signal faces and pedestrian signal faces shall be of the adjustable, vertical type as shown on the plans. They shall provide light indication in one direction only and shall be adjusted through three hundred sixty (360) degrees about a vertical axis.

All mast arm mounted heads shall be mounted at the location determined by the Traffic Engineer. No holes shall be placed in the mast arms until actual head location has been determined in the field by the Traffic Engineer.

Unless otherwise shown by the approval plans, traffic faces shall be standard and shall contain three (3) sections arranged vertically; red-top; yellow-center; green-bottom.

All vehicle faces shall be focused to allow maximum visibility to approaching motorists. All signal heads installed at anyone intersection, shall be of the same make and type, unless otherwise stated by the bid Special Provisions, these Special Functions, or by the Traffic Engineer.

Programmable Adjustable Face Twelve (12) Inch Signal Heads (Optically Programmable Signals)

Optically programmed signals shall permit the visibility zone of the indication to be determined optically and required no hoods or louvers. The projected indication may be selectively visible or veiled anywhere within fifteen (15) degrees of the optical axis. No indication shall result from external illumination, nor shall one light illuminate a second.

Components of the optical system shall comprise:

- Lamp
- Lamp collar
- Optical limiter-diffuser
- Objective lens

The lamp shall be nominal one hundred fifty (150) watt, 115V AC or seventy -five (75) Watt, 120V, three-prong sealed beam, having an integral reflector with stippled cover and an average rated life of six thousand (6,000) hours when operated in a Optically Programmed Signal according to the manufacture's specifications.

The Optical limiter shall provide an accessible imaging surface at focus on the optical axis for objects nine hundred (900) to 1,200 feet distance, and permit a effective veiling mask to be variously applied as determined by the desired visibility Zone. The optical limiter shall be provided with positive indexing means and composed of heat resistant glass.

The objective lens shall be a high-resolution annular incremental lens hermetically sealed within a flat laminant of weather- resistant acrylic, or approved equivalent. The lens shall be symmetrical in outline and maybe rotated to a 90-degree orientation about the optical axis without displacing the primary image.

The optical system shall accommodate projection of diverse, selected indication to separate portions of the roadway such that only one indication shall be simultaneously apparent to any viewer. The projected indication shall conform to ITE transmittance and chromaticity standards.

### Construction

Die cast aluminum parts shall conform to ITE alloy and tensile requirements and have a chromate preparatory treatment. The exterior of the signal case, lamp housing and mounting flanges shall be finished with a high-quality baked acrylic finish paint. The lens holder and interior of the case shall be optically flat black.

Signal case and lens holder shall be pre-drilled for backplates and visors. Hinge and latch pins shall be stainless steel. All access openings shall be sealed with weather-resistant rubber gaskets. Each section shall have two (2) drain holes.

Sheet metal parts, including visors and backplates, shall conform to ITE material requirements, and shall include a chromate preparatory treatment and optical flat black on all surfaces, unless otherwise specified.

### Mounting

The Signal shall mount to standard one and one-half (1-1/2) inch N.P.T. fittings as a single section, a multiple section face, or in combination with other signals. The signal section shall be provided with an adjustable connection that permits incremental tilting from zero (0) degrees to ten (10) degrees above or below the horizontal, while maintaining a common vertical axis through couplers and mounting. Terminal connection shall permit external adjustment about the mounting axis in five-degree increments. The signal can be installed with ordinary tools and serviced with no tools.

Attachments such as visors, backplates or adapter shall conform and readily fasten to existing mounting surfaces without affecting sealing and light integrity of the signal.

### Electrical

Lamp fixture shall comprise a separately accessible housing and integral lamp support, indexed ceramic socket and self aligning, quick-release lamp retainer. Electrical connection between case and lamp housing shall be accomplished with an interlock assembly, which disconnects a lamp housing when opened. Each signal section shall include a covered terminal block or screw attachment of field wires. Concealed # 18 AWM, Stranded and coded wires shall interconnect all sections to permit field connection within any section.

### Photo Controls

Each signal section shall include integral means for regulating it's intensity between limits as a function of individual background illumination. Lamp intensity shall not be less than ninety-seven (97) percent of uncontrolled intensity at one thousand (1,000) foot candle (ft-c.) and shall reduce to fifteen (15) plus two (2) percent of maximum at less than one (1) ft-c. over the applied voltage and ambient temperature range. Response shall be proportional and essentially instantaneous to any detectable increase from darkness to one thousand (1,000) ft-c. and damped for any decrease from one thousand (1,000) ft-c.

The intensity controller shall comprise an integrated, directional light sensing and regulating device interposed between lamp and field wires. The device shall be responsive over an applied voltage of 95V to 130V, 60 Hz. temperature range of forty (40) degrees Fahrenheit to one hundred sixty-five (165) degrees Fahrenheit and may provide phase controlled output voltage, but shall have a nominal open circuit terminal impedance of one thousand (1,000) Ohm.

### Installation

The signal should be installed, directed and veiled in accordance with published instructions and the Traffic Engineer's visibility requirement. Each section of the signal should be masked with prescribed materials in an acceptable and workmanlike manner.

### Non-Programmable Signal Heads

All signal heads, eight (8) inch, twelve (12) inch, and combination eight (8) inch and twelve (12) inch shall be cast aluminum and shall come complete with mounting opening plugs, washers and gaskets for mounting. Heads shall be highway signal yellow in color (both faces and housings). Visors shall be aluminum and shall be highway yellow for outside and flat yellow inside.

Pedestrian Signal heads shall be I.C.C. eighteen (18) inch clamshell mounting type, (Portland Orange and Lunar White). Units shall be highway yellow in color. Units shall come complete with a combination cut out and/or honeycombed visors, to prevent sun washout. Units are to be incandescent.

# Mounting Hardware - Section 2-8

### Mast Arm Mounts

Signal head placement as shown on the plans are representative only. All mast arm signal head mounts shall be of an Astro Type mount. Each head shall be mounted with a separate mount. Horizontal clustering of two (2) arrowed heads next to a three-section standard head shall be permitted on one Astro Type signal mast arm mount.

### Side of Pole and Top of Pole Mounts

One-way side and top mounts shall be either bronze or malleable iron and shall be highway yellow in color. Two-way side mounts for signal and pedestrian signal heads shall be bronze or malleable iron, and shall be highway yellow in color. Two-way signal head mounting assemblies shall use a "T" fitting in the center frame pipe in lieu of a drop nipple form the top.

### Backplates

Backplates shall be furnished and installed on all vehicular signal heads. No background light shall show between the backplates and the signal face or between sections of the signal head.

Backplates shall be either all one piece or sectional. Sectional backplates shall be riveted together. No screws shall be allowed for putting backplates together. Backplates shall be five (5) inches in width unless otherwise approved by the traffic Engineer. Backplates shall be louvered to allow airflow and yet not permit background light to be visible to the motorist. Backplates shall be painted Fat Black. Backplates shall be installed to the signal head using the appropriate screws and one-quarter (1/4) inch zinc plated flat washers.

### Push Button Stations

Pedestrian push buttons shall be of the direct push button contact type. They shall operate on a voltage not to exceed 18V AC. They shall be of tamper-proof design and equipped with a push button instruction sign. Button frames shall be painted yellow.

The assembly shall be weatherproof and constructed so it shall be impossible to receive any electrical shock under any weather conditions.

The pedestrian push button instruction sign shall include informational text To Cross Push Button, Start Crossing (graphic of walking man) Watch for Turning Cars Flashing -Don't start (graphic of hand) – finish.

### Controller and Cabinet Specifications

820-VMS controller and cabinet assembly consisting of the following:

- The NEMA, 820-VMS Controller is a two-to-eight phase (with pedestrian Service on all phases), four overlop, dual-ring controller.
- NEMA Controller Cabinet Type P aluminum cabinet in accordance with NEMA 3R rating and UL listed.

Including the following:

# • Four (4) Model 430 transfer relays

- One (1) Model Midtex 136-62T3A1 120 VAC, 30 AMP
- Twelve (12) Model 200 load switches (twenty-five (25) AMP cube type)
- Six (6) Model 262 Detector System dual loop amplifiers
- One (1) NEMA Conflict Monitor LCD-12P
- One (1) front fluorescent lamp assemblies
- A switch (police door) compartment, with removable back panel, shall be supplied on the outside of the cabinet main door.
- One (1) Transient voltage surge suppression system
- One (1) Model 752 opticom discriminator
- Radio interference suppressor (RIS) shall be supplied
- A mercury contractor shall be used to switch AC power on load bay
- Crossing if Started, Steady (graphic of hand)- Pedestrians Should Not Be in Crosswalk.
- Sign dimensions shall con form to mounting frames as shown in details.

### **Electronic Equipment**

All loop detector amplifiers shall be two-channel plug in type, which incorporates digital output timing functions. The timing functions are Delay and Extension. All amplifiers shall have both pulse and presence for each channel to be set by thumb wheel switching only. All amplifiers shall have sequential scanning for elimination of cross talk.

- Emergency Vehicle Pre-empt Opticom No. 711 and 752(3M) units shall be used exclusively.
- Conflict Monitor The conflict monitor shall be a NEMA Standard TS-1

### Illuminated Overhead Signage

The internally illuminated signs are for "Naim-Inter Mark II, doubled faced logo and guide. These may be fabricated or of the general type manufactured by Nu-Art lighting and Manufacturing Company, Salt Lake City, Utah; or WinkoMatic signal Company, Avon Lake, Ohio. Some manufacturers fabricate standard sizes of those signs required on the plans. All signs on any single project or at any specific location shall be from the same manufactures or fabricated.

The face of the panel shall be "Lexan" or an approved type of sufficient thickness to permit minimum deflection, as certified by the manufacturer. All faces shall be of the same material. Colors shall be standard approved colors for highways signs. The colors shall be white, green and blue applied on the interior sign face.

The illumination source shall be florescent lamps, powered by a ballast for low temperature operation. The interval illumination shall provide a uniform lighting on the sign message and background. Photoelectric controls are required and shall be of the "hail-resistant" type and of the road rating for the intended use as shown on "Wiring Schematic."

The front side panels of the case shall be hinged, either by a continuous hinged or extruded interlocking hinge, to provided access to the lamps. A weather tight gasket shall be provided all around the sign face to exclude dust and moisture. The latching device shall be either screw type or latch type to provide a secure attachment of the sign face to the case. All the exterior hardware, hinges, etc. shall be painted mocha brown, in accordance with Subsection 703.3.

The sign case shall be securely attached to the support structure. Close coordination is to be maintained between the sign fabricator to assure all attachments devices are properly placed. The sign layout shall include the street name, metro block number, and the City of Fort Collins Logo on both sides of the sign assembly. Each sign shall have a plug in type photocell.

### **Cabinet Foundations**

Cabinet foundations will be completely poured in one operation and will be composed of concrete conforming to Section 600, Concrete work, of these STANDARDS AND SPECIFICATIONS. The ground mount cabinet will be the bench top type and will be as shown on the accepted plans or as directed by the Traffic Engineer. Anchor bolts will be installed using the supplied template with a controller on a foundation that has been poured level so that the cabinet will set flush with the foundation.

As an alternative, the Traffic Engineer may approve a fiberglass cabinet base. Foundations around controllers will be caulked both inside and outside the controller base to prevent water seepage.

### Cabinet locations

Visual aesthetics should be considered in the location of signal controller cabinets.

# Traffic Signal Poles and Mast Arms - Section 2-9

### Standard Type Poles

All traffic signal poles and mast arms shall be of American Steel and shall be structurally engineered by the manufacturer in the United States to carry the proposed weight load to sign heads, mounting hardware and traffic control and street name signs and as stated herein; the poles and mast arms shall also be structurally engineered to withstand wind loads of AASHTO 90 standards minimum design criteria with the maximum number of purposed traffic signal heads with five (5) inch backplates and traffic control and street name signs.

All poles shall be furnished with anchor bolts, nuts and washers; pole caps; door covers; rebar cages in conformance with CDOT Specifications (except ten (10) foot poles); anchor bolt nut covers. All curved mast arm traffic signal poles shall be one of the following or approved equivalents:

• Valmont Poles

Ameron Poles

Roadway clearance at end of signal mast arm shall be twenty-one (21) feet from roadway with side slope of two (2) to three (3) percent.

All traffic signal poles and mast arms shall be of like manufacture. The type of poles shown on the plans is for illustrated purposes only and is not to be construed as representative of one manufacturer. Workmanship and finish shall be equal to the best general practice of metal fabrication shops.

All traffic signal poles, mast arm, concrete foundations, and necessary hardware shall conform to the appropriate requirements of sections 601, 613, 713 and 715 of CDOT Standard Specifications for Road and Bridges, and the details shown on the plans.

### Standard Poles

Poles shafts shall be straight, with a permissive variation not to exceed one (1) inch measured at the midpoint of a thirty (30) foot or longer pole, and not to exceed three quarters of an inch of an inch measured, at the midpoint of a pole shorter than thirty (30) feet.

Ten (910) foot signal poles shall be capable of supporting a signal head using a standard pole top mount.

### Signal Mast Arms

All traffic signal mast arms shall be furnished with end caps. If, while being installed, a arm is determined to be shortened, the Responsible Party must fabricate and install a new end cap.

### Luminare Mast Arms

All luminare are mast arms shall be of the single arching type, and straight, angled or ornamental types shall be acceptable. These mast arms are to be standard eight (8) foot arms.

### Pole Foundations

All foundations shall be Portland cement concrete conforming to the applicable requirements of Class A, as referenced in the CDOT Standard Specification for Road and Bridge Construction, most current edition. (Foundation dimensions shall be determined by the Traffic Engineer.)

The bottom of concrete foundations shall rest on firm ground. Foundations shall be poured monolithically where practicable. For pole of pedestal, the top four (4) inches shall be poured after the pole or pedestal is in proper position. The exposed portions of the foundation shall be formed to present a new appearance.

Top of foundations, except noted on the plans, shall be finished to curb or sidewalk grade, or as ordered. Forms shall be rigid and securely braced in place. Conduit ends and

anchor bolts shall be placed in proper position and proper height, and shall be held in placed by means of template until the concrete sets.

Both forms and ground which shall be in contact with the concrete shall be thoroughly moistened before placing concrete.

Where obstructions prevent construction of a planed foundation, the Responsible Party shall construct an effective foundation, as directed by the Traffic Engineer.

Span wire and mast arm poles shall be installed with the proper rake as recommended by the manufacturers of the poles so as to assure a substantially vertical set when the specified signal and lighting equipment is installed.

Anchor bolts provided by the manufacturer of the poles shall conform to Subsection 715.02 of the CDOT Standard Specification, and shall be provided with two (2) washers and two (2) nuts each. Pluming the pole shall be accomplished by adjusting the nuts before the foundation is finished to final grade. Shims or other similar devices for pluming or raking shall be permitted only when approved by the Traffic Engineer.

The excavation required for the installation of pole foundation shall be performed in such a manner as to avoid any unnecessary damage to streets, sidewalks, landscaping, utilities and other improvements. Excavation shall be performed immediately before the installation of the concrete foundation. The material from the excavation shall be placed in a position that shall not cause damage or obstruction to vehicular and pedestrian traffic, or interfere with surface drainage. Foundation hole that have been excavated, and shall not be filled with concrete immediately, must be covered with a solid surface covering and barricaded until concrete is poured.

### Span Wire Poles

Span wire poles are discourage and shall only be permitted with a written variance Given by the Traffic Engineer. All poles for Span wire installation shall be ten (10) inches diameter poles minimum length thirty-five (35) feet. Poles shall have a minimum yield strength of thirty-five thousand (35,00) psi and a minimum unit weight of 40.48 pounds per foot for ten (10) inch poles for a span of one hundred ten (110) feet or less. Spans over one hundred and ten (110) feet in length shall require twelve(12) inch diameter poles with a minimum unit weight of 49.56 pounds per foot. Poles shall be installed so that they shall plumb when deflected by the installed load.

Protective Coatings for all Span Wire Poles - Signal Poles with Mast Arms

### Scope

This specification is designed for the use of Amercoat 450 GL aliphatic polyurethane (or approved equivalent) in conjunction with Amercoat 71 polyamide cured epoxy primer (or approved equivalent) for the protection and finish of the exterior or tapered and non-tamper, color steeled poles. Interior surfaces shall be prime painted by dip or spray. This specification is designed for the use of galvanized (or approved equivalent) for the protection or finish of the exterior of tapered and non-tapered steel poles.

# General

In order to be acceptable, all poles and component parts furnished on this project by a manufacturer, or their authorized representative, shall be in accordance with the terms and requirements asset forth herein. Other comparable coating systems that comply with these specifications may be acceptable subject to the approval of the City. The Responsible Party shall be required to furnish the City with a notarized certificate of compliance from the pole manufacturer that guarantees the coating system used in conformance with these Standards and Specifications and is free of defective workmanship.

# Surface Preparation for Exterior Protective Coating Systems (Painted)

Exterior surfaces of shaft and arm(s), and component parts, shall be abrasive blasted in accordance with coating manufacturers recommendations. The lower interior portions of the shaft from the base plate bottom to the top of the hand opening, shall receive the same treatment. All rough and sharp edges shall be rounded off. All weld splatter, flux and slag around the base plate, handhole, arm connections and other areas of welding shall be removed. All drilling of holes and welding of tenons or hubs shall be done prior to abrasive blasting.

# **Requirements of Exterior Protective Primer System**

The interior surface of the pole shaft shall be thoroughly cleaned, dried, and free of mill scales, rust, oil, grease, and dirt, or other contaminants before interior primer is applied. Primer shall conform with Federal Specifications TTP-645, yellow or red oxide. Minimum dry film thickness shall be two and one-half (2-1/2) mils.

## **Requirements of Exterior Protective Coating System**

After abrasive blast, all exterior steel surfaces shall receive a treatment with a heavyduty, corrosion-resistant protective coating system consisting of two (2) coats of polyamide-cured epoxy (Amercoat 71), or approved equivalent, at a minimum of one and one-half (1-1/2) mils dry film thickness per coat to provide basic corrosion protection. Color topcoat shall consist of one aliphatic polyurethane (Amercoat 450 GL or approved equivalent) at minimum of one and one-half (1-1/2) mils thickness. The total exterior coating system shall consist of a minimum of four and one-half (4-1/2) mils. D.F.T. Coating shall be composed of acrylic resins and modifiers in suitable organic solvents forming a satin finish with lasting color, resistant to fumes, splash and spillage of acids and alkalies.

All two-coat systems for exterior application shall be supplied by the same coating manufacturer to ensure a compatible protective coating system resistant to corrosion, abrasion and impact.

Color for finish topcoat shall conform to the City of Fort Collins, Colorado requirements. Color to be determined by City of Fort Collins.

# Application

Primer shall be polyamide-cured (#71 Amercoat or approved equivalent) and shall be strictly applied according to manufacture s recommendation. The lower interior portion of the shaft, from the bottom of the base plate to the top of the handhole opening, shall receive the same application treatment. All surfaces are to be kept free of moisture, oil, grease and the organic matter until coated. Failure to do so shall prevent proper adhesion and shall require the abrasive blast procedure to be repeated. Solvent wiping is not satisfactory as contamination may be spread and not be removed. Application shall be by conventional or airless spray only.

# **Drying or Curing Time**

Drying time for both Amercoat #72 or approved equivalent primer coats prior to color topcoat application shall be a minimum of four (4) hours each at seventy-seven (77) degrees Fahrenheit (twenty-five (25) degrees Celsius).

Drying time for the application of Amercoat 450 GL or approved equivalent color topcoat (one and one-half (1-1/2) mils minimum) shall be minimum of four (4) hours at seventy (70) degrees Fahrenheit (twenty-one (21) degrees Celsius).

Curing time after final color coat and prior to packaging, loading and shipment shall be a minimum of seventy-two (72) hours at seventy (70) degrees Fahrenheit (twenty-one (21) degree Celsius). This requirement must be met to ensure complete dry-through time.

# Wrapping and Packaging

Upon completion of the coating system, and prior to shipment, poles and arms shall protective Wrapping With two (2) inch minimum overlap applied at all contact points with cushioned dunnage during transport. This wrapping should be a cushioned material, be a minimum of one-eighth (1/8) of a inch thick and twenty-four (24) inch wide, be applied at all contact points, and extend a minimum of eighteen (18) inches on either side of dunnage locations at poles and arms. Minimum thickness of wrap shall be three-eighth (3/8) of a inch at all contact points. All component parts shall be individually wrapped with heavy Kraft paper and boxed for shipment.

# Handling and Shipment

Poles shall be handled in a manner that shall preserve the overall appearance and prevent damage to the coating. The use of chains or cables for loading, unloading, shipping or installing is prohibited. Only three-quarters (3/4) of a inch in diameter or larger nonabrasive nylon rope or equivalent nylon belting may be used. Adequate hold-downs and appropriate blocking shall be utilized for shipping to prevent load movement and damage to the outer coating in transit. No handling should be allowed until "dry-through" condition has been achieved with the coating.

# **Delivery, Installation and Acceptance of Poles**

Extra care shall be taken to not damage the coating. Upon arrival of the poles at the delivery point, neither chains nor cable shall be used for either unloading or installation of poles.
### **Procedure for Field Touch-Up**

The Responsible Party shall utilize a pole manufacture who shall furnish extra primer and color coat paint to satisfy the needs of field touch-up requirements, in the event of minor physical damage to the coating from handling or transit. Damage area must be cleaned and dry before repair application. Field touch-up shall follow the direction of the pole manufacturer or an authorized representative in order to guarantee manufacturers warranty.

### Surface Preparation for Exterior Protective Coating System (Galvanize)

The traffic signal poles shall be galvanized in accordance to ASTM A123 Each component must be completely coated in a single dip. No double dipping will be allowed. All miscellaneous hardware shall be galvanized per ASTM A123.

Concrete Foundations - Section 2-10

General

Foundations will be composed of concrete conforming to Section 600, Concrete work, of these STANDARD AND SPECIFICATIONS. Foundations for all poles, standard, pedestal, and cabinets as shown on the accepted plans, will rest on firm ground. Forms required in pouring bases will be true to line and grade, rigid, and securely braced.

Both forms and ground which contact the concrete will be thoroughly moistened prior to pouring of the concrete. Conduit stubs and anchor bolts will be placed in proper position, alignment, height, and securely held in place by means of a template while concrete is being poured and until the concrete has properly set. After pouring concrete, the anchor bolts will be raised and lowered individually to eliminate air pockets and to allow proper alignment of the anchor bolts in the concrete prior to the setting of the concrete. Any deviation in the pouring of the foundation proposed by the Contractor will require prior approval by the Traffic Engineer.

### Poles, Standard and Pedestal Foundations

Poles, standard, and pedestals will not be erected until the foundation concrete has been set at least seven (7) days (foundation of high-strain poles will set a minimum of ten (10) days and will be plumbed or raked as required and directed by the Traffic Engineer.

Foundation for all poles will normally be flush-top variety and will be located as shown on the plans or as directed by the Traffic Engineer. In each case the maximum distance behind the curb for pole location is desired in locations where the road-way is not curbed, the top of the foundation will be six and one-quarter (6-1/4) inches above the grade of the edge of the payment. Where foundations are located in the sidewalk, the foundations will be two (2) inches above the surface of the sidewalk, and expansion materials will be placed between the foundation and the sidewalk, with the top of the expansion material level with the sidewalk surface. Foundations for traffic signal control cabinets, which are located in the sidewalk, will rise above the sidewalk surface as shown on the plans.

The foregoing provisions are general descriptions for normal roadway conditions. In certain cases, special foundation requirements may be indicated on the accepted plans or required by the Traffic Engineer, i.e., where heavy excavations, embankments, slopping (rip-rap) areas near roadways, or unusual soil conditions are encountered.

Service Systems

### General

Service points shown on the accepted plans are approximate. The exact location will be determined in the field by the Contractor, The Traffic Engineer, and the City of Fort Collins Light and Power.

The Contractor will furnish and install conduit and conductors to the service points as shown on the plans. Conduit for traffic signal service will not be less than two (2) inches in size.

Conduit and wiring specified in the wire layout sheets and shown on the accepted plans will be furnished and installed from service poles to the controller cabinet, or to the location shown on the accepted plans. Will be furnished and installed from service pole to the controller cabinet, or to the location shown on the accepted plans.

### **Service Poles**

All conduit will be strapped to poles with rigid 2-hole straps and #8 or #9, one and one (1-1/2) long wood screws, or as shown on the accepted plans. Plumber's tape, wire nails or other means of fasting conduit WILL NOT BE PERMITTED. Where necessary, conduits, covers and gaskets will be provided and installed.

All conduit in service installation above ground will be a rigid galvanized steel type of the size specified on the plans. In areas where rigid steel conduit is coupled to rigid PVC conduit, which in turn used for the underground portion of the service run, the joining of two conduits will take place underground from two (2) inches to ten(10) inches below the surface.

The disconnected switch mounted in a weatherproof box will be located on the service pole as designed on the plans. The conduits will be securely bonded to the service pole when deemed necessary by the Traffic Engineer, and will be bonded in a like manner to the service pole ground system.

### Pavement Markings - Section 3-1

General

This assistance shall be in the form of advising the Responsible Party's engineers or Responsible Party on what type of layout is required. This shall include the designation of locations where crosswalks, exclusive right-turn lanes, exclusive left-turn lanes, edge lines, stop bars, white skip lines, solid double yellow lines, and yellow skips are to be installed.

It is the intent of these Standard and Specifications to describe the requirements for reflective pavement marking thermoplastic (performed) to be used on all roadway surfaces within the City, to provide for the submission of samples, to describe the laboratory and service test procedure which must be used to rate the materials proposed for making new city roads, and to describe the requirements for the actual field installation of proposed pavement markings. Alternative markings for temporary installations are also listed as traffic line paints, hot extruded thermoplastics and detour grade tapes.

Policies

### **Signing and Pavement Marking Work Procedures**

Time Frame:

1. Notice of Work from developers

Notice

Four sets of plans - entire subdivision or PUD

- 2. Engineering/design of work
  - Site review Work design (three prints) Billing Action report
- 3. Process billing (50% due) Good for one year. Refund dependent on material cost and work done. Must be received 10 WEEKS prior to work for signage and pavement markings; 7 MONTHS prior to work for traffic signals.
- 4. Receive payment
- 5. Process payment
  - Notice to engineer Forward plans (action request) to crew chief Allow four weeks for processing
- 6. Order and make up materials
- 7. Request of work (map of area requested) must be received 4 weeks prior to work plans time for contractors' payment of final payment
- 8. Final engineering work

On-site review Design revisions Final billings Action report

- 9. Process final billing (No refunds)
- 10. Process payment
  - Notice to engineer

Forward area map, final billing, action report, initial action report to crew chief. Release to Engineering and Building Inspection

11. Construction

12. Return and process action report

### **Street Signing Specifications**

The City of Fort Collins requires street name and regulatory warning signs for new developments prior to the issuance of Certificates of Occupancy. These signs are necessary to direct emergency services and assist motorists with the proper street identifications.

Only the authority of the Traffic Operations Department shall place traffic control devices. Street name signs and other required signs shall be erected at specific locations as designated by the Traffic Operations Department. It is very important that the developer submits a plat map and a letter of request for street name signs and other required signs to the Traffic Operations Department at least 5 (five) weeks prior to the completion date, with the following information:

- A plat of the development indicating the official street names.
- Block numbers or house addresses.

After the Traffic Operations Department has designated the plat, the developer will be contacted. At this point, the developer may choose to have the City of Fort Collins or a signing company install the signs as designated on the plat. After the signs have been installed, the Traffic Operations Department will perform an inspection to ensure that all-signing installations and materials meet the City of Fort Collins signing standards.

If a signing company installs signs, the City of Fort Collins will not be responsible for the upkeep and maintenance of any signing until all standards are met.

It is the responsibility of the developer to assume the initial cost of the signing installations of street name signs and other required signs or devices.

Performed Plastic Pavement Markings and Legends

### General

The prefabricated markings described shall consist of white or yellow pigmented plastic film with reflective glass spheres, uniformly distributed throughout their entire crosssectional area, and shall be capable of being affixed to bituminous or Portland cement concrete pavements by either a pressure sensitive pre-coated adhesive or a liquid contact cement. The markings shall be provided in complete, a form that shall facilitate rapid application and protect the markings in shipment and storage. The manufacturer, when bidding, shall identify proper solvent and/or adhesives to be applied at the time of application, all equipment necessary for proper application, and recommendation for application that shall assure an effective performance life. The marking film shall have resealing characteristics such that it shall fuse with itself and with previously applied marking materials of the same composition under normal conditions of use. Prefabricated legends and symbols shall conform to the applicable shapes and sizes as outlined in the MUTCD.

### Classification

The markings shall be highly durable retro reflective pliant polymer materials, designed for longitudinal and word/symbol markings subjected to high traffic columns and severe wear conditions, such as shear action from crossover, or encroachment on typical longitudinal configuration such as edge lines, barrier lines and lane lines.

### **General Requirements for Preformed Plastics**

Composition: The retro reflective pliant polymer pavement marking film shall consist of a mixture of high quality polymeric materials, pigments, 1.5 index glass beads uniformly distributed throughout its cross sectional area and with a reflective layer of beads bonded to the top surface. The film shall be composed of the following materials.

Conformability and Resealing: The retro reflective pliant polymer pavement marking film shall be capable of conforming to pavement contours, breaks, faults, etc. through the action of traffic at normal pavement temperatures. The film shall have resealing characteristics such that it is capable of fusing with itself and previously applied marking film of the same composition under normal conditions of use.

Pigmentation: The pigments shall be selected and blended to provide a marking film which is white or yellow conforming to standard highway colors through the expected life of the film.

Glass Beads: The glass beads shall be colorless and have a minimum index of refraction of 1.70 when tested using the liquid oil immersion method. The size and quality of the beads shall be such that performance requirements for the retro reflective pliant polymer film shall be met. Bead adhesion shall be such that beads are not easily removed when film surface is scratched firmly with thumbnail. The film shall have glass bead retention qualities such that when a two (2) inch by six (6) inch sample is bent over a one-half (11/2) inch dimension perpendicular to the mandrel axis, microscopic examination of the area on the mandrel shall show no more than ten (10) percent of the beads with entrapment by the binder of less than forty (40) percent.

Skid Resistance: The surface of the retro reflective pliant polymer film shall provide a minimum resistance value of forty-five (45) BPN when tested according to ASTM E303-83.

Reflective Intensity: The white and yellow film shall have the following initial reflective values at 0.2 degrees and 0.5 degrees observation angles measured in accordance of the photometric testing procedures of Federal Specifications FP-74 Section 718.01 (A).

Reflective values shall be expressed as candlepower per foot-candle per five (5) square feet (candelas per lux per five (5) square meters measured on a fifteen (15) square foot panel) (two and one-half  $(2 \ 1/2)$  feet by two (2) feet) at an 86.5-degree entrance angle. The five (5) square feet is derived from a standard stripe, defined as four (4) inches by fifteen (15) feet equals five (5) square feet.

	White		Yellow			
Entrance Angle	86.0	86.0	86.5	86.0	86.0	86.5
Observation Angle	0.2	0.5	1.0	0.2	.05	1.0
Specific Luminance	1000	690	550	750	460	395

(SL) [ (mcd . ft ) . fc 1]

Reflectivity Retention: To have a good, effective performance life, the glass beads must be strongly bonded and not be easily removed by traffic wear. When installed in accordance with the manufactures recommendations, these markings shall exhibit the follow average reflectance values after forty-eight (48) months, when measured at an entrance angle of 86.5 degrees and an observation retroreflectometer, as described in the Effective Performance Life section.

	White	Yellow
Entrance Angle	86.5	86.5
Observation	1.0	1.0

(SLO [mcd . ft ) . fc 1 ]

### Average Value

Effective Performance Life: The materials, when applied according to the recommendations of the manufacture, shall provide neat, durable markings that shall not flow or distort due to temperature, if the pavement surface remains stable. Although reflectivity is reduced by wear, the pliant polymer shall provide a cushioned, resilient substrate that reduces bead crushing and loss. The markings shall be weather resistant, and through normal traffic wear, shall show no appreciable fading, lifting or shrinkage which would significantly impair the intended usage of the marking throughout its useful life, and show no significant tearing, roll back or other signs of poor adhesion.

The Responsible Party shall utilize a manufacturer who warrants that longitudinal markings installed using materials meeting this specification shall meet the criteria shown in the table ( under the reflectivity Retention section ) for a period of forty-eight (48) months from the date of installation regardless of average daily traffic volume. The responsible Party and/or the manufacturer shall replace in total the portion of the material shown to be below these values.

Reflective performance shall be determined by an average brightness reading.

Yellow and White Traffic Line Paint

### Scope

Ready mixed paint shall be of a consistency suitable for use on a highway pavements and curbings of either asphaltic or Portland cement type. It is required that the white and yellow paint furnished shall bind glass spheres which shall be incorporated into the line by a drop-on or pressure-fed dispenser, at a minimal rate of six (6) pounds per gallon of paint. The paint shall be applied to the pavement in such manner as to provide a

satisfactory marking and delineation in all respects, as determined by the Traffic Engineer.

Traffic line paints shall only be used on newly construction areas, which are scheduled to be totally replaced or overlaid within a twenty-four (24) month time period. Paints can also be used on existing roadways adjacent to new section due to newly created alignments. This can be done with the specific written consent of the Traffic Engineer.

### Requirements

All manufactured paint shall be prepared at the factory to be ready for application. The addition of thinner or other materials to the paint after the paint-has been shipped shall not be permitted.

The finished paint shall be homogenous, free of dirt, water and other foreign matter. The paints shall be strained immediately prior to canning.

An anti-settling agent or combination of anti settling agents shall be incorporated in the paint to prevent caking and excessive settling of the pigment in the package, and to control the viscosity. The total of all these additives may not exceed eight (8) pounds per one hundred 100) gallons, except when "M-P-A 60 (Toluene)" (twenty-four (24) percent solids) alone is used, not more than twelve 12) pounds may be incorporated in one hundred (100) gallons.

There shall be no caking or excessive settling in the package that cannot be readily pumped and processed through striping equipment.

The color of the yellow paint shall conform to Federal Standard 595A.

### Inspection

All materials used in formulation shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Traffic Engineer.

### Testing

All tests shall be conducted in accordance with the latest test methods of The American Society for Testing and Materials, Federal Test Method Standard No. 141, and if the Traffic Engineer requests, methods in use by CDOT. Evidence of improper formulation, shall be cause for rejection.

Manufacturing Note:

The agents used in each formula for achieving satisfactory anti-settling properties, as described in requirements, may vary to suit the manufacturer's method of manufacture. Finished paint shall still be required to conform to the characteristics of the furnished paint as described in requirements.

Packaging:

All shipping containers must comply with Federal Interstate shipping standards of the CDOT and be stamped 17-H in accordance with the standards.

All containers of paint shall be labeled with the weather proof markings, the color, manufacturers name, date of manufacture, and manufacture's batch number on the lid only.

White Pavement Marking Paint Composition

### **Pigment**

Pigment shall have the following composition for one hundred (100) gallons of paint.

	LBS/Gallons
Rutile Titanium Dioxide, TT-P-422, Type III or	125.0
IV	
Magnesium Silicate, TT-P-403	70.5
Diatamacious Silica 1	89.6
Mica 2	70.5
Calcium Carbonate 3	265.9
Copper Phthalocyanine, TT-P-355, Type I	0.1 oz.

### Vehicle

Vehicle shall have the following composition of approximately one hundred (100) gallon of paint:

	LBS/100 Gallons
Varnish (50% non-volatile in Toluene)	218.9
Chlorinated Paraffin 4	35.9
Chlorinated Rubber 5	89.0
Propylene Oxide	2.0
Toluene TT-T-548	231.9
6% Cobalt Naphthenate, TT-D-643	1.2
24% Lead Naphthenate, TT-D-643	2.4
Anti-Skinning Agent	8.0 max.
Anti-Settling Agent	0.5

### Varnish

The varnish shall consist of fifteen (15) gallon length bodies conjugated safflower oil 6 or bodies caster oil 6 product, the resign of which shall be a petroleum hydrocarbon resin 7. The thinner shall be Toluene. The ingredients shall be processed in such manner as to yield a varnish which, at fifty (50) percent non-volatile content and seventy seven (77) degrees Fahrenheit temperatures, shall have the following characteristics:

	LBS/100 Gallons
Weight Per Gallon, pounds	7.6-7.8
Saponification No., Federal Test Method	100-100
No. 141, Method 5081, (on Non-volatile)	
Acid No., Federal Test Method Standard	4 max
No. 141, Method 5073 (on Non-volatile)	
Viscosity, Gardner Holdt	4 max

### Compatibility

The components of the vehicle shall be compatible when mixed in the proportions specified as listed in the composition of the pavement marking paint.

<b>Characteristics of Finished Paint</b>	LBS/100 Gallons.
Pigment, percent of weight	51.0 -53.5
Volatile, percent by weight	30.5 max
*Viscosity KU at 77 F	72.0 - 80.0
Fineness of grind, Hegman	3 - 5
Weight per gallon, pounds	11.9-12.4

Drying time without beads, 18" wheel patch

	, j U	1
•	(ASTM D 711) minutes	7 max
•	Chlorine content of non-volative vehicle, percent.	29.5-30.5
•	Yellowness Index, Federal: Method	0.10 max
•	(Standard No.141 Method 613)	
•	Aromatic Content of Volatile, percent by weight	100 min

\*Viscosity must be maintained in storage. Working properties shall be satisfactory.

Yellow Pavement Marking Paint Composition

### **Pigment**

Pigment shall have the following composition for on hundred (100) gallons of paint:

	LBS/100 Gallons
Calcium Carbonate 3	278.5
Chrome Yellow Medium TT-P-246, k Type III	130.0
Magnesium Silicate 2	50.0
Diatomaceous Silica 2	80.0
Mica 2	60.0

### Vehicle

Vehicle shall have the following composition for approximately one hundred (100) gallons of paint:

	LBS/100 Gallons
Propylene Oxide	2.0

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Varnish, (50% Non- volatile)	229.0
Chlorinated Paraffin 4	42.0
Chlorinated Rubber 5	95.0
Toluene TT-T-548	259.0
6%Cobaft Naphthenate, TT-D-643	1.3
24% Lead Naphthenate, TT-D- 643	2.5
Anti-Skinning Agent	1.2
Anti-Settling Agent	8.0 Max
Soya Lecithin	0.5

### Varnish

The varnish shall consist of fifteen (15) gallon length bodies conjugated safflower oil 6 or bodies dehydrated caster oil 6 product, the resin of which shall be a petroleum hydrocarbon resin 7. The thinner shall be Toluene.

The ingredients shall be processed in such a manner as to yield a varnish which at fifty (50) percent non-volatile content and seventy- seven degrees Fahrenheit temperature shall have the following characteristics:

	LBS/100 Gallons
Weight Per Gallons, pounds	7.6-7.8
Saponification No., Federal Test Method	
No. 141, Method 5081, (on Non-volatile)	100-100
Acid No., Federal Test Method Standard	
No. 141, Method 5073, (on Non-volatile)	4 max
Viscosity, Gardner-Holdt	4 max

### Compatibility

The Components of the vehicle when mixed in the proportions specified under "Vehicle" shall develop no cloudiness when retained in the airtight container.

### **Pavement Marking Paint Addendum**

Calcined Grade (Celite 499 or equal)

Color	88
+150 Mesh, %	0
+325 Mesh, %	0.1
Oil Absorption, Gardner	160
Wet Density Lbs., Cu. Ft.	19-20
Bulk Density	4
Hegman	
Chemical Analysis	
H20 Maximum	1.0
S102 Minimum	90.0

Ignition Loss, Maximum	0.5
A1203, Maximum	3.3
T120, Maximum	0.5
CA02	0.5
MGO	0.5
NA20	0.5
NA20 and K20	2.0
Water Solubles, Maximum	0.15
Chemical and Physical Characters	%
S102	70.10
A1203	20.15
K20	3.64
CAO	.50
MGO	.41
T102	1.05

### Material Specification- Potassium Aluminoslicate(Type of Muscovite Mica)

Color Shaded White Specific Resistance-10.000 OHMS Plus Hardness- 2.5-3.0 Mesh, Specification -4-X 1000 Mesh Particle Size - Graduated Scale Specific Gravity 2.73

Tap Density Lb./Cu. Ft.	67.9
Apparent Density - Lb./Cu. Ft.	23.0
0iI Absorption	20.0
Hegman Fineness	4.75
Surface Area M2/GM	3.6
(Nitrogen Absorption)	

### Particle Size Distribution Micron Diameter

Percent by weight/Below Indicated SI	ze
44 (325 mesh)	-
40	-
30 (450 mesh)	100
20 (625 mesh)	98
15	95
10 (1250 mesh)	85
7.5	65
5	49
4	42
3	34

2 1	26 15
Chlorine, Percent Color, Gardner Viscosity at 25 C, Poise Specific Gravity at 25/25 C Stability Max. percent of HCL Liberated in hours at 175 C	40-43 12 Max 20-30 1.150-1.565 0.80

Chlorine, Percent	65-68
Viscosity, 20% in Toluene, Centipoise	14-20
at 25 C	
Specific Gravity	1.550-1.568
Index of Refraction	1.550-1.560

A twenty-five, (25), percent concentration in Toluene shall show no haziness or turbidity, and when stored for one (1) week at seventy-seven (77) degrees Fahrenheit, shall not corrode the tin plate in a covered tin-coated can.

Acid Number	4 Maximum
Iodine Number	123 Min.
Saponification Number	185-200
Specific Gravity 25/25'C	0.945-0.9555
Viscosity, Gardner-Holdt	73
Color (Gardner)	4 Maximum
Pout Point, degrees F	-5
Color (Gardner 1933)	13 Maximum
Softening Point, ASTM degrees F	200-220
Iodine Number, WIJS	140 Max
Acid Number	2 Maximum
Saponification Number*	2 Maximum
Specific Gravity 60/60'F	1.07-1.20
Non-volatile matter, Wt. Percent	100
Solution 77'F.	F-P
Ash	

\*Follow Method No. 5081 of Federal Test Method Standard 141 except as follows: Use twenty-five (25) ml of reagent grade Toluene for solution and five (5) ml of 0.5N alcoholic potassium hydroxide. After reflux add excess of standard acid and back titrate very slowly with shaking, using 0.2N standard alkali. Use special alkali resistant flasks.

### Reflectorize Glass Bead - Section 3-2

General

This specification is intended to cover free-flowing waterproofed, reflectorizing glass beads for drop-on type application on highway traffic paint for the production of a reflective surface improving night visibility to the painted markings without altering daytime visibility. The beads shall conform to the following specifications:

A blended material consisting of spheres containing refractive. indices of 1.50 and 1.65 Manufactured form high grade optical crown glass of a composition designed to be highly resistant to traffic wear and to the effects of weathering. Colorless, clean and transparent.

### Material

The reflectorizing glass beads shall conform to the following: Refracture Index - When testing by the liquid immersion method at twenty-five (25) degrees Celsius, seventy (70) percent of the spheres shall have an average index of not less than 1.50, and thirty (30) percent shall have an average index of not less than 1.65.

### **1.50 INDEX GLASS BEADS**

U.S. Standard Sieve Number	Percent Passing-by Weight
20	95-100
30	75-95
50	9-32
80	0-15

### **1.65 INDEX GLASS BEADS**

U.S. Standard Sieve Number	Percent Passing by Weight
50	100
80	90-100
100	75-90
200	0-5

Percent Spheres - A minimum of seventy-five (75) percent (by) weight of the spheres shall be true spheres when tested in accordance with ASTM-D-1155-.53.

Color- The glass spheres shall be colorless to the extent that they impart no objectionable day or night time hue to the binder when applied at concentrations equal to those used on the road surface.

Guidelines for Bicycle Facilities Operation and Marking Bike Lane, Stencils, and Sign Locations:

The purpose of the placement of bicycle stencils on the roadway is to reinforce the specified use of this designated area (bikelane) and to supplement the regulatory signs. Bicycle stencils are to be used on collector and arterial roadways with designated bikelanes. Whenever possible, longer last stencil materials (i.e. stamark) should be used. Bicycle stencils are to be re-installed in the same location on roadways that have been under construction for routine street maintenance or rehabilitation. The standard for the placement of bicycle stencils are as follows:

Arterial Street between two arterial roadways (Example: Drake Road between Shields and Taft Hill Road)

### Standard: 3 stencils per mile each direction

Placement:

- 1. Approximately 50 to 100 past the intersection based upon roadway geometry's (driveways, curb cuts, speed limit signs etc). Example: Drake Road, place stencil approximately 100 west of the Shields Street intersection.
- 2. Mid-block install a stencil approximately 100 on the descent of the collector/arterial intersection. Example: Drake Road, place stencil approximately 100' past Dunbar Avenue.
- 3. Approximately 400 prior to the arterial/arterial intersection. Example: Drake Road, place stencil westbound approximately 400 prior to the intersection of Drake and Taft Hill Road.

*Collector Street between two arterial roadways. Example: Constitution Avenue between W. Drake and W. Stuart* 

### Standard: 3 stencils per mile each direction

Placement:

- 1. Approximately 50 to 100 past the collector/arterial intersection based upon roadway geometry's (driveways, curb cuts, speed limits etc.). Example: Place stencil approximately 100 on Constitution north of Drake for northbound bike traffic.
- Mid-block install a stencil approximately 100 past the local street or collector/collector intersection. Example: Place stencil on Constitution Avenue 100 north of the Independence Road intersection.
- 3. Approximately 400 prior to the Collector/Collector or Collector/Arterial intersection.

### *Example: Place stencil on Constitution northbound approximately 400 before the intersection of W. Stuart.*

### Bicycle Signs

The City of Fort Collins Bikeway Program has a unique logo that has been used to identify bicycle facilities as part of the overall bikeway system. This logo is being used as a backdrop to the regulatory signs and is a consistent identifier of the bikeway program. All bikeway signs will be mounted on a green sign blank with the FC logo on top and

BIKEWAY printed on the second line in white. The third section of the sign is the regulatory/informational stencil (i.e. R3-17 - Right Lane Bikes Only). For sketches of the Bikeway Program signs, see appendix A. Bikelane signs placement should parallel the bike stencil locations (three per mile each direction) and serve to reinforce the pavement marking regulations.

Bike Route signs will be used and will follow the previously described sign standard. A Bicycle Route may be relatively short connecting two bike facilities or long providing a recommended alternative when a bikelane is unavailable. Since a bike route does not benefit from the use of pavement stencils, three signs per mile each direction should be installed. The sign locations match the same standards as bikelane signs and stencils previously discussed.

BICYCLE PARKING signs will also utilize the same bike sign design standards previously discussed and will be placed where necessary.

### Traffic Control Devices

Bicycles should be considered in the traffic signal timing cycles at intersections where bicycle traffic exists or is expected. Special consideration should be given to the use of traffic detection devices at intersections as well. Normally, bicyclist can cross an intersection under the same signal timing phase as vehicles. However, special consideration should be given to multi- lane roadways to ensure adequate crossing time. Bike lanes crossing multi-lane roadways, such as College Avenue at Pitkin Street, should be equipped with bike loop detectors for traffic- actuated signals. These bicycle loop detectors actuate pedestrian timing splits, which extend crossing times for that movement. Detectors for traffic-actuated signals should be sensitive to bicycles and located in the bicyclist's expected path, including left turns. Conveniently located pedestrian/bicyclist push buttons can be used as an alternative to pavement loop detectors if other options are not present.

### Intersections with Bike Lane Markings

A main point of conflict between automobiles and bicycles occurs at intersections. The placement of bikelanes keep bicyclists to the right side of the roadway and motorists to the left. At intersections, bicyclists proceeding straight and motorists turning right must cross paths, thus creating points of conflicts. Striping and signing will be used to encourage the changing of lanes in advance of the intersection. Bikelanes on roadways without dedicated right turn lanes should be dropped off approximately 50 to 75 prior to the intersection to allow cyclists to merge with forward or left-turn moving traffic

### Maintenance of Bicycle Facilities

Bikeways are more susceptible to collecting debris, such as sand, rocks, tree limbs, overhanging shrubs, and broken glass; therefore regular sweeping and maintenance of bikelanes and routes is necessary. A smooth surface, free of potholes and debris, is essential to promoting cycling as a safe alternative method of transportation. Additionally, the pavement edges should be smooth, uniform and not have sharp

dropoffs. Seams between the bikelane and travel lane or drainage pan will not exceed 1/411 in height.

The Streets Division is responsible for maintaining the city's roadways, including bikelanes and routes. Potholes and broken pavement should be repaired immediately, as needed. Bikeways on arterial and collector streets should be swept twice a month and more frequently in the winter months as sand and debris collect in the bikelanes. During the summer, the Bike Ranger rides the bikeways weekly and provides minor cleaning where needed.

Overhanging tree limbs or shrubs encroaching into the bikeways are often identified by citizens or the Bike Ranger and are trimmed by the Forestry Division as needed.

Signs and pavement markings should be inspected semi-annually and kept in good condition. Stamark bicycle stencils should be used on roadways not scheduled for street overlay or rehabilitation.

### Appendix G

Policy and Standards for Maintenance and Improvement of Annexed Infrastructure (City of Fort Collins only)

### **APPENDIX "G"**

### POLICY & STANDARDS for MAINTENANCE AND IMPROVEMENT of ANNEXED INFRASTRUCTURE (CITY OF FORT COLLINS ONLY)

**G.01** City of Fort Collins Policy GM-3.1 "Annexation Policy" of the City Plan Principles and Policies, includes the following general statement for the handling of existing infrastructure constructed in Larimer County and subsequently annexed into the City:

**Infrastructure standards.** Developed land, or areas seeking voluntary annexation, must have their infrastructure improved (e.g., streets, utilities and storm drainage systems) to City standards, or must have a mechanism (e.g. a special improvement district, capital improvements program or other type project) in place to upgrade such services and facilities to City standards before the City will assume full responsibility for future maintenance.

This statement requires further clarification for application to infrastructure already meeting City standards as well as infrastructure that does not meet City standards. Therefore, this Appendix is established in order to (1) set the level of maintenance that the City will initially provide on annexed infrastructure and (2) present criteria for determining what improvements have to be done to upgrade the infrastructure to meet City Standards before the City assumes full responsibility for maintenance.

### **G.02 MAINTENANCE CRITERIA**

### G.02.01 INITIAL MAINTENANCE

G.02.01.01 STREETS BUILT TO CITY STANDARDS - In August 1989 the Larimer County Commissioners adopted "Urban Area Road Standards" (County Urban Standards) for streets built in the urban growth areas of the cities of Loveland and Fort Collins. These standards were modeled after, and equal to or better than, the City of Fort Collins street standards in effect at that time. Streets developed in the County that were designed and constructed to those standards would be considered "meeting current City standards." As long as those streets have been maintained and not allowed to deteriorate, the City would take on "full responsibility for future maintenance" to the level that all City streets built to City standards have been maintained. If the streets had not been maintained properly and repairs were necessary, the City would only provide minor maintenance to a level to keep the streets from becoming unsafe. With the improvements in a deteriorated state, the property owners adjacent to these streets would be required to rehabilitate the streets to meet acceptable maintenance standards of the City, at their expense, prior to the City taking on full responsibility for maintenance.

G.02.01.02 STREETS NOT BUILT TO CITY STANDARDS - All other streets and roads that have been annexed into the City and not constructed to County Urban Standard nor to City standards, shall be handled in the following way:

(a) The City shall provide only minor maintenance to the pavement surfaces to keep them from becoming unsafe. Minor maintenance may consist of periodic grading of gravel surfaces and filling potholes in asphalt surfaces. In addition the City will maintain all culverts and storm drainage pipes that pass under an annexed street.

(b) The property owners adjacent to annexed county streets will be responsible for maintenance of curb and gutter and/or borrow ditches and culverts that cross under driveways.

- **G.02.01.03 UTILITIES** are generally owned by the City or by publicly regulated utility companies and/or districts. The City or the utility companies/districts shall maintain all utility lines and facilities owned by them. Private utility systems shall be the responsibility of the utility owners and not the City.
- **G.02.01.04 STORM DRAINAGE SYSTEMS** The level of maintenance of storm drainage facilities dedicated to the public, to be assumed by the City, shall be determined by the City. The property owners must first have a study made (at their expense) of the existing drainage system, including everything that contributes runoff to the system, how it functions, and how it conforms or fails to conform to City standards. The study must be performed by a professional engineer licensed in the State of Colorado. The study results must then be submitted to the City for evaluation. The City will evaluate the system for its adequacy as a functioning system and determine whether it meets city standards. If the system functions adequately, meets City standards and is located in the public right-of-way or located on land owned by the City, the City

will may accept certain responsibilities for maintenance. If the system does not function or has certain non-functioning parts or does not meet City standards, the City shall evaluate the seriousness of the deficiencies for the health, safety or welfare of the public and take appropriate action. Non-functioning components that cause damage only to the property owners adjoining the system, will be the full responsibility of those property owners to correct or improve as they deem necessary. If the system deficiencies do cause damage to the public other than the adjoining property owners, the City shall take action to the degree necessary to inform the property owners of the problem, indicating their responsibility to correct the problems.

### G.02.02 FULL RESPONSIBILITY FOR MAINTENANCE

When infrastructure meets or has been upgraded to an acceptable level to meet City standards for the City to accept "full responsibility for maintenance," the City shall maintain such infrastructure to the same level that maintenance is performed on all other public infrastructure in the City.

### G.03 IMPROVEMENTS TO CITY STANDARDS CRITERIA

At such time that the City determines that minor maintenance is no longer adequate to protect public safety, the annexed infrastructure must be upgraded to City standards at no expense to the City. Improvements may be done voluntarily by the adjacent property owners, or the City Council may impose the improvements through the adoption of a Special Improvement District (SID). The SID is still an option available to the property owners on a voluntary basis.

The required improvements will be determined by the City specifically for each subdivision depending upon the existing problems that need to be corrected and constraints that may prevent certain improvements from being built. Required improvements to meet City standards at the expense of the property owners may include, but not be limited to, the following:

### G.03.01 STREETS

- (a) Improve all streets to standard widths
- (b) Pavement (upgraded to 20 year design life)
- (c) Curb and gutter required (if borrow ditches must remain, other measures may be considered to allow runoff to the ditch, such as using a concrete edge to protect the pavement and borrow ditch)
- (d) Sidewalk detached from the curb or roadway surface
- (e) Bridges and box culverts Upgrade for HS20 design loading and 50 year design life
- (f) Retaining walls Not allowed in the public right-of-way
- (g) Grades Must meet minimum and maximum criteria
- (h) Street lights must be paid for by the property owners and installed

by the City

(i) Borrow ditches and driveway culverts - If necessary to remain, must be maintained by the adjacent property owners

### G.03.02 UTILITIES

- (a) Water lines
  - (1) City or district owned lines, no improvements required
  - (2) Private lines will need to be upgraded to City or District standards for City or district acceptance
- (b) Sewer lines
  - (1) City or district owned lines, no improvements required
  - (2) Private lines will need to be upgraded to City or District standards for City or district acceptance
  - (3) In areas with no existing sewers (septic systems), sewer lines must be installed in the streets prior to upgrading the street.
- (c) Manholes and valve boxes Adjust to grade of finished street surface

(d) Other utilities - Upgrade to acceptable standards of the utility prior to paving

### G.03.03 STORM DRAINAGE

- (a) The drainage system must be upgraded to a functioning system
- (b) Borrow ditches Remove and replace with concrete curb and gutter ( if borrow ditches must remain, the minimum thalweg slope is 2% or if <2%, ditch must be paved with a concrete valley pan to prevent standing water)
- (c) Borrow ditch side slopes Must be 4:1 or flatter
- (d) Driveway culverts Replace with acceptable City standard pipe
- (e) Borrow ditches and driveway culverts If necessary to remain, must be maintained by the adjacent property owners
- (f) Detention Ponds Must be certified by a professional engineer licensed in the State of Colorado that it functions in accordance with City standards
- (g) Culverts under the streets Corrugated metal, plastic or other material culverts must be resized and replaced with Reinforce Concrete Pipe that meets City standards.
- (h) Inlets May need to be replaced or remodeled if they are undersized or do not meet City standards

### G.03.04 OTHER IMPROVEMENTS

(a) Other improvements unique to the location - The City shall be the determining authority on what must be done with unique circumstances not covered in the above criteria.

### G.04 ARTERIAL AND COLLECTOR STREETS

These Criteria shall apply to all annexed streets, including arterial and collector streets, which have been developed in the County. Since arterial and collector streets generally carry more traffic for the public at large than for adjacent properties, they may be maintained by the City to a higher standard until such time as upgrades are constructed. The adjoining property owners shall then be responsible only for the cost to upgrade the equivalent of their local street frontage.

Appendix H

### **NOTE:** Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Fort Collins Multimodal Transportation Level of Service Manual

			rtation Master Plan
City of Fort Collins Multimodal Transportation Level of Service Manual	March 28, 1997		City of Fort Collins Transpo

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Adequate Public Facilities Plan	PRINCIPLE GM-5: The provision of adequate public facilities and the phasing of infrastructure improvements will be important considerations in the timing and location of development.
Goals, Objectives and Standards	Policy GM-5.1 Phasing of Development. The provision of public facilities and services will be utilized to direct development in desired directions, according to the following considerations:
Level of Service (LOS) standards do not exist as stand-alone measures, but are part of a system of goals, objectives and standards. They are interpreted by the public and by elected decision makers in the context of current and future issues, trends, conditions, expectations, and perceptions and they require a system of measurement.	<ul> <li>Development will only be permitted where it can be adequately served by critical public facilities and services such as water. sewer, police, transportation, schools, fire, storm water management, and parks.</li> </ul>
LOS standards are an important form of municipal "policy" and are based on the City of Fort Collins "Community Vision and Goals 2015," the "City Structure Plan" and the "City Plan Principles and Policies" documents developed as part of the City Plan process. LOS standards provide a means of testing the City's plan for future land uses (as represented in the Structure Plan) against the City's goals for transportation and for overall quality of life.	<ul> <li>New roads and other City services shall not be extended to serve development outside the designated Urban Growth Area (Stage 1) Moreover, the City shall not enter into any agreements with other jurisdictions to jointly fund or construct infrastructure improvements or provide services that might foster growth outside of the Urban Growth Area (Stage 1). These policies will not preclude the City from working with other jurisdictions</li> </ul>
The LOS standards also provide a means of applying the City's goals in the development review process.	to provide services and facilities which benefit the entire community such as regional trails, open space and parks.
The general principle and specific policies that give rise to the Adequate Public Facilities (APF) requirement are found in the City's Principles and Policies. The provisions dealing with adequate public facilities and the	<ul> <li>Development which occurs within the Urban Growth Area (Stage 1) shall have at least one-sixth of its boundary area contiguous with existing urban development.</li> </ul>
Principles from the Transportation section are reprinted below:	<ul> <li>Preferential consideration will be given to the extension and augmentation of public services and facilities to accommodate infill and redevelopment before new growth areas are prepared for development.</li> </ul>

Direct pedestrian connections s, pedestrian travel as a viable transportation mode and elevate it in importance to be in balance with will be provided and encouraged from place of residence to transit, schools, activity centers, work Street crossings will be development of comfortable and attractive pedestrian facilities and settings to create an The City will acknowledge The City will encourage the The City shall develop secure pedestrian settings by developing a well-lit inhabited pedestrian network and by mitigating the PRINCIPLE T-9: Private automobiles will continue to be an important means of transportation. coordinated, regional approach to transportation PRINCIPLE T-6: Street crossings will be developed to be safe, comfortable, and attractive. PRINCIPLE T-10: The City will participate in interesting pedestrian network. and public facilities. impacts of vehicles. all other modes. PRINCIPLE T-7: PRINCIPLE T-5: PRINCIPLE T-8: Multimodal Transportation Level of Service Manual planning. The City will review applications for the creation of new special service agencies and the expansion of existing special service agencies for conformance with The City will work with Larimer County to develop plans and policies for public services and facilities required for new and existing development located in unincorporated areas of the City's Urban Growth Area, with special consideration to those subareas and neighborhoods where more detailed planning will follow the adoption of these City Plan Principles and transportation alternatives that maximizes access PRINCIPLE T-3: Transportation Demand Management will be a critical component in the The City should charge additional fees to non-city PRINCIPLE T-1: The physical organization of the city will be supported by a framework of PRINCIPLE T-2: Mass transit will be an integral PRINCIPLE T-4: Bicycling will serve as a viable and mobility throughout the city, while reducing alternative to automobile use for all trip purposes. part of the city's overall transportation system. dependence upon the private automobile. these City Plan Principles and Policies. City's overall transportation system. residents who utilize City services. Goals, Objectives and Standards Policies. • •

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The "Adequate Public Facilities" principle is intended to ensure that	
adequate transportation infrastructure and services required to meet the needs and demands created by new development will be provided	provided (hours of service, frequency of service, and so forth). Alwith the bicycle and pedestrian modes, the proximity of tr service becomes an issue to be addressed by LOS standards.
by the time the development is occupied (that is, concurrently). The purpose of these Level of Service standards is to provide a definition of "adequate" for each mode of travel.	For each non-auto travel mode bicycle, pedestrian and public the LOS standards do not require forecasts of user volum demand. Instead, they are designed to ensure ubiquitous avail of adequate bicycle and pedestrian facilities, and transit service
General Methodology	In the case of roadways, however, estimating future LOS cond
Historically, LOS standards were applied only to roadways and only in engineering. Their primary purpose was to facilitate the design of specific roadway improvement projects based on forecast demand. Now, however, LOS standards also serve as performance planning and measurement systems. The City of Fort Collins has chosen to develop	requires predicting future traffic levels. In other words, forect future roadway LOS involves forecasting both supply and deman Coordination With Other Plans
performance-based LOS standards and to do so for all modes. Evaluating LOS standards for purposes of determining their adequacy under City policy requires more than an evaluation of specific transportation facilities. Roadways that are of adequate width and	On the following two pages are tables listing the City's gobjectives and standards from which the proposed LOS stanhave been derived. The tables are divided into four modes of t public transit, pedestrian, bicycle and motor vehicle.
design must also be adequately connected into the larger street grid. Bicycle and pedestrian facilities, too, must be connected into the City's grid of bicycle and pedestrian facilities.	City of Fort Collins documents relied upon in preparing LOS Stan for the modes included:
Applying LOS standards to specific sidewalks, for example, would ignore the issue of whether the sidewalk in question is connected to the rest of the pedestrian network. Similarly, proximity to service and connectivity to the larger city-wide grid are important issues for all modes and are included in the LOS standards.	<ul> <li>Fort Collins Congestion Management Plan:</li> <li>Community Vision and Goals 2015;</li> <li>City Structure Plan:</li> <li>City Plan Principles and Policies;</li> <li>Fort Collins Bicycle Program Plan;</li> </ul>
In the case of public transit, the "bricks and mortar" physical infrastructure approach used to evaluate the other modes is not adequate to the task. Transit performance is determined, not only by what is built, but also by the amount and type of <u>operations</u> that are	<ul> <li>Residential Street Standards:</li> <li>Transit Development Plan 1996-2002; and,</li> <li>Fort Collins Pedestrian Plan.</li> </ul>

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Multimodal Transportation Level of Service Manual Goals, Objectives and Standards

Design & Operations Standards *	<ul> <li>Residential streets: 4.5' wide sidewalks with a 6' andscaped parkway, except for rural residential streets, which do not require sidewalks, and 36' require sidewalks, and 36' require sidewalks, and 36' require streets: 4.5' sidewalks and and a 6' landscaped parkway.</li> <li>Collector streets: 5' sidewalks and an 8' landscaped parkway.</li> <li>Collector streets: 5' sidewalks and a s' landscaped parkway.</li> <li>Industrial/Commercial Local streets: 5' sidewalks and a f' landscaped parkway.</li> <li>Arterials &lt;35,000 ADT: 6' sidewalks and a 10' landscaped parkway.</li> <li>Arterials &lt;35,000 ADT: 6' sidewalks and a 10' landscaped parkway.</li> </ul>	<ul> <li>12' travel lanes will be required for all atterial streets and for collectors without parking.</li> <li>11' travel lanes will be required for all other streets, except for connectors and residential streets.</li> <li>Residential local streets with parking on both sides of the street or 24' for streets with parking on one side of the street.</li> <li>Residential alleys will be 12-20' wide.</li> <li>A continuous median will be required on all arterial and major arterial streets.</li> </ul>
LOS Standard	<ul> <li>Pedestrian LOS will be evaluated according to prevailing or forceast conditions within a 1/4. sphere of influence. This to be measured as 1,320 along a straight line rad "as the crow files" in all directions from the site. LOS requirements are based on ease of street crossings, side walk continuity, directness of travel, amenities, and security and will be evaluated according to of adjacent land use.</li> </ul>	<ul> <li>Automobile LOS will be evaluated using the late version of the Highway version of the Highway version of the Highway version of the Highway version of the test classification and adjacent land use.</li> <li>When LOS falls below underfield levels in Mixu identified leve</li></ul>
Objective	Revise local statutes and codes to increase pedestrian safety and security by 1998. Achieve a level of funding for the pedestrian program which is in proportion to mode share. Place a high funding priority on pedes minimum pedestrian LOS requirements for school walking areas, parks and recreation facilities, transit corridors, and activity areas. Achieve active and continuing involvement by the pedestrian community in the development and implementation of pedestrian policies and facilities. Ensure that all pedestrian facilities are designed and constructed according to new standards.	<ul> <li>Ensure that the rate of growth in vehicle miles traveled (VMT) does not exceed the rate of growth in population.</li> <li>ds may occur in constrained corridors.</li> </ul>
Goal	<ul> <li>A safe, comfortable, attractive and secure pedestrian environment.</li> <li>A pedestrian network which is well-connected and directly linked to schools, neighborhoods, other destination areas.</li> <li>Pedestrian facilities which provide universal access to all users, including children, the mobility impaired, and elders.</li> <li>Regular maintenance of pedestrian facilities.</li> <li>An urban form which promotes pedestrian activity.</li> </ul>	<ul> <li>A transportation system which provides both access and mobility and which minimizes automobile dependence.</li> <li>* Note: exceptions to standar</li> </ul>
	Redestrian	əlidomotuA

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Multimodal Transportation Level of Service Manual Goals, Objectives and Standards

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Design & Operations Standards *	8' bicycle lanes are required on all arterial streets and on collectors without parking. A 6' bicycle lane is required collector streets with parking An 11' shared bicycle and parking lane or a 6' bicycle lane is required on commercial local streets. Industrial/Commercial Local streets require an 11' shared	6' bicycle and parking lane or a 6' bicycle lane. An 8' foot bicycle and pedestrian path connection will be required to make neighborhood connections where streets are not require or feasible.	Ensure transit travel times ar no greater than 2.5 times competing automobile travel times. Weekday headways will be reduced to at least 30 minutes in all corridors by 2002 and to no more than 20 minutes in in corridors and commercial corridors by 2015.	Peak load factor will be less than 1.2. Transit stops will be located 1,000 to 1,400 feet apart in high-use areas and 2,000 feet
LOS Standards	<ul> <li>Bicycle level of service (LOS) will be evaluated according to facility and area-based requirements.</li> <li>Area LOS requirements are based on connectivity to North-South and East-West corridors.</li> </ul>		<ul> <li>Transit LOS will be evaluated based on hours of weekday service, weekday frequency of service, travel time factor and peak load factor.</li> </ul>	· ·
Objective	<ul> <li>Achieve a continuous system by the year 2015.</li> <li>Double the percentage of daily resident person trips made by bicycle from 7% in 1995 to 14% in 2015.</li> <li>Reduce the bicycle accident rate by 10% by 2015.</li> </ul>		<ul> <li>Ensure that 70%.of the city has access to transit service (1/4 mile walk).</li> <li>Double the size of existing service by the year 2002.</li> <li>Increase the area served, frequency of service and hours of operation by 2002.</li> <li>Increase ridership to 2,000,000</li> </ul>	annual trips by 2002. • Reduce transfer wait times. s may occur in constrained corridors.
Goal	<ul> <li>A safe, convenient, continuous and well- connected bicycle system which provides access to major destination areas and activity centers.</li> <li>A bicycle system which provides links to the regional system.</li> </ul>		<ul> <li>A well-connected intermodal transportation system.</li> <li>Frequent, reliable and accessible transit service.</li> <li>Transit service oriented around activity centers.</li> <li>Comfortable transit service.</li> </ul>	* Note: exceptions to standard
	Bicycle		tiz	neiT

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## Multimodal Transportation Level of Service Manual Public Transit LOS

### Public Transit LOS

part on standards developed in the City's Transit Development Plan. The service level standards are intended for use in evaluating and land use characteristics of the areas served. Figure 1 relies in Transit LOS standards take into account route service characteristics service planned by the year 2015. The transit LOS rating for an area is based on how many of the four service standards are met. The minimum condition is higher in mile of the area being evaluated. Routes more than a half-mile mixed use centers and commercial corridors. The level of route service is graded higher if the transit routes run within a quarteraway cannot be considered in arriving at transit LOS.

The minimum requirements for transit level of service are (by 2015):

- At least 70% of the land area of Fort Collins outside of Mixed Use Centers and Commercial Corridors shall be served by transit at no less than LOS D.
- For Mixed Use Centers and Commercial Corridors, the minimum level of service for adequacy is LOS B.

Definitions of terms used in Figure 1 are as follows:

Hours of Weekday Service -- The weekday hours of service on the applicable route, measured from the first scheduled stop to the last.

Weekday Frequency of Service -- Peak period headway.

auto travel time. Auto is measured using average speed in peak hour via the most direct route on arterials and collectors and includes time Travel Time Factor -- Portal-to-portal bus travel time divided by

# Figure 1. Public Transit LOS -- Standards and Ratings

service level standards: (by 2015)	mixed use centers and commercial corridors	remainder of service area
Hours of weekday service	18 hours	16 hours
Weekday frequency of service	15 min	20 min
Travel time factor	2.0 X	2.0 X
Peak load factor	≤ 1.2	≤ 1.2
LOS ratings:	number of service lev	rel standards met
areas within 1,320° of transit routes	A B D	
areas within 2,640' of transit routes	BHCHD	

to park and walk. Transit is measured along the bus route using peak hour speed, including walk, transfer, and expected wait times.

Peak Load Factor -- Calculated by dividing the number of passengers on board at the peak time of day by the available seats. Mixed use centers and commercial corridors are designated on the City's Structure Plan.

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Pedestrian LOS	
Five level of service standards specific to pedestrian facilities are utilized to address pedestrian needs and land use considerations. These standards are briefly described below and are defined in more detail in Appendix A.	Unsignalized Intersection Crossing the Major Street: Unsignalized Intersection Crossing the Major Street: telements include grade separation, number of lanes to cross, we marked crosswalks, lighting, raised median width, visibil and curb ramps. Unsignalized Intersection Crossing the Minor Street: Unsignalized Intersection Crossing the Minor Street: I elements.
Directness Directness is defined as the walking distance to destinations including transit stops, schools, parks, commercial amployment, or activity areas. A grid street pattern with sidewalks on-site or within/adjacent to existing public right of way typifies the deal system, however "off-road" multi-use paths may also be considered if practical to provide more direct pedestrian routes.	Mid-block Crossing: LOS elements include grade separa mumber of lanes to cross, strength of crosswalk presence, marked crosswalks, lighting, raised median width, curb rai pedestrian signals, convenience, comfort and security.
Measurement of directness is the ratio of the $\Delta$ ctual (existing or proposed) distance to such destinations by way of pedestrian sidewalk or pathway divided by <u>M</u> inimum north/south and east/west right angle distance characterized by the grid street pattern (the A/M ratio).	Visual Interest and Amenity To promote pedestrian activity use of transit, the pedestrian system should be esthetic compatible with local architecture and should include ameniti serve pedestrians. The attractiveness of the pedestrian network range from visually appealing and compatible with l architecture, including environmental enhancements (such
<i>Continuity</i> Continuity is defined as the completeness of the sidewalk/walkway system with avoidance of gaps. Levels of service ange from an A/B, where the pedestrian corridor is integrated within the activities along the corridor, to a C, where continuous stretches of sidewalks with variable widths and design elements, to D/E, where there are breaches in the pedestrian network, to F, which indicates	pedestrian street lighting, fountains, and benches) to an experien- discomfort and intimidation, associated with absence of amen and incompatible architectural design. Security Pedestrians require a sense of security, through visual sight with others, separation from motor vehicles and bicycles,
arge gaps in the network. street Crossings Each of the four types of street crossings is assigned in LOS rating.	acequate lighting levels. The nignest level of service is in environment with high pedestrian and police presence, clear lin sight, and good lighting levels. The lowest is where the streetsca otally intimidating with major breaches in pedestrian visit
Signalized Intersections: LOS elements include grade separation, number of lanes to cross, signal indication, well marked crosswalks, lighting, raised median width, visibility, curb ramps, pedestrian buttons, convenience, comfort and security.	rom the street, adjacent land uses, and activities. For de regarding sight distance and lighting requirements, refer to the of Fort Collins' street design standards and codes.

The five types of areas are as follows:		entire	ng, improv , transit, ar city into co	ements will ents will activity a mpliance wi	s within th service sta be prioritiz reas with t th the LOS	e City that or ndards. Beo ed toward ro he objective standards by	lo not currel ause of limi utes to scho of bringing 2015.
<i>Pedestrian District</i> This area includes the existing I downtown, the CSU area, and a future activity center in th portion of the city which has been designated on the Fort Structure Plan.	Fort Collins he northwest Collins City	To pre and pi must i	event an ind rivate, as w meet these r	rease in the ell as major : ninimum pe	backlog, ne street impro destrian lev	w developme wements and el of service s	ents, both pu redevelopm tandards.
A map (from the City's Pedestrian Plan) is provided in <i>l</i> showing the location of existing and future pedestrian dist	Appendix A tricts.	The fire for the fire of the theorem of the theoremoone of the theorem of the theorem of the theorem of the the	ve pedestri trian Plan ndix A.	an environm and the LOS	ent factors v letter grad	vere develop les are descr	ed as part of bed in detai
Activity Corridor/Center These include the commercia of North and South College Avenue as well as areas within a quarter-mile (1,320') radius around neighborhood and community retail centers. They are designated on the map in Appendix A. Transit Corridor These include all areas within a	ial corridors Figure Pedesti	2 rian L	evel of	Service	oy Loca	tion Area	ı Type
quarter-mile $(1,320')$ of existing transit routes and transit routes to be initiated by 2015.	area type	factors	directness	continuity	street crossings	visual interest & amenities	security
<i>School</i> Walking Area These include all areas within a mile (5 2801) radius around existing public schools (K -	dist	trian	A	Α	В	Α	Α
12) and around sites officially designated by the School District for future public schools.	activ center/c	vity corridor	В	В	В	В	B
Other This category includes all locations not falling	tran corri	sit dor	В	В	В	С	В
within one of the four previous areas.	school	walk	В	B	B	С	В
achieve the LOS standards.	oth	5	U	J	c	c	J

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community/neighborhood commercial centers:

recreation sites:

Figure 3 shows the minimum LOS standards for the

bicycle system.

connectivity has become paramount.

C

base city-wide minimum level: public school sites:

minimum LOS

the fact that the City's bike grid will steadily approach completion. In the future, it will be possible, once access to the grid is achieved, to travel safely by bicycle directly to any other area that has access to the grid. Thus the issue of

II.

Motor Vehicle LOS	
Over the past two decades, sophisticated formulas and routines for measuring arterial roadway LOS have been developed. These take into account such details as intersection design, signal timing and frequency of connecting driveways. Unfortunately, such variables cannot be reliably forecast twenty-five years into the future.	"LOS objectives for the roadway system should be defined in a manner that differentiates between the type of urban development being served. Standards for vehicular circulation within densely developed areas such as the core city and other activity centers should be such as the form areas over mobility. Standards for radial
Instead, forecasts of future roadway LOS must rely on a simpler approach which compares predicted volume to predicted capacity. These "willing to camacity" (V/C) ratios are then used to determine	set to picot access occurring. The access the should be routes to suburban areas and for through routes should be set to reflect the importance of community-wide mobility." (Chapter 8, p. 70)
the LOS letter grade rating (A through F). The means for predicting the LOS letter grade rating (A through F). The means for predicting future roadway V/C or LOS levels is the MINUTP traffic model maintained by the City's transportation staff and the regional North Front Range Transportation & Air Quality Planning Council.	The City's motor vehicle LOS standards have been designed to re the type of area being served (based on the City Structure Plan) the City's system of functional classification of roads. This allow the City to manage investments in motor vehicle capacity
(Note: for purposes of completing a "Transportation Impact Study" for specific proposed development projects, a method of measuring roadway LOS is required which involves applying Highway Capacity Manual procedures and LOS definitions.)	efficiency in a manner that supports its land use plan. The City of Fort Collins functional classification system recogn four broad categories of roadway. (Only arterials and collectors shown on the City's adopted Master Streets Plan map.)
Prior to adoption in early 1995 of the Congestion Management Plan, the City had an objective of maintaining at least LOS D on all	The four classifications are defined below:
arterial roadways. The City's Congestion Management Plan (CMP) changed that approach, addressing motor vehicle LOS as follows:	ARTERIAL (includes: Major Arterials, Arterials, and Minor Arterials) One or more of the following conditions may apply:
"This objective (LOS D) is unachievable for the core area of the city; all of the scenarios examined by the Committee predicted some of the arterial system would fall below this level. LOS D is also not an adequate basis for roadway system planning because it has a tendency to direct capacity investments to where they are not appropriate"	<ul> <li>provides direct service to major center(s) of activity;</li> <li>provides continuity and length for crosstown trips;</li> <li>connects to at least one other arterial; and,</li> <li>may carry high levels of traffic (&gt;3,500 vpd).</li> </ul>

	COLLECTOR (includes: Collectors With and Without Parking	(Note: the City's street design standards provide mor physical characteristics of streets by functional classifical
One	or more of the following conditions may apply:	The street system provides both mobility (the ability to
	connects local streets with arterial streets; continuity and length may be less than one mile; some commercial activity may be present in the corridor; and, may carry moderate levels of traffic (2,500 - 3,500 vpd).	town) and access (the ability to get to a specific local important to balance these competing demands, and it is that LOS standards adopted for motor vehicles reflect th Where arterials and collectors pass through built-up or areas (e.g., downtown) they may become congested in the there will be no way to build roadway improvement
	CONNECTOR	eliminate such congestion.
	(includes: Connectors only )	Successful destination areas usually reach levels of mo traffic that cannot be handled at high levels of service.
One	or more of the following conditions may apply:	because the "people-holding" capacity of successful comm eventually exceeds the traffic capacity of the roadways
	connects local streets to collector(s) or arterial(s); gathers traffic from throughout a residential district; continuity and length may be less than one mile; connects adjacent residential districts; and.	them. At such locations, alternative means of gettine (especially walking, but also including transit and bicyclin important.
•	may carry traffic of 1,000 - 2,000 vpd.	To the extent that arterial and collector roadways transecl destination areas, they will become less effective for p
(i)	LOCAL cludes: Conmercial Local, Industrial Local, Residential Local, Narrow Residential Local, and Rural Residential Local)	actine ving long ustance mobility. At this point, the accest becomes more important to the public than "mobility." Collins, these conditions are anticipated for "commercial and within "mixed use districts." The motor vehicle LOS shown in Figure 4 on the next page reflect this fact.
One	or more of the following conditions may apply:	con he along one and an inclusion of the second
•••	provides access to property; continuity with the street network may occur only at one end;	The LOS standards in Figure 4 recognize five levels of roa four categories of land use (from the City Structure Plan):
	facility length may be less than one mile; may connect to connector(s) or collector(s); and, carries low levels of traffic ( $< 1,000$ vpd, except up to 2,500 vpd for commercial and industrial local streets).	<ul> <li>commercial corridors (e.g., College Avenue);</li> <li>mixed use districts (e.g., downtown, campus);</li> <li>low density mixed residential areas; and,</li> <li>all other land uses.</li> </ul>
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Local streets present special issues. Their primary function is local access, and in many cases the principal issue is not capacity, but rather the impacts of traffic on adjacent properties.

Local streets are not included in Figure 4 and are not included in the evaluation of the "adequate public facilities" performance of the City Structure Plan and the Master Street Plan. The City has developed a special "Neighborhood Transportation Impact Analysis" process to address issues related to local street performance. In addition to the recognition of the special situations anticipated along commercial corridors and within mixed use districts, the City has identified two circumstances for special treatment: "Constrained Corridors" and "Backlogged Facilities."

These are defined as follows:

*Constrained Corridors* — These are segments of the street network which are physically constrained from further widening or major reconstruction. The constraint may be caused by the proximity of buildings (e.g., along College in Downtown Fort Collins) or by environmental conditions (e.g., the presence of a wetland or riparian corridor). *Backlogged* Facilities -- These are roadway segments which currently operate below the LOS standards in Figure 4. These roadways are normally adjacent to developed properties and are not expected to be improved by future development.

Both Constrained Corridors and Backlogged Facilities will be identified on a city map. These special circumstances will warrant special treatment in the development review process described in Part II of this Manual.

Figure 4. Motor Vehicle LOS Standards

	land	use (from	structure p	lan)	
roadwav		Oth	er Corridors With	in:	
functional classification	Commercial Corridors	Mixed Use Districts	Low Density Mixed Residential	All Other Areas	
Major Arterial	ш	E*	D	D	
Arterial	Е	E*	D	D	
Minor Arterial	Е	E*	С	D	
Collector	D	D*	С	D	
Connector		C*	В	С	
* Corridors v indicated. In congestion th	vithin mixed us such cases, the rough alternat	se districts ma City will provives to motor v	y fall below the vide for mitiga vehicle travel.	e LOS level tion of	

City of Fort Collins Transportation Master Plan

City of Fort Collins Transportation Master Plan Multimodal Transportation Level of Service Manual The LOS standards define "acceptable" relationships between future land development patterns and transportation demand in terms of overall service levels by the year 2015. A number of specific strategies will be required to achieve city-wide transportation adequacy. Among these is evaluating the level of service of each of the The LOS standards set forth in Part I of this Manual form the basis for planning the future location and intensity of land uses in Fort Collins as embodied in the City Structure Plan. The document which outlines the process for evaluation of proposed new development in terms of transportation LOS standards is the "Transportation Impact Study Guidelines" which is available from Part II of this Manual provides detailed guidance on comparing the existing LOS condition for each of the modes with the minimum standards, and for forecasting future LOS conditions once development transportation modes as part of the development review process. LOS Standards for Development the City's development review staff. LOS Standards for Development Review Review Part II. occurs.

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<ul> <li>Public Transit LOS Standards for Development Review, the "travel time factor" sha divelopment sites within the City shall be based on Figure 1 of this Manual.</li> <li>Evaluation of public transit LOS shall be based on Figure 1 of this Manual.</li> <li>Manual.</li> <li>All development sites within the City shall be evaluated with transpect to the level of transit service serving the site as outlined in the Transportation Impact Study Catellines and this Manual and College transit service plan. (Appendix B monown Fort Collins (corner of Mountain and College provides a map of the routes and service plan. (Appendix B more and service and service plan. (Appendix B more and service plan. (See Appendix B)</li> <li>For sites within Mixed Use Centers and Commercial Corridors, the minimum level of public transit service plan. (See Appendix B more and service plan. (See Appendix B more and service plan. (See Appendix B more and service plan. (See A</li></ul>	Public Transit LOS Standards for Development Review Calcula calcula	
<ul> <li>Evaluation of public transit LOS shall be based on Figure 1 of this Manual.</li> <li>All development sites within the City shall be evaluated with For Collins High School (main entrance) respect to the level of transit service plant and shall on the Error of transit service plant and the manual, and shall be based on the City's long range transit and the Manual, and shall be based on the City's long range transit service plant and the Manual, and shall be based on the City's long range transit service planted for 2015.</li> <li>Although each proposed new development within the City will the Structure Plan and Zoning Manual and School (main entrance) the pased on the City's long range transit service planted for 2015.</li> <li>Although each proposed new development within the City will the Structure Plan and Zoning Man guill not be precluded from provided by the Transfort Manager. For all turnit the Structure Plan and Zoning Man guill not be precluded from provided by the Transfort Manager. For all turnit the Structure Plan and Zoning Man guill not be precluded from provided by the Transfort Manager. For all turnit the Structure Plan and Zoning Man guill not be precluded from provided by the Transfort Manager. For all turnit the Structure Plan and Zoning Man guill not be precluded from precenting by time to pholic transit service plan. (See Appendix B).</li> <li>For sites outside of Mixed Use Centers and Commercial Corridors, the properiate time to equate the life.</li> <li>For sites within Mixed Use Centers and Commercial Corridors, the provided by the Transportation Impact Study Guidelines.</li> <li>For sites within Mixed Use Centers and Commercial Corridors, the provided by the transfort study Guidelines.</li> <li>For sites within Mixed Use Centers and Commercial Corridors, the provided by the transfort study Guidelines.</li> <li>For sites within Mixed Use Centers and Commercial Corridors, the provided by the transfort study Guidelines.</li> <li>For sites within Mixed Use Centers and Commercial Corri</li></ul>		rposes of development review, the "travel time factor" shall b ted to four specific destinations:
<ul> <li>All development sites within the City shall be evaluated with Tarspectation Impact Study Guidelines and this Manual, and shall be based on the version transit service phan. (Appendix B bour. Travel time components within the existing Transfort systeroids a map of the routes and service levels planned for 2015).</li> <li>Although each proposed new development within the City will be based on an average bus speed of twelve miles provides a map of the routes and service levels planned for 2015).</li> <li>Although each proposed new development within the City will require a transit analysis as part of a Transportation Impact Study at the fransfort manager. Travel time of development that is in conformance there in the of development that is in conformance to the routes and zoning dy virtue of failing to meet the transit level of service test provided by the Transfort Manager. For all furtile the Structure Plan and Zoning Map will not be previous the post of the routes on current data provided by the Transfort Manager. For all furtile the structure plan and Zoning Map will not be previous the post of the transit service is Level of Service D or better approvided by the Transfort Manager. For all furtile the structure plan and Zoning Map will not be previous the post of the transit service is Level of Service D or better appropriate time to request this data is at the Initial Scoping Mee minimum level of public transit service is Level of Service B or better appropriate time to request this data is at the Initial Scoping Mee minimum level of public transit service plan. (See Appendix B).</li> <li>A site may be graded as "served" by public transit service plan. (See Appendix B).</li> <li>A site may be graded as "served" by public transit service plan. (See Appendix B).</li> <li>A site may be graded as "served" by public transit service plan. (See Appendix B).</li> <li>A site may be graded as "served" by public transit service frequency, hours of woundin and the preased on planned s</li></ul>	Evaluation of public transit LOS shall be based on Figure 1 of this Annual.	the CSU Campus Transit Center Foothills Fashion Mall (north entrance) Fort Collins High School (main entrance)
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A site may be graded as "served" by public transit only if the transit route utilizes a street that lies within one-half mile (2,640°) of the proposed development site. Site evaluation pursuant to Figure 1 of service frequency, hours of weekday service and route location are to be based on planned service	For sites within Mixed Use Centers and Commercial Corridors, the minimum level of public transit service is <b>Level of Service B</b> or better based on the City's long range transit service plan. (See Appendix B.)	
Site evaluation pursuant to Figure 1 of service frequency, hours of weekday service and route location are to be based on planned service	A site may be graded as "served" by public transit only if the transit route utilizes a street that lies within one-half mile (2,640') of the proposed development site.	
	Site evaluation pursuant to Figure 1 of service frequency, hours of weekday service and route location are to be based on planned service characteristics in 2015 (shown in Appendix B).	
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Level of Service Manual	<ul> <li>"transit corridor" These include all areas within a quarter-mile (1,320<sup>°</sup>) of existing transit routes ojects which would and transit routes to be initiated within seven years.</li> </ul>	<ul> <li>"school walking area" These include all areas within a mile (5,280') radius around existing public ich shall be used to schools (K-12) and around sites designated by the School District for future public schools.</li> </ul>	<ul> <li>"other" This category includes all locations not falling within one of the four previous areas.</li> <li>cess for evaluating Step 2. Using Figure 5 (on page 17), determine the</li> </ul>	ct is located approace LOO minimum standards for the project steation areas: If the project site is located in more than one area type, the enter, transit type with the higher LOS standards shall be used.	ea. These are <b>Step 3.</b> Identify all "destination areas" located within tion area type a quarter-mile (1,320') of outside edges of the project site. Six types of destinations should be identified:	<ul> <li>includes the "recreation sites" These include public parks, J area, and a sports facilities, public tennis courts and other sites where the public would be expected to go to participate in physical recreation and sports activities.</li> </ul>	<ul> <li>recentrant</li> <li>"residential areas" These include any concentration of at least ten dwelling units that may reasonably be regarded as a contiguous neighborhood or</li> </ul>	e include the which are part of a single subdivision. outh College • "institutional sites" These include all 1,320') radius • "institutional sites" These include all etail centers. churches, public schools, and public buildings which tix A. regularly receive the public for public business.
Multimodal Transportation LOS Standards for Development Review - Pedestrian	Pedestrian LOS Standards for Developme Development approval will not be granted for pro	Figure 6 (on page 18) provides a worksheet whic compare actual pedestrian conditions with the r	and, if applicable, with a future condition once i been made. Applicants should follow this step-by-step proc pedestrian LOS:	Step 1. Determine whether the projec within one or more of the five types of lo pedestrian district, activity corridor/ce	corridor, school walking area, or other are defined below. The identification of locati forms the basis for determining min standards.	<ul> <li>"pedestrian district" This area existing Fort Collins downtown, the CSU future activity center in the northwest provident city which has been designated on the Fort city which has been designated on the Port</li> </ul>	Structure Plan. A map (from the City Plan) is provided in Appendix A showing of existing and future pedestrian districts.	<ul> <li>"activity corridor/center" These commercial corridors of North and So Avenue and areas within a quarter-mile (1 around neighborhood and community re They are designated on the map in Append</li> </ul>

# Pedestrian LOS St

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υ	υ	υ	υ	c	other	d" row of boxes, show the LOS conditions esult from any pedestrian improvements
В	U	в	В	В	school walk area	oublicly-accessible edge of the project site the destination areas in the worksheet. In
В	U	B	В	В	transit corridor	d on actual documented field measurement, tual LOS condition for the areas between
8	B	B	B	B	activity center/corridor	for all destination areas.
V	A	2	Α	Α	district	I location of the project site, identified in so the entries in the "minimum" boxes will
	•	a	<	<	pedestrian	trea identified (the minimum standard is location of the project site identified in
teurity	cisual interest se & amenities	street	continuity	directness	L	OS standards in the boxes for each
	a	of Servic			TITTITIT	
0	letter grades.		n Level	edestria	inimim P	d on Figure 5 above, fill in the applicable
ny financial responsible Appendix A	City against ar otherwise be mpact Fee). A	dards (colur signment of	of the stan ilized in as n Level	scriptions ons to be u edestria	provides de and conditio gure 5	sses. Show the destination area of each in the second column. Space for up ation areas is provided in the worksheet. four sites are identified, use additional worksheet.
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Multimodal Transportation Level of Service Manual LOS Standards for Development Review - Pedestrian

Figure 6. Pedestrian LOS Worksheet

pr	oject location classification:					(enter	as many a	s apply)
	description of applicable	destination area	level of serv	ice (minim	um based o	n project lo	cation class	ification)
	destination area within 1,320' including address	classification (see text)		directness	continuity	street crossings	visual interest & amentites	security
-			minim					
			actual					
			proposed					
			minum					
1	5		actual					
			proposed					
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-			rninim					
1			actual				•	
			proposed					
-			minimum					
			actual					
			proposed					

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	The worksheet in Figure 7 will form the basis for City review levelopment proposals. Agreement should be reached at the Initi
Development approval will not be granted for projects which will not ir ir meet two LOS standards by the time the project is to be occupied:	scoping Meeting concerning which destination areas should nucluded in the worksheet. The applicant should evaluate the bat of condition at the top part of the worksheet and evaluate the condition of the worksheet and evaluated destination to the condition of the more set.
The project must be directly connected to the greater Fort Collins <sup>If</sup> bicycle grid at no less than LOS C as defined in Figure 3. w	ourrections to all applicable destination areas in the tows provide f there are more than four destination areas, additional copies of t worksheet may be utilized.
The project must be directly connected to all priority If destinations located within a quarter mile (1,320') of any edge of view the project boundaries.	f applicable, developers may meet bicycle LOS standards voluntarily providing off-site improvements to achieve minimu conditions. Such off-site improvements, however, are not exactio moosed by the City but rather are voluntary actions taken by t
Priority destinations include all "priority destination areas" located diwithin a quarter-mile (1,320') of outside edges of the project site. Untree types of destinations should be identified:	eveloper, a its sole option, to accelerate the attainment of minimulation of the project site. The costs of such off-s. OS conditions for the project site. The costs of such off-s mprovements shall not be credited by the City against any financ beligations for which the developer may otherwise be responsited.
"public school sites" These include any existing public schools <sup>(s</sup> (K-12) as well as any sites designated by the School District for " future public schools."	such as Street Oversizing or Transportation Impact Fee). Directly connected" shall mean the project site is penetrated by t sicvcle facility: or the bicvcle facility runs immediately adjacent
<ul> <li>"recreation sites" These include public parks, sports th facilities, public tennis courts and other sites where the public of would be expected to go to participate in physical recreation and re sports activities.</li> </ul>	he property and is not separated from it by any significant barrie or the bicycle facility runs perpendicular to the property edge and eadily accessible from the property with no significant barriers.
B "community and neighborhood commercial centers" These are do designated on the City Structure Plan map and are shown on the U	Sicycle facilities which are not consistent with the City's minimulesign standards shall not be considered in arriving at bicycle Lusing the worksheet in Figure 7.
E. Figure 7 provides a worksheet which is to be used to compare actual of bicycle connectivity conditions with the minimum standard and, if applicable, with a future condition once improvements have been made.	xplanation of the letter grades for bicycle LOS are found in Figur in page 10 of this Manual.

Multimodal Transportation Level of Service Manual LOS Standards for Development Review - Bicycle

# Figure 7. Bicycle LOS Worksheet



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Multimodal Transportation Level of S LOS Standards for Development Review - Motor Vehicle	ervice Manua	lı			ف	21
Motor Vehicle LOS Standards for Development Review	standard for sign arterial intersection	alized arter as on comr	ial intersec nercial corr	tions. The idors and v	standard f vithin activi	for
The facility-based motor vehicle LOS standards shown in Figure represent city-wide level of service standards. They are based o	4 centers is LOS E. n arterial roadway w	(Arterial in ith another	itersections arterial or	are the inte a collector.)	rsection of	an
"volume/capacity" calculations prepared in connection with traff modeling of future land uses and roadway networks.	C Figure 8 below p development revie	rovides int w. Develo	ersection L	OS standar ects which	ds for use will genera	in ate
In development review, projects will be evaluated based on a detaile analysis of intersections and links in a manner consistent with the 196 Highway Capacity Manual. The procedure and requirements for th analysis are described in detail in the Transportation Impact Stud	d traffic causing inte 5 regarded as "signifies is cases, mitigation m y City as outlined in	ersections to icantly imp easures mus the Transpo	o fall below acting a stu st be evalual rtation Impe	r these stan dy intersect ed in coope ict Study Gu	dards will ion." In the ration with t idelines.	be ese the
Guidelines. They are summarized here.	The City has also i	dentified ce	rtain corrido	ors and road	ways as eith	Ter
Transportation Impact Study Guidelines	constrained or terms). Projects	packlogged which sign	(see page ificantly in	ipact such	corridors a	pu
The Transportation Impact Analysis will determine if a proposed development project will create any significant impacts at the study intersections and on roadways surrounding F	facilities will also b igure 8. Motor Vel	oe required nicle LOS	to provide a Study I	ppropriate	mitigation. NS	ſ
the project site. In order to determine this, peak nour revels on service at each of the study intersections will be evaluated for		land	use (from	structure p	an)	
each of the following scenarios:			Oth	er Corridors With	in:	
<ul> <li>existing conditions;</li> <li>existing conditions plus site generated traffic;</li> <li>chost representations (3 - 5 years); and</li> </ul>	intersection type	Commercial Corridors	Mixed Use Districts	Low Density Mixed Residential	All Other Areas	
<ul> <li>Iong range conditions (10 - 15 years).</li> </ul>	Signalized Intersections	D	E*	D	D	
The level of service evaluation for each of these traffic scenarios should include estimates of the percentage distribution	Stop Sign Control (arterial/local)	N/A	E*	E*	Е	
or person trips among the modes of travel. Motor vehicle LOS analysis should be conducted for	Stop Sign Control (collector/local)	N/A	С	С	С	
intersections located within one-half mile of the project site. The City Traffic Engineer may require analysis of additional intersections. The City has established LOS D as the general	* Intersections specific strate to motor vehi	: falling below gies for mitiga cle travel.	LOS E will rec tion of congest	puire identification through al	tion of ternatives	
	City	of Fort Col	llins Trans	portation <b>N</b>	Aaster Plan	-

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Relationship to Street Oversizing Fee

(For a detailed explanation of the Street Oversizing Fee, see Section 24-111 to 24-121 of the Fort Collins City Code, or contact the City's Director of Engineering).

Street oversizing fees are collected prior to the issuance of building permits. These fees are coordinated with the City's overall Transportation Level of Service standards and with its capital improvements planning. Proposed developments which would not meet Motor Vehicle LOS standards without additional investment in roadway infrastructure must be evaluated in light of the City's Street Oversizing Fee provisions. For such projects, the relationships between LOS standards and the Street Oversizing Fee Program, including the anticipated sharing of costs for roadway investments and the timing of such improvements, should be established as part of early review and should be explicitly addressed at the Initial Scoping Meeting. In some instances, the City will participate through the street oversizing program in funding the street improvements to be constructed in connection with the development. This will be determined on a case-by-case basis according to the criteria in City Code Section 24-111 to 24-121. In all cases, however, the developer will be expected to pay the City's street oversizing fee and all other applicable fees as required by City ordinances.

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Appendix A Pedestrian Plan

# **Pedestrian Priority Areas**

As part of the 2010-11 update to the *Pedestrian Plan*, the Pedestrian Priority Areas (PPA) map was updated. The updated PPA map incorporates information from the 1996 *Plan* map, *Plan Fort Collins* Targeted Infill and Redevelopment Areas map, *City Plan* Structure Plan map, *Master Street Plan* Overlay map, and Pedestrian Demand Index map. The PPA map is shown on the following page.

The PPA map represents a key element of the *Pedestrian Plan* and is used for applying the Level of Service (LOS) standards to pedestrian priority areas. These priority areas reflect different amounts of pedestrian use or activity throughout the city. There is one set of LOS measurements for all pedestrian activity areas. However, acceptable LOS thresholds vary by type of activity area. It would not be logical to require the same LOS standards everywhere. As an example, the needs and standards for the downtown and Colorado State University campus areas, which are highly pedestrian-dependent, are significantly different in character and need than an outlying industrial area. Therefore the Pedestrian activity areas from which to assign LOS Standards. There are five pedestrian activity areas defined here.



Outdoor seating areas create energy and activity on the street, while allowing sufficient room for sidewalk access

# **Pedestrian Districts**

This area reflects the highest pedestrian environment desired, a location where all LOS standards are A or B. This area would be appropriate for downtown and university areas, which typically have the highest pedestrian activity in a city. This pedestrian district would also reflect future high-use pedestrian activity areas, such as the *Mountain Vista Subarea Plan* Community Commercial District.

# Activity Centers/Commercial Corridors

This category combines two high use pedestrian areas. Activity Centers represent primary commercial shopping centers throughout the community, as depicted on the *City Structure Plan* map. These areas include neighborhood and community commercial centers, typically served by transit and within walking distance of higher density residential areas. The second area is defined by the primarily commercial corridors such as College Avenue, East Mulberry Street, and Harmony Road. Other areas have a very high automobile dependency. By providing pedestrians linear connections between retail uses and the adjacent residential areas, pedestrian activity along these corridors could be significantly improved. Pedestrians are more likely to walk to areas within a one-quarter mile radius of neighborhoods and retail areas with higher pedestrian LOS.

# School Walking Areas

These areas include all routes within a one-mile radius of an existing public school and around sites designated for future public schools. The PPA map does not show the one-mile radius buffer around each school site in order to not complicate the graphic presentation of the overall map layers.

# **Transit Corridors**

Areas within a one-quarter mile of existing transit and future routes identified in the Transfort Strategic Plan, including Enhanced Travel Corridors.

# Other

This category includes all locations not falling within one of the four previous areas.

Figure P- 4: Pedestrian Priority Areas



# Level of Service (LOS)

Level of Service (LOS) is a measure that is used to determine the effectiveness of elements of transportation infrastructure. The LOS measurement is most commonly used to analyze traffic delay on roadways. However, the City of Fort Collins has LOS standards for each travel mode including motor vehicle, public transit, bicycle, and pedestrian. These LOS standards guide public and private planning for mobility and accessibility in all transportation modes.

When the City of Fort Collins prepared the Pedestrian LOS standards and methodology in 1996, it became evident that pedestrian measures such as pedestrian density and flow rate, as defined by the Highway Capacity Manual, were inappropriate for Fort Collins. As a result, a set of planning LOS procedures were developed to evaluate existing conditions and proposed public and private projects. In addition to the methodologies of the LOS procedure, LOS targets or standards were also defined for different areas of the City.

As part of the 2010-11 update to the *Pedestrian Plan*, the Pedestrian Level of Service was evaluated to ensure that it still meets the needs of the City of Fort Collins. After evaluating the Pedestrian LOS against several other Pedestrian LOS methodologies, City staff determined that the majority of the existing Pedestrian LOS is still relevant and will continue to be used. The sections of the Pedestrian LOS related to unsignalized and mid-block crossings are being updated to more accurately reflect the City's strategies for implementing these types of crossings. A new process has been developed to determine the type and location of crossings. The new process is described in the next section of the *Pedestrian Plan*.

The Pedestrian LOS will retain the five areas of evaluation that were previously developed:

- 1. Directness
- 2. Continuity
- 3. Street Crossings (signalized only)
- 4. Visual Interest and Amenity
- 5. Security

These areas of evaluation are described below.

# DIRECTNESS

Directness is a measurement of walking trip length. The measure of directness is simply how well an environment provides direct pedestrian connections to destinations such as transit stops, schools, parks, commercial areas, or activity areas. The grid pattern typifies the ideal system where a person can go north or south, or east or west, to easily get to their destination. The common curvilinear residential subdivision which may have cul-de-sacs that back onto a commercial center, transit stop, school, or park might be physically proximate to a potential pedestrian destination. However, many areas often require a circuitous route which deters pedestrian trips.

Figure P- 5: Level of Service - Directness

The directness LOS measure is based on a ratio of the actual distance from trip origin to trip destination divided by the measured minimum distance (as the crow flies) between those two points. Actual destination is further defined by either existing conditions or the proposed public/private development.

Measuring the directness LOS requires selecting one or two trip origin locations in a smaller development and up to five or six representative trip origin locations in a larger development. Trip destinations are then identified.

Trip destinations are those locations to which pedestrians may walk such as transit stops, schools, parks, trails, and commercial areas. These destinations should be within approximately one-quarter mile, but could be further (e.g., junior high schools and high schools have a one-mile and one and one-half mile walking distance, respectively.) If no pedestrian destinations are within the immediate study area, the directness LOS is not applicable. Connections to arterials that could eventually support transit should be evaluated.

 C LOS Minimum
 C LOS Minimum
 F LOS Poor
 F LOS Poor
 A = Actual distance to walk M = Measured minimum distance X = Destination

If the directness LOS is defined by the grid system, the minimum distance is the measurement from a representative trip origin to destination by the north/south axis. The actual distance is either the existing distance to walk from an origin to destination, or the distance if the development was constructed.

The actual/minimum ratio and Level of Service table is illustrated in Table P-1 below:

Level of Service	Actual Distance/Minimum
	Distance Ratio
A	< 1.2
В	1.2-1.4
С	1.4-1.6
D	1.6-1.8
E	1.8-2.0
F	>2.0

Table P-1: Directness Level of Service

An actual/minimum (A/M) ratio of less than 1.2 is considered an A, whereas an A/M ratio of 2.0+ would be considered an F. An A/M ratio of below 1.0 could be achieved with the introduction of a diagonal street. Ideally, development proposals should be self-mitigated to achieve acceptable LOS standards prior to submittal to the City.

# CONTINUITY

Continuity is the measurement of the completeness of the sidewalk system. A continuous pedestrian system from origin to destination is critical for pedestrian mobility. Continuity is a measure of both the physical consistency and type of pedestrian sidewalk and the visual connection from one block to the next.

Figure P- 6: Level of Service - Continuity

LOS A is achieved when the pedestrian sidewalk appears as a single entity within a majority of activity area or public open space.

LOS B provides a quality continuous stretch of pedestrian networks which are physically separated with landscaped parkways.

LOS C provides for a continuous pedestrian network on both sides of the street; however, these sidewalks may not be built to current standards.

LOS D reflects areas where there may not be sidewalks on both sides of the street or there are breaches in the system.

LOS E reflects areas where there are significant breaks in the system.

LOS F is a complete breakdown in the

pedestrian flow where each pedestrian selects a different route because no pedestrian network exists.

# STREET CROSSINGS

If pedestrians cannot safely cross a street to get to their destination there is little likelihood that they will be inclined to walk. Because street crossings place the pedestrian in the middle of the street, involving both the pedestrian and the automobile driver, the measurement of a street crossing becomes very complex. Achieving a high LOS for street crossings can require significant investment.

# Street Crossing Types

There are four main types of street crossings – signalized intersections, unsignalized intersections crossing a major street, unsignalized intersections crossing a minor street, and mid-block crossings. Each has inherent differences. The pedestrian LOS will be used for evaluating and upgrading signalized intersections. The crosswalk treatment identification process that is described in the next section will be used to identify appropriate improvements for unsignalized intersections.



Roundabouts are becoming a more prominent street crossing type. In terms of pedestrian safety, single lane roundabouts typically increase pedestrian safety. This is due to decreased crossing distances and only having to cross one direction of travel at a time. Additionally, traffic is typically moving much slower at a roundabout than at a signalized intersection.

Street crossing LOS was correlated to pedestrian exposure the to the automobile and design elements which reflect positively the pedestrian presence. The following are key street crossing elements that need to be examined when measuring street crossing LOS at signalized locations.

### Number of Lanes

Wider intersections create exposure of pedestrians to motorists. In addition, wider streets tend to carry higher volumes of traffic with higher speeds.

### Crosswalks

Crosswalks are present and well marked.



Figure P-7: Pedestrian design elements at street crossings

### **Signal Indication**

Signal heads are easily visible to the pedestrian and the motorist.

# **Lighting Levels**

Intersection and crosswalks are well lit so that the pedestrian is visible at night.



Pedestrian improvements at College and Harmony intersection

# **Pedestrian Signal Indication**

Some signals have the walk phase automatically set for each cycle. This is desirable for all activity areas, as it states the importance of the pedestrian. An alternative is the pedestrian button, where the pedestrian presses the button, waits for the cycle to repeat, and gets the walk phase. The third type of signal does not have any walk phase. For an actuated signal this type of pedestrian indication is unacceptable, since the only way a pedestrian gets a green light is when an automobile on the side street activates the cycle.

### **Pedestrian Character**

Signing, striping, and roadway character strongly suggest the presence of a pedestrian crossing.

# Sight Distance

Unobstructed views between motorists and pedestrians are important for ensuring safe crossings.

### **Corner Ramps**

Directional corner ramps are preferred because they notify drivers of intended pedestrian walking direction.

# VISUAL INTEREST AND AMENITY

Visual interest and amenity considers the pedestrian system's attractiveness and features. The attractiveness of the pedestrian network can range from visually appealing to appalling. Compatibility with local architecture and site enhancements, such as fountains, benches, pavement materials, and lighting improve visual interest.

# SECURITY

Security is the measure of a pedestrian's sense of security. Pedestrians require a sense of security, both through visual line of sight with vehicles drivers and separation from vehicles. Major portions of the city's sidewalks along arterials are narrow and adjacent to high-volume, high-speed travel lanes. Other sidewalks are intimidating because they are not visible to the motorist and surrounding activities. Pedestrian sidewalks and corridors should also be examined based on lighting levels and sight distance.

### Table P- 2: Pedestrian Level of Service Descriptions

Directness	Α	В	C	D	E	F
	Excellent and direct connectivity through full utilization of urban space, streets, transit, and activity centers with clear linear visual statements.	Excellent and direct connectivity with clear linear and visual connection to transit facilities, streets, and activities.	Minimum acceptable directness and connectivity standard. Perceptions and urban space become less coherent with the beginnings of discomfort with visual clarity and lack of linearity.	Increasing lack of directness, connectivity and linearity with incoherent and confusing direction and visual connection to pedestrian destinations.	Poor directness and connectivity. Pedestrian perception of a linear connection to desired destination falters and serves only the person with no other choice.	No directness or connectivity. Total pedestrian disorientation; no linearity and confusing.
	(A/M Ratio < 1.2)*	(AM Ratio 1.2 to 1.4)*	(A/M Ratio 1.4 to 1.6)*	(A/M Ratio 1.6 to 1.8)*	(A/M Ratio 1.8 to 2.0)*	(A/M Ratio > 2.0)*

Continuity	Α	В	С	D	E	F
	Pedestrian sidewalk appears as a single entity with a major activity area or public open space.	Continuous stretches of sidewalks which are physically separated by a landscaped parkway.	Continuous stretches of sidewalks which may have variable widths, with and without landscaped parkways.	Pedestrian corridors are not well connected with several breaches in pedestrian network.	Significant breaks in continuity.	Complete breakdown in pedestrian traffic flow. All people select different routes. No network exists.

Signalized Crossings**	В	с	D	E	F
3 or fewer lanes to cross Signal has clear vehicular pedestrian indications Well marked crosswalks Good lighting levels Standard curb ramps Automatic pedestrian signal phase Amenities, signing, and sidewalk and roadway character strongly suggest the presence of a	4 or 5 lanes to cross and/or Missing 2 elements of A	6 or more lanes to cross and/or Missing 4 elements of A	Missing 5 elements of A	Missing 6 elements of A	Missing 7 elements of A

Α	B	С	D	E	F
Use Crosswalk	Treatment Identi	ification Process			
Α	В	с	D	E	F
		<u> </u>			
	Use Crosswalk	A     B	A     B     C       Use Crosswalk Treatment Identification Process       A     B     C	A     B     C     D       Use Crosswalk Treatment Identification Process       A     B     C     D	A     B     C     D     E       Use Crosswalk Treatment Identification Process       A     B     C     D     E

Mid-block major street crossing ***	Α	В	С	D	E	F

Use Crosswalk Treatment Identification Process

Visual Interest and Amenity	A	В	С	D	E	F
	Visually appealing and compatible with local architecture. Generous sidewalk width, active building frontages, pedestrian lighting, street trees, and quality street furniture.	Generous sidewalks, visual clarity, some street furniture and landscaping, no blank street walls.	Functionality operational with less importance to visual interest or amenity.	Design ignores pedestrian with negative mental image.	Comfort and convenience nonexistent, design has overlooked needs of users.	Total discomfort and intimidation.

Security	Α	В	с	D	E	F
	Sense of security enhanced by presence of other people using sidewalks and overlooking them from adjacent buildings. Good lighting and clear sight lines.	Good lighting levels and unobstructed lines of sight.	Unobstructed lines of sight.	Sidewalk configuration and parked cars may inhibit vigilance from the street.	Major breaches in pedestrian visibility from street, adjacent land uses, and activities.	Streetscape is pedestrian intolerant.

- \* A/M Ratio: Actual distance between pedestrian origin/destination divided by minimum distance defined by a right angled grid street system.
- \*\* A signalized intersection LOS will go up one Level of Service with a dedicated pedestrian signal phase and/or a colored or textured crosswalk.
- \*\*\* Unsignalized crossing at intersection of major street (minor arterial to major arterial) and minor street (local, connector and collector).

# LEVEL OF SERVICE THRESHOLDS

The following defines the minimum acceptable standards for Pedestrian Priority Areas. It should be noted that numerous locations within the City will not achieve the minimum LOS. Because of limited funding, improvements should be prioritized toward activity areas and routes to schools, parks, and transit. To cap the current problem, new development, both public and private, as well as major street improvements and redevelopment, should adhere to the pedestrian LOS standards.

Table P- 3: Targeted Level of Service by Pedestrian Priority Area

	Directness	Continuity	Street Crossing	Visual Interest and Amenity	Security
Pedestrian Districts	A	A	В	A	А
Activity Centers and Corridors	В	В	С	В	В
School Walking Areas	В	В	В	С	В
Transit Corridors	В	С	С	С	В
Other Areas Within City	С	С	С	С	С

# **APPLICATION**

Vehicle, transit, bicycle, and pedestrian LOS analysis is required for all proposed public and private development and arterial improvements. Street improvements may require pedestrian improvements to facilitate acceptable pedestrian street crossings. Street improvements are unacceptable if they reduce pedestrian LOS below acceptable levels. Private developments may be required to construct off-site pedestrian improvements to achieve acceptable pedestrian LOS, similar to the request to provide off-site mitigations to achieve acceptable automobile LOS.

City of Fort Collins Transportation Master Plan

THERE

Multimodal Transportation Level of Service Manual

Appendix B Public Transit Plan



# Appendix I

# NOTE: Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Appendix I shall be used as a reference for Roundabout Design within the City Limits of Fort Collins and Loveland, and within Larimer County GMAs.



# Roundabout Design Manual

# **LCUASS** Appendix I

City of Loveland City of Fort Collins Larimer County

March 17, 2016



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# A. Introduction

These guidelines are to be used, along with information from other sources and engineering judgment, in the design of all roundabouts. Where conflicting information exists, this manual shall govern, or the local entity can provide clarification.

When designing roundabouts, there are several characteristics that can be standardized, such as signing and marking; while others must be adapted to fit the demands of the location, such as approach angles and right of way restrictions. This manual has been created to allow engineers sufficient flexibility to design a roundabout to fit a particular site, while still maintaining consistency with other roundabouts within the Local Entity in order to enhance driver expectancy.

All roundabout designs will be required to follow a four stage process (scoping meeting, conceptual design, preliminary design, and final design), and these stages shall run concurrently with the overall development review process:

- The Roundabout Scoping meeting will deal specifically with any proposed roundabout intersections, and will be scheduled within two weeks of the Local Entity's receipt of a completed *Roundabout Scoping Form* and any ancillary information necessary to determine the parameters of the proposed roundabout. The intent of the scoping meeting is to clearly define the expectations for design of the proposed roundabout and to discuss particular site-specific challenges.
- The conceptual design is intended to vet the general capacity issues, and performance of a roundabout, conceptual location/layout, and pedestrian / bicycle safety issues based upon direction given in the scoping meeting.
- Submission of a preliminary design that meets design criteria listed herein, or as modified in accordance with guidance provided by the Local Entity during the scoping or conceptual design stages of review. Horizontal design of the proposed roundabout shall be finalized prior to approval of the preliminary design. The preliminary design may be incorporated into the Preliminary Public Improvement Construction Plans (PICP's), or processed separately, as necessary.
- Submission of a final design shall include all: construction details, signing and striping plans, and proposed construction phasing (if applicable). The final design shall be incorporated in to the Final PICP submittal.

The final approval of any platting application and/or Final PICP's will not occur until the final design plans for the roundabout are also ready for approval.

MULTI LANE ROUNDABOUTS	GENERAL USE DESCRIPTION	REFERENCE EXHIBIT
4-Lane by 4-Lane Arterial	Residential/Commercial major arterial intersection	Figure 10
2-Lane by 4-Lane Arterial	Residential/Commercial greenfield development access to existing major arterials	Figure 11
2-Lane by 4-Lane with by-pass lane	Residential/Commercial greenfield development to existing major arterials with heavy right-turn from minor road entry	Figure 12
SINGLE LANE ROUNDABOUTS		
2-Lane by 2-Lane Arterial	Residential/Commercial greenfield development; Arterial- Arterial or Arterial-Collector	Figure 13
Collector	Residential/Commercial greenfield development; Collector-Collector or Collector Residential	Figure 14
Mini	Commercial retro-fit, 2-lane road w/o center lane to facilitate traffic processing and pedestrian safety in place of 4-way stop control or signal	Figure 15
Residential Compact	Residential Traffic Calming	Figure 16

# **TABLE 1: ROUNDABOUT CATEGORIES**

# **B.** General Design Criteria

# 1. Appropriate Roadways/Locations

Roundabouts should only be used where physical conditions, such as approach grades and adequate right of way, allow for proper entry alignment. Roundabouts are generally limited for use on a roadway with four or fewer through lanes, resulting in no more than two circulatory lanes. They are not appropriate where their use is expected to produce greater vehicle delay or significantly increased difficulty for pedestrians without the need for special accommodation measures. Selection of a roundabout intersection should be proposed and accepted for consideration at the conceptual level for a proposed development.

The design of the approach roadways must provide adequate visibility from a distance that will allow approaching drivers to see the roundabout under daytime and nighttime conditions. This decision sight distance (DSD) is the minimum distance required which will allow deceleration from the 85<sup>th</sup> percentile travel speed (or posted speed limit, whichever is greater) to the maximum allowable entry speed of 25 MPH (single lane) or 30 MPH (multilane) at the Point Of Entry (POE) without exceeding a deceleration rate of 11.2 ft/s/s. The POE shall be considered the point of curvature of the entry curve (R1). The DSD shall be based on Avoidance Maneuver B from Table 3-4 of the AASHTO Green Book. The length of the maneuver shall be measured along the vehicle path(s) to the conflict point as shown on Figure 4.

# 2. Approach & Circulatory Speeds

The approaching roadway lanes should generally be shifted to the left of center of the proposed roundabout, producing a "left-loaded" entry design. This should be accomplished by flattening the exit curvature to the maximum extent possible, and/or realigning the entry lanes through the use of a chicane. This may, or may not incorporate shifting of the central island or approach roads to achieve the best left-loaded entry for the predominant entry movements. Approach alignments to the center or slightly right of center will not be acceptable, unless the fast path criteria and truck turning movements can be met without compromising other design criteria.

As a general rule, roundabouts may have three or four approaches. A fifth approach leg or driveway may be approved by variance, as long as it can be shown that the additional leg will not significantly degrade the operation or safety of the roundabout. Increasing the number of approach legs will generally require a larger inscribed diameter to accommodate the additional leg. A three leg roundabout should be configured as a tee intersection to minimize fast right-turn movements. All approaches on a three-leg roundabout shall be left loaded to provide adequate slowing for the entry movements.

Approach roadways may be designed as:

- single-lane
- single-lane with a flare-out to provide an added entry lane
- partial right-turn bypass lane at the circulating roadway
- single-lane with a right-turn by-pass lane
- two lanes
- two lanes with a right-turn by-pass lane

The configuration selection shall be based on the turning movement volumes and pedestrian considerations. Right turn by-pass lanes should not be considered where significant conflicting pedestrian crossings are expected, unless special treatments such as rapid flashing beacons or HAWK (High intensity Activated crossWalK) type signals are proposed. Right-turn by-pass lanes shall not be considered unless the capacity analysis indicates one is necessary to meet level of service (LOS) requirements.

The approach roadway section is defined to include the length of roadway from the point where an approaching vehicle begins to decelerate, to the yield line, where the vehicles enter the inscribed circle (see Figure 1 for an explanation of the various roundabout elements). For design purposes, this section shall extend to the limits of the decision sight distance, as defined in Exhibit 3-4, Chapter 3, of the AASHTO Green Book, using the "Avoidance maneuver B: Stop on urban roadway" distance. The central island shall be visible from a minimum distance equal to the stopping sight distance both day and night (with standard street lighting).

Operating speed maximums are controlled by the "fast path" (FP) as noted in Figure 2. The fast path is the minimum radius of an arc that is 65 feet in length, fit to the fast path spline and measured along the vehicle path (not along the curb flowline). Increasing the inscribed diameter, coupled curves, landscaping, roadway narrowing,

and other forms of psychological speed reduction measures may be required where approach speeds are higher due to design constraints.

Design speed limitations and their respective radii through the roundabout are shown on Figures 2 & 3, included in section C – Specific / Geometric Design Elements, identified as R0, R1, R2, R3, R4 and R5. The maximum radius and respective speeds at various locations on the travel path through the roundabout are critical to the safe operation of the roundabout. Curb & gutter, splitter islands and the central island placement control the fastest vehicle path, but are not the same radii. In addition to the overall speed limitation for operation, the maximum speed differential between any two vehicles of the traveled path is 12 MPH to reduce the potential for rear-end type accidents for vehicles turning left or exiting. The fast path shall be modeled in accordance with methods described in NCHRP 572, Appendix G.

All alignment parameters, including sight distance restrictions for landscaping, shall be included in the preliminary design drawings. See Figure 4 for sight distance triangle restrictions.

# 3. Design Vehicle

All single-lane roundabouts shall be designed to allow single passenger cars, pickups, single unit (SU) trucks and fire trucks (B-40, BUS-45 AND WB-45) to proceed without requiring the use of the truck apron. For two-lane roundabouts, the design shall accommodate a WB-50 vehicle without the use of the truck apron. It is expected that larger trucks will require the use of the truck apron, especially on single-lane roundabouts. In addition to the aforementioned requirements, all roundabouts shall be designed to accommodate the passage of a WB-67 vehicle. In the determination of vehicular travel/turning paths, the gutter pans may not be considered as part of the traveled way, and vehicles shall not be proposed to utilize these areas while negotiating the roundabout. As such, the designer shall assume a two-foot (2') offset from the face of curb when defining acceptable truck paths.

The design of Mini roundabouts shall allow for longer trucks (B-40, BUS-45, WB-45, WB-50, and WB-67) to traverse the central and splitter islands. Therefore, the central and splitter islands on Mini roundabouts shall remain free of signage and other non-mountable obstructions.

In areas where high truck volumes exist or are anticipated, additional design accommodations may be required as determined by the Local Entity Engineer. Similarly, it may be necessary to model special vehicles through a roundabout that is located along a route that is, or may be, used for the transport of oversized equipment, such as, large transformers, wind turbine parts, heavy military equipment, manufactured housing, etc. Some of these delivery trailers have adjustable hitches or have steerable rear axles that will need to be considered in the design. If any, special delivery needs along the proposed route will need to be defined at the conceptual submittal stage. In all cases, the design vehicle shall be defined and accepted prior to preliminary design.

The adequacy of all roundabouts in regard to the design vehicle shall be evaluated using a Local Entity-approved truck turning software package to show the appropriate wheel paths for right, through, and left turn movements from each entry of the roundabout, and shall be submitted with preliminary design. Truck positioning on entry to a multi-lane roundabout may assume that the truck will occupy both entry lanes and utilize both circulatory lanes during the traverse of the roundabout. For all truck turning evaluations, the minimum vehicle speed shall be 10 miles per hour.

# 4. Pedestrian / Bicycles

All roundabouts shall be designed to allow pedestrian crossings whenever sidewalks are existing or planned. Pedestrian crossings shall be provided with appropriate pavement markings, as outlined in Figure 4. Supplemental signage may also be required for pedestrian crosswalks located along a school route, bordering a park or shopping area, or any other area where high pedestrian activity is expected. Crosswalk lighting shall be designed in accordance with the National Cooperative Highway Research Program publication 672 (NCHRP 672). The designer shall work with the local power provider to facilitate the necessary power connections. The light standard placement shall be a minimum of four feet (4') from the back of curb.

In areas of high potential for vehicle/pedestrian conflict, supplemental active warning devices, such as flashing beacons or LED supplemented signage, may be required,. The warning devices may be activated either manually by the user or automatically by a Local Entity-approved detection / actuation technology.

Except in residential compact roundabouts or where otherwise precluded due to site constraints, all sidewalks and multi-use paths in the area of a roundabout shall be detached from the curb by a minimum distance of 10 feet.

If the roundabout is on a street with approaching bike lanes or on a roadway with planned bike lanes, the approach shall provide for a connection from the bike lane to the multi-use path, as illustrated on Figure 7. The intent is to allow the bicyclist the choice to either proceed through the roundabout as a vehicle, or exit the roadway prior to the roundabout onto the detached multi-use path. The on-street bike lane should terminate at the point where the bike lane exits from the roadway using a 40' taper as shown on Figure 7.

Figures 4 thru 9 provide design details for construction, signage, and pavement markings for pedestrians and bicyclists. Details of site-specific markings and signage shall be included with the preliminary design submittal for all proposed roundabouts.

# 5. Design Software

Local Entity-approved design software shall be used to ensure proper design and capacity for any new roundabouts. For Local Street or Minor Collector intersections where the 20-year projected link volumes are expected to be less than 500 AADT, a capacity analysis is not required unless the roundabout will experience high peak volumes for vehicles and/or pedestrians (such as near a school).

At the conceptual level, intersections with collector or higher roadway classifications shall be evaluated with the Roundabout Capacity Evaluation Spreadsheet 1A.1 and the 2010 Highway Capacity Manual methodology or RODEL/ARCADY. At the Preliminary Design level, all roundabout intersections will require analysis by methods detailed in current versions of: RODEL, ARCADY or VISSIM to analyze the roundabout for level of service (LOS) and queue concerns in relation to the Local Entity's Adequate Community Facilities (ACF) Ordinance. The City of Fort Collins may require SIDRA INTERSECTION software for roundabout evaluation. Designers should contact the Local Entity Engineer for guidance on required analysis and input parameters.

For roundabouts proposed at the intersections with Major Collector, Minor Arterial, or Major Arterial roadways, the use of RODEL or ARCADY analysis software is required for capacity analysis and evaluation of geometric design variables. The specific RODEL or ARCADY parameters shall be developed based on the recommendations of their respective instruction manuals. Additionally, VISSIM analysis may also be required for verification of the RODEL or ARCADY results. A lane use diagram showing origin-destination turning movement volumes will be a requirement of preliminary design review. For unbalanced entry and circulation modeling in multi-lane roundabouts, the analysis software chosen shall consider the key individual conflict zone as determined by the proposed geometry and striping.

The following guidance is given for the RODEL effective entry width parameter "E", assuming a striped roundabout entry:

- A. Single-Lane Entry -
  - 1. E shall be a **minimum** of 3.0m (9.84ft)
  - 2. E shall be a **maximum** of 4.5m (14.76ft) if the approach feeds a single circulating lane
  - 3. E shall be a **maximum** of 5.5m (18.05ft) if the single lane approach feeds 2 (or more) circulating lanes
- B. Multi-Lane Entry -
  - 1. The **minimum** lane width shall be 3.0m (9.84ft)
  - 2. The **maximum** lane width shall be 4.0m (13.12ft)

Based on the above, a two lane entry can be 6m - 8m (19.69ft - 26.25ft) wide

The Kimber roundabout capacity equations used in the RODEL and ARCADY analysis programs show capacity increases on a smooth curve related to input parameters that do not consider roadway striping. Where striping is proposed with the roundabout design, the E values must be input based on the effective width as detailed above and in the RODEL manual consisting of different lane width sizes. For example, if the measured design entry width E is 10m in the model, this represents three 3.33m lanes, not two 5m lanes as the entry width E exceeds the maximum lane width. The effective width should be set in the model to the maximum for two lanes at 8m even though the measured with is 10m.

If any lanes are designed wider than 4.0m in order to accommodate trucks, they should be considered to be 4.0m wide when summing the lane width to get E for use in RODEL. Usually, entry lanes have equal width, but a two lane approach may have a 3.60m lane and a 5m lane, the latter made over-wide for trucks. For RODEL, the input would be E = 3.6 + (4.0) = 7.6m, not E = 3.6 + (5.0) = 8.6m

All preliminary designs shall be accompanied by AM and PM peak hour turning movement counts for existing and build-out conditions and traffic growth projections for both 10 and 20-year horizons. The RODEL or ARCADY output shall also be provided at this time, when required. Where the roundabout is near a school, shopping center or other major traffic generator, the peak hour for local traffic with the traffic generator fully developed shall be used and may be different from standard a.m. or p.m. peak times. In addition to the RODEL or ARCADY output file, a diagram graphically depicting the input parameters similar to that shown on Figure 1, shall be provided. The horizontal roundabout layout shall be provided to the Local Entity in CAD format that is compatible with Autodesk version 11.0 to allow for review of input parameters.

# 6. Utilities & Drainage

Design of underground and overhead utilities shall be included with the Preliminary Design. Design of water, sewer, and electric shall meet the appropriate Local Entity's standards, or the standards of any applicable special district. The placement of manholes and valve risers shall consider maintenance safety issues as well as their location relative to wheel path in order to minimize surface ride issues. Street lighting shall follow the Local Entity's standards for pole, light fixture and type of lighting. In general, lighting shall be designed to illuminate any pedestrians within the crosswalks without causing a backlighting effect. Lighting shall also be situated to help the driver identify the general shape of the intersection and to highlight conflict points or areas of entry and exit from a distance equal to, or greater than the stopping sight distance as identified in Figure 4.

Drainage design shall comply with the Local Entity's storm drainage standards. Roundabouts should be generally designed to slope away from the central and splitter islands with drainage inlets located on the outer curb line of the approach roadways and away from the pedestrian crossings. Inlets within the roundabout circulatory roadway shall be constructed with CDOT Type R inlets with sufficient capacity to limit the encroachment into the circulating area to a maximum depth of 4-inches for the 10-year event. Placement of any inlets shall also consider the vehicle's wheel path when traveling through the roundabout.

# 7. Landscaping

Landscaping is an important part of the design, especially in the central island, as it provides visual awareness of the roundabout. Landscaping designs must consider pedestrian and vehicle safety, providing year-round amenities for the roundabout users without causing sight distance problems. This is especially important on approaches to pedestrian crossings.

All final designs shall include a landscaping design sheet identifying plant types, height from the top of the mature plant to the roadway surface (including the height of planter area), and the minimum pruning height for the lower branches of any trees to be planted. See Figures 4 and 6 for areas where plant height is restricted for sight distance reasons. Within the central island, but outside of the required stopping sight distance line, the use of larger plant materials is encouraged to improve the driver's perception of the roundabout location and shape. Care should be taken to avoid distracting displays, such as signs, intricate sculptures, animated items, glare from lighting, or any other features that could increase the potential for driver distraction. In no case should anything be placed within the central island which would encourage pedestrians to access the central island.

# 8. Other

Other design criteria include but are not limited to:

- The departure width of the roundabout shall be no narrower than the width of the circulatory roadway and include a transition to the departure lane width cross-section, exclusive of on-street parking and bike lanes (Figure 7). The roadway shall then taper out to its full width (bike-lane or parking) as shown on Figure 6.
- Transit stops should be located downstream of the roundabout, clear of the exit area, and a minimum of 50 feet downstream of the bicycle re-entry ramp (Figure 7). The transit stops shall be built with a LCUASS standard pullout or combined with the on-street parking area.

All unusual or location-specific design issues shall be resolved prior to the submission of final design plans.

# C. Specific / Geometric Design Elements

# 1. Critical Geometry

The roundabout advantage is its ability to move large volumes of traffic at a slow deliberate rate of speed that processes the necessary turning movements into the through movements with less potential for high speed accidents. The efficient use of the intersection area is created and controlled by the geometry of the roundabout and specifically the approach road entry. Roundabout design is a balance between competing objectives and thus requires a context sensitive approach to meet the design objectives. The design guidance described below is a standardized approach intended to produce a reasonable, first-cut horizontal design. Intersections with specific rights-of-way constraints or traffic needs will have to be addressed with a context sensitive approach.

# 2. Roundabout Design Approach

Once a preliminary roundabout lane configuration has been developed based on projected traffic turning movements and capacity evaluations, the designer should develop a rough horizontal layout by using the applicable Figures in this manual as a guide.

The approach roadway design elements include curb alignment, median width and transition, approach flare, crosswalk location, horizontal and vertical alignment of the approach lane(s), intersection and stopping sight distance calculations, approach speed, fast path radii, and other associated elements identified in Figures 1through 7. Minimum / maximum design standards are as follows:

Fast Path (FP)		Single Lane (ICD 115-155)		Mult-lane (ICD 150 - 215)	
Designation	Movement	FP Radius Range	FP Max	FP Radius Range	FP Max
		(ft)	Speed	(ft)	Speed
R1	Entry	120 - 160	25	175-275	30
R2	Circulating	90 - 115	25	175-215	25
R4	Left	40-60	15	70	15
	Minimum				
R5	Right Turn	120 -160	25	175-215	25

\*R4 has a minimum requirement to reduce rear end accidents caused by excessive speed differential

Note – radii are given as a range for various superelevation rates from 0% to 4%, positive for R1, R3 & R5, and negative for R2 and R4. Calculations for each specific roadway segment and corresponding cross slope shall follow the AASHTO Green Book.

Maximum vertical grade (approach)	<ul><li>2% for 200' on minor and principal arterials</li><li>4% for 100' on minor and major collectors</li><li>4% for 50' on local streets</li></ul>
Approach Decision Sight Distance ("DSD" on Figure 4 - measured from the yield line)	400' for 25 MPH or less 490' for 30 MPH 596' for 35 MPH 690' for 40 MPH 800' for 45 MPH 910' for 50 MPH

Note – Approach Decision Sight Distance, DSD, is the distance at which the driver is aware of the change in alignment caused specifically by the roundabout. If the required DSD is not available due to topographic limitations, advance warning signs shall be required. Vertical alignment must be checked as well as horizontal alignment for restrictions to DSD.

Minimum Approach Tangent	300' on principal arterial
(approach centerline to yield line)	200' on minor arterial
	100' on all collectors
	50' on local access

Min. distance to nearest access (distance from splitter island)

600' on principal arterial 300' on minor arterial 100' on all collectors 30' on local access

# 3. Circulating Roadway

The circulating roadway, that portion of the roundabout between the central island and the inscribed circle diameter (ICD), is the portion of the roadway used by vehicular traffic. In Loveland (city limits only), the circulating roadway within all proposed roundabouts shall be concrete pavement, unless otherwise approved by the Local Entity Engineer. The ICD of the roundabout, which encloses the circulating roadway, shall be large enough to accommodate all road users without exceeding the fast path maximum radii. Generally, the design of the inscribed circle will be from 140' to 215' for multilane roundabouts, and from 90' to 155' for single lane roundabouts and 50' to 90' for Mini and Residential Compact roundabouts. The outside edge of the circulating roadway is within and generally the same size as the inscribed circle.

The circulating roadway shall be from 1.0 to 1.2 times the maximum approach roadway width at the widest entry to the roundabout. Super-elevation for the circulatory road should generally be no greater than 2%, although a super-elevation of up to 4% may be approved if conditions warrant. Adverse super elevation is preferred for the circulatory road as it provides a smoother transition for motorists, better drainage, and keeps circulating speeds to an acceptable level.

Roundabouts may be designed and built in stages, with the initial size of the inscribed circle large enough for a multilane roundabout, with an oversized central island that restricts the circulating roadway to one lane. In this case, it is likely that an oversized truck apron will be needed.

Dedicated bypass lanes should be avoided if possible, due to the difficulty for pedestrians to cross three roadway segments instead of the usual two in other roundabouts. If the capacity analysis with RODEL indicates that the existing and shorter range projected volumes will operate at LOS D or better, the roundabout should be built without a bypass. If the 20 year projected volumes show the need for a bypass, adequate right of way shall be included to accommodate the future expansion and the bypass will be built when the operating LOS exceeds level C.

# 4. Sight Distance

Stopping Sight Distance (SSD) is the distance between a roadway obstruction and the approaching driver, measured along the vehicle path. It is used to assess safety for vehicle to vehicle, vehicle to pedestrian or bicycle, and vehicle to other object hazards. Every conflict point at the intersection must be checked, based on fast path vehicle speed near the conflict area for obstructions of the required visibility area – see Figure 4.

SSD for the approach and yield at the roundabout shall be based on current AASHTO Green Book standards for urban roadways.

# 5. Splitter Islands

Splitter islands are necessary to provide proper deflection of vehicular traffic for speed control and to provide pedestrian refuge areas. For multi-lane roundabout entries, the alignment of the splitter island curb shall incorporate an extension of the splitter island that is tangential to the outside flow line of the central island (Figure 1). For arterial roundabouts, splitter islands shall be a minimum of 150' in length (300' preferred). See Figures for minimum splitter island lengths for other types of roundabouts.

Splitter islands shall be designed with a minimum 6'x 6' (8'x 8' preferred) pedestrian refuge. Crosswalks shall be located 25' from the yield line for all roundabouts unless otherwise approved by the Local Entity Engineer (Figure 5). Crosswalks shall also be designed to be radial to the traveled roadway in order to improve visibility for pedestrians.

The splitter island curb layout shall be designed in accordance with Figure 6.
The central island diameter for a multilane roundabout shall be determined in a manner that assures that the deflection for entering vehicles will result in a design that meets the maximum fast path requirements. Generally, the central island diameter will fall between 115' and 175' for a multilane roundabout and between 95' and 135' for single lane roundabouts and 35' to 75' for Mini roundabouts.

Truck aprons are required and may not exceed 5% superelevation. They shall be constructed of concrete and be contrasting in texture and color from the surrounding roadway, easy to maintain, and able to withstand the loadings of turning trucks (i.e. minimum 6" thick, decorative, contrasting colored concrete, etc.). In no case should a truck apron resemble a sidewalk. Brick, cobblestone or other individually placed paving materials may be considered when set on an adequately designed concrete supporting shelf. Additionally, truck aprons shall be provided with a monolithic 4" mountable perimeter curb that is back-sloped at a 45 degree angle with a rounded top. See Figure 5 for additional truck apron design information.

Elevation drawings of the central island shall be included with the preliminary plans. Except for Mini and Residential Compact roundabouts, the central island, exclusive of the truck apron and any sight distance restricted areas, shall be a minimum of 2' above the surrounding roadway, and shall be of contrasting texture and colors to the roadway and surrounding areas. The interior surfacing of the central island shall also be designed for low maintenance, discouraging the use of sod or other high maintenance plantings/materials.

#### 7. Signing & Marking

All signs and pavement markings shall conform to the current *Manual on Uniform Traffic Control Devices* (MUTCD) as amended, and by these design standards.

- 1. **Signing** See Figure 9 for sign locations.
  - Advance roundabout warning signs with advisory speed plaques are required whenever topography or driver distraction precludes adequate advance visibility of the roundabout.
  - Yield signs shall be placed on the right side of the approach roadway, at the point where vehicles are required to yield when entering the roundabout. With the exception of Mini and Residential Compact roundabouts, yield signing will also be required in the splitter islands. Supplemental "YIELD" pavement markings may also be required where field observation warrants.
  - Lane assignment signs, depicting the lanes maneuvering around the roundabout, shall be provided on all multi-lane approaches (Figure 8). This requirement shall also be applied to single-lane approaches with auxiliary turn lanes.
  - Street name signs with minimum 8" lettering shall be placed on the splitter islands and oriented toward traffic on the circulatory roadway (Figure 8).
  - Flag type guide signs, indicating the correct directional exit for service, recreational and cultural destinations are required for major destination routes.
  - Advanced guide signs (Figure 9) shall be required for the junction of numbered routes.
  - Pedestrian crossing signage shall be required where high pedestrian usage is expected, or as otherwise determined by the City.
- 2. Marking Pavement markings shall consist of pre-formed, hot-applied thermoplastic material. All linear pavement markings, including crosswalks, shall be grooved in using approved grinding process after the concrete has cured and installed even with the surface of concrete paving. All pavement markings can be installed directly on top mat of asphalt without being recessed. Where installed on concrete paving, all markings (lines, symbols, etc.) shall be outlined in black for increased visibility. Use CDOT specifications, section 627.08 (7a) for inlaid lines, symbols will not be inlaid. See Figures 10-15 for typical pavement marking types and locations.
  - Lane use pavement markings, including arrows and solid or dashed lines shall be used on all multilane roundabouts. See Figure 5 for their correct spacing and placement.

- Lane use pavement markings, including arrows and solid or dashed lines shall be used on all multilane roundabouts. See Figure 5 for their correct spacing and placement.
- Yield lines and "YIELD" pavement markings shall be used to mark the location at which drivers must yield to circulating traffic. The yield lines shall be curved along the outline of the circulatory roadway and shall be oriented toward approaching drivers as depicted on Figures 10-15. Placement and orientation of "YIELD" pavement markings will also be required as indicated on Figure 5. "Shark's Teeth" type yield markings will not be permitted.
- Yellow edge lines shall be placed along the left edge of the approach roadway and along the edge of the splitter islands. For multilane roundabouts, white edge lines are required along the right side of the splitter island outlining the circulating roadway and yellow edge lines may be required around the central island.
- Pedestrian crossings shall be marked with "Denver" or "Continental" style markings, consisting of 1.5' x 9' bars located in a manner that avoids the projected wheel path.
- Retroreflective raised pavement markers (RRPM) may be required on the central island and splitter island curbs where sight distance and/or other concerns indicate that additional warning is necessary for improved nighttime operational safety.

#### 8. Landscaping Design Elements

In general, landscaping and design elements shall:

- Be aesthetically pleasing
- Fit within the context of the surrounding area
- Not create a distraction for drivers
- Not interfere with pedestrian safety
- Not attract pedestrians into the central island

Splitter islands shall either be hardscape or contain low level vegetation with a maximum height at maturity, of 30" above the roadway (Figure 6).

In order to reduce approach speeds, and with the exception of Residential Compact and Mini roundabouts; the central island shall contain vertical features that are visible to approaching traffic under daylight and nighttime conditions. All vertical features, however, shall be located outside of the stopping sight distance restriction area.

New roundabouts with landscaping shall be subject to a maintenance agreement with the local homeowners Association (HOA), providing for maintenance of all proposed landscaping. In the alternative, guaranteed funding for maintenance of the landscaping by other private organizations such as Metro Districts, Property Management Agencies, etc., may be acceptable. Retrofit roundabouts shall have low-maintenance landscaping or a maintenance agreement similar to new roundabouts.

















				(D)*
SIGN PLACEMENT LEGEND: (SEE FIGURE 8 FOR SIGN ILLUSTRATION	NS) C	mot y		
A R1-2 YIELD SIGN 36"x36"x36" (SEE GENERAL NOTE 3)	*0			Г
	$\sim$		X /	
$   \left( 1 \text{ Sign per exit to be placed at driver eye height)} \right) $				
INSTALL 4" PVC SLEEVE 2 FEET BACK FROM NOSE OF MEDIAN FOR YELLOW SAFE HIT INSTALL 4" PVC SLEEVE 8 FEET BACK FROM NOSE OF THE MEDIAN FOR R4-7 KEEP RIGHT SIGN AND OM-3(L) OBJECT MARKER SIGN 12"x36"	24"x30"			-
* W11-2a PEDESTRIAN TRAFFIC SIGN 30"x30" AND W16-7P DIAGONAL ARROW PLAQUE 24"x18" (AS DIRECTED BY THE CITY TRAFFIC ENGINEER) (*OPTIONAL AT TRAFFIC ENGINEER'S DIRECTION	N)			I
** 🕞 R3-8 36"x36" OR R3-8a 48"x30" ADVANCE INTERSECTION LANE CONTROL SIGN (**MAY BE REQUIRED AT MULTIPLE LOCATIONS)			150 <sup>,</sup>	
R3-7R MANDATORY MOVEMENT LANE CONTROL SIGN 30"x30"			×* (	
G D1-5 DESTINATION SIGN 48"x96"			E I	
D1-1 STREET NAME SIGN 60"x12" (1 SIGN PER EXIT)				
(BLACK LEGEND ON YELLOW BACKGROUND)	x18"			
			150'	
				NOTE 5)
GENERAL NOTES: 1. SIGNS TYPICAL AT EACH APPBOACH LEG STYLE				
<ol> <li>ALL PROPOSED STRIPING AND SIGNING MUST BE APPROVED BY THE CITY TRAFFIC ENGINEER.</li> <li>USE SINGLE R1-2 YIELD SIGN AT OUTSIDE CUBB LOCATION PER ENTRY FOR MINLAND RESIDENTIC</li> </ol>	AL COMPACT DESIGN			
DRIVE OVER SPLITTER ISLAND. NO SIGNS SHALL BE PLACED IN THE SPLITTER OR CENTRAL ISLAND COMPACT DESIGN TO ALL OW FOR TRUCK TURNING	FOR THE MINI OR RE	SIDENTIAL		
4. ADDITIONAL R3-8 OR R3-8a ADVANCE INTERSECTION LANE CONTROL SIGNAGE MAY BE REQUIRE	ED FOR MULTIPLE LA	NE	150'	
5. CHECK MUTCD TABLE 2C-4 FOR SIGN PLACEMENT. MEASURE ALONG OUTSIDE CURB FACE FROM CROSSWALK.	M LEADING EDGE OF			NOTE 5)
6. ALL SIGN SHALL BE A MINIMUM CLEARANCE OF 18" FROM CLOSEST POINT OF SIGN FACE TO BAC 7. PVC SLEEVES TO BE CORED THROUGH PAVEMENT TO SOIL. CUT PVC OFF 1" ABOVE MEDIAN CAP	CK OF CURB. P. TELESPAR SLEEVE			
EXTEND 36" MINIMUM BELOW SURFACE.	1			
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Last Modification Date: 3/14/16 Initials: SRA		410 East Fifth Street Loveland, Colorado 80537	No Revisions:	ST
Full Path: V:\Public Works\Civit Engineering\Design lools\Roundabout Info\Design Manual\Exhibits		Phone: (970) 962-2627 FAX: (970) 962-2908	Revised:	Designer: Detailer:
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#### **D.** Definitions

**AASHTO Green Book** – The current version of the American Association of State Highway and Transportation Officials publication "A Policy on Geometric Design of Streets".

Central Island - the raised area in the center of a roundabout around which traffic circulates.

**Circulating Volume** -the total vehicular volume on the circulatory roadway immediately prior to an exit, measured over a specified period of time.

Circulatory Roadway – the roadway portion of a roundabout which circles the central island.

**Circulatory Roadway Width** - the distance between the outer edge striping of the circulatory roadway and the outer margin or lip of gutter of the central island, exclusive of aprons.

**Deflection** - the change in trajectory of a vehicle imposed by geometric features of the roadway.

Departure Width - the downstream width of the roadway used by vehicles departing the roundabout.

Design Vehicle - the largest vehicle that can reasonably be anticipated to use a facility.

Entry Flare - the widening of an approach upstream of the yield line in order to provide additional capacity.

**Entry Path Radius (R1)** - the minimum arc radius, fitted to the fast path, that occurs prior to the yield line (See Figures 2 & 3).

**Entry Radius** - the minimum radius of curvature of the outside (right) edge stripe, or lip of gutter, of the roundabout entry.

Entry Speed - the speed of a vehicle as it crosses the yield line.

**Entry Width** - the width of the roundabout approach where it meets the inscribed circle, measured perpendicularly from the right edge of the entry to the point of intersection of the left edge line and the inscribed circle (see Figure 1).

**Exit Path Radius (R3)** - the minimum arc radius, along the fast path, that extends from the roundabout exit (see Figures 2 & 3).

**Exit Width** - the width of a roundabout exit where it meets the inscribed circle, measured perpendicularly from the right edge of the exit to the point of intersection of the left edge line and the inscribed circle (see Figure 1).

**Fast Path (FP)** - a hand or spline-drawn representation of a vehicle's path through a roundabout which would allow the least deflection and thus, the highest travel speed given the geometric constraints. The method of determining the FP is detailed in NCHRP Publication 572, with further clarification available in Appendix G of that Publication.

**Fast Path Radius** - the minimum radius on the fastest through path around the central island measured 5' from any vertical face and 3' from center striping, as shown on Figures 2 & 3.

**Inscribed Circle -** used to define the size of a roundabout, it is the diameter of the largest circle that can be fit within the outer edges of the circulating roadway.

**Local Entity Engineer** - The Engineering Division Manager, City Engineer, or another Local Entity representative authorized to act on behalf of the Local Entity.

**Mini-Roundabout** - a small, retrofit roundabout intended process traffic volumes greater than 3500 AADT combined intersection traffic, which is intended to fit into locations with significant right-of-way constraints.

**Multilane Roundabout** - a roundabout that has a circulatory roadway that can accommodate at least 2 vehicles traveling side-by-side.

**Partial Right-Turn Bypass Lane** - a channelized right-turn lane that does not share the same entrance to the roundabout as the other entering lanes but yields to exiting vehicles due to the lack of an additional downstream merge lane.

**Residential Compact Roundabout -** a new construction, residential roundabout intended for traffic calming in situations with less than 3500 AADT combined intersection traffic.

**Right-Turn Bypass Lane -** a lane provided adjacent to, but separate from, the circulatory roadway, that allows right-turning vehicles to bypass the roundabout. Also known as a right-turn slip lane, this lane must be able to accommodate the design vehicle.

**Roundabout** – an intersection with 3 or more approach legs, generally circular in shape where continuous flow of traffic is facilitated through the use of yielded entry and defined lane use.

**Sight Triangle** - an area required to be free of obstructions in order to ensure visibility between conflicting movements.

Single-Lane Roundabout - a roundabout that has one circulatory lane.

**Splitter Island** - a raised area on an approach designed to separate entering and exiting traffic, deflect and slow entering traffic, and provide a refuge area for pedestrians crossing the approach.

**Stopping Sight Distance** - the distance, measured along the centerline of travel, along a roadway that is required for a driver to perceive an object in the roadway, react, and brake to a complete stop prior to reaching that object.

**Truck Apron** – a raised, colored and/or textured concrete surface, adjacent to the central island curbing, that is designed to allow large vehicles to proceed through the roundabout with their rear wheels leaving the circulating roadway and riding onto the apron area.

**Two-Stage Crossing** - a process in which pedestrians cross a roadway by crossing one direction of traffic at a time, waiting in a pedestrian refuge between the two traffic streams if necessary before completing the crossing.

#### Appendix J

#### **NOTE:** Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Appendix J shall be used for Bus Stop Design Standards and Guidelines within the City Limits of Fort Collins.

Appendix I shall be used as a reference for Bus Stop Design Standards and Guidelines within Larimer County GMAs.

# TRANSFORT BUS STOP DESIGN STANDARDS & GUIDELINES

July 21, 2015

# **ACKNOWLEDGEMENTS:**

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# **1. OVERVIEW**1.1 **PURPOSE**

The purpose of the Bus Stop Design Standards and Guidelines document is to assist City staff, developers, local partners and private property owners in locating and designing bus stops and their associated passenger amenities within the City of Fort Collins as well as the greater Transfort service area. The document consists of five chapters:

.....

- Overview discusses how to use the standards and guidance
- **The Big Picture** discusses the transit network as it currently exists and the envisioned future of transit service in Fort Collins
- **Street-side Characteristics** discusses the factors associated with the roadway that influence bus operations
- **Curb-side Characteristics** discusses the factors associated with the comfort, safety and convenience of patrons at bus stops
- **Next Steps** discusses Transfort's approach to pursue capital improvements and outlines related action items related to bus stop accessibility

### 1.2 THE DEVELOPMENT OF THESE STANDARDS AND GUIDANCE

This guidance document was created with the assistance of a Citizen Advisory Committee (CAC), created by Transfort, comprised of local transit riders, cycling advocates, safety specialists, urban designers, students, media professionals, Transfort staff and other interested parties. The CAC members included individuals with a wide range of abilities and experiences with the transit network.

A project management team (PMT) of City staff also assisted in the development of this document. This group focused on the technical components and safety considerations as they relate to bus stops. The following City departments were represented in the PMT: Engineering, FC Moves, Planning, Streets, Traffic, and Transfort.

In addition, Transit Cooperative Research Program (TCRP) Report 19 – Guidelines for the Location and Design of Bus Stops, as well as various other transit agency bus stop design documents, provided best practices and general guidance in the development of the standards and guidance outlined in this document.

### 1.3 INTEGRATION WITH OTHER STANDARDS AND GUIDANCE

There are various tools that work in tandem with this standards and guidance document. Within the Transfort department, other important guidance tools that may provide guidance on facilities and services include: Transfort Strategic Operating Plan (TSOP), Transfort Operating Manual (TOM), and Transfort Service Standards. Additional documents that govern site development include: Fort Collins Land Use Code (LUC) and Larimer County Urban Area Street Standards (LCUASS). If conflicts arise between these documents, the more specific and/or stringent standard will apply.

# 2. THE BIG PICTURE 2.1 INTRODUCTION

Bus stops are a critical part of the transit system as they serve as the first point of contact between the customer and the service. In addition, bus stop placement throughout the community acts to promote alternative modes of transportation to the traveling public. The spacing, location and design all affect the operation of the transit system and, in turn, the transit patron's satisfaction. The standards and guidance in this document are intended to guide the design of transit stops that complement their immediate surroundings, meet the transit patron's comfort and safety needs, and support an efficient transit network.

The placement of transit stops is guided by safety considerations, community context, patron's origins and destinations, opportunity, and Transfort's strategic planning efforts. The TSOP is Transfort's long range planning tool; however, it is possible that community growth and change will occur in ways not anticipated by the TSOP, and therefore routes and bus stops may be different from those envisioned in the TSOP. The TSOP proposed long range routes are depicted in Figure 2 below.

# 2.2 TRANSIT SYSTEM OVERVIEW

The City of Fort Collins operates its own transit system, which is branded as Transfort. Transfort operates fixed route transportation within the City of Fort Collins and in parts of unincorporated Larimer County. Complementary paratransit service is contracted to and operated by Veolia Transportation. A regional express route, known as FLEX, is provided through a partnership between Fort Collins, Loveland, Berthoud, Longmont and Boulder County. Transfort bus stops are located within Fort Collins city limits as well as in unincorporated Larimer County, the City of Loveland, the Town of Berthoud, Boulder County and the City of Longmont.

Transfort's route map (August 2015) is provided below in Figure 1. Following Figure 1 is a map of the long range vision for transit service in and surrounding Fort Collins, Figure 2. This map illustrates the TSOP vision for a full transition into a productivity-based grid system. It incorporates the Phase 3 planned routes, along with additional recommendations from other adopted plans

and new routes that have been added since the TSOP's adoption. The purpose of this map is to indicate where new bus stops will be located as development occurs throughout the city.









## 2.3 BUS STOP INSTALLATION AND UPGRADE — HOW DOES IT HAPPEN?

There are just over 500 existing bus stops in the Transfort system; of these, some meet the standards outlined in this document and some do not. In addition to existing bus stops that Transfort currently serves, the TSOP sets forth a plan for expanded service which will require new transit facilities throughout Transfort's service area.

There are a variety of ways transit facilities are installed and upgraded throughout the Transfort system, and they are described below:

- Transfort's Capital Improvement Plan The Improvement Plan, which is based on location specific criteria, identified in the Bus Stop Development Form (Appendix 1) and Section 4.5, prioritizes bus stop improvements in the Transfort Service Area. Transfort anticipates an annual budget of \$100,000, based on dedicated tax revenue (Building on Basics), for bus stop improvements. It is estimated that this amount will fund approximately 7–10 bus stops annually. Transfort also pursues grants to fund additional improvements. Improvements are generally implemented according to the Improvement Plan, but obstacles do arise as described in Section 2.4.
- Transfort's Service Agreement for Bus Stops Transfort contracts with an advertising company for the installation, provision of passenger amenities and maintenance of Transfort's bus stops. This agreement permits Transfort to request solid surface upgrades to bus stops that are located within public right-of-way (ROW) and installation of passenger amenities at bus stops in Transfort's service area. In a typical year, this agreement provides for the upgrade of approximately 10 bus stops.
- Development and/or Redevelopment As properties develop and redevelop within city limits the City's Land Use Code (LUC) requires that the development accommodate both the existing and planned transit network (LUC Section 3.6.5 text included in Appendix 2). This requires developers to provide the necessary transit infrastructure and passenger amenities, if applicable, on or adjacent to their property. Developer responsibilities may include: dedicating additional public ROW; dedicating a Transit Easement; installation of a bus stop solid surface; installation of a bus pullout; and installation of or payment in lieu for

the applicable bus stop passenger amenities, all in accordance with the standards set forth in this document.

- Transfort does not have control over which stops are improved via this method. Bus stop improvements may not be in accordance with the Improvement Plan Priorities set forth in this document.
- City Capital Improvement and Street Maintenance Projects Every year the City's Engineering and Streets Departments implement capital improvements and street maintenance. These departments manage infrastructure improvements and work with Transfort to help upgrade bus stops, as needed in the area of the project's impact. Since stops improved through this method are opportunistic, improvements may not reflect the same priorities as listed in the Improvement Plan.

### 2.4 **OBSTACLES TO IMPROVING TRANSIT INFRASTRUCTURE**

Many obstacles exist outside of Transfort's control, which makes providing quality transit facilities challenging at times. Obstacles to improving bus stops include: available space (including public ROW) for stop infrastructure (solid surface and passenger amenities); accessible neighborhood sidewalks connecting to stops; accessible street crossings; and temporary obstacles such as those due to weather events like snow, rain or hail. Transfort actively works with other City departments to make improvements to the sidewalk network and to add accessible bus stops in conjunction with City construction activities. However, it will take many years for all stops to be improved because infrastructure deficiencies are widespread. Images 1, 2 and 3 below demonstrate some of the obstacles that limit transit facility improvements.

Image 1



Laporte and Overland Eastbound (EB) Obstacles: • Limited public ROW • No sidewalks





Shields and Swallow Northbound (NB) Obstacles: • Limited public ROW

#### Image 3



#### Harmony and Corbett (EB)

Obstacles: • Covered section of ditch runs between sidewalk and edge of street

### 2.5 **BUS STOP MAINTENANCE AND ADVERTISING**

Transfort, like many transit agencies across the nation, utilizes advertising revenue to provide both maintenance of and passenger amenities at bus stops. Transfort contracts this service with an advertising contractor, allowing them to advertise at Transfort bus stops. In return, Transfort benefits from a portion of the advertising revenue, as well as the contractor's maintenance of bus stops (including snow removal) and the contractor's provision of passenger amenities and solid surface installation at locations within public ROW. However, advertising is not permitted at all bus stops within Transfort's network. In single family residential areas, for example, advertising is limited to side-yards. In addition, certain areas may not be appropriate for advertising, such as historically significant sites. In such cases, Transfort has a limited number of non-advertising bus stop benches and shelters that can be used if advertising is deemed to be incompatible with the character of the area.

Images 4–7 below are examples of advertising at Transfort bus stops.

Image 4

Image 6



Harmony and Timberline (EB)

Image 5



Harmony and Larkbunting (WB)

Image 7



Rock Creek at Fossil Ridge High School (EB)



Taft Hill and Drake (NB)

# **3.1 INTRODUCTION**

This section discusses preferred and alternative street-side or in-street stop designs. Street-side characteristics refer to features associated with the roadway that influence transit operations. These features include elements such as: traffic speeds, street design, intersection design and the location of acceleration/deceleration lanes. Street-side features influence the location of and in-street design of bus stops. It is important to note that since stop designs were developed based on standard roadway characteristics, the on-site context may call for locations or designs that are tailored to that context. Ultimately, Transfort staff, with the input from the City's Traffic, Engineering and FC Moves Departments, will make the final decision on the location and design that is appropriate for a given situation.

Image 8



# 3.2 **STOP SPACING**

Stop spacing refers to the distance between stops along a bus route. Stop spacing takes into consideration the trade-offs between vehicle travel times and walking distances to bus stops. While more frequently placed bus stops reduce walking distances, it also slows down bus service. In contrast, longer distances between stops increases vehicle speed but may result in customers having to walk longer distances to get to bus stops. This is described in TCRP's Report 19 as trade-offs between operating efficiencies and customer accessibility, as follows:

Table 1 – T	Trade-offs	of Stop	Spacing
-------------	------------	---------	---------

**Close stops** (every block or <sup>1</sup>/<sub>8</sub> mile – <sup>1</sup>/<sub>4</sub> mile spacing)

- Short walking distances
- More frequent stops, creating longer travel time

Further distance between stops (Beyond <sup>1</sup>/<sub>4</sub> mile spacing)

- Longer walking distances
- Less frequent stops, creating shorter travel time

TCRP Report 19 also describes the industry standards for bus stop spacing typically being subdivided by land use types/densities or locating stops near major trip generators. This suggests using closer spaced stops in more densely populated areas, such as the central business core, and increasing space between stops when approaching more suburban and rural areas of the community. In addition Bus Rapid Transit (BRT) type routes generally suggest an increased distance between stops to decrease travel times. Table 2 below describes typical ranges for the different land use environments.

Transfort uses these ranges as references, but in general the main considerations for bus stop locating and spacing are safety, such as reducing bus and vehicle conflicts, and major trip generators, such as, community activity centers and concentrations of residences and businesses. Where feasible, stops shall be located approximately <sup>1</sup>/<sub>4</sub> mile apart. In locations where stop spacing is more then <sup>1</sup>/<sub>3</sub> mile apart, a midpoint stop may be considered if adjacent land uses warrant such additional stop placement.

Table 2 – Recommended	l Bus	Stop	Spacing
-----------------------	-------	------	---------

Environment	Route Type	Spacing Range
Urban Area (within a City	Local Route	1/8 - 1/4 Mile
Figure 20 in Section 4.5)	Express or Bus Rapid Transit Route	$\frac{1}{2}$ – 1 Mile or As Needed
Suburban Area	Local Route	¼ – ¼ Mile
	Express or Bus Rapid Transit Route	1 Mile or As Needed
Rural Area	Local Route	As Needed
	Express or Bus Rapid Transit Route	As Needed

## 3.3 **STOP LOCATING**

There are three location options for bus stops: near-side, far-side and mid-block, as shown in Figure 3 below. Far-side stops are, in general, Transfort's preferred stop location because they are shown to be the safest for passengers exiting the bus and minimize conflicts with other vehicles. However, a mid-block or near-side stop may be more appropriate in some situations. Many factors influence the location of stops, such as site specific safety considerations, traffic patterns, intersection geometry, passenger origins and destinations, pedestrian accessibility, route design and available space. Transfort staff determine which stop location is most appropriate for each individual situation, and Table 3 may be used to help make a decision based on the trade-offs of each possible location.




#### Table 3 – Recommended Bus Stop Location

STOP LOCATION	ADVANTAGES	DISADVANTAGES
<ul> <li>NEAR-SIDE STOP</li> <li>Use if: <ul> <li>Destinations are focused at the near-side corner</li> </ul> </li> <li>Route pattern calls for near-side location</li> <li>Available space is limited on far-side</li> </ul>	<ul> <li>Allows passengers to access buses close to the crosswalk</li> <li>Eliminates the potential for double stopping — passenger loading can occur when bus is stopped at the signal</li> </ul>	<ul> <li>Increases conflict with right-turning vehicles</li> <li>May result in stopping buses obscuring curbside traffic control devices and crossing pedestrians</li> <li>May block the through traffic lanes during peak hours</li> <li>May cause sight distance problems for pedestrians and motorists</li> <li>May increase rear-end accidents if drivers aren't anticipating the bus stopping before the intersection</li> <li>Vehicles may attempt to turn in front of a stopped bus that is beginning to pull away</li> </ul>
<ul> <li>FAR-SIDE STOP</li> <li>Use if:</li> <li>Destinations are on both sides of street or on the far side of the intersection</li> </ul>	<ul> <li>Minimizes conflicts between right- turning vehicles and buses</li> <li>Allows for additional right-turn capacity (because bus is not stopping in the right turn lane)</li> <li>Minimizes sight distance difficulties on approach to intersections</li> <li>Encourages pedestrians to cross behind the bus</li> <li>Bus can merge into traffic more easily, taking advantage of gaps</li> </ul>	<ul> <li>Stopped buses may block intersections during congested periods</li> <li>May cause a bus to stop twice in short order: once at a red light and once at the bus stop</li> <li>May increase rear-end accidents if drivers do not anticipate the bus stopping after the intersection</li> </ul>
<ul> <li>MID-BLOCK STOP</li> <li>Use if:</li> <li>Block size is large and/or destinations are focused mid-block</li> <li>Route pattern calls for mid-block stop</li> </ul>	<ul> <li>Minimizes sight distance difficulties at intersections</li> <li>Removes the influence of traffic congestion occurring at intersections</li> </ul>	<ul> <li>Encourages passengers to cross mid-block (jaywalk)</li> <li>Increases walking distance for patrons to cross at intersections</li> </ul>

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## 3.4 IN-STREET DESIGN

The In-Street Design refers to the location that the bus stops in the street to approach the bus stop, such as in a bus pullout, travel lane, bike lane or on a road shoulder. Determining what design is appropriate depends on safety considerations, street design, available space, ridership and other factors. Most of Transfort's buses stop in bike or travel lanes, but bus pullouts may be used in areas where there is high ridership, a large number of route transfers or where traffic is considered to be high volume. Queue jumps refer to an intersection design that allows the bus to move ahead of queueing traffic to progress through high congestion intersections quicker. Queue jumps and bus pullouts typically originate from recommendations of a corridor, sub-area or service-related planning effort (e.g. Harmony Road Enhanced Travel Corridor Alternatives Analysis, Lincoln Corridor Plan, or West Central Area Plan). In addition, a bus pullout may be required when multiple routes transfer at the location. Foothills Mall provides an example of such a situation.

In-Street Design alternatives are illustrated below in Figures 4 and 5. Bus pullouts, shall be designed to the detail shown in LCUASS drawing 711. The flow chart in Figure 6 helps to determine what In-Street Design is appropriate, and the trade-off of each design is described in Table 4.









#### Figure 6 — In-Street Design Recommendations



#### Table 4 — Recommended Bus Stop In-Street Design

STOP LOCATION	ADVANTAGES	DISADVANTAGES		
<b>CURBSIDE STOP</b> (Typical)	<ul> <li>Provides easy approach for bus drivers and results in minimal delay to the bus</li> <li>Simple design and inexpensive to install</li> <li>Easy to relocate</li> </ul>	<ul> <li>Can cause traffic delays since bus stops in the travel lane</li> <li>May cause drivers to make unsafe passing maneuvers</li> </ul>		
BUS PULLOUT (Route transfer stop and/or on roads with two travel lanes)	<ul> <li>Bus is out of travel lane, minimizing delay to traffic</li> <li>Passengers board/alight out of traffic</li> </ul>	<ul> <li>Re-entry into congested traffic can be difficult and cause delays</li> <li>Expensive to install, making relocation difficult/expensive</li> </ul>		
OPEN BUS BAY	<ul><li> Allows the bus to decelerate in the intersection</li><li> See Bus Pullout advantages</li></ul>	See Bus Pullout disadvantages		
QUEUE JUMP	<ul><li> Allows bus to bypass queued traffic</li><li> See Bus Pullout advantages</li></ul>	<ul><li>May delay right turning vehicles</li><li>See Bus Pullout disadvantages</li></ul>		
<b>BULBOUT/NUB</b> (For locations with on-street parking)	<ul> <li>Removes fewer parking spaces than others</li> <li>Decreases walking distances to bus stops for pedestrians</li> <li>Provides additional sidewalk area for passengers</li> <li>Results in minimal delay for buses</li> </ul>	<ul><li>Costs more to install compared to curbside stops</li><li>See Curbside Stop disadvantages</li></ul>		

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# **4.1 INTRODUCTION**

This section describes criteria that all bus stops shall meet, provides preferred layout of passenger amenities at stops and recommends how amenities should be distributed throughout the Transfort service area. Curbside characteristics refer to features associated with the comfort, safety and convenience of customers at bus stops outside of the roadway. These features include factors like sidewalk width, connections to adjacent land uses, and bus stop passenger amenities such as shelters, benches, bike racks, trash and recycling receptacles and lighting. Newly constructed or altered bus stops shall meet the standards in this section to the maximum extent feasible.

#### Image 9



## 4.2 UNIVERSAL DESIGN AND ADA ACCESSIBILITY

The Americans with Disabilities Act of 1990 regulated enforceable accessibility standards for new construction and alterations to places of public accommodation, which include bus stops. The 2010 ADA Standards for Accessible Design, the most recent guidance, outlines the following four basic principles to accomplishing ADA accessibility at bus stops, as it applies to all newly constructed or altered Transfort bus stops.

- 1) **Surface** the bus stop boarding and alighting area shall have a firm, stable surface;
- 2) Dimensions the bus stop boarding and alighting area shall provide a clear length of 8' minimum, measured from the curb, and a clear width of 5' minimum, measured parallel to the roadway.





- 3) **Connection** the bus stop boarding and alighting area shall be connected to streets, sidewalks, or pedestrian paths by an accessible route, of at least 4' wide.
- 4) **Slope** the slope of the bus stop boarding and alighting area shall be the same as the roadway to the maximum extent practical, and not steeper than 1:48, a 2% grade.

If a bus stop has a shelter, there shall be a minimum clear floor space of 30" wide by 48" deep inside the shelter and an accessible path leading from the shelter to the boarding and alighting area.



Figure 7 – ADA Interior Bus Shelter Space

### 4.3 BUS STOP TYPES

Transfort has four typical stop types tailored to the context of each stop area. Higher ridership areas or areas with high concentrations of youth, senior, disabled or low-income populations are recommended to have a higher level of patron amenities such as a shelter, bench, bike rack, trash receptacle and lighting. Lower ridership areas may have fewer amenities. The Bus Stop Development Form (Appendix 1) will assist in determining what stop type is appropriate. The stop types are described below:

Type I – Sign Stop – A bus stop with a bus stop sign and basic ADA accessible landing surface are the primary features of this stop type, meaning there is no bench or shelter. This is the most basic stop type and is appropriate for low land-use density and low ridership areas. Figures 8 and 9 and images 10 and 11 show standard and constrained options for this type of stop, depending on the available right-of-way and sidewalk design.



Images 10 and 11 – Existing Type I Standard Stop Examples:



Shields and Rolland Moore Park SB Bus Stop



Harmony and Taft Hill EB Bus Stop

Type II – Bench Stop – This describes a bus stop with a stand-alone bench as the primary feature, and which does not include a shelter. The stop should also have a bus stop sign, bike rack and trash receptacle. The most appropriate use of Bench Stops is areas with low to mid ridership potential. Figures 10 and 11 and images 12 and 13 show standard and constrained options for Type II – Bench Stops.

Figure 11

Type II Constrained (Attached sidewalk)

#### Figure 10 Type II Standard (Detached sidewalk)



#### Images 12 and 13 – Existing Type II Standard and Constrained Examples

(to comply with above design, these stops need the addition of a bike rack and trash receptacle)



Shields and Centre Avenue NB Bus Stop



Lincoln Avenue and Buckingham Park WB Bus Stop

- Type III Shelter Stop This describes a bus stop with a shelter as the primary feature. This stop type should also include a bus stop sign, at least one bench, a trash receptacle, one or more bike racks, interior lighting and advertising panels. A Shelter Stop should be used in areas with medium to high ridership potential, high concentrations of elderly, youth, disabled and low-income populations and in areas with high exposure to the elements.
  - There are four alternative designs for Type III stops. The alternative chosen depends on the sidewalk design, public right-of-way and existing structures that may render the standard design impractical. Transfort staff will assist in determining which design is appropriate for each individual situation. Figures 12–19 and images 14–17 show examples of Type III Shelter Stop configurations. The existing stop images aren't necessarily compliant with the organization/siting recommendations for passenger amenities in this section, for the appropriate organization/siting of passenger amenities, see the "amenity detail" following each Type III configuration.

#### Figure 12 Type III Standard (Detached sidewalk)



#### Figure 13 Type III Standard (Detached sidewalk) – Amenity Detail



#### Figure 14 Type III Constrained (Detached sidewalk)



#### Figure 15 Type III Constrained (Detached sidewalk) — Amenity Detail



#### Figure 16 Type III Constrained (Attached sidewalk)



#### Figure 17 Type III Constrained (Attached sidewalk) — Amenity detail



Street

#### Figure 18 Type III Wide Parkway (Detached sidewalk)

\*To be used in areas with wider than typical parkways such as E. Harmony Road



Street



Image 14 and 15 Existing Type III Examples



\*These do not meet the siting/organization of passenger amenity recommendations detailed in this section. Over time stops will be upgraded to meet revised standards, see Section 5.2 for more information.



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#### Images 16 and 17 - New Shelter Examples

Type IV – Station Stop – This describes a bus stop that has enhanced passenger amenities such as a ticket vending machine, real time next bus LED and/or digital signage, a unique shelter structure, as well as the standard passenger amenities provided at Type III stops. Elements required at a Station Stop include those identified in Image 18 and Section 4.4 below. MAX Stations are currently the only Station Stops in Transfort's system. Stations should be used on specialty routes, most often in Enhanced Travel Corridors as defined in the Transportation Master Plan as "uniquely designed corridors that are planned to incorporate high frequency transit, bicycling and walking as part of the corridor."

#### Image 18 – Example Station Stop



Image 19 - Troutman Station (Concept)



Image 20 - Troutman Station (Built)



## 4.4 **PASSENGER AMENITIES**

Passenger amenities are a significant element in attracting people to use public transportation. Shelters are the most preferred passenger amenity because they offer the best protection from the elements. Other important amenities include: benches; customer information such as transit maps; real-time bus arrival information and directional signage; lighting; bike racks; and trash and recycling facilities. All passenger amenities should be located within public right-of-way or within a dedicated transit easement. The Bus Stop Passenger Amenities required, based on Stop Type described in Section 4.3, are provided in Table 5. In addition, see the Bus Stop Development Form in Appendix 1 for determining stop type.

- Bus Stop Sign All active bus stops (except Type IV Station Stops) are required to have a Transfort bus stop sign. Signage includes a round bus stop sign and a routes served sign. Transfort will arrange for the installation of the signage at the time service is initiated at a stop.
- Solid Surface and full ADA Accessibility All newly constructed or altered bus stops shall have a solid surface at least as large as the minimum size described in the Stop Types in Section 4.3 and comply with the four dimensions of accessibility described in Section 4.2. Newly implemented routes offer an exception to this rule, as sometimes stop locations need to be monitored to ensure they are in the best location prior to making the full investment upgrading the stop infrastructure. Final stop locations are generally finalized within two years.
- Bench All new benches shall be selected from the options described in this section and shall be powder coated in either RAL 7047 (for benches in shelters) or RAL 7039 (for stand-alone benches), refer to the Shelter Paint Colors on page 31. Images 21-23 depict the acceptable options.



6' Stand-alone ad bench REF RFB-14 4793-121

Image 22



5–7' In-shelter non-ad bench REF SFB-02 14001-121





5' In-shelter non-ad bench REF SFB-08 12096-121

 Shelter — All new shelters (not including Type IV Stations) shall be selected from the options described in this section and be powder coated in RAL 7047 and RAL 6017 as depicted in the examples below. Walls shall be either perforated metal or custom glass with the official Transfort branded banner and routes served information as shown in images 24-27. A double-sided advertising panel is the standard requirement. The non-ad shelter option is only available upon Transfort's approval. In addition, shelters are preferred to incorporate solar panels for lighting or shall be directly wired for electric service.

#### Image 24



15' Standard advertising shelter **REF SIGA-TFP15 25340-00** 

#### Image 25



14' Standard Non-advertising shelter (Use must be approved by Transfort) **REF SIGNA-TFP14** 

#### Image 26



15' Upgraded ad shelter with glass walls **REF SIGA-TFG15 25341-00** 

Image 27



18' Upgraded ad shelter with V-ad Panels **REF SIGA-TFV 24343** 

## **SHELTER PAINT COLORS**



• **Bike Racks** — Bike racks are recommended at all bus stops and specifically required at all type II–IV stops. The preferred bike rack style is a simple hitching post or inverted U, as shown below, and should be powder coated in RAL 7047, RAL 7039 or RAL 6017.



 Trash and Recycling Receptacles — Trash and recycling receptacles are required at all Type III and IV stops and are an option at Type I and II stops. Lower ridership stops may utilize a pole mounted trash receptacle, and higher ridership stops (projected over 25 daily boardings) shall provide a stand-alone trash receptacle from the options below, and should be powder coated in RAL 7047 or RAL 7039.



Pole Mounted REF SFTR-10 25393-121 25394-121

Image 32



32 Gallon Steel Strap REF SFTR-11 25395-121 25396-121

- Lighting Solar lighting panels are included on the roof of the approved shelter options described previously. Type I and II stops typically do not have their own lighting, and instead utilize nearby street lights and lighting from neighboring businesses. Pole mounted lighting may be an option for stops with limited nearby lighting.
- Transit System Map Transfort installs transit system maps at high ridership Type III stops (over 50 daily boardings). System maps are only installed at Type III stops because the shelter provides a mounting location for the map display case.
- Transit Route Map/Schedules(s) Transfort typically installs individual route maps at high ridership Type III stops (over 50 daily boardings). Route maps are only installed at Type III stops because the shelter provides a mounting location for the map display case.
- Ticket Vending Machine (TVM) Ticket vending machines are included at MAX stations and in the example Type IV Station Stop design, as shown in Images 18–20. However, while TVMs remain a recommended element, the need for TVMs may be reduced as Transfort moves towards mobile ticket purchase options.
- Digital Signage Digital signage is recommended at all Type IV Station Stops and may be installed by Transfort at high use and/or transfer bus stops. Digital signs, which are LED panels and/or LCD screens, typically display real-time bus arrival information, rider alerts, and other critical passenger information.
- **Ground Mounted Tactile** Type IV Station Stops are recommended to include ground mounted tactile surfaces adjacent to boarding and alighting areas.
- **Paper Schedules** Paper schedules are typically provided just at transit centers, but could be considered for high ridership stops as needed. This information would be provided by Transfort.
- Security Cameras and Emergency Call Box Security cameras and emergency call boxes are recommended to be provided at Type IV Station Stops.
- Wind Screen Wind screens are integrated into the standard shelter designs, but depending on the orientation of the shelter, the standard wind screens may not be adequate for the specific location. If wind is deemed to be an issue at a particular stop, a custom wind panel should be considered in addition to or in lieu of the standard shelter wind panel.

- **Secure Bike Parking** Secure bike parking is an optional element at any stop, but should be considered at high use stops, especially transit centers and/or park-n-rides.
- Braille Signage Braille signage is not a standard element at bus stops, but has been recommended to be evaluated further following the completion of this document. Section 5.3 discusses next steps related to Braille Signage.
- **Wayfinding Signage** Wayfinding signage is optional at all bus stops but is recommended at Type IV Station stops.

Bus Stop Amenities	Type I	Type II	Type III	Type IV
Bus Stop Sign				
Solid Surface				
5' x 8' Landing Pad				
4' Path Connection to adjacent sidewalks				
Minimal Slope				
Bench				
Shelter				
Custom Shelter				
Bike Rack(s) (At least 1 rack recommended at all stops [except Type I], additional racks may be required based on projected ridership)				
Trash and Recycling Facilities				
Lighting				
Transit System Map				
Route Map/Schedule(s)				
Ticket Vending Machine (TVM)	[			
Digital Signage				
Ground Mounted Tactile				
Paper Schedules				
Security Cameras and Emergency Call-box				
Wind Screen	[			
Secure Bike Parking				
Braille Signage				
Wayfinding Signage				

#### Table 5 – Bus Stop Amenities

#### Legend:



Required Amenity Recommended Amenity Optional Amenity

## 4.5 **BUS STOP TYPE DETERMINATION**

The selection of the appropriate stop type should consider both qualitative and quantitative measures, such as:

- ridership potential and/or existing ridership,
- neighboring land uses, including concentrations of youth, seniors, disabled, and low-income populations (e.g. schools, housing or social service agencies)
- proximity to defined activity centers (as part of City Plan), and
- exposure to the elements.

As new stops are developed, the following criteria should be used to determine the appropriate stop type. Please refer to the Bus Stop Development Form in Appendix 1 for a site specific evaluation form.

Higher priority for upgrades should be given to bus stops with mid-high ridership (above 50 boardings per day), demographic considerations such as youth, senior, disabled and low-income population concentrations within <sup>1</sup>/<sub>4</sub> mile of the stop, and stops with high exposure to the elements.

Criterion	Type I – Sign	Type II – Bench	Type III – Shelter	Type IV – Station
<b>Ridership Potential</b> (existing or projected)	Low Ridership (<25 daily boardings)	Low–Med Ridership (25–50 daily boardings)	<b>Med-High</b> <b>Ridership</b> (>50 daily boardings)	Very High Ridership (250+ daily boardings)
Land Use Density (Refer to Zoning Map)	RUL, UE, RF, RL, or POL	NCL, NCB, LMN, RC, RDR, NC, CL, E, I	NCM, MMN, HMN, D, CC, CCN, CCR, CG, CS, HC	
Youth, Seniors or Disabled Populations Concentrations			Within a ¼ mile of population concentrations	
Located in an Activity Center (City Plan– Targeted Infill and Redevelopment Area map, see Figure 20 below)			Recommended	
Located in an Enhanced Travel Corridor			Recommended	
High Exposure to the Elements			Recommended	

#### Table 6 — Bus Stop Type Criteria



# **5.1 INTRODUCTION**

# As noted previously, Transfort serves just over 500 bus stops; some of which meet the design and amenity distribution standards outlined in Sections 3 and 4. This section is intended to describe Transfort's plan to bring bus stops into compliance with these standards as well as the City's Americans with Disabilities Act Transition Plan as adopted in 1992.

.....

The Transition Plan set forth a five year approach to achieving full compliance with the Americans with Disabilities Act standards. At that time, Transfort had a much smaller service area and anticipated that full compliance could be achieved through a \$17,000 investment in bus stop solid surface improvements. The plan presumed that once existing stops were brought into compliance, future stops would be developed in accordance with the ADA standards. However, that was not the case and many of Transfort's current stops are not compliant with ADA standards.

In 2013, a full inventory of bus stops was completed. This identified that only 32% of Transfort's stops met the ADA standards described in Section 4.2. Since 2013's inventory, service has been eliminated in some areas (College Avenue and Timberline Road) and new service has been added to other areas (Mason Corridor, North Timberline Road, West Vine Drive, East Drake Road and East Horsetooth Road). In addition, as of spring 2015, approximately 50 stops had been upgraded to meet ADA standards. Transfort managed projects upgrading 27 stops, including 18 MAX stations and nine stops throughout the community; private development upgraded upwards of seven stops; and Transfort's advertising contractor upgraded 16 stops. Based on this information Transfort estimates that now approximately 35% of bus stops meet ADA accessibility requirements. Inventorying of bus stops is ongoing and Transfort will have a more accurate understanding of ADA compliance by the end of 2015.

Based on the previous estimate, approximately 330 bus stops in Transfort's service area are not in compliance with ADA standards. Many of these are located in areas with limited neighborhood sidewalks. In addition to the cost of any necessary connecting sidewalks, bus stop improvements can range between \$2,500 to \$30,000 depending on the available public ROW and other site specific characteristics (an average is estimated at \$10,000 for each stop). Stops on the low

end are generally within public ROW and have level grading to build on. Stops on the higher end are in areas that often require negotiations with private property owners before any accessible infrastructure can be installed and where drainage or grading challenges are present. The obstacles to upgrading bus stops is described more thoroughly in Section 2.4.

This information leads Transfort to estimate that full compliance with ADA standards would cost between \$3,000,000 and \$5,000,000 (in 2015 dollars). Transfort's Bus Stop Improvement Plan, in Section 5.2, describes Transfort's phased approach to achieving (at a minimum) ADA accessibility at all bus stops as well as compliance with the bus stop type and amenity distribution standards in this document.

Section 2.3 — "Bus Stop Installation and Upgrade — How does it happen?" explains the four primary ways that bus stops are upgraded:

- Transfort Bus Stop Improvement Plan
- Transfort's Advertising Contractor
- Development and/or Redevelopment
- City Capital Projects and Street Maintenance Program

This section focuses on stops improved through the Transfort Bus Stop Improvement Plan and by Transfort's advertising contractor. Transfort's Bus Stop Improvement Plan is not all inclusive of every Transfort stop, since two other improvement methods, Development/Redevelopment and City Capital Projects – Street Maintenance Projects, will also result in upgraded stops throughout the community.

### 5.2 TRANSFORT BUS STOP IMPROVEMENT PLAN

This April, City of Fort Collins residents approved a 10-year 0.25% sales tax for Capital Projects. In addition to other City Capital Projects, this tax includes a dedication of an average of \$100,000 a year to bus stop improvements in the Transfort service area. It is anticipated that this will fund an average of 10 stops a year over the next 10 years for a total of 100 stops (between 2016 and 2026). This

funding can also serve as local as leverage for grants for additional stop improvements. In addition, Transfort can work with their advertising contractor to upgrade additional stops within public ROW.

Based on this identified funding source and Transfort's working relationship with their advertising contractor, Transfort projects an average of 15–20 stops be improved to meet the new design standards each year based on the priorities described in Section 4.5. To reiterate, priority for bus stop upgrades are given to areas that do not meet ADA requirements and meet the following criteria:

- Mid-high ridership (above 50 boardings per day),
- Demographic considerations such as youth, senior, disabled and low-income population concentrations within 1/4 mile of the stop
- Stops with high exposure to the elements

## 5.3 **RECOMMENDED FUTURE ACTIONS**

- **Grant Funding** The City should pursue grant funding to leverage the limited local funding to accelerate the Transfort Bus Stop Improvement Plan.
- Snow Removal on Adjacent Sidewalks The inconsistent removal of snow surrounding bus stops was a point of concern for the Citizen Advisory Committee that helped guide the development of this document. Transfort would not be the appropriate leader to initiating this discussion, but the City's Street Maintenance and Code Enforcement Departments will be made aware of the concerns expressed.
- **Braille Signage** Braille signage was identified as an element of interest by the Citizen Advisory Committee that guided the development of this document. Following the adoption of this document, Transfort will establish a group of interested transit users to help determine how Braille signage could be implemented and what the Braille signage should say.

## 6. APPENDIX

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## 6.1 BUS STOP DEVELOPMENT FORM

#### **Transfort Bus Stop Checklist TRANS**FORT To be filled out by Transfort Staff Fort Collins Location (cross streets): □ Far-side **Block Location:** □ Near-side □ Mid-block □ Future Transit Route Service: □ On Existing Transit Route **Street-Side Design Considerations:** Is a design recommended as part of an adopted plan? YES NO Use design Is the stop a identified transfer location? in the Plan YES NO What volume Is there on-street of transfers are **HIGH VOLUME** LOW VOLUME (2-3 low frequency routes) YES NO more than 3 routes How many travel lanes are serve the stop) on the adjacent road? A Bus Pullout or A Bulbout stop 1 in each 2 or more in A Curbside stop Open Bus Bay is is most likely each direction is appropriate appropriate appropriate A Bus Pullout or Open Bus Bay is appropriate

#### **Curb-side Design Considerations:**

Projected Ridership (boardings) Low Ridership (<25 daily boardings) – 0 points Moderate Ridership (25–50 daily boardings) – 2 points High Ridership (>50 daily boardings) – 5 points Very High Ridership (200+ daily boardings) – 10 points	
Land Use Density (Zoning) Low Density (RUL, UE, RF, RL, POL or County) – 0 points Medium Density (NCL, NCB, LMN, RC, RDR, NC, CL, E, I) – 2 points Higher Density (NCM, MMN, HMN, D, CC, CCN, CCR, CG, CS, HC) – 5 points	
Youth, Senior, Disabled or Low-income Population Concentrations (includes schools, dedicated housing, and social service entities) Within a <sup>1</sup> / <sub>4</sub> mile of population concentrations – 2 points Within a <sup>1</sup> / <sub>8</sub> mile of population concentrations – 5 points	
Activity Center Within a designated Activity Center or on CSU's campus – 2 points	
Enhanced Transportation Corridor (ETC) Located along an ETC – 2 points Designated as Station in an ETC plan – 15 points	
High Exposure to Elements In areas with exposure to wind, rain, high traffic speed, etc. – 5 points	
TOTAL	
<b>Scoring</b> Type I Stop — Basic accessibility required Type II Stop — Basic accessibility and bench required Type III	<b>Score Range</b> 0 - 1 2 - 4
Type III – Basic accessibility, standard shelter, trash and 1 bike rack (2 bikes) Type III – Basic accessibility, standard shelter, trash and 2 bike racks (4 bikes) Optional Type IV (upon consideration by transit provider)	5 - 10 11 - 15 >15

#### In-street and Curb-side Design

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Recommended In-Street Design: 🛛 Curb-side Stop 🛛 Bulbout Stop
🗆 Bus Pullout Stop 🛛 Open Bay Stop 🖾 Queue Jump Stop
Recommended Curb-side Stop Type: 🛛 Type I (Sign Stop) 🗍 Type II (Bench Stop)
□ Type III (Shelter Stop) □ Type III (Shelter Stop – 2 bike racks) □ Type IV (Station Stop)

## 6.2 LAND USE CODE SECTION 3.6.5

#### 3.6.5 Bus Stop Design Standards (update in progress)

**(A) Purpose.** The purpose of this Section is to ensure that new development adequately accommodates existing and planned transit service by integrating facilities designed and located appropriately for transit into the development plan.

**(B) General Standard.** All development located on an existing or planned transit route shall install a transit stop and other associated facilities on an easement dedicated to the City or within public right-of-way as prescribed by the City of Fort Collins Bus Stop Design Standards and Guidelines in effect at the time of installation, unless the Director of Community Services determines that adequate transit facilities consistent with the Transit Design Standards already exist to serve the needs of the development. All development located on existing transit routes will accommodate the transit facilities by providing the same at the time of construction. All development located on planned routes will accommodate said facilities by including the same in the development plan and escrowing funds in order to enable the city or its agents to construct the transit facilities at the time transit service is provided to the development. All facilities installed shall, upon acceptance by the City, become the property of the City and shall be maintained by the City or its agent.

**(C)** Location of Existing and Planned Transit Routes. For the purposes of application of this standard, the location of existing transit routes shall be defined by the Transfort Route Map in effect at the time the application is approved. The location of planned transit routes shall be defined according to the Transfort Strategic Operating Plan, as amended.

## 6.3 **TECHNICAL DESIGNS** (As Incorporated into Larimer County Urban Area Street Standards)









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### 6.4 CITIZEN ADVISORY COMMITTEE LETTER OF SUPPORT

Date: May 20, 2015

To: Fort Collins Transfort

From: Fort Collins Transit Design Standards Citizen Advisory Committee

Re: Bus Stop Design Standards and Guidelines Draft

To Whom It May Concern,

Following The Transit Design Standards Citizen Advisory Committee meeting on Monday, April 13, 2015 and after much discussion, we wish to convey our support and endorsement of the *Bus Stop Design Standards and Guidelines*. The Guidelines include the following:

Bus Stop Design Standards and Guidelines Highlights

- Accessibility Enhancements Updates the Accessibility Requirements of bus stops to be in compliance with ADA standards
- Bus Stop Amenity Distribution Enhances bus stop passenger amenity provision throughout the Transfort Service Area
- Capital Improvement Plan Sets a goal of bringing approximately 20 bus stops into compliance with these standards each year
- Next Steps Identifies the next steps to pursue Braille signage at bus stops and recommends further evaluation of how snow removal is enforced throughout the City

The Fort Collins Transit Design Standards Citizen Advisory Committee believes it is appropriate and highly important to include the *Bus Stop Design Standards and Guidelines* in Transfort's plans for all bus stop plans. We are particularly sensitive to ADA requirements therefore, we encourage Transfort to seriously consider and include all such regulations in any bus stop designs. Bus stop accessibility and safety is of serious concern in the growing Fort Collins community and should be guaranteed to all citizens. Bus stops are a key link in the journey of a bus rider. For people with disabilities, inaccessible bus stops often represent the weak link in the system and can effectively prevent the use of fixed-route bus service. Physical, cognitive, and psychological barriers associated with bus stops can severely hamper bus ridership by the disability community, thus limiting their mobility and potentially leading to increased paratransit costs. As such, Transfort is encouraged by this committee to advocate for accessibility improvements and barrier removal in all bus stop designs. Thank you for your consideration of this written endorsement.

Sincerely,

The Fort Collins Transit Design Standards Citizen Advisory Committee Members Fort Collins, Colorado 05/20/2015
Citizen Advisory Committee Member Signatures:

Sarah Allmon Date

-midi P.PS 5/26 bah 15 tadro

Noah Al Hadidi

Date

Verified by PDF files n5/25/2015

Michael R. Devereaux

Michael Devereaux

Date

Verified by PDFfiller 05/29/2019

015

Kathryn Grimes

Vivian Armendariz

Date

Date

Jamie Rideou

Jamie Rideoutt

Date

Ed Roberts

Date

án

Carol Thomas

Date

6-24-1

# Appendix K

# NOTE: Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Appendix K shall be used as a reference for Pavement Markings Layout Standards within the City Limits of Loveland.

# PAVEMENT MARKINGS LAYOUT STANDARDS



City of Loveland Traffic Operations 3

Shared Left Turn (Suicide) Lanes Longer than 94'

1) Shared Left Turn (Suicide) Lanes are used by vehicles to make Left turns from opposite flows of traffic.

2) Refer to the diagrams for understanding steps that follow.

3) If measurements from point A to B are longer than 94' the 12' Arrows are placed 25' out from the center of the lane.

4) Using the measuring wheel measure how long the lane is from A to B. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram* #1

5) Starting with the 12' Arrow in front of the thermo truck, from the center marks measure out 25'on both sides of the lane and mark with chalk. *diagram #1* 

6) From those 25' marks measure out 12' on both sides of the lane and mark with chalk. *diagram #1* 

6) Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning. 7) Using the 25' chalk marks measure across the lane (inside of solid yellow lines), and mark the center with a vertical and horizontal chalk mark. (This is where the #2 top thermo piece goes) diagram #1

8) Using the 12' chalk marks measure across the lane (inside of solid yellow lines), and mark the center with a vertical and horizontal chalk mark.

9) At that center point measure 18" over and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) refer to diagrams #2 or #3

10) Now the 12' Arrow thermo pieces can be laid down. *diagrams* #2 or #3

11) When lined up properly burn to the pavement. While thermo is still hot spread reflective glass beads down. Doing a section at a time.

12) Repeat the above steps for the other 12' Arrow behind the thermo truck. Pay close attention to where the 18" offset is for the bottom of the arrow.







## Over 80' RIGHT turnbay

When the Turn Bay is over 80' lay (2) 12' Rev. Turn Arrows and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

If measurements from point A to B (8" white turn line) are over 80' the 12' Arrows are placed 10' in from the ends of the lane and the ONLY in the center.

#### When doing layout for RIGHT turnbay, all measurements, marks and chalk lines are done on the paved road. Not on the concrete pan at the edge of the lane next to the curb. diagram #1

Using the measuring wheel measure how long the lane is from A to B with the 8" white turn line as a guide. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram* #1

#### 12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in *front* of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram* #1

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of the 8'' white to be and the edge of the pavement, not the concrete pan) and mark the concer with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) diagram #1 & #2

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a small chalk mark.

At that center point measure 18" over to the Left and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) diagrams #1 & #2

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. diagrams #1 & #2 Note: When doing a RIGHT turnbay flip the Premark thermo pieces on the other side. This will make the Arrow point in the RIGHT direction.

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

e the thermo truck back toward the bottom of the turn lane and repeat the above steps for the bottom 12' Arrow.

The only change is the bottom of the 12' Arrow is layed out on the 10' line across the lane. This is where the 18" offset is layed out,

#### ONLY

The (2) 12' Arrows are done. Now time for the layout of the ONLY.

Move the thermo truck up past the center marks of the Left turnbay lane.

The chalk marks at the center of the Turnbay lane have already been marked. This is the starting point for the ONLY layout.

Using the 2 center chalk marks measure down 49" & up 49" (8"2"). Mark with chalk on both sides of the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan).

Blow off the 8' area (where the ONLY will be placed).

Using the 49" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) Mark the center on both chalk lines.

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3* 

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.







## **Over 80' LEFT turnbay**

When the Turn Bay is over 80' lay (2) 12' Rev. Turn Arrows and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

If measurements from point A to B (8" white turn line) are over 80' the 12' Arrows are placed 10' in from the ends of the lane and the ONLY in the center.

Using the measuring wheel measure how long the lane is from A to B with the 8" white turn line as a guide. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram* #1

### 12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. diagram #1

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of solid yellow line ?, 8" white turn line) and mark the center with a vertical chalk mark. (t where the top, #2 thermo piece should line up to) diagram #1 & #2

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a small chalk mark.

At that center point measure 18" over to the right and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) diagrams #1 & #2

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. diagrams #1 & #2

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

Move the thermo truck back toward the bottom of the turn lane and repeat the above steps for the bottom 12' Arrow.

The only change is the bottom of the 12' Arrow is layed out on the 10' line across the lane. This is where the 18" offset is layed out, where the #6 thermo piece goes. *diagram* #1 & #2

### ONLY

The (2) 12' Arrows are done. Now time for the layout of the ONLY.

Move the thermo truck up past the center marks of the Left turnbay lane.

The chalk marks at the center of the Turnbay lane have already been marked. This is the starting point for the ONLY layout.

Using the 2 center chalk marks measure down 49" & up 49" (8"2"). Mark with chalk on both sides of the lane (inside of solid yellow lines & 8" white turn line).

Blow off the 8' area (where the ONLY will be placed).

Using the 49" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane *(inside of solid yellow lines & 8" white turn line)* Mark the center on both chalk lines.

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3* 

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.







# 50' - 80' RIGHT turnbay

When the Turn Bay is from 50' - 80' lay (1) 12' Rev. Turn Arrow and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

Use the measuring wheel.

If measurements from point A to B (8" white turn line) are from 50' - 80' the 12' Arrow is placed 10' in from the top end of the turnbay lane and the ONLY is placed 10' in from the bottom of the turnbay lane.

When doing layout for RIGHT turnbay, all measurements, marks and chalk lines are done on the paved road. Not on the concrete pan at the edge of the lane next to the curb.

#### 12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram* #1

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) diagram #1

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a small chalk mark.

At that center point measure 18" over to the Left and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) diagrams #1 & #2

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. diagrams #1 & #2

Note:When doing a RIGHT turnbay flip the Premark thermo pieces on the other side. This will make the Arrow point in the RIGHT direction.

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

### ONLY

The (1) 12' Arrow is done. Now time for the layout of the ONLY.

Move the thermo truck back towards the bottom of the Left turnbay lane. diagram #1

From the bottom of the turnbay lane measure in, first 10' and then 8' 2" and mark with chalk on both sides of the lane. diagram #1

Blow off the 8' area (where the ONLY will be placed).

Using the 10' and 8' 2" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan). diagram #1

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) on both the snapped chalked lines and mark the center with a small vertical chalk mark. diagram #1

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram* 3

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hol spread some reflective glass beads down. Continue this process for all the ONLY letters.







## 50' - 80' LEFT turnbay

When the Turn Bay is from 50' - 80' lay (1) 12' Rev. Turn Arrow and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

Use the measuring wheel.

If measurements from point A to B (8" white turn line) are from 50' - 80' the 12' Arrow is placed 10' in from the top end of the turnbay lane and the ONLY is placed 10' in from the bottom of the turnbay lane.

### 12' Rev. Turn Arrow

Starting with the 12' Arrow at the *top* of the Turnbay lane in *front* of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram #1* 

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) diagram #1 & #2

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a small chalk mark.

At that center point measure 18" over to the right and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) diagrams #1 & #2

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. *diagrams* #1 & #2

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down.

Move the thermo truck back toward the bottom of the turn lane and prepare to layout the ONLY.

#### ONLY

The (1) 12' Arrow is done. Now time for the layout of the ONLY.

Move the thermo truck back towards the bottom of the Left turnbay lane. diagram #1

From the bottom of the turnbay lane measure in, first 10' and then 8' 2" and mark with chalk on both sides of the lane. *diagram* #1

Blow off the 8' area (where the ONLY will be placed).

Using the 10' and 8' 2" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of solid yellow lines & 8" white turn line). diagram #1

Measure across the lane (inside of solid yellow lines & 8" white turn line) on both the snapped chalked lines and mark the center with a small vertical chalk mark. diagram #1

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3* 

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.





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# Bikers & 6' Arrow L: Jut

Refer to the illustration on this page as you read.

Layout for Biker symbol & 6' arrow are done ONLY on paved Asphalt or Chip Seal, NEVER on the concrete pan at the edge near the curb.

At the beginning end of the Bike Lane measure up 10' mark with chalk. Then measure up 4' and mark with chalk.

Measure across the Bike Lane at that 10' mark and mark with chalk the middle of the lane. (from inside the white line to inside the other white line or from inside the white line to the edge of the Asphalt).

From the 10' mark snap a chalk line across the Bike Lane, (this will be the bottom of the Biker Symbol).

From the middle of the lane mark measure 12" each way and mark vertical lines with chalk about 10".

From that same 10' mark again measure up 4' and mark with chalk just like the 10' chalk mark.

From the 4' mark measure across the lane and mark the middle with a vertical & horizontal line (+). (the horizontal line will be the top of the Biker symbol)

Now layout the thermo pieces as seen on the Premark Design sheet in the box. Use the head piece with the helmet.

When the thermo pieces are set now is time to burn the thermo to the Asphalt with the propane torch.

When burning with the propane torch remember to spread the reflector Glass Beads over a section at a time while the thermo is still hot & soft.

When done with the Biker measure up from the 4' mark 20' & 6' and mark with chalk.

Measure across the lane at the 20' & 6' marks and mark the middle vertical & horizontal (+).

Layout the 6' arrow thermo pieces.

When centered & straight burn to the pavement with the propane torch. (spread reflector Glass Beads)

# liker & 6' Arrow Layouts (A)

ALL street variations of Biker symbols & 6' Arrows are these two (2) layouts. They will either be between two (2) white lines or between one (1) white line and the curb at the right side edge of the street.



## 16' & 20' Railroad Xing & RR

refer to page with diagrams A & B

1) When laying down RR X on (1) lane flow of traffic, traffic control using Flaggers is necessary unless there is a Shared Lane between the opposite flows of traffic.

#### Stop Bar

2) Start with the "Stop Bar" which must be layed a minimum of 5' from the RR Drop Arm. Measure 5' from the Drop Arm and snap a chalk line horizontal across the lane. (diagram A)

3) Blow off the stop bar area. Lay down the 36" x 18" thermo pieces along and BEHIND the chalk line. Start laying pieces down from the 4" edge line to the double yellow lines. Cut to fit if necessary. When set burn to the pavement. (diagram A)

As a section of the Stop Bar is being burned to the pavement, while still hot spread some reflective glass beads down on the hot thermo. Continue this process for the entire Stop Bar. (diagram A)

#### Prep

5) Next step is to layout the (2) thermo borders, X & RR. The bottom thermo border will line up with the RXR sign. (diagram A & B)

6) Blow off the entire area where the (2) thermo borders, X & RR are to be layed down (roughly a 54' area from top to bottom). (diagram A)

#### **Bottom Thermo Border**

7) Start with the bottom thermo border snapping a chalk line across the lane that is lined up with the RXR sign. Repeat the steps of the Stop Bar. Only difference the thermo border goes from the inside of the 4" edge line to the inside of the double yellow lines and BEHIND the horizontal chalk line. (diagram A)

# X

8) Measure up 25' from the bottom thermo border chalk line on both sides of the lane and mark with chalk. Snap a horizontal chalk line across the lane using the (2) chalk marks. (diagram A & B)

9) Make a vertical chalk mark at the center of that snapped chalk line measuring across the lane from inside the 4" edge line to the inside of the double yellow lines. This is where the center piece of the X will be placed. (diagram A & B)

10) Lay down the X thermo pieces starting with the center piece.When all pieces are laid down and lined up vertical & horizontal, start burning to the pavement. While burning thermo pieces and still hot spread some reflective glass beads down on the hot thermo. (diagram A & B)

**RR** 11) When X is finished snap a horizontal chalk line at the bottom legs of the X. Lay down RR pieces 10" apart on the inside and centered in line with the X. Line both RRs pieces vertical with the X. Once lined up burn to the pavement spreading reflective glass beads while still hot. (diagram B & A)

#### **Top Thermo Border**

12) Last is the top thermo border. Measure up 25' from the X center chalk line on both sides of the lane and mark with chalk. Snap a chalk line across the lane. Lay down the thermo pieces from inside the 4" edge line to the inside of the double yellow lines. Lay the pieces ABOVE the horizontal line. (diagram A)

When top thermo border pieces are layed down start burning to the pavement spreading reflective glass beads a section at a time while still hot. (diagram A)



# Appendix L

# NOTE: Appendix Information is for Reference Only. Contact Local Entity Engineer for Current Information.

Appendix L shall be used as a reference for Thermoplastic Standards within the City Limits of Loveland.

# 2013 THERMOPLASTIC STANDARDS



# **TRAFFIC OPERATIONS**

#### CITY OF LOVELAND

RYAN BIERMANN 970-685-8007 DAVID GOODMAN 970-567-1243

()

# PAINT MARKING STANDARDS



# **TRAFFIC OPERATIONS**

CITY OF LOVELAND RYAN BIERMANN 970-685-8007 DAVID GOODMAN 970-567-1243

# THERMO DIMENSION ORIGINALS

City Of Loveland Traffic Operations

1/17/13



Mail Address: P.O. Box 160 • Thomasville, NC 27361 • Delivery Address: 115 Todd Court • Thomasville, NC 2736 No. (236) 475-6600 • Fax (336) 475-7900 • E-Mail: flintti@compuserve.com, Web: www.flinttrading.com



# 8' "AHEAD" w/1.5" Contrast

Design Number

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8130106CONT



Mail Address: P.O. Box 160 • Thomasville, NC 27361 • Delivery Address: 115 Todd Court • Thomasville, NC 27360



Mail Address: P.O. Box 160 • Thomasville, NC 27361 • Delivery Address: 115 Todd Court • Thomasville, NC 27360 Phone (336) 475-6600 • Fax (336) 475-7900 • E-Mail: flintti@compuserve.com, Web: www.flinttrading.com



# 8' "ONLY" w/Contrast

Design Number

130102CONT



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8' "XING" w/1.5" Contrast



Mail Address: P.O. Box 160 • Thomasville, NC 27361 • Delivery Address: 115 Todd Court • Thomasville, NC 27360



## 8' "YIELD" W/ 1.5" Contrast

Design Number

C

8130127-CONT





## 4' X 2' RIGHT BIKE LANE SYMBOL

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Phone (336) 475-6600 \* Fax (336) 475-7900 \* E-Mail: flint@flinttrading.com. Web: www.flinttrading.com



Mail Address: P.O. Box 160 • Thomasville, NC 27361 • Delivery Address: 115 Todd Court • Thomasville, NC 27360 Phone (336) 475-6600 • Fax (336) 475-7900 • E-Mail: flintti@compuserve.com, Web: www.flinttrading.com



DDEMIADIZ Daview Manufact

220 EE0 (1-1-4





## 9'10" STRAIGHT ARROW W/4" CONTRAST

Design Number

DMIGNALLACONT



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Davian Maria





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## 20' COMBI ARROW LEFT - NEW FHWA





PREMARK Design Number

PM390500RCONT