

**CITY OF BOULDER
CITY COUNCIL AGENDA ITEM**

MEETING DATE: October 6, 2009

AGENDA TITLE: Second reading and consideration of a motion to adopt Ordinance No. 7687 amending the Boulder Revised Code, 1981 and Ordinance No. 7688 amending the Design Construction Standards related to work area traffic control and standards for transportation improvements, and setting forth related details.

PRESENTER/S:

Jane S. Brautigam, City Manager
Paul J. Fetherston, Deputy City Manager
Maureen Rait, Executive Director of Public Works
Tracy Winfree, Director of Public Works for Transportation
Mike Sweeney, Transportation Operations and Planning Coordinator
Bill Cowern, Traffic Operations Engineer
Jeff Arthur, Engineering Review Manager
Marni Ratzel, Bicycle and Pedestrian Planner

EXECUTIVE SUMMARY:

The proposed ordinances would amend sections of the Boulder Revised Code (BRC), 1981 and the Design and Construction Standards (DCS). Changes are primarily to standards for traffic control in both city and development related construction projects. Additional minor clarifications and updates to other transportation standards have been incorporated into the same ordinances.

The Transportation Advisory Board (TAB) and members of the public have expressed concerns that work area traffic control practices do not equitably distribute impacts across all modes of transportation. Staff approaches to developing and approving work area traffic control plans have evolved over the last several years to better accommodate bicycles, pedestrians, and transit. The proposed ordinances outline and refine these approaches and are intended to improve efficiency and consistency of implementation.

STAFF RECOMMENDATION:

Motion: Staff requests council consideration of this matter and action in the form of the following motion: Motion to adopt Ordinance No. 7687 amending the BRC, 1981 and Ordinance No. 7688 amending the Design Construction Standards (DCS) related to work area traffic control and standards for transportation improvements.

COMMUNITY SUSTAINABILITY ASSESSMENTS AND IMPACTS:

- **Economic:** The proposed ordinance is not expected to have a significant economic impact. While traffic control is a major cost consideration for construction projects, the proposed changes generally serve to better document existing requirements. Improved documentation may result in some reduction in economic impacts by allowing projects to better understand and budget for requirements earlier in the process. Costs associated with preparing and implementing a traffic control plan in the City of Boulder would likely remain higher than in communities that don't require accommodations for alternate modes of transportation. No increases to permit review fees are proposed as part of the ordinance.
- **Environmental:** The proposed ordinance is intended to help minimize the impact of work zones on all modes of transportation. Avoidance of impacts to alternate modes and provision of safe and efficient detours where necessary may help reduce the environmental impacts of single-occupancy vehicle use. In addition, effective work zone traffic control may reduce environmental impacts associated with motor vehicles by reducing delays and detour lengths.
- **Social:** The proposed ordinance is intended to benefit all segments of the community. Persons with disabilities or impairments that reduce mobility may benefit from more effective pedestrian and transit detours.

OTHER IMPACTS:

- **Fiscal:** No significant fiscal impacts are anticipated and no adjustments to associated fees are proposed. Clearer communication of standards may result in some reduction in the staff time dedicated to coordinating with contractors.

BOARD AND COMMISSION FEEDBACK:

The Transportation Advisory Board (TAB) reviewed the proposed ordinance at its May 11, 2009 meeting. TAB voted 5-0 to recommend approval of the proposed changes, but recommended that an expanded intent section or preamble restating language from the Transportation Master Plan (TMP) be added to the DCS section on temporary traffic control plans. Specifically, TAB recommended that the section include language stating that all closure signage give each group appropriate advanced notice of required detours, that safety of each user group drives all decisions, and that inconvenience is no greater for bikes and pedestrians than motorists. Meeting minutes and the complete motion language are available in the June 25, 2009 Weekly Information Packet (WIP).

Planning Board reviewed the proposed ordinance at its July 16, 2009 meeting and voted 6-0 to recommend approval (Sopher absent). Meeting minutes will be provided to City Council in the Sept.10 WIP.

PUBLIC FEEDBACK:

In addition to public hearings before the TAB and Planning Board, staff solicited feedback from a variety of stakeholders including the Colorado Department of Transportation (CDOT), Boulder County Transportation, CU-Boulder, Boulder Valley School District, Community Cycles, Walk Boulder, Boulder Housing Partners, Qwest Communications, and Xcel Energy. Several companies specializing in preparation and implementation of traffic control plans were also contacted. Preliminary materials were presented to the Planning & Development Services Advisors Group on March 4, 2009. This group consists of a variety of stakeholders, including local developers, architects, engineers, and contractors.

Public feedback and concerns have been fairly limited. Input has primarily been from cyclists who have recommended that staff have less discretion in balancing impacts across modes and that a more defined approach be codified.

BACKGROUND:

Transportation impacts due to construction activity are a common concern for the public. Significant public and private projects along major transportation corridors during the past several years have raised interest among members of the public and TAB members about how the city manages associated impacts. In particular, questions have been raised about whether work area traffic controls effectively and equitably accommodate all modes of transportation.

An additional factor in the timing of proposed updates is a new "Lane Closure Strategy" adopted by the CDOT Region 4 in 2008. The new strategy dictates lane closure policies for CDOT highways (such as 28th Street, Canyon Boulevard, Foothills Parkway, the Diagonal Highway, and portions of Broadway and Arapahoe Avenue) and could impact the city's flexibility in implementing work zone traffic control in those rights-of-way. CDOT has agreed in principle to grant the city a blanket waiver from their policy, provided the city provides a satisfactory alternative set of policies and procedures.

The Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration, was adopted by the city as the standard for work zone traffic control. While the manual does provide some consideration for alternate modes of transportation, it emphasizes accommodation of automobiles and provides limited guidance for facilities like multi-use paths, which are a critical part of Boulder's transportation network. The manual also provides minimal guidance on avoiding or prioritizing closures. The lack of written standards has resulted in the need for significant staff involvement in traffic control plan development as well as financial impacts to contractors who have not anticipated and budgeted for multimodal accommodations.

Staff has also found that existing city codes and enforcement protocols are not as effective as they could be in supporting work zone traffic control compliance. As an example, a "stop work order" is generally an effective compliance tool that requires a

contractor to cease construction until a violation is remedied. In the case of a contractor illegally implementing a lane closure during peak traffic hours, a stop work order would only be effective if staff was notified of the violation and was able to respond before the restricted peak hours had ended.

ANALYSIS:

Proposed Work Zone Traffic Control Changes

Proposed changes include more specific standards for development and implementation of work zone traffic control plans as well as changes to regulatory language that would expand potential enforcement options.

As part of the proposed changes, work zone traffic control plan standards have been added as a new section in the DCS. The standards continue to adopt the MUTCD, but add supplementary requirements to better address impacts to alternative modes of transportation. In particular, the proposed standards include a section on "Nonstandard Closures" that establishes thresholds and requirements for traffic control setups that require more detailed applicant analysis and staff review. For example, work impacting multi-use paths or transit facilities would require supporting analysis of avoidance and minimization options and mitigation beyond MUTCD standards.

Proposed changes to the BRC are primarily clarifications and administrative changes to support the updated DCS. In a number of locations, the word "permittee" has been replaced with broader language such as "person" or "person performing work." This language better addresses work that does not require a permit but may still impact a transportation facility. For example, since utility companies like Xcel and Qwest may be exempt from permitting for some operations/maintenance activities, the revised language clarifies that they are still required to provide adequate traffic control and are subject to enforcement remedies if they fail to do so.

Because most requirements are already being implemented to some degree under existing standards, staff does not anticipate a significant increase in the burden for contractors. Improved documentation of requirements should provide a better opportunity for contractors to understand, plan, and budget for traffic control in advance of actually applying for a permit to perform work in the public right-of-way. Costs associated with preparing and implementing traffic control plans will continue to remain higher than in communities with less focus on alternate modes of transportation.

The proposed ordinances include several changes intended to address the TAB recommendation. A new "Transportation Master Plan" section was added to the standards for temporary traffic control plans indicating that plans must be consistent with TMP goals, policies, and standards. The "Objectives" section was also updated to include language related to equitable treatment of all transportation modes and prioritization consistent with the TMP. Staff recommends that specific language and policies contained in the TMP not be restated in full within the DCS. The focus of the

DCS is on detailed standards rather than broader policies. Combining the two could make implementation and interpretation more difficult and could create future conflicts between redundant sections. Staff will develop a handout for contractors that integrates standards, policies, and regulations that are distributed across the DCS, TMP, and BRC into one comprehensive document.

Staff has not attempted to codify a numerical method for calculating equitable distribution of delay across transportation modes as part of these ordinances, as recommended by some members of the public. A method that would work effectively in a wide variety of situations and integrate effectively with less easily quantifiable considerations, such as safety, would likely be highly complex, and, if codified, could result in unintended consequences. It would also create financial impacts to obtain large amounts of data and staff impacts to review that data in the numerical method developed. The ordinances as proposed will provide staff with the discretion to require numerical information where appropriate and use professional judgment to integrate that data into a broader analysis. Recourse for persons aggrieved by interpretations of the DCS is via the Executive Director of Public Works and the City Manager.

Other Proposed Changes

Public Works staff compiles potential changes to the BRC and DCS on an ongoing basis and generally forwards changes for Planning Board and City Council consideration in packages of updates. Concurrent with the work zone traffic control updates, staff is proposing adoption of a number of other minor transportation updates. Similar to work zone traffic control, the changes are not significant departures from current practices, but are intended to more clearly document requirements.

A significant number of the proposed changes relate to compliance with the Americans with Disabilities Act (ADA). The DCS requires compliance with the ADA and states that the more restrictive standard applies in the case of conflicting standards. Staff has used this provision to maintain ADA compliance in cases where city standards have become outdated. Proposed updates will eliminate current conflicts and clarify requirements for all users.

Other changes are primarily intended to clarify conflicting or confusing language. For example, dimensions for on-street bike lanes are not consistent throughout the DCS. The standards have been revised to specify a consistent five-foot width. The standard for maximum street slopes currently contains both a standard maximum (five percent) and higher maximum based on topography (eight percent) without specific guidance on when the higher standard is appropriate. Staff is proposing to eliminate the eight percent reference and utilize the variance procedure already contained in the DCS for situations where topography or other constraints necessitate steeper slopes.

There are numerous other changes to the DCS currently under consideration that have not been included in the proposed updates because they require further refinement by staff

and/or public process. Staff will continue to bring forward changes as they become ready for consideration.

FIRST READING QUESTIONS:

There were no questions from City Council or members of the public at the first reading of the ordinances. City Council Agenda Committee requested additional information on several topics at its Sept. 28 meeting:

Public Outreach

To date, outreach has been targeted at both transportation system users and entities that prepare and implement traffic control plans. Staff solicited feedback and provided draft documents for review by facility users such as Boulder Valley School District, Community Cycles, Walk Boulder, CU-Boulder, and Boulder Housing Partners. Organizations with experience preparing and implementing traffic control plans such as the Colorado Department of Transportation (CDOT), Boulder County Transportation, Xcel Energy, Qwest Communications, and private traffic control contractors were also consulted. Earlier this year, draft information was presented to the Planning & Development Services Advisors group which includes a variety of stakeholders including developers, architects, engineers, and contractors. The proposed ordinances have been publicly noticed for hearings before TAB, Planning Board, and City Council.

Staff anticipates additional public outreach following adoption of ordinance changes. This would include incorporating the various policies, codes, and standards that exist in the TMP, DCS, and BRC into a user friendly handout for contractors, city project managers, and the public.

Compensation for Public Impacts

Contractors requesting to implement traffic control plans in public rights-of-way and access easements currently pay a permit fee based upon 100 percent cost recovery. This fee covers the full cost of the city review of the proposed plan and the periodic compliance inspections. The fee structure was updated in 2006 to ensure that longer term projects adequately compensated the city for associated inspection costs. As an example, the Arete project at 1095 Canyon Boulevard has been assessed approximately \$10,000 in right-of-way permit fees for the various closures that have occurred over the multi-year demolition and construction.

An additional fee that attempted to recover the cost for loss of facility use due to construction activities could be considered. Such a fee might be implemented through the revocable right-of-way permit/lease ordinance contained in BRC Section 8-6. Revocable right-of-way permits are currently used for encroachments such as patio seating on the Pearl Street Mall. One significant concern with implementing this type of fee for construction projects is that it may send a mixed message. The intent of the current ordinance updates is to more effectively avoid, minimize, and mitigate impacts to

the public. Allowing contractors to rent public space may give contractors a perceived sense of entitlement that would be contrary to those objectives. Economic vitality is also a consideration. The addition of a potentially significant new fee during difficult economic times may be perceived as inconsistent with economic vitality objectives.

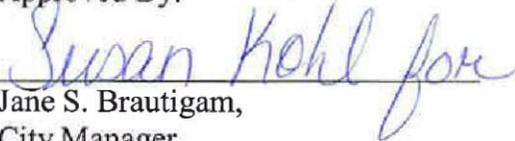
Construction Dust

Control of dust on construction sites is regulated under BRC section 8-5-11(h) which states that, "The permittee shall use appropriate measures, such as watering and best management environmental practices, to control dust and erosion at the construction site." In addition to the city's ability to pursue compliance action for inadequate use of protective measures, the Boulder County Health Department provides support related to specific discharge limits and impacts. Failure to adequately control dust can result in issuance of a stop work order or municipal summons. This regulation was not specifically evaluated as part of changes to traffic control requirements, but will be considered as part of future updates to the city's erosion and sediment control regulations. Staff anticipates bringing those changes to City Council in the second quarter 2010 following completion of an update to regional standards by the Urban Drainage and Flood Control District later this year.

Broadway Reconstruction Compensation

The proposed ordinance changes are generally related to mitigating impacts to the traveling public and do not modify existing requirements intended to protect adjacent property owners such as requirements related to noise. As part of the Broadway reconstruction, staff did conduct transportation management plan (TDM) outreach to adjacent businesses to assist them with effectively utilizing alternate modes to mitigate construction impacts. Staff will continue to investigate and seek funding for programs that enhance alternative mode utilization on future construction projects.

Approved By:


Jane S. Brautigam,
City Manager

ATTACHMENTS:

- A. Proposed Ordinance No. 7687 amending Sections 2-2-11, 9-2 and 8-5 of the Boulder Revised Code, 1981
- B. Proposed Ordinance No. 7688 amending Chapter 1, Chapter 2, Chapter 8, Chapter 11, and Glossary of the Design and Construction Standards.

ORDINANCE NO. 7687

AN ORDINANCE AMENDING SECTION 2-2-11, "TRAFFIC ENGINEERING, CHAPTER 8-2, "STREETS AND SIDEWALKS," AND CHAPTER 8-5, "WORK IN THE PUBLIC RIGHT OF WAY AND EASEMENT ENCROACHMENTS," B.R.C. 1981, TO IMPLEMENT STANDARDS RELATED WORK AREA TRAFFIC CONTROL AND SAFETY STANDARDS, AND SETTING FORTH RELATED DETAILS.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BOULDER, COLORADO:

Section 1. Paragraph 2-2-11(b)(13), B.R.C. 1981, is amended to read:

Section 2-2-11 Traffic Engineering.

(b) In addition to other duties prescribed by this code or other ordinances of the city, the city manager may, without limitation:

(13) Close or prescribe methods for handling traffic impacts on streets during civil emergencies, and construction projects, or other activities impacting the public rights of way or easements;

Section 2. Section 8-2-11, B.R.C. 1981, is amended to read:

Section 8-2-11 Duty To Maintain Walkway Around Obstructed Portions Of Sidewalks.

Whenever in the construction, rebuilding, or repairing of any building or structure it is necessary to blockade, obstruct, or remove the adjacent sidewalk, no person in charge of such work shall fail to build and maintain a sound and substantial walkway meeting the requirements of the City of Boulder department of public works, *Work Area Traffic Control and Safety Handbook*, July 1980 provide an appropriate alternative pedestrian facility meeting the requirements of the City of Boulder *Design and Construction Standards*, around the obstructed portion of such sidewalk.

Section 3. Section 8-5-1, B.R.C. 1981, is amended to read:

Section 8-5-1 Legislative Intent.

The purpose of this chapter is to regulate the placement of structures and infrastructure, construction, excavation, encroachments, and work activities within or upon any public right of way or public easement, to assure public safety and to protect the integrity and operation of the transportation system. To achieve this purpose, it is necessary to establish standards for any work activity, -require permits, to establish permit procedures, and to fix and collect fees and charges. This chapter is intended to balance the public objectives for providing efficient, safe transportation routes with the use of public rights of way for city-owned and non-city-owned public utilities, including:

- (a) Ensuring that the public safety is maintained and that public inconvenience is minimized.
- (b) Protecting the city's investment in its infrastructure by establishing repair standards for surface improvements and pavement when work is accomplished.
- (c) Facilitating work within the right of way and public easements through the adoption and implementation of standards for regulating the placement and construction of infrastructure and defining actions for balancing work activity impacts with the public need for transportation access and mobility.
- (d) Maintaining an efficient permit process.
- (e) Conserving the limited physical capacity of the public rights of way and public easements held in public trust by the city.
- (f) Assuring that the city can continue to fairly and responsibly protect the public health, safety, and welfare.

Section 4. Section 8-5-2, B.R.C. 1981, is amended by the amendment and addition of the following definitions, to read:

Section 8-5-2 Definitions.

The following terms used in this chapter have the following meaning, unless the context fully indicates otherwise:

...

“Permittee” means the holder of a valid permit, any subcontractor, or other person that who is doing any work authorized by a permit issued pursuant to this chapter.

“Temporary traffic control zone” means an area of the public right of way where transportation conditions are changed for pedestrians, bicyclists, transit, or motorists because of work, a work activity or incident by the use of temporary traffic control devices or personnel including without

limitation, barricades, traffic signs, traffic signals, flaggers, law enforcement or emergency operations officers, or other authorized personnel.

“Temporary traffic control plan” means a method for handling traffic prepared under the supervision of a traffic control supervisor in accordance with the requirements of the City of Boulder Design and Construction Standards and implemented under the supervision of a traffic control supervisor or traffic control technician in conformance with Section 8-10, “Temporary Traffic Control,” B.R.C. 1981.

“Traffic control supervisor or technician” means a person that has been certified as a traffic control supervisor or technician by the American Traffic Safety Services Association or a person with similar qualifications that has been approved by the city manager.

Section 5. Section 8-5-3, B.R.C. 1981, is amended to read:

Section 8-5-3 Permit Required for Work in the Public Right of Way and Public Easements.

- (a) Work in Right of Way or Public Easement Prohibited Without Permit: No person shall undertake or permit to be undertaken any work in the public right of way or a public easement without first obtaining a permit from the city as set forth in this chapter, unless such work is exempt under the provisions of section 8-5-17, “Work In The Public Right of Way Or Public Easement Exempt From Required Permit,” B.R.C. 1981, or involves sidewalk construction as permitted under section 8-2-18, “Permit For Sidewalk Construction Required,” B.R.C. 1981.
- (b) Display of Permit: ~~No person~~The permittee shall fail to maintain the applicable permits, including without limitation, a right of way permit, state highway access or utility permit, floodplain development permit, wetland permit, and temporary traffic closure authorization, along with associated project documents, including without limitation, the approved engineering construction drawings or site plans, and applicable temporary traffic control plan, and a ~~or stormwater quality best management practices erosion control~~ plans, on the job site. ~~and a~~All documents shall be made available for inspection upon request by any officer or employee of the city.
- (c) Work Consistent with the Permit: No permittee shall work in an area larger or at a location different from that specified in the approved permit. If it becomes necessary to work in a larger or different area than originally requested under the application, the permittee shall obtain authorization from the city manager, prior to proceeding with the work. The permittee shall submit ~~notify the city manager and file~~ a supplementary application for the additional work within twenty-four hours.
- (d) Permits are not Transferable: Permits shall not be transferable or assignable. The permittee may subcontract the work to be performed under a permit provided that the holder of the

permit shall be and remain responsible for the performance of the work under the permit and provide all insurance and financial security as required.

Section 6. Section 8-5-4, B.R.C. 1981, is amended to read:

Section 8-5-4 Permit Application.

An applicant for a permit to work in the public right of way or public easement under this section shall file a written application on a form provided by the city manager that includes the following:

- (a) The date of application; the name and address of the applicant; the name and address of the developer, contractor or subcontractor licensed to perform work in the public right of way; the exact location of the proposed work; the type of existing public infrastructure including es, without limitation, street pavement, curb and gutter, sidewalks bicycle facilities, transit facilities, parking meters or kiosks, traffic signs or pavement markings, or utilities impacted by the work; the purpose of the proposed work; the dates for beginning and ending the proposed work; the measurements, quantities, itemization and total cost, including labor and materials, of the construction improvements and excavations for improvements that are to be owned and operated by the City of Boulder; and type of work proposed.
- (b) Engineering construction drawings or site plans for the proposed work.
- (c) A ~~satisfactory temporary~~ traffic control plan and a ~~erosion protection stormwater quality best management practices plan~~ that comply with the requirements of the City of Boulder Design and Construction Standards for the proposed work.
- (d) Evidence that the applicant has an effective license, including, without limitation, required insurance, deposits, bonding, and warranty to perform work in the public right of way or public easement, as prescribed under chapter 4-6, "Contractor in the Public Right of Way License," B.R.C. 1981.
- (e) A satisfactory plan of work, showing protection of the subject property and adjacent properties including the protection of shade and ornamental trees and the restoration of turf.
- (f) Evidence that the applicant or its contractor is not delinquent in payments due the city on prior work, and that all orders issued by the city to the applicant, requiring the applicant to correct deficiencies under previous permits issued under this chapter, have been satisfied.
- (g) Evidence that any financial guarantee required under section 9-2-20, "Required Improvements and Financial Guarantees," or 9-12-13, "Subdivider Financial Guarantees," B.R.C. 1981, have been provided in connection with the approved subdivision, site plan, or engineering construction drawings.
- (h) Documentation that all permits required for the proposed work have been obtained including, without limitation, floodplain development permits, wetland permits, state highway access or utility permits, revocable right of way permits, and sewer and water utility permits.

- (i) Pay the fees prescribed by section 4-20-6, "Public Right of Way Permit and Contractor License Fees," B.R.C. 1981.

Section 7. Section 8-5-8, B.R.C. 1981, is amended to read:

Section 8-5-8 Public Safety And Nuisance.

- (a) Permittee's Responsibilities: No person shall violate any condition contained in a permit. No person who obtains a permit for works in the public right of way or public easement shall fail to maintain a safe work area, free of nuisance conditions. If the permitteesaid person fails to provide a safe work area free of hazards or nuisance conditions, the city may issue an order to make any repair necessary to eliminate any hazards or nuisances.
- (b) Failure To Comply: If ~~the permittee~~ any person fails to correct a hazard or a public nuisance caused by such person, the city may issue a stop work order and make any repair necessary to eliminate such hazard or public nuisance. Any such work performed by the city shall be billed to the permitteesaid person at overtime rates. The permittee person responsible for causing the hazard or nuisance shall pay all such charges within thirty days of the statement date. If the permittee said person fails to pay such charges within the prescribed time period, the city may, in addition to taking other collection remedies, seek reimbursement through the warranty guarantee. Furthermore, the permittee said person shall be barred from performing any work in the public right of way or public easement, and under no circumstance will the city issue any further permits of any kind to said permittee person until such time that all outstanding charges have been paid in full. This remedy is in addition to any criminal action which the city may bring or pursue for violation of the chapter.

Section 8. Section 8-5-10, B.R.C. 1981, is amended to read:

Section 8-5-10 Temporary Traffic Control.

~~The permittee~~ No person shall perform any work in a public right of way or public easement without providing temporary traffic control measures (as may be required by the City of Boulder Design and Construction Standards) to mitigate transportation impacts affecting all modes of travel, including pedestrian, bicycle, transit, or vehicles. No person shall initiate any work in the public right of way or public easements without meeting the following requirements:
~~on the transportation system that include the following:~~

- (a) Temporary Traffic Control Plan Required: When it is necessary to impede or obstruct pedestrian, bicycle, transit, or vehicular traffic, a temporary traffic control plan shall be prepared by a traffic control supervisor in conformance with the Manual on Uniform Traffic Control Devices City of Boulder Design and Construction Standards and ~~shall be~~ submitted

to the city prior to starting work. No permit will be issued until the plan is reviewed and approved by the city.

- (b) Access and Movement: No person shall interrupt access to and from private property, block emergency vehicles, block access to fire hydrants, fire stations, fire escapes, water valves, underground vaults, valve housing structures, or any other vital equipment unless permission is obtained from the city manager. Streets, including without limitation, vehicle travel lanes, bicycle lanes, sidewalks, and multi-use paths, are to remain passable at all times, unless permission authorization to close a street or a portion thereof is approved by the city manager, as prescribed under section 2-2-11, "Traffic Engineering," B.R.C. 1981. ~~No person shall be the responsibility of the permittee~~ fail to notify and coordinate all work in the public right of way with police, fire, ambulance, and transit organizations.
- (c) Temporary Traffic Warning And Control Devices: ~~The permittee~~ Any person implementing a temporary traffic control plan shall ~~illustrate on the permit~~ provide all warning and traffic control devices proposed for use. At the direction of ~~the~~ The city manager may require that, such warning and control devices ~~shall be~~ increased, decreased, or modified if traffic impacts or safety concerns for transportation users or workers arise. ~~The Manual on Uniform Traffic Control Devices, Part IV, shall be used as a guide for all maintenance and construction signing. Traffic control devices, as defined in Part VI of the Manual on Uniform Traffic Control Devices, must be used whenever it is necessary to close a traffic lane or sidewalk. The permittee shall provide all traffic control devices. If used at night, the any temporary traffic control devices must~~ shall be reflectorized and be illuminated or have barricade warning lights. Oil flares or kerosene lanterns are not allowed as a means of illumination.
- (d) Flag Person Required: When called for under a temporary traffic control plan, or where necessary for public safety, the city manager will require the permittee to employ certified flag persons shall be employed to implement temporary traffic control measures. The flag persons whose duties shall be to control traffic around or through the construction site temporary traffic control zone.
- (e) Supervision: A traffic control supervisor or traffic control technician shall be responsible for implementing a temporary traffic control plan for any temporary traffic control zone.

Section 9. Section 8-5-11, B.R.C. 1981, is amended to read:

Section 8-5-11 Minimizing the Impacts of Work in the Rights of Way and Public Easements.

- (a) Responsibility Of Permittee: ~~The permittee~~ No person shall fail to conduct work in such a manner as to avoid unnecessary inconvenience and annoyance to the general public and occupants of neighboring property.
- (b) Location of Utilities: Before any ~~permittee person~~ person begins work in any public right of way or public easement, it shall contact the Utility Notification Center of Colorado and make inquiries of all ditch companies, utility companies, districts, municipal departments, and all

other agencies that might have facilities in the area of work to determine possible conflicts. ~~The permittee~~No person shall fail to contact the Utility Notification Center of Colorado and request field locations of all facilities in the area at least forty-eight hours in advance of commencing work.

- (c) Protection of Utilities: ~~The permittee~~No person shall fail to support and protect all infrastructure, including, without limitation, pipes, conduits, poles, wires, or other apparatus which may be affected by the work from damage during construction performance of the work, or settlement of trenches subsequent to construction.
- (d) Work Hours: ~~Work activity performed in public right of way or public easements under a right of way permit may occur Monday through Friday, between the hours of 7:00 a.m. and 5:00 p.m. No work shall be performed nor shall any traffic lane be closed to traffic during the hours of 7:00 a.m. to 8:00 a.m. or 4:30 p.m. to 5:00 p.m. on streets designated "collector" or greater in the adopted *Transportation Master Plan* without the approval of the city manager. Construction hours may be further modified by the city manager to minimize construction impacts on traffic flow along arterial and collector roadways, or to address environmental and safety concerns which may be associated with a right of way construction permit application.~~
- (e) After Hours Work: ~~The applicant~~Work activity performed in the public right of way or public easements may occur between the hours of 7:00 a.m. and 5:00 p.m. A person may request permission to perform work before 7:00 a.m. or after 5:00 p.m. after hours work activity in a public right of way or public easement, subject to city approval considering the type of work to be performed, the public necessity to have the work performed outside of normal hours, and the potential inconvenience or annoyance the work may have on the general public and occupants of neighboring property. Any approval to permit after-hours construction under an approved right of way construction permit shall be subject to approval of a sound level variance, if necessary, prescribed under chapter 5-9, "Noise," B.R.C. 1981, and the applicant's agreement to pay the fee for after hours inspection prescribed under subsection 4-20-6, "Public Right-of-Way Permit and Contractor License Fees," B.R.C. 1981.
- (ef) Noise: ~~The permittee~~No person shall fail to comply with allowable noise levels prescribed under chapter 5-9, "Noise," B.R.C. 1981.
- (g) Trash and Construction Materials: ~~The permittee~~No person shall fail to maintain the work site such that:
- (1) Trash and construction materials are contained and do not blow off the construction site;
 - (2) Trash is removed from a construction site often enough so that it does not become a health, fire, or safety hazard; and
 - (3) Trash dumpsters, materials, storage trailers, or construction trailers shall not be placed in the right of way unless approved with the right of way permit.

- (hg) Dust and Erosion: ~~The permittee~~No person shall fail to use appropriate measures, such as watering and best management environmental practices, to control dust and erosion at the construction site.
- (ih) Deposit of Dirt and Material on Roadways: ~~The permittee~~No person shall fail to comply with the requirements to eliminate the tracking of mud or debris upon any street or sidewalk as prescribed under section 8-2-10, "Deposit Of Dirt And Material On Streets And Alleys Prohibited," B.R.C. 1981. Equipment and trucks used during construction, excavation or work activity shall be cleaned of mud and debris prior to leaving any work site.
- (ij) Use of Street and Sidewalk Within the Right of Way or Public Easement: A permittee for a right of way construction permit shall:
- (1) Make provisions for employee and construction vehicle parking so that neighborhood parking adjacent to a work site is not impacted;
 - (2) Obtain permission from the city manager to occupy public metered parking spaces and pay applicable parking reimbursement fees for any work activity that impacts public metered parking spaces, as set forth in section 4-18-8, "Parking Meter Hood And Sign Permits," B.R.C. 1981;
 - (3) Maintain safe traffic operations along all public streets in conformance with section 8-5-10, "Traffic Control," B.R.C. 1981;
 - (4) Maintain an adequate and safe unobstructed public walkway through or around the working construction site or blocked sidewalk in conformance with section 8-2-11, "Duty To Maintain Walkway Around Obstructed Portions Of Sidewalks," B.R.C. 1981;
 - (5) Clear all snow and ice hazards from public sidewalks or walkways through or around the work site by 12:00 noon following a snowfall in conformance with section 8-2-13, "Duty To Keep Sidewalks Clear Of Snow," B.R.C. 1981; and
 - (6) Secure all dangerous areas, such as trenches and excavations, with appropriate markers, barricades, and/or fencing.
- (kj) Protection of Trees and Landscaping: ~~The permittee~~No person shall fail to protect trees, landscape, and landscape features as required by the city. All protective measures shall be provided at the expense of the ~~permittee~~person performing work. Any damage to existing trees and landscaping shall be reported to the city manager for inspection. The person performing work~~permittee~~ shall be required to complete any remedial action necessary to repair and restore damaged trees and landscaping, as determined by the city manager. Any trees and landscape materials which are damaged beyond repair or restoration shall be replaced at an equivalent value to the damaged material at the expense of the ~~permittee~~person performing work.
- (kl) Protection of Paved Surfaces From Damage: The permittee or any other person performing work shall be responsible for any damage caused to any pavement by any work activity.

- Upon order of the city manager, ~~the permittee~~ said person shall repair all damage to the satisfaction of the city manager. Failure to repair such damage will result in the use of the permittee's performance bond, financial guarantee, or warranty by the city to repair any damage. To protect against pavement damage, backhoe equipment outriggers shall be fitted with rubber pads when used on pavement surfaces, and tracked vehicles are not permitted on paved surface unless specific precautions approved by the city manager are taken to protect the surface.
- (~~m~~) Protection of Property: ~~The permittee~~ No person shall fail to protect from injury any adjoining property by providing adequate support and taking other necessary measures. ~~The permittee~~ Said person shall, at their expense, shore up and protect all buildings, walls, fences or other property likely to be damaged during the work, and shall be responsible for all damage to public or private property resulting from failure to properly protect and carry out work in the public right of way and public easements.
- (~~m~~) Cleanup: As the work progresses, all public rights of way, public easements, and private property shall be thoroughly cleaned of all rubbish, excess dirt, rock, and other debris. All cleanup operations shall be done at the expense of the permittee or any other person performing work.
- (~~n~~) Preservation of Monuments: ~~The permittee~~ No person shall ~~not~~ disturb any surface monuments or survey hubs and points found on the line of work unless approval is obtained from the city manager. Any monuments, hubs, and points disturbed shall be replaced by a Colorado Registered Land Surveyor at the expense of the permittee's or the person that is responsible for its removal ~~expense~~.

Section 10. Section 8-5-12, B.R.C. 1981, is amended to read:

Section 8-5-12 Standards for Repairs and Restoration of Pavement or Sidewalks.

- (a) Permittee Responsibility: The permittee or any other person performing work shall be fully responsible for the cost and actual performance of all work in the public right of way or public easement. ~~The permittee~~ Said person shall do all work in conformance with city design and construction standards. All restoration work shall result in a pavement and sidewalk condition equal to or better than that which existed prior to construction. All streets and paved surfaces shall be restored within two weeks of their excavation. Where bike lanes and multi-use paths are reopened to the public prior to final restoration, a temporary, all-weather, hard surface patch shall be provided. No person shall fail to repair or restore any public improvement damaged, removed, or destroyed during the performance of any work under a permit issued pursuant to this chapter.
- (b) Flowable Fill Required: Flowable fill backfill material, or an equivalent backfill material approved by the city manager that provides an incompressible, settlement-free, stable surface satisfying the design and construction standards adopted by the city, shall be used to restore all trenches that have been excavated in the paved or traveled portion of any public street or alley.

- (c) Rock Backfill Material Permitted: The city manager may permit an applicant to use rock backfill material in lieu of flowable fill backfill material on streets that are designated "local" in the Transportation Master Plan, provided all of the following conditions are satisfied:
- (1) Prior to issuance of a permit for work activity in the public right of way or public easement, the applicant must request and receive city manager approval for the use of the rock backfill material;
 - (2) The work activity requires trench excavation in excess of five feet in depth;
 - (3) The trench excavation is along a parallel alignment beneath the paved roadway or travel lane, and does not include any perpendicular or diagonal trench excavation across the paved roadway or travel lane;
 - (4) The type, gradation, placement, compaction, and testing of the rock backfill material shall meet or exceed all requirements specified in the design and construction standards adopted by the city; and
 - (5) The applicant shall warrant the restoration of the public street for a period of three years as set forth in section 8-5-6, "Public Improvement Warranty," B.R.C. 1981.
- (d) Subsurface or Pavement Failures: In the event that subsurface material or pavement over or immediately adjacent to any excavation should become depressed, broken, or fail in any way at any time after the excavation has been completed, the city manager will notify the permittee or any other person performing work of the condition, location, and required remedy for the street failure, and the permittee or any other person performing work shall repair or restore, or cause to be repaired or restored, the street failure to the satisfaction of the city manager within three days of such notice. The city manager may extend the time for the permittee or any other person performing work to repair or restore the affected public street.
- (e) Repair by the City: In the event that any person or permittee fails, neglects, or refuses to repair or restore any condition pursuant to the city manager's notice as set forth in subsection (d) of this section the city manager may repair or restore, or cause to be repaired or restored, such condition in such manner as the city manager deems expedient and appropriate pursuant to the following:
- (1) Any such work performed by the city shall be billed to the permittee or any other person performing work to recover the cost thereof plus up to fifteen percent of such cost for administration. The permittee or any other person performing work shall pay all such charges within thirty days of the statement date. If the permittee or any other person performing work fails to pay such charges within the prescribed time period, the city may, in addition to taking other collection remedies, seek reimbursement through the warranty guarantee;
 - (2) The permittee or any other person performing work shall be barred from performing any work in the public right of way or public easement, and under no circumstance will the city issue any further permits of any kind to said permittee or any other

person performing work, until such time that all outstanding charges have been paid in full; and

- (3) Repair or restoration by the city in accordance with this subsection shall not relieve the permittee or any other person performing work from liability for future failures at the site of the repair or restoration.

Section 11. Section 11-1-22, B.R.C. 1981, is amended to read:

11-1-22 Excavation and Backfilling Water Service Lines.

- (a) No person except an employee of the city or a person licensed as a contractor in the public right-of-way under chapter 4-6, "Contractor in the Public Right-of-Way License," B.R.C. 1981, shall excavate in public streets or alleys. Such persons shall obtain a permit from the city manager and comply with all applicable provisions of this code, and other ordinances of the city, ~~and the *Work Area Traffic Control and Safety Handbook*, City of Boulder Department of Public Works, July 1980.~~
- (b) No person shall backfill any trenches under city streets and sidewalks except in accordance with the City of Boulder *Design and Construction Standards*.

Section 12. Section 11-2-15, B.R.C. 1981, is amended to read:

11-2-15 Excavation and Backfilling Sanitary Sewer Service Lines.

- (a) No person except an employee of the city or a person licensed as a contractor in the public right-of-way under chapter 4-6, "Contractor in the Public Right-of-Way License," B.R.C. 1981, shall excavate in public streets or alleys. Such persons shall obtain a permit from the city manager and comply with all applicable provisions of this code, other ordinances of the city ~~and the *Work Area Traffic Control and Safety Handbook*, City of Boulder Department of Public Works, July 1980.~~
- (b) No person shall backfill any trenches under city streets and sidewalks except in accordance with the City of Boulder *Design and Construction Standards*.

Section 13. This ordinance is prospective in nature and shall apply to all permits requested after the effective date of its adoption. Permits applied for prior to the effective date of this ordinance may proceed under the regulations in effect at the time of application.

Section 14. This ordinance is necessary to protect the public health, safety, and welfare of the residents of the city, and covers matters of local concern.

Section 15. The city council deems it appropriate that this ordinance be published by title only and orders that copies of this ordinance be made available in the office of the city clerk for public inspection and acquisition.

INTRODUCED, READ ON FIRST READING, AND ORDERED PUBLISHED BY TITLE ONLY this 15th day of September, 2009.

Mayor

Attest:

City Clerk on behalf of the
Director of Finance and Record

READ ON SECOND READING, PASSED, ADOPTED, AND ORDERED PUBLISHED BY TITLE ONLY this 6th day of October, 2009.

Mayor

Attest:

City Clerk on behalf of the
Director of Finance and Record

ORDINANCE NO. 7688

1 AN ORDINANCE AMENDING THE CITY OF BOULDER
2 DESIGN AND CONSTRUCTION STANDARDS (the "D.C.S.")
3 ADOPTED PURSUANT TO ORDINANCE NO. 5986 BY
4 ADDING STANDARDS RELATED TO WORK AREA
5 TRAFFIC AND SAFETY STANDARDS; MAKING REVISIONS
6 TO UPDATE THE D.C.S., AND SETTING FORTH RELATED
7 DETAILS.

8 BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BOULDER,
9 COLORADO:

10 Section 1. The City Council adopts the amendments to the City of Boulder *Design and*
11 *Construction Standards*, originally adopted pursuant to Ordinance No. 5986 (and amended by
12 Ordinance Nos. 7088 and 7400) that are shown in Exhibit A of this ordinance.

13 Section 2. This ordinance is prospective in nature and shall apply to all permits requested
14 after the effective date of its adoption. Permits applied for prior to the effective date of this
15 ordinance may proceed under the regulations in effect at the time of application.

16 Section 3. The following technical drawings in Chapter 11 of the City of Boulder
17 *Design and Construction Standards* are hereby repealed: 2.01, 2.01A, 2.02, 2.02A, 2.04, 2.04A,
18 2.04B, 2.07, 2.07A, 2.21, 2.22, 2.52, 2.53, 2.54, 2.61A, 2.61B, 2.63, 2.64, 2.66, 2.81, 2.82, 2.83,
19 2.84, 2.85, 2.86, 2.87.

20 Section 4. Chapter 11 of the City of Boulder *Design and Construction Standards* is
21 amended by the addition of the following technical drawings: 2.01A, 2.01B, 2.02A, 2.02B,
22 2.02C, 2.02D, 2.07, 2.21, 2.22A, 2.22B, 2.52A, 2.52B, 2.54, 2.61A, 2.61B, 2.63, 2.64, 2.66,
23 2.81, 2.86, 2.87.
24
25
26
27
28

1 Section 5. This ordinance is necessary to protect the public health, safety, and welfare of
2 the residents of the city, and covers matters of local concern.

3 Section 6. The city council deems it appropriate that this ordinance be published by title
4 only and orders that copies of this ordinance be made available in the office of the city clerk for
5 public inspection and acquisition.
6

7
8 INTRODUCED, READ ON FIRST READING, AND ORDERED PUBLISHED BY
9 TITLE ONLY this 15th day of September, 2009.
10

11 _____
12 Mayor

13 Attest:

14
15 _____
16 City Clerk on behalf of the
17 Director of Finance and Record

18 READ ON SECOND READING, PASSED, ADOPTED, AND ORDERED
19 PUBLISHED BY TITLE ONLY this 6th day of October, 2009.
20

21 _____
22 Mayor

23 Attest:

24
25 _____
26 City Clerk on behalf of the
27 Director of Finance and Record
28

CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS

CHAPTER 1
GENERAL REQUIREMENTS

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1.01 General

(A) Intent

The Design and Construction Standards ("Standards") are intended to protect the public health, safety, and welfare in the provision and maintenance of public improvements within the City of Boulder "City". These Standards apply to the comprehensive design and construction of adequate and functional public improvements associated with developing, redeveloping and subdividing lands and providing necessary right-of-way, transportation, and utility services.

(B) Scope

The City will review, approve, and monitor the design and construction of all public improvements within the public right-of-way or public easements to ensure compliance with these Standards. The City has the sole authority for approving, accepting, or denying the design and construction of any public improvement.

(C) Minimum Standards

- (1) These Standards prescribe minimum requirements that shall be met or exceeded when designing and constructing all public improvements. Whenever the requirements of these Standards are found to be inconsistent with any other adopted standards, regulations, or codes, the more restrictive standards, regulations, or codes shall control. Reference to any code, regulation, standard, criterion, or manual of any technical society, organization, or association, or to any law or regulation of any governmental authority, whether such reference be specific or by implication, shall mean the most recently adopted or current law, code, regulation, standard, criterion, or manual in effect at the time of City approval of any project.
- (2) The design of all public improvements shall be prepared by or under the direct supervision of a professional Engineer duly registered and licensed in the State of Colorado. The construction of all public improvements shall be performed in a professional and workmanlike manner by a contractor licensed by the City as set forth in Chapter 8-5, "Work in the Public Right-of-Way and Public Easements," Boulder Revised Code, 1981 (B.R.C.). The City assumes no responsibility for supervising or directing construction activities performed by a licensed contractor.
- (3) All materials and equipment used for public improvements shall be of new and good quality. Recycled materials and equipment may be used if they meet the quality standards and conditions equivalent to new materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable supplier or manufacturer, except as otherwise prescribed.

(D) Terminology

Terms, words, and abbreviations used in these Standards are defined in the Glossary (Appendix B).

1.02 Description and Use of These Standards

(A) Using these Standards

- (1) These Standards are to be used when designing and constructing all public improvements and infrastructure within the City. For the purposes of this document, public improvements and infrastructure include without limitation: streets, sidewalks, trails, curb and gutter, curb cuts, streetscaping, water mains, fire hydrants, water services and meters, wastewater mains and services, manholes, storm water mains, inlets, drainage swales and channels, and other improvements intended for public purposes or for the benefit of the community located within dedicated public rights-of-way and public easements.
- (2) These Standards also provide design and construction requirements to be used when developing private lands that create an impact on public rights-of-way and public easements. The required private improvements associated with property development include without limitation: traffic mitigation, site access and driveway design, storm water site drainage and detention ponding improvements, and water quality and erosion control measures.

(B) Restrictions

The descriptions in this Chapter provide the reader with a general guide to using these Standards. Nothing in this Chapter is intended to be a substitute for the requirements, criteria, and procedures contained in these Standards.

(C) Public Improvements Design

- (1) These Standards prescribe minimum requirements and specifications for designing adequate and functional public improvements. However, the design of public improvements also depends on the land use zoning and comprehensive planning requirements for the City, as well as the specific site geography of the land to be improved or developed.
- (2) The City review for approval of submitted design plans for public improvements occurs as part of the development review process that distributes design applications to staff in multiple departments, divisions, and agencies. The Department of Public Works development review staff has the primary responsibility for the review and approval of construction plans for public improvements. An applicant for construction approval would be well advised to consult with the Department of Public Work's development review staff prior to submitting designs for public improvements.

(D) Construction Approvals

- (1) An applicant seeking approval to construct public improvements in the City will need to develop engineering designs and construction plans that comply with the design and construction standards provided in this manual. In addition to complying with these Standards, an applicant will need to file the necessary applications and meet the requirements of the City's land use regulations, permit

standards, and fee assessments as prescribed in the Boulder Revised Code (B.R.C.), 1981.

- (2) An applicant seeking construction approval will need to consult local master plans and the location of existing public infrastructure to develop specific project designs.
- (3) In order to develop project designs that comply with these Standards, an applicant for construction approval will need to enlist the services of a professional civil Engineer and professional land surveyor to meet the requirements for certifying acceptable designs for public improvements. An applicant may consult local directories for listings of professional engineering and surveying service providers.

(E) Public Improvements Construction

- (1) **Right-of-Way Permit:** The construction of public improvements in the City public rights-of-way and public easements requires a right-of-way permit, as set forth in Chapter 8-5, "Work in the Public Right-of-Way and Public Easements," B.R.C., 1981. An applicant for construction approval will need to enlist the services of a contractor licensed with the City in order to obtain a permit to construct public improvements.
- (2) **Variances**
 - (a) When practical difficulties are involved in meeting the provisions of these Standards, the Director of Public Works ("Director") may alter, modify, or waive the strict application of these Standards to allow for the reasonable use of land or accommodate special circumstances peculiar to such land as set forth in Section 1.04, "Alternate Materials and Methods of Construction," and Section 1.05, "Alterations, Modifications, and Waivers," of these Standards.
 - (b) Alterations, modifications, or waivers are intended only for the special purposes described, and are not to be routinely considered or approved. Where it is necessary to vary from these Standards, an applicant for construction approval must clearly demonstrate that the provisions of these Standards cannot be met and the alteration, modification, or waiver will create the minimum variance necessary to accomplish the intended purpose.

(F) Standards

- (1) **Transportation:** The transportation standards prescribed in Chapter 2, "Transportation Design," and Chapter 8, "Transportation Standards," provide for the study, design, and construction of site accesses, streets, sidewalks, bicycle facilities, and trails. A traffic impact study may be required as part of construction approvals to demonstrate adequate design and mitigation for traffic impacts associated with new streets and driveways.
- (2) **Streetscapes:** The streetscape standards prescribed in Chapter 3, "Streetscape Design and Tree Protection," and Chapter 10, "Streetscaping Standards," provide

for the selection, design, placement, and protection of trees and landscaping along public streets throughout the community. The City places high value on and strongly encourages the use of streetscapes as a means to calm automobile traffic, address environmental concerns for clean air and water quality, and enhance neighborhood qualities. General criteria are also included related to subsurface work impacting transportation infrastructure.

- (3) **Water and Wastewater Utilities:** The utility standards prescribed in Chapter 4, "General Utilities Design," Chapter 5, "Water Design," Chapter 6, "Wastewater Design," and Chapter 9, "Utilities Standards," provide for the study, design, and construction of water and wastewater service facilities. These Standards detail required forecasting for sizing water distribution and wastewater collection mains, specific construction requirements for ensuring public health standards, and requirements for installing domestic water and sewer service lines.
- (4) **Storm Water:** The storm water standards prescribed in Chapter 7, "Storm Water Design," and Chapter 9, "Utilities Standards," provide for the study, design, and construction of storm water drainage and flood control improvements. Detention ponding, storm sewer and drainageway systems, water quality, and erosion control measures may be required as part of construction approval to mitigate the impacts of increased runoff resulting from land development.
- (5) **Technical Drawings:** The standards for construction detail drawings prescribed in Chapter 11, "Technical Drawings," provide design requirements for specific construction features associated with the general construction of public improvements and infrastructure. These drawings are intended to supplement the design and approval of construction plans and ensure consistency in project construction to promote long-term dependability and maintenance of public improvements and infrastructure.

1.03 Submittal Requirements for Construction Approval

(A) Documentation

- (1) An applicant for construction approval shall submit required engineering reports, rights-of-way and easement dedications, ancillary permits and agreements, and construction plans in compliance with these Standards. Construction approvals are subject to the Director's review, approval, and acceptance.
- (2) Prior to approving construction plans, the Director may require an applicant to submit the following documentation:
 - (a) Engineering reports
 - (b) Rights-of-way and easement dedications
 - (c) Permits and agreements
 - (d) Financial guarantees
- (3) Prior to issuing a right-of-way permit or building permit, the Director may require an applicant to submit the following documentation:

- (a) Documents listed in Section 1.03, Paragraph (A)(1), above
 - (b) Construction plans
 - (c) City land use approvals
 - (d) Financial guarantees
 - (e) Documents required by Section 8-5-4, "Permit Application," B.R.C., 1981.
- (4) Prior to the final acceptance of public improvements, the Director may require an applicant to submit the following documentation:
- (a) Documents listed in Section 1.03, Paragraphs (A)(1) and (A)(2), above
 - (b) As-built drawings
 - (c) Testing results
 - (d) Inspection approvals
 - (e) Financial guarantees and warranties

(B) Engineering Reports

- (1) Engineering reports required for construction approval shall be prepared as follows:
- (a) In compliance with these Standards.
 - (b) Under the direct supervision of the Engineer certified as an expert in areas covered in the report, and it shall be signed, sealed, and dated by the Engineer.
 - (c) Containing adequate information to evaluate submitted findings and designs, including calculations, details, and references.
- (2) Engineering reports required for construction approval may include the following:
- (a) Geotechnical Soils Report, which provides geotechnical conditions and design requirements based on soils investigation and testing and geologic site conditions in compliance with standard engineering practices for soil mechanics and groundwater analysis.
 - (b) Pavement Design Report, which provides geotechnical soils conditions and adequate pavement design requirements and structural cross-sections for roadway, sidewalks, trails, and parking lot construction. Pavement design shall be in accordance with CDOT standards.
 - (c) Storm Water Report, which addresses storm water conditions, impacts, and design requirements in compliance with Section 7.04, "Final Storm Water Report and Plan."
 - (d) Utility Report, which addresses water and wastewater utilities service impacts, demands, and design requirements in compliance with Sections 5.02, "Utility Report," and 6.02, "Utility Report."
 - (e) Traffic Study, which identifies traffic impacts from proposed

developments or roadway modifications and proposes transportation design requirements and mitigation measures in compliance with Section 2.02, "Traffic Study."

- (3) The Engineer shall be responsible for correcting any error or omission in the engineering report. City approval of the report in no way relieves the Engineer of any responsibility for errors or omissions in the report.
- (4) An applicant for construction approval shall submit at least three copies of any required engineering report to the Director for review and approval. If acceptable, a City approval stamp signed and dated by the Director will be placed on each copy of the report. The City will retain one copy as a record set, one copy as a field copy for construction inspection, and one copy will be returned to the Engineer.
- (5) Engineering report approval expires 1 year following the date of approval, unless construction of improvements under the report has been initiated.

(C) Rights-of-Way and Easement Dedications, Permits, and Agreements

- (1) Rights-of-way and easements required for construction approval shall be described by a licensed professional land surveyor registered in the State of Colorado and dedicated as follows:
 - (a) In compliance with these Standards; and
 - (b) By subdivision platting or by a separate legal instrument that describes a specific legal description of the dedication.
- (2) Agreements required for construction approval shall be executed and may include without limitation:
 - (a) Development agreement
 - (b) Public improvements agreement
 - (c) Public improvements extensions agreement
 - (d) Subdivision agreement
 - (e) Utility oversizing reimbursement agreement
- (3) Permits required for construction approval shall be of approved and issued status and may include without limitation:
 - (a) City of Boulder floodplain development permit
 - (b) City of Boulder right-of-way construction permit
 - (c) City of Boulder revocable right-of-way permit
 - (d) City of Boulder wetland permit
 - (e) Colorado Department of Transportation access permit
 - (f) Colorado Department of Transportation utility permit
 - (g) Railroad right-of-way encroachment permit

- (h) State of Colorado Health Department 401 permit
- (i) State of Colorado storm water discharge permit
- (j) United States Corps of Engineers 404 permit

(D) Construction Plans

- (1) **Preparation Standards:** Construction plans required for construction approval shall be prepared as follows:
 - (a) In compliance with these Standards;
 - (b) Under the direct supervision of the Engineer certified as an expert in areas covered in the report, and it shall be signed, sealed, and dated by the Engineer; and
 - (c) With adequate information and detail to evaluate submitted designs and ensure accurate and functional construction of public improvements.
- (2) **Drafting Standards:** All construction plans shall meet the following minimum drafting standards to ensure legibility and consistency; to facilitate review, construction, and public inspection; and to provide a clear public record.
 - (a) Drawings shall be submitted in both hard copy and electronic, computer-aided design and drafting (CADD) formats to allow information to be transferred to the City's geographic information system and facilitate clear microfilming or digital scanning.
 - (b) Electronic drawing format, or electronic CADD files, shall be in ".DXF" or "AutoCad.DWG" format on CD-ROM or 3½ -inch disks. Construction plan drawings are to be layered in electronic CADD format by improvement type in a manner acceptable to the Director of Public Works. Separate layers shall be provided for individual improvement categories including without limitation base mapping, transportation, landscaping, water, wastewater, and storm water.
 - (c) Hard-copy drawing format shall measure 22 inches by 34 inches on 3-mil reproducible sepia or black-line mylar, and be clean, clear, and free from objectionable background.
 - (d) Symbols and line types shall comply with Technical Drawing 1.01 in Chapter 11, "Drafting Standards," and shall graphically distinguish between existing and proposed items.
 - (e) All drawings are to be numbered in consecutive order.
 - (f) Abbreviations reflected on the construction plans are to correspond to those presented in the Glossary.
 - (g) No hand-drawn or adhesively attached information, such as Kroy lettering, adhesive backed reproductive film, or tape, may be placed on construction plans.
- (3) **Cover Sheet:** Construction plans required for obtaining construction approval shall include a cover sheet with the following elements:

- (a) Project name, with legal description of the project parcel;
- (b) Vicinity map, on a scale reflecting the location of the project and all streets within 1 mile of the project;
- (c) Key map, on drawing sets of three sheets or more, of a scale reflecting the entire project, separate drawing numbers, and street names;
- (d) Index of drawings presenting the title of each drawing and drawing number; and
- (e) The following standard construction notes:
 - (i) "All work shall be performed in accordance with the "Design and Construction Standards" of the City of Boulder, and shall be completed to the satisfaction of the Director of Public Works. In the event that a design element does not reflect City standards, the matter must be immediately brought to the attention of the Engineer and the Director of Public Works. The Engineer shall be responsible for recommending a solution or alternative solutions to the City for review and approval."
 - (ii) "The approval of a Construction Plan does not relieve the Contractor of the responsibility of constructing workable public improvements. All revisions and/or corrections required will be solely the Contractor's responsibility, and at their expense."
 - (iii) "These Plans have been checked by the City of Boulder only for conformance with the "Design and Construction Standards," compliance with development agreement conditions, and for general conceptual approval of public improvements as shown. The City's review does not verify or ensure the accuracy of existing or proposed dimensions, lines, coordinates, or grades shown, including all existing utilities shown or not shown."
 - (iv) "Utility locations shown reflect available record data. The Contractor shall take precautionary measures to protect all utility lines shown and other utility lines otherwise located. The Contractor shall contact the "Utility Notification Center of Colorado" at 1 800 922 1987 for utility locates 24 hours prior to beginning construction."
 - (v) "Before work begins, the Contractor shall obtain a permit to work in the right-of-way from the City and must notify the City Right-of-Way Inspection staff at least 24 hours in advance of commencing construction activities."
 - (vi) "The Contractor shall obtain and maintain a complete and approved set of Construction Plans. These drawings, and any required permits, shall be available at the project site at all times and shall be made available to City staff upon request. If construction plans are not readily available at the project site, the Director of Public Works may issue a stop work order and halt all

construction activities pending compliance by the Contractor.”

- (vii) “The Contractor agrees to comply with the provisions of the Traffic Control Plan and the current edition of the “Manual on Uniform Traffic Control Devices,” “Part IV Temporary Traffic Control” section, for construction signage and traffic control.”
- (viii) “All surplus materials, tools, and temporary structures, furnished by the Contractor, shall be removed from the project site by the Contractor. All debris and rubbish caused by the operations of the Contractor shall be removed, and the area occupied during construction activities shall be restored to its original condition, within 48 hours of project completion, unless otherwise directed by the Director of Public Works.”
- (ix) “The Contractor shall provide tree and landscape protection as set forth in Chapter 6-6, “Protection of Trees and Plants,” Boulder Revised Code (B.R.C.) 1981 and the City of Boulder Design and Construction Standards (DCS). All landscaping shall be provided and maintained in compliance with the approved Landscaping Plan, B.R.C. and DCS.”
- (x) “The Contractor is required to provide and maintain erosion and sediment control measures in accordance with the Urban Drainage and Flood Control District “Urban Storm Drainage Criteria Manual Volume 3”, the M-Standard Plans of the Colorado Department of Transportation, and the approved erosion control plan. The Director of Public Works may require the contractor to provide additional erosion control measures due to unforeseen erosion problems or if the plans do not function as intended.”
- (xi) “The City of Boulder requires that sidewalks constructed have a cross slope of less than 2%. Sidewalks shall be designed and constructed with cross slopes sufficiently less than 2% to ensure that they do not exceed the 2% maximum.”

(4) **Plan Sheets:** Construction plans required for construction approval may include without limitation the following plan sheets:

- (a) Storm Water Quality and Erosion Control Plan, prepared in compliance with Subsection 7.01(E), “Storm Water Quality and Erosion Control.”
- (b) Utility Plan, prepared in compliance with Section 4.03, “Utility Plan.”
- (c) Final Storm Water Plan, prepared in compliance with Section 7.04, “Final Storm Water Report and Plan.”
- (d) Traffic Control Plan, when construction plans have an impact on existing transportation facilities, such as utility or access construction within existing public streets, sidewalks, or trails. The plan is to be prepared in compliance with Part IV of Section 8.04, “Temporary Traffic Control Plan,” of these Standards, the current edition of the “Manual on Uniform

Traffic Control Devices,” “Temporary Traffic Control” section and as set forth in Section 8-5-10, “Temporary Traffic Control,” B.R.C., 1981. Plans shall include adequate provision for the detour of vehicular, bicycle, and pedestrian traffic.

- (e) Transportation Striping and Signage Plan, when construction plans include transportation traffic control measures, such as stop signs, centerline striping, and trail signage. The plan is to be prepared in compliance with the current edition of the “Manual on Uniform Traffic Control Devices,” and should include the following standard construction notes:
 - (i) Contact the City of Boulder Sign Shop (303-413-7122) for location of all signs prior to installation and for sign layout/details prior to ordering.
 - (ii) All sign sheeting to be Class XI (DG3 material) with 3M 1150 overlay film.
 - (iii) All signs shall be 0.100 gauge aluminum.
 - (iv) All sign posts to be 12 gauge 2 inch unistrut.
 - (v) All sign bases to be 12 gauge 2-1/4 inch unistrut.
 - (vi) Sign post lengths will vary, but 7 foot minimum clearance from bottom of sign to ground level is required.
 - (vii) All sign mount hardware to be Gator Lock System.
 - (f) Construction Phasing Plan, when projects are planned to be constructed in phases. The plan is to illustrate the entire project site and delineate and label each separate phase,
 - (g) Landscaping Plan, when construction plans include streetscaping improvements or landscaping that has an impact on public rights-of-way or public easements. The plan is to be prepared in compliance with Subsection 3.02, “Landscaping Plan.”
- (5) **Survey Information:** Construction plans shall refer horizontally to the Colorado State Plane Coordinate System NAD83, and are to include at least two horizontal and two vertical control points presenting appropriate x , y , and z coordinates. Electronic base map and survey control monument information is available from the City and should be used as a basis for construction plan drawings.
- (a) Horizontal control monuments reflected on drawing sheets and survey lines are to correspond to City-recognized horizontal control points. Horizontal locations for design features are to be presented in terms of survey line stationing and offset or x , y coordinates.
 - (b) Vertical elevation control points reflected on drawing sheets are to be tied to City-recognized benchmarks with reference to the City’s vertical control network. Vertical elevations for design features are to be presented as a z coordinate.

(E) Plan and Profile Drawings

- (1) **Required Elements:** Plan and profile drawings are required as part of the construction plan to ensure accurate and functional construction by the contractor when the construction is for public improvements. Plan and profile drawings are to be prepared on standard engineering plan and profile grid sheets and shall contain the following elements:
 - (a) Drawing border at least one-half inch from all edges of the drawing;
 - (b) Title block located inside the border in the lower portion of the sheet that includes the following information:
 - (i) Project name, location, and sheet title;
 - (ii) Name, address, and telecommunication numbers of the engineering consultant preparing the drawing, and the name of the supervising professional Engineer;
 - (iii) Date designed, drawn, surveyed, and checked;
 - (iv) Date prepared, and dates of all revisions;
 - (v) Drawing number and total number of drawings; and
 - (vi) Name of electronic file;
 - (c) North orientation arrow and scale;
 - (d) Certification space: a 2-inch by 2-inch space near the title block reserved for the seal and signature of the Engineer;
 - (e) Approval space: a 3-inch by 3-inch space in the lower-right corner of each drawing sheet reserved for the City's approval stamp;
 - (f) Revisions information space: space for noting all revisions, separate from the original plan preparation date, that includes revision numbers, a brief description of what was revised, and the date of the revision;
 - (g) Survey information;
 - (h) Property boundaries, lot lines, public rights-of-way, and public easements, which are to be clearly labeled by type and dimension. Dedications previously recorded are to be referenced by applicable film and reception numbers;
 - (i) Subdivision block, and lot numbering; and
 - (j) Street names.
- (2) **Plan Drawing:** The "plan view" is to be located on the upper half of the drawing sheet and drawn to a scale of 1 inch equals 20 feet. This view contains the following information:
 - (a) Existing and proposed public improvements and structures, including without limitation all grading, transportation, landscaping, City-operated and non-City-operated public utilities (including telephone, gas, electric, cable television, fiber optics), irrigation ditches, and other significant

- features.
- (b) Match lines connecting information between drawings.
 - (c) Utility information required in Section 4.03, "Utility Plan," and the following:
 - (i) Pipe type, size, class and joint restraint.
 - (ii) Separation distance between existing and proposed water and wastewater mains and services, with horizontal and vertical location of sewer crossings requiring special construction.
 - (iii) Angles at alignment changes.
 - (iv) Horizontal and vertical locations and sizing of water service lines and meters with ties to property lines.
 - (v) Horizontal and vertical locations, sizing, and types of valves, fittings, control devices, and fire hydrants.
 - (vi) Horizontal and vertical locations and sizing of manholes, cleanouts, and service lines for sanitary sewers.
 - (vii) Horizontal locations of soil borings.
 - (viii) Horizontal locations of structures.
 - (d) Storm water information required in Section 7.04, "Final Storm Water Report and Plan," and the following:
 - (i) Existing and proposed contours of at least 2-foot intervals.
 - (ii) Existing and proposed storm drainage facilities and details, including storm sewers, inlets, manholes, culverts, swales, detention ponds and drainageways.
 - (iii) Horizontal and vertical locations and sizing of manholes and inlets for storm drainage.
 - (iv) Horizontal and vertical location of existing and proposed drainage outfall points.
 - (e) Survey, transportation, and surface improvements information including without limitation:
 - (i) Survey lines and stations based on center line or flowline stationing, and equated to flowline at bubbles, cul-de-sacs, horizontal curves, and other departures from normal street cross sections.
 - (ii) Stations and elevations of flowlines at all existing and proposed curb returns, such as horizontal points of curvature (PC's), points of tangency (PT's), and points of compound curvature (PCC's); at the high or low point on all vertical curves; at inlets (including invert); and at intervals of no more than 50 feet along the streets.
 - (iii) Existing and proposed curb return radii.

- (iv) Handicap access ramps.
 - (v) Complete horizontal curve data: radius (R), delta (D), arc length (L), and tangent length (T).
 - (vi) All crown lines, where they depart from the normal cross sections (transitions to existing roadways), with appropriate transition starting elevation.
 - (vii) Centerline stations at all intersecting streets.
 - (viii) Stations of drainage facilities, including inlets, manholes, and storm water outfalls, and directional drainage flow arrows.
 - (ix) Full width of right-of-way, intersecting roadways, street cross sections, sidewalks and trails, existing curb cuts, and other relevant features along all roadways abutting the project.
 - (x) Traffic control devices, including striping, markings, signage, and signals.
- (3) **Profile Drawing:** The “profile view” is to be located directly below the plan view along a matching survey line and stationing and is to be drawn at a horizontal scale of 1 inch equals 20 feet and a vertical scale of 1 inch equals 5 feet. This view shall contain the following information:
- (a) Original and proposed ground elevations.
 - (b) Stationing sequence, left to right.
 - (c) Elevations labeled on both left and right sides of the drawing sheet.
 - (d) Match lines.
 - (e) Elevations based on center line, flow line, or invert of pipe. (Top of pipe is acceptable only for existing utilities.)
 - (f) Stations and elevations of existing and proposed grade breaks.
 - (g) Crossings of existing and proposed utilities.
 - (h) Elevations of manhole inverts and rims, and service line inverts.
 - (i) Elevations of inlets, top of curb, flowline, inverts, and connection locations.
 - (j) Slopes or grades of wastewater and storm water sewers.
 - (k) Existing and proposed finished grades over utilities.
 - (l) Street profiles, including:
 - (i) Stations and elevations of existing and proposed horizontal PC, PT, PCC, PRC.
 - (ii) Vertical curves with VPI, VPC, VPT, high point or low point (not middle ordinate) stations and elevations.
 - (iii) Center line stations of all intersecting streets.
 - (iv) Grades for all profiles.

- (v) Curb flowlines at 25-foot minimum intervals, and at all vertical sags or crests.
 - (vi) Curb return profiles to ensure positive drainage at ramp locations.
- (4) **Detail Drawings:** Detail drawings are required for construction details not provided in Chapter 11, "Technical Drawings." Detail drawings illustrate construction details for critical design features such as concrete paving sections, mechanical pipeline connections, and detention ponding release structures. Detail drawings are to include dimensioning, materials, specifications, and specific construction notes appropriate to each construction detail.
- (5) **Cross-Sectional Drawings:** These drawings are required with all construction plans that include varying or transitional features, such as street sections, fill slopes, and drainage channels. Cross-Sectional drawings reflect dimensions, elevations, stationing, and any other detailed information necessary to ensure accurate construction.

(F) Submittal and Approval of Construction Plans and Drawings

- (1) **Submittal:** An applicant for construction approval shall submit at least three drawing sets of any required construction plans to the Director for review and approval, including:
- (a) Original mylar, mylar sepia, black-lined or blue-lined drawing set prepared by the Engineer to be stamped and approved by the City and returned to the Engineer
 - (b) 2 Sets of black-lined or blue-lined prints drawing set signed, sealed, and dated on each drawing sheet by the Engineer to be maintained on file with the City as the record set of the construction plan approval documents and for use by the City right-of-way inspector.
- (2) **Approval:** The Director will review construction plans for compliance with these Standards. If acceptable, a City approval stamp signed and dated by the Director will be placed on each drawing sheet of the construction plans.
- (3) **Effective Period:** Construction plan approval expires 1 year following the date of approval, unless construction has been initiated. An applicant for construction approval may resubmit the construction plan for reapproval, subject to review for compliance with standards in effect at the time of resubmittal.
- (4) **Errors and Omissions:** The Engineer shall be responsible for correcting any error or omission in the construction plans or drawings. City approval of the construction plans in no way relieves the Engineer of any responsibility for errors or omissions in the plans.

(G) As-Built Drawings

- (1) **Requirements:** As-built drawings reflect the actual in-place construction of public improvements.
- (a) The applicant shall submit as-built drawings for final construction

approval within 60 days from the date construction was completed and prior to City acceptance of any public improvements.

- (b) The applicant shall ensure that every sheet of the approved construction plans reflects the as-built drawings conditions.
- (2) **Preparation:** As-built drawings shall be prepared by the Engineer responsible for the original construction plan approved by the City. Drawings shall be prepared as follows:
 - (a) In compliance with the requirements in Sections 1.03(D), "Construction Plans," and 1.03(E), "Plan and Profile Drawings."
 - (b) Based on completed field inspections, accurate measurements, survey data, and testing results, materials, and equipment records.
 - (c) To reflect any variations from the approved construction plans in the public improvements actually constructed.
- (3) **Transfer of Responsibility:** If the Engineer responsible for the original construction plan is replaced prior to preparing as-built drawings, the replacement Engineer shall agree in writing to accept the responsibility for the design certified by the original Engineer under the approved construction plan prior to City acceptance of the constructed public improvements.

(H) Submittal and Approval of As-Built Drawings

- (1) **Submittal:** An applicant for construction approval shall submit at least two drawing sets of any required as-built drawings to the Director of Public Works for review and approval. As-built drawing sets shall contain the following:
 - (a) A complete 3-mil mylar drawing set of the as-built construction plan drawing set reflecting the as-built conditions.
 - (b) A complete black-lined or blue-lined prints drawing set of the as-built drawing set reflecting the as-built conditions and signed, sealed, and dated on each drawing sheet by the Engineer.
- (2) **Approval:**
 - (a) The Director will review the as-built drawings for compliance with these Standards. If acceptable, a City approval stamp, signed and dated by the Director, will be placed on each drawing sheet of the as-built drawings.
 - (i) The mylar drawing set will replace the construction approval drawing set and will be maintained on file with the City's Mapping and Records Office as the approved as-built drawings set, from which copies may be reproduced.
 - (ii) The black- or blue-lined print drawing set, signed, sealed, and dated by the Engineer, will be maintained on file with the City as the record document of the as-built drawing set that has been approved by the City.
 - (b) The Director will not approve any construction, place in service, release

financial guarantees, or issue utility connections for any public improvements for which acceptable as-built drawings have not been submitted.

- (3) **Variations and Discrepancies:** If any substantial variations or discrepancies, particularly with respect to location, design slopes, grades, dimensions, and clearances, are discovered between the approved construction plans and the public improvements actually constructed, the Engineer shall propose and recommend a solution or alternative solutions to the City for review and approval. If no proposed alternative will satisfy the requirements of these Standards, the contractor shall reconstruct the deficient public improvements to comply with the approved construction plans.
- (4) **Errors and Omissions:** The Engineer shall be responsible for the correction of any error or omission in the as-built drawings. City acceptance of the as-built drawings in no way relieves the Engineer of any responsibility for errors or omissions in the drawings.

1.04 Alternative Materials and Methods of Construction

(A) Use

The provisions of these Standards are not intended to prevent the use of any materials or methods of construction not specifically prescribed in these Standards, provided that the alternative materials or methods of construction have been approved and their use authorized by the Director.

(B) Approval

The Director may approve an alternate material or method of construction, provided the proposed design is satisfactory and complies with the provisions of these Standards and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in these Standards in suitability, strength, effectiveness, durability, safety, and sanitation.

(C) Proof of Claims

The Director will require that sufficient evidence be submitted to substantiate any claims that may be made regarding an alternate material or method of construction. The details of any action granting approval of an alternate material or method will be recorded and entered in the files of the City.

1.05 Alterations, Modifications, and Waivers

(A) Practical Difficulties

When practical difficulties are involved in executing the provisions of these Standards, the Director may alter, modify, or waive the strict application of these Standards, according to the process described herein.

(B) Criteria

No alteration, modification, or waiver of the strict application of any provision of these Standards shall be granted unless the applicant clearly demonstrates and the Director finds that the following conditions exist:

- (1) The strict application of the provisions of these Standards would deprive an individual of the reasonable use of land or structure, and
- (2) Special circumstances peculiar to such land or development justify the requested alteration, modification, or waiver, and
- (3) Any alteration, modification, or waiver would result in a solution consistent with the goals of the underlying zoning district, a Boulder Valley Comprehensive Plan goal, a specific neighborhood plan, or an adopted design guideline, and
- (4) Any alteration, modification, or waiver represents the minimum variance from these Standards that will accomplish the intended purpose, and
- (5) Any alteration or modification will at least equal the suitability, strength, effectiveness, fire resistance, durability, safety, and sanitation performance requirements prescribed in these Standards, and
- (6) Any alteration, modification, or waiver will not harm the adjacent land owners, the neighborhood, or the welfare of the public at large, and
- (7) Any alteration, modification, or waiver will not create an additional maintenance or financial burden for the affected property owners or the City.

(C) Application Requirements

- (1) An applicant for an alteration, modification, or waiver to these Standards shall submit a written request to the Director. The request shall state in detail the specific sections and subsections of these Standards requested to be altered, modified, or waived, and the request shall describe in detail why the requested waiver, alteration, or modification meets the criteria in Section 1.05(B), above.
- (2) The Director may require additional documentation to support the request and shall require that sufficient evidence be submitted to substantiate any claims that may be made regarding alterations, modifications, or waivers to these Standards. Sufficient evidence may include verification by a Colorado registered professional Engineer, possessing relevant expertise in the area.

(D) Decision

- (1) The Director will advise the applicant, in writing, of the decision on the requested alteration, modification, or waiver. The Director's decision is a final action that is administrative and may be appealed through the judicial process. In granting any alteration or modification to these Standards, the Director may impose specific conditions necessary to ensure that the criteria described in Section 1.05(B), above, are, and will remain, satisfied.
- (2) The Director of Public Works will consult with the Planning Director when evaluating issues that potentially impact urban design. The details of any decision

granting approval of an alteration, modification, or waiver to these Standards will be entered in the form of written findings. A written log of all decisions granting alterations, modifications, or waivers to these Standards will be kept current in the office of the Director of Public Works and will be available for public inspection.

CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS

CHAPTER 2

TRANSPORTATION DESIGN

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2.01 General

(A) Intent

The Transportation Design Standards are intended to provide for an integrated transportation system for all transportation modes, including pedestrian, bicycle, transit, and motor vehicle.

(B) Transportation Master Plan

All improvements proposed to the City's transportation system shall conform with the goals, policies, and standards adopted in the Transportation Master Plan (TMP).

(C) Reference Standards

Where not specified in these Standards or the B.R.C. 1981, to protect the public health, safety, and welfare, the Director of Public Works will specify the standards to be applied to the design and construction of transportation improvements and may refer to one or more of the references listed in the References Section of these Standards.

(D) Functional Street Classification

Public streets shall be designed and improved to conform to the applicable functional street classification as defined on the "Street Function Class and Proposed Street Facilities" map of the TMP. ~~Section 7.3, "Roadway Functional Classification,"~~ TMP.

2.02 Traffic Study

(A) Traffic Assessment

The Director will require an applicant to submit a Traffic Assessment in order to adequately assess the impacts of any development proposal on the existing and planned transportation system. The Assessment shall include a peak hour trip generation study projection (Refer to 2.03(J)) and may require additional information as determined by the Director.

(B) Traffic Study Requirements

For any development proposal where trip generation from the development during the peak hour of the adjacent street is expected to exceed 100 vehicles for nonresidential applications, or 20 vehicles for residential applications the Director will require an applicant to submit a Traffic Study to evaluate the traffic impacts of any development proposal required to undergo a concept review as set forth in Section 9-4-102-13, "Concept Plan Review and Comment," B.R.C. 1981. The traffic study may include the information required in Subsections (A) through (K), of Section 2.03, "Traffic Study Format," of these Standards at the discretion of the Director.

(C) Responsibilities for Traffic Studies

An applicant for construction approval shall be responsible for assessing all traffic impacts associated with a proposed development, with the City serving in a review and approval capacity.

(D) Preparation

A Traffic Study shall be prepared by an Engineer with adequate experience and expertise in transportation engineering. The Engineer shall be identified in the Traffic Study.

(E) Coordination with City

Transportation consultants and Engineers preparing Traffic Studies shall discuss proposed development projects with the Director prior to initiating the study. Issues to be discussed include, without limitation, the TMP, definition of the study area, relevant subarea plans, methods for projecting build-out volumes, background traffic conditions, trip generation, directional distribution of traffic, and trip assignment. These aspects of the Traffic Study shall be approved by the Director prior to study preparation.

(F) Submittal

A Traffic Study shall be prepared in conformance with, and including, the information required in Section 2.03, "Traffic Study Format," of these Standards.

2.03 Traffic Study Format

(A) Study Requirements

The information provided in the Traffic Study shall include the following sections as outlined below. The study shall be typed and bound, and clearly identify the data and information in the appropriate sections. In addition, the study shall contain a table of contents, lists of figures, and tables, and shall identify any map pockets and included drawings.

(B) Introduction

The Traffic Study shall provide an introduction with an overview and discussion of the project or development proposal.

(C) Site Location and Zoning

Include a vicinity map detailing the property location, a conceptual site plan reflecting the boundaries of the project or development, and information detailing the designated zoning district, general terrain and physical features of the site and the surrounding area.

(D) Study Area Boundaries

Include the Study Area Boundaries as determined based on discussions with the Director and include all roadways and transportation routes providing access to the site and the surrounding transportation system.

(E) Existing Area Street System Description

Describe and include roadway orientations, functional classifications and geometries, intersection geometries, and traffic controls, including without limitation signage and striping, speed limits, parking restrictions, sight distance, transit routes, the presence of bicycle and pedestrian facilities, and any other related traffic operations information and improvements approved or planned by government agencies. For identified improvements scheduled by government agencies, include the nature of the improvements, extent, implementation schedule, and the agency or funding source responsible.

(F) Existing and Projected Roadway and Intersection Traffic Volumes

Include diagrams that map existing traffic volumes, and each variation of projected traffic volumes, for all roadways and intersections within the study area. Also provide diagrams that map the intersection and roadway geometries and traffic control within the study area.

(G) Existing and Proposed Site Uses

Include an identification of the existing land use and proposed land use or the highest potential land use based on zoning and maximum trip generation where a specific use has not been determined. If rezoning is proposed, the study shall provide a comparison between the highest trip generation uses for the existing zoning and the highest trip generation uses for the proposed zoning.

(H) Existing and Proposed Land Uses in Vicinity of the Site

Document any vacant land or potential redevelopment that may result in a change in traffic volume conditions within the study area during each time period studied. Perform and provide trip generation on these parcels and include the trips generated from these parcels in the trip volume diagrams and level of service analyses for each appropriate time period studied.

(I) Travel Transportation Demand Management Strategies

Include an outline of travel transportation demand management strategies to mitigate traffic impacts created by proposed development and implementable measures for promoting alternate modes of travel, including but not limited to the following:

- (1) **Site Design:** Incorporate design features that facilitate walking, biking, and use of transit services to access a proposed development, including features such as transit shelters and benches, site amenities, site design layouts, orientations and connections to increase convenience for alternate modes and reduce multiple trips to and from the site, and direct connections to existing offsite pedestrian, bicycle, and transit systems.
- (2) **Programs and Education:** Incorporate alternate modes programs, such as providing transit passes to employees and residents, van pooling to the site by a major employer, ride-sharing, parking pricing, and planned delivery services, and

educational measures such, as promoting telecommuting, distributing transit schedules and trails maps, signing alternate travel routes, and providing an onsite transportation coordinator or plan to educate and assist residents, employees, and customers in using alternate modes.

(J) Trip Generation

Traffic estimates for the proposed project and potential developed or redeveloped properties in the study area shall be obtained by performing trip generation using the procedures outlined in the most current edition of the *Trip Generation Manual* of the Institute of Transportation Engineers (ITE). If adequate *Trip Generation Manual* data is not available for a specific land use, the procedures used to estimate trip generation data shall be approved by the Director. Include the following specific trip generation information:

- (1) **Summary Table:** List each land use that requires trip generation analysis, including the project plus developed or redeveloped land uses within the study area. For each trip generation summary include land use type, amount, intensity, average trip generation rates for total daily traffic and peak hour traffic (a.m., noon and/or p.m. peak hour traffic generation may be required), and the resultant total trips generated for each time period and each land use.
- (2) **Calculations:** Calculation of projected trip generation for any land use, used to determine study area impacts, shall be based on the following:
 - (a) Trip generation formulas (or rates, if formulas are not available) published in the most recent version of the *Trip Generation Manual*. Trip generation reports from other industry publications may be considered but are subject to the approval of the Director.
 - (b) A local trip generation study, following procedures outlined in the most recent version of the *Trip Generation Manual*, if no published rates are available and similar land uses can be studied.
 - (c) Additional data or studies from other similar jurisdictions. Trip generation obtained in this fashion is subject to the review and approval of the Director.
- (3) **Trip Generation Reductions:** Credit for any trip reductions is subject to review and approval in advance by the Director. Anticipated trip reduction assumptions should be discussed and approved by the Director prior to the preparation of the Traffic Study. Trip reductions typically fall into one of two categories: those that reassign some portion of the trip generation from the surrounding roadway network (passerby and diverted trip reductions), and those that remove trips generated from the land use trip generation (internal and modal split reductions).
 - (a) Use of passerby and diverted trip reductions may be evaluated and considered in reducing the additional estimated total trip generation of a new land use. However, passerby and diverted trip reduction factors are not to be applied directly to reduce trip generation and turning movement volumes at driveways serving the studied land use. These factors are subject to the approval of the Director.

- (b) Internal trip reductions and modal split assumptions may reduce the total trip generation of a land use. These factors considered in the Traffic Study shall supply analytical support and detailed documentation to demonstrate how the estimates were derived and incorporated, and are subject to the approval of the Director.

(K) Trip Distribution/Assignment and Modal Split

Trip distribution/assignment of any generated traffic estimates shall be clearly summarized and illustrated for each access route entering and exiting the generating land use, using the study area transportation system as a basis. Include the following specific trip distribution/assignment information:

- (1) **Trip Distribution:** The trip distribution for each site shall be identified and illustrated with a graphical figure detailing the percentages making each movement, at each intersection in the study area. The trip distribution shall be logically based upon factors such as the site's location within the City's existing traffic volume data in the study area, market analyses, applied census data, and/or professional engineering judgement. Trip distribution assumptions are subject to the approval of the Director.
- (2) **Trip Assignment:** Trip assignment shall be done by applying the trip generation totals for each time period studied, to the trip distribution percentages developed. The trip assignment shall develop anticipated traffic volumes for each of the movements identified by the trip distribution and each of the time periods identified in the analyses. The resulting traffic volumes shall be illustrated with graphical figures detailing the anticipated volumes making each movement, at each intersection in the study area, during each time period studied.

(L) Existing and Projected Traffic Volumes

- (1) **Traffic Volume Scenarios:** Five traffic volume scenarios and three separate times of the day may be required to be included in a Traffic Study analysis. The applicant shall meet with the Director to determine the scenarios and time periods to be studied, prior to the development of the Traffic Study. The number of scenarios and time periods to be studied are subject to the approval of the Director. The potential scenarios and time periods include the following:
 - (a) Scenario 1 - Existing Conditions: An analysis of existing traffic conditions will be required in the Traffic Study. Existing Conditions analysis should attempt to model traffic conditions at the time the traffic study is being prepared. Traffic counts that are older than the year the study is being prepared shall be factored up or adjusted to existing year volumes.
 - (b) Scenario 2 - Anticipated Project Completion Year Without Project Volumes: Include an analysis of the anticipated traffic conditions during the year the project is intended to be finished and traffic is generated. The analysis shall anticipate the increase in background traffic volumes and the generation of other related projects that are not present in the existing condition, but would likely be completed and generating trips in this time

period. The trip generation for the proposed project shall not be included in this scenario. If the project is intended to be completed the same year that the Traffic Study is being prepared, then this scenario is the same as Scenario 1 - Existing Conditions.

- (c) Scenario 3 - Anticipated Project Completion Year With Project Volumes: This scenario is the same as Scenario 2, except that the project volumes are assigned to the roadway network and included in the analyses.
 - (d) Scenario 4 - Future Buildout Conditions Without Project Volumes: An analysis of the anticipated traffic conditions during buildout, using the projected buildout year defined in the City's TMP. The analysis shall anticipate the increase in background traffic volumes and the generation of other related projects that are not present in the existing condition, but would likely be completed and generating trips in this time period. The trip generation for the proposed project should not be included in this scenario.
 - (e) Scenario 5 - Future Buildout Conditions With Project Volumes: This scenario is the same as Scenario 4, except that the project volumes are assigned to the roadway network and included in the analyses.
- (2) **Traffic Volume Projections:** The traffic volume projections shall identify existing and projected daily traffic counts and peak hour turning movement counts for each access point, intersection and street identified in the traffic study area for each of the aforementioned scenarios required in the study.
 - (3) **Time Periods:** Each scenario may be required to look at three different time periods (the a.m., noon and p.m. peak hour conditions). The Director will determine which time periods and scenarios are required for each Traffic Study depending upon the project's size, location, types of land uses and other pertinent factors.
 - (4) **Raw Traffic Count Data:** Include all raw traffic-count data for average daily and peak hour conditions and traffic analysis worksheets in the appendices of the Traffic Study for reference. Computer techniques and associated printouts may be used for this part of the report.

NOTE: All total daily traffic counts must be actual machine counts, not based on factored peak hour sampling. Latest available machine counts from the City, and other agencies, may be acceptable if not more than 2 years older than the year the Traffic Study is being prepared. Data older than the year the Traffic Study is being prepared shall be factored up to current year numbers, using growth rates approved by the Director.

(M) Transportation Service Standards

Include a discussion and analysis assessing the impacts of the project or development proposal on the existing and planned transportation system in the study area with respect to the following traffic impact and mitigation objectives:

- (1) **Transportation Master Plan Objectives:** TMP service standards' objectives

include the following:

- (a) No long-term growth in auto traffic over current levels described as a 0 percent increase in vehicle miles traveled.
 - (b) Reduction in single-occupant vehicle travel to 25 percent of total trips.
 - (c) Continuous reduction in mobile source emission of air pollutants, and no more than 20 percent of roadways congested at LOS F.
- (2) **Level of Service Design Guide:** LOS standards objectives include:
- (a) Minimum LOS D design guide for peak hour conditions for all movements. Project impacts that maintain LOS D or better for all intersections and street segments may not be required to provide LOS-related traffic mitigation improvements.
 - (b) LOS E and lower peak hour conditions require the implementation of one or more transportation management strategies consistent with the goals and objectives of the TMP. A transportation management strategy plan required to address and mitigate these conditions may include travel demand management, land use intensity reduction, site design, layout and access modifications, parking reduction measures, or transportation infrastructure improvements.

(N) Level of Service Analysis

- (1) The Traffic Study shall provide LOS analyses for all study area intersections (signalized and unsignalized) and mid-block roadway segments using methodologies outlined in the current *Highway Capacity Manual*. The analyses should be performed for Scenarios 1 through 5, described in Section 2.0 32(L), "Existing and Projected Traffic Volumes," and for each time period (a.m., noon and/or p.m. peaks) that is required in the Traffic Study, unless otherwise required by the Director.
- (2) Level of service analyses shall consider the appropriate infrastructure, lane usage, traffic control and any other pertinent factors for each scenario to be studied. Intersections with planned improvements, discussed in City planning documents, may have those improvements shown in the level of service analyses.
- (3) Signalized intersection level of service analyses shall use the existing timing and phasing of the intersections for all scenarios. If the analyses are to deviate from existing timings or phasing, then a detailed signal progression analyses for the affected corridor shall also be provided.
- (4) The results of the level of service analyses for each scenario and each time period shall be summarized into one or more tables that illustrate the differences in level of service for each scenario. At a minimum, these tables shall list the level of service results for each intersection to include the level of service for each approach and the total intersection level of service, as well as the appropriate delay values for each approach and the total intersection. These tables shall highlight any locations where the addition of project traffic has caused any

approach of any intersection to fall below the LOS D standard for the City.

(O) Traffic Counts and Analyses Worksheets

Provide capacity analysis calculations based on the planning or operational analysis techniques contained in the current *Highway Capacity Manual* or subsequent highway capacity techniques established by the Federal Highway Administration, including the following:

- (1) **Raw Traffic Count Data:** Include all raw traffic count data for average daily, hourly Average daily trip (ADT), and peak hour conditions and traffic analysis worksheets in the appendices of the traffic study for reference. Computer techniques and associated printouts may be used for this part of the report.
- (2) **Level of Service Analyses:** Include all level of service analyses performed for intersections and roadway links. If signal timing or phasing changes are proposed for traffic mitigation and the signal is currently part of a coordinated system, a progression analysis will be required to ensure that adequate progression is maintained or provided. All progress analysis and assumptions to be used shall be reviewed and approved by the Director.

(P) Traffic Control and Signals

The Traffic Study shall discuss and analyze any traffic control measures that may be necessary to serve a proposed project or development. Any traffic control measures are to be evaluated based on the requirements established in the *Manual on Uniform Traffic Control Devices* (MUTCD) and by the City, and will be applied as necessary to ensure safe and efficient operation of the City's transportation system. The analysis shall demonstrate the need for traffic control measures considering the objectives and policies of the TMP and alternative site designs in order to minimize or mitigate traffic impacts from the proposed project or development. The following traffic control measures are to be addressed:

- (1) **Regulatory Signage, Markings and Islands:** These traffic control measures shall be applied as necessary in conformance with the MUTCD and City standards and policies.
- (2) **Traffic Signals:** The installation of new traffic signals is not encouraged by the City and all possible alternatives to signalization shall be evaluated before the installation of a new traffic signal will be considered. The need for new traffic signals will be based on warrants contained in the MUTCD and on City policies. In determining the location of a new signal, safety and community traffic circulation and progression will be the primary considerations. If a traffic signal is suggested as part of a mitigation package, and the intersection lies within a series of coordinated traffic signals, then a progression analysis may be required to ensure that adequate progression may still be provided. Generally, a spacing of one-half mile between all signalized intersections is to be maintained, to achieve

optimum capacity and signal progression. Pedestrian and bicycle movements shall be considered in all cases and adequate pedestrian clearance is to be provided in the signalization design.

- (3) **Intersection and Access Locations:** To provide flexibility and safety for the existing roadway system and to ensure optimum two-way signal progression, an approved traffic engineering analysis shall be made to properly locate all proposed intersections that may require signalization, and any accesses to the proposed development.

(Q) Traffic Accidents

The Traffic Study may need to include accident analyses at one or more locations in the study area. The Director shall specify whether such accident analyses are needed for each Traffic Study. Where required, estimates of increased or decreased accident potential shall be evaluated for the proposed project or development and appropriate safety related mitigation measures are to be included. Traffic accident data is available from the City of Boulder's Police Department or from the Director.

(R) Noise Attenuation

If residential development is planned adjacent to a roadway designated collector or greater, the City may require noise attenuation measures. A discussion and analysis of noise attenuation measured using the methods in the *Fundamentals and Abatement of Highway Traffic Noise Textbook* is to be included in all traffic studies for residential developments adjacent to roadways designated collector or greater.

(S) Recommendations

- (1) The Traffic Study shall include a section in the report that provides any recommendations of the Engineer. These recommendations shall include the Engineer's recommended location, nature and extent of proposed transportation improvements associated with the project or development to ensure safe and efficient roadway operations and capacity, and compatibility with the City's transportation system and the goals of the TMP.
- (2) These recommendations are to be supported with appropriate documentation and discussion of the technical analyses, assumptions and evaluations used to make the determinations and findings applied in the Traffic Study. In the event that any Traffic Study analyses or recommendations indicate unsatisfactory levels of service on any study area roadways, a further description of proposed improvements or mitigation measures to remedy deficiencies shall be included.
- (3) These proposed improvements or mitigation measures may include projects by the City or The Colorado Department of Transportation for which funds have been appropriated and obligated. These proposals may also include improvements to be funded and constructed by the applicant as part of project or development

construction. Assumptions regarding future roads, widths and lane usages in any analyses are subject to the approval of the Director.

- (4) In general, the recommendation section shall include:
- (a) Proposed and Recommended Improvements: Provide a detailed description and sketch of all proposed and recommended improvements. Include basic design details showing the length, width and other pertinent geometric features of any proposed improvements. Discuss whether these improvements are necessary because of development traffic or whether they would be necessary due to background traffic. Specify the approximate timing necessary for each improvement.
 - (b) Level of Service Analysis at Critical Points: Provide another iteration of the LOS analyses that demonstrate the anticipated results of making recommended improvements, such as movement LOS, operational and safety conditions and conformance with the City's transportation system goals and TMP. In association with LOS analyses for recommended improvements, include a comparison of these results with the background LOS analyses without the proposed project or development. Where appropriate, this step is to be provided for both near term (year of project completion) and buildout scenarios.

(T) Conclusion

Include a conclusion in the report that provides a clear and concise description of the study findings and recommendations, and serves as an executive summary.

(U) Revisions to Traffic Study

- (1) Following City review, the Director may require revisions to a traffic study based on the following considerations:
 - (a) Completeness of the study,
 - (b) Thoroughness of the level of service and impact analyses and evaluations,
 - (c) Compatibility of the study with the proposed access design, project or development plan and local transportation system,
 - (d) Compliance with local and state regulations and design standards, and
 - (e) An analysis of study deficiencies, errors, or conflicts.
- (2) Revisions may also be required as a result of public process with surrounding neighborhoods and land uses or review by City Council or the Planning Board. Additional details requiring traffic study revisions may include, but are not limited to, the following:
 - (a) An enlarged study area

- (b) Alternative trip generation scenarios
- (c) Additional level of service analyses
- (d) Site planning and design issues.

2.04 Site Access

(A) Access Requirements

All accesses and curb cuts shall be designed and constructed in compliance with these Standards and the requirements set forth in Section ~~9-9-53.3-15~~, "Site Access Control," B.R.C. 1981.

(B) Access Permit Required

All accesses and curb cuts proposed and constructed on City streets and alleys require a permit, as set forth in Section ~~9-3.3-15~~, "Site Access," ~~9-9-5~~, "Site Access Control," B.R.C. 1981.

(C) Location of Access

(1) **Spacing:** Table 2-1, "Access Spacing Requirements," shows the required spacing of access points and curb cuts. Minimum spacing from corners shall be measured from point of intersection of the street flowlines. Minimum spacing between accesses shall be measured at the property line.

Table 2-1: Access Spacing Requirements

Minimum Spacing (in Feet) <u>measured from edge of access</u>	Single Family Residential	Other Residential	Commercial	Industrial
Local Streets				
- from property line	7.5'	10'	10'	10'
- from corner	20'	50'	50'	50'
- between accesses	15'	20'	20'	20'
Collector Streets	Permitted only when no other <u>access is available</u> .			
- from property line	access is available.	10'	10'	10'
- from corner		50'	50'	50'
- between accesses		20'	20'	20'
Arterial Streets	Permitted only when no other <u>access is available</u> .			
- from property line	access is available.	75'	75'	75'
- from corner		150'	150'	150'
- between accesses		250'	250'	250'

- (2) **Alignment:** Accesses shall intersect City streets at a 90-degree angle. Accesses to properties on opposite sides of a collector or arterial, where turning movements are not controlled by a center median or access island, shall either be aligned, or offset by at least 150 feet on collectors, or at least 300 feet on arterials. Greater offsets may be required if left-turn storage lanes are required.
- (3) **Relocation of Existing Access Points and Curb Cuts:** Relocation, alteration, or reconstruction of any existing access points and curb cuts shall meet the requirements of these Standards.

(D) Sight Distance

All access points and curb cuts shall provide adequate sight distance as set forth under Section 9-3.3-59-7, "~~Sight Distance~~ Triangles," B.R.C. 1981.

(E) Restriction of Turning Movements

Along streets designated arterial or greater, or where necessary for the safe and efficient movement of traffic, the City will require access points and curb cuts to provide for only limited turning movements, as follows:

- (1) **Access With Barrier Island - Left-Turn Restrictions ("Pork Chop"):** Where restricted turning movements are required by the City, and where the abutting street does not have a median, a barrier island will be required.
 - (a) Islands shall have a minimum area of 150 square feet, be bounded by vertical curb, and have an appropriate concrete center surface treatment, approved by the Director.
 - (b) Barrier island lanes shall be at least 12 feet wide, have a radius of at least 20 feet, and be designed to accommodate the largest vehicle using the access on a daily basis. The island shall provide congruent curb ramps or cut through for sidewalks. The minimum width of the island along the abutting roadway frontage shall be 30 feet for right-in, right-out only islands, and 15 feet for islands allowing right-in, right-out and a left-turning movements.
- (2) **Access With Median Divider Barriers – Left-Turn Restrictions:** Median barriers may be permitted where a median design can improve traffic circulation and safety, or overall site access. Where permitted, medians shall be at least 4 feet wide, and shall extend at least 25 feet beyond the right-of-way.

(F) Traffic Control

All accesses shall be designed and constructed with appropriate traffic control and signage conforming to the MUTCD, B.R.C. 1981, and these Standards.

(G) One-Way Access Lanes

One-way access lanes may be permitted where restricted access is limited to one turning movement, or where the one-way access improves traffic circulation and safety. One-way access lanes shall be at least 12 feet wide, have at least radius of 20 feet, and be designed to accommodate the largest vehicle using the access on a daily basis.

(H) Speed Change Lanes

Speed change lanes shall be required on collectors or arterials when the design hour vehicles from the access will meet or exceed the standards in Section 4.8 of the Colorado State Highway Access Code. Design of speed change lanes shall conform with Subsection 2.07(D), "Horizontal Alignment," of these Standards.

(I) Access and Curb Cut Type

- (1) **Driveway Ramp and Curb Cut:** All new accesses and curb cuts shall be designed as driveway ramps and curb cuts, using the standard ramp driveway details provided in Chapter 11, except as allowed in Subsection (h2), along streets where no curb and gutter exists, or for single family lots where roll-over curbs have been provided.
- (2) **Radii Curb Returns:** Radii curb return accesses may be required or permitted by the Director under the following conditions:
 - (a) The access is located along an arterial or collector.
 - (b) Access volumes indicate a need for a radii curb return where the ADT exceeds 500 or where speed change lanes would be required.
 - (c) The access is designed to restrict turning movements, requiring the installation of an access island or center median.
 - (d) The roadway has no curb and gutter.
 - (e) The access serves an industrial property, or provides for commercial deliveries, where large truck movements are required.
 - (f) The Director determines that a radii access is necessary to ensure adequate traffic safety and operation.
 - (g) The access is for a new public street

Table 2-2: Access Design Specifications

	Single Family Residential	Other Residential	Commercial	Industrial
Width (in feet)				
- Minimum	10	10	15	20
- Maximum	20	35	35	35
- One-Way Lane	N/A	12-18	12-20	14-24
Radii (in feet)				
- Minimum	N/A	15	15	20
- Maximum	N/A	30	30	40
Access Grades				
Initial Grade (to a point 10 ft beyond ROW)				
- Minimum	(+) 3%	(+) 1%	(+) 1%	(+) 1%
- Maximum	(+) 8%	(+) 6%	(+) 6%	(+) 6%
Final Grade (G2)				
- Minimum	(+/-) 3%	(+/-) 1%	(+/-) 1%	(+/-) 1%
- Maximum	(+/-) 14%	(+/-) 8%	(+/-) 8%	(+/-) 8%
Max Grade Break	(+/-) 10%	(+/-) 6%	(+/-) 6%	(+/-) 6%

(J) Access and Curb Cut Width

Access and curb cut widths shall be consistent with Table 2-2, "Access Design Specifications," of these Standards. The width of each access shall be the minimum width that is necessary to serve the property and use. No more than 50 percent of the street frontage shall be occupied by the access driveway, except for access to a cul-de-sac or flag lot. All access widths are measured from edge of pavement to edge of pavement (or curb to curb) at the throat of the driveway (or edge of the right-of-way), and are not inclusive of drive cut transitions or curb return radii.

(K) Access and Curb Cut Radii

Access and curb cut radii shall meet the specifications shown in Table 2-2, "Access Design Specifications," of these Standards. All radii are measured from the flowline or from the edge of the pavement where no flowline exists.

(L) Access and Curb Cut Grades

Access and curb cut grades shall be consistent with Table 2-2. The initial grade (G1) shall be a positive grade, beginning at the back of the sidewalk, the back of the driveway ramp or pan section, or the edge of the pavement (where no curb and gutter exists), and shall continue at least 10 feet beyond the right-of-way. The

final grade (G2) may be positive or negative, depending on the access conditions. The maximum grade break (or change in slope) shall apply at all grade changes. Additional grade changes may occur at intervals of at least 20 feet.

(M) **Driveways**

- (1) **Vehicle Storage:** Adequate driveway storage capacity for both inbound and outbound vehicles to facilitate safe, unobstructed, and efficient traffic circulation and movements from the adjacent roadway and within the development shall be provided, except for single-family or duplex residential driveways on local streets. Adequate driveway length will be subject to approval by the Director and shall extend at least 20 feet beyond the right-of-way before accessing the first off-street parking space or parking lot aisle.
- (2) **Internal Circulation:** Developments requiring off-street parking facilities shall provide onsite vehicular circulation allowing access to all portions of the site without using the adjacent street system, unless a joint access or parking easement with one or more of the adjacent property owners has been dedicated.
- (3) **Backing Into the Right-of-Way Prohibited:** Driveways shall be designed to contain all vehicle backing movements onsite, except for single family or duplex residential uses on local streets.
- (4) **Minimum Back-Up Distance for Detached Single-Family Residential Driveways Accessing Public Alleys:** Driveways shall provide for a minimum distance of 24-feet from the rear of the parking stall or face of garage to the far edge of the adjacent alley right-of-way or turn around area as required by Chapter 9-9-6, "Parking Standards," Appendix A, "Parking Design Standards," B.R.C. 1981.
- (5) **Shared Driveways (Detached Single-Family Residential Only):** Shared driveways to access detached single-family residential lots may be permitted pursuant to an approved site review or subdivision as set forth in Chapter 9-4, "Land Development Review," 9-9-14, "Development Standards Site Review," B.R.C. 1981 or Chapter 9-512, "Subdivisions," B.R.C. 1981, if they meet the following criteria:
 - (a) A common parking court is provided at a ratio of 0.5 additional spaces per unit if less than two onsite parking spaces, meeting City requirements, are provided on each single-family lot served by the shared driveway.
 - (b) The shared driveway is no more than 100 feet long, except in districts zoned LR-ERL-1 (low density residential established district Residential-Low 1), ER-ERE (estate residential established district Residential-Estate), and RR-ERR1 (rural residential established district Residential-Rural 1) and RR 2 (Residential-Rural 2), where the shared driveway may extend up to 300 feet long if each lot accessing the shared driveway exceeds 10,000

- (c) The number of units served shall be no more than three lots or houses that have less than 30 feet of usable frontage on the accessing street.
- (d) Adequate turnaround for vehicles is provided either on an individual lot or lots.
- (e) The driveway is properly engineered and constructed to mitigate any adverse drainage conditions and is appropriately surfaced for the type of development, usage, and zoning district.
- (f) The Driveway is at least 12 feet wide.
- (g) For units not fronting on the accessing street, addressing shall be located near the entrance to the shared driveway insuring visibility of the numbering from the street.
- (h) A public access easement, a minimum fifteen feet in width, for the benefit and use of all properties and property owners accessing the shared driveway has been dedicated and recorded to ensure legal access rights in perpetuity for each property served.
- (i) Driveway spacing conforms with the requirements in Table 2-1, "Access Spacing Requirements," of these Standards.

2.05 Right-of-Way Requirements

Dedication or reservation of public right-of-way required as part of any project or development proposal shall comply with the requirements set forth in Section ~~9-3.3-14, "Reservation, Dedication, and Improvement of Rights-of-Way, 9-9-8, "Reservations, Dedication, and Improvement of Rights-of-Way,"~~ B.R.C. 1981.

2.06 Base Street and Alley Standards

(A) Base Street Standard

Except for residential streets approved pursuant to Chapter ~~9-5, "Subdivisions, 9-12, "Subdivisions,"~~ B.R.C. 1981, and Section 2.09, "Residential Streets," all new streets shall provide at a minimum the base street standard components listed in Table 2-3, "Base Street Standard Components."

(B) Base Alley Standard

Except for residential streets approved pursuant to Chapter ~~9-5, "Subdivisions, 9-12, "Subdivisions,"~~ B.R.C. 1981, and Section 2.09, "Residential Streets," all new alleys shall provide at a minimum the base alley standard components listed in Table 2-4, "Base Alley Standard Components."

Table 2-3: Base Street Standard Components

Street Component	Base Standard
Right-of-Way	60' Minimum Width
Paved Street Section	36' Minimum Width, Curb Face to Curb Face
Travel Lanes	Two Travel Lanes, Two-Way Traffic
Curb and Gutter	Required Both Sides
Parking	Parking Allowed Both Sides
Sidewalks	5' Minimum Width, Detached, Required Both Sides
Streetscape Planting Strips*	<u>8' Preferred Width (6' Minimum) Width</u> , Required Both Sides

*NOTE: In commercial streetside retail zones where 12-foot wide attached sidewalks may be provided, streetscape planting strips may be created using street trees in planting pits with tree grates (15-foot width between back of curb and back of walk).

Table 2-4: Base Alley Standard Components

Alley Component	Base Standard
Right-of-Way	20' Minimum Width
Paved Street Section	18' Minimum Width, Pavement Edge to Pavement Edge
Travel Lanes	Two-Way Traffic Allowed
Parking	Parking on Alley Not Permitted

2.07 Street Geometric Design

(A) Minimum Requirements

Except for State Highways and the geometric design variations allowed for residential streets approved pursuant to Chapter 9-5, "Subdivisions, 9-12, "Subdivisions," B.R.C. 1981, and Section 2.09, "Residential Streets," all city streets shall be designed in conformance with this section. The design standards outlined in this section are minimum design standards, and all street design shall meet or exceed these standards. On streets designated collector or arterial in the TMP, the Director may specify standards to be applied to street design that may exceed the minimum standards in this section based on functional need to ensure safe and efficient operation of the street.

(B) Right-of-Way

The right-of-way width required for new streets shall comply with the requirements of Section 9-3.3-14, "Reservation, Dedication, and Improvement of Rights of Way, 9-9-8, "Reservations, Dedication, and Improvement of Rights-of-Way," B.R.C. 1981, and shall include without limitation the following elements:

- (1) The paved roadway section including without limitation travel lanes, turning and speed change lanes, transit lanes, bicycle lanes, and parking lanes;
- (2) Curbs and gutters or drainage swales;
- (3) Roadside and median landscaping areas;
- (4) Sidewalks and multi-use paths; and
- (5) Any necessary utility corridors.

(C) Lane Width

Street lanes shall meet the minimum width specifications shown in Table 2-5, "Minimum Street Lane Widths," of these Standards.

Table 2-5: Minimum Street Lane Widths

Travel Lanes*	Auxiliary Lanes*	On-Street Bicycle Lanes	Parking Lanes
11'	10'	56', with parking lane	7'-8' from curb face
		6.5' from curb face w/out parking lane	

NOTES: Travel and Auxiliary lane dimensions do not include gutter pan width. Auxiliary lanes include, without limitation, turning and speed change lanes.

(D) Horizontal Alignment

- (1) **Conformance to Street Plan:** Horizontal alignment shall conform to the pattern of streets in the Boulder Valley ~~Community-Comprehensive~~ Plan, TMP, and adopted right-of-way plans and shall provide continuous alignment with existing, planned, or platted streets with which they will connect.
- (2) **Extension to Property Line:** All streets shall be extended to the property lines across the property to be developed, unless the street to be constructed has been approved by the City as a cul-de-sac or other no-outlet street.
- (3) **Minimum Horizontal Curve:** Street curvatures shall meet the minimum specifications shown in Table 2-6, "Minimum Horizontal Street Curve Specifications," of these Standards.

Table 2-6: Minimum Horizontal Street Curve Specifications

Design Criteria	Local Street	Collector Street	Arterial Street
Minimum Design Speed	20 mph	35 mph	40 mph
Minimum Centerline Radius	100 feet	300 feet	500 feet
Minimum Reverse Curve Tangent	50 feet	100 feet	200 feet
Minimum Intersection Approach Tangent	100 feet	200 feet	300 feet

- (4) **Design Horizontal Curve:** The design horizontal street curvature shall meet or exceed the minimum horizontal curvature and be calculated using the following equation:

$$R = V^2 / 15 * (e-f)$$

Where: E = rate of superelevation per foot
 F = side friction factor
 V = vehicle speed in MPH
 R = radius of curve in feet

Side Friction Factors	
Design Speed (mph)	Side Friction Factor (f)
30	0.22
35	0.20
40	0.18
45	0.16

(5) **Intersections and Street Spacing**

- (a) **Angles:** All streets shall intersect at right angles (90°).
- (b) **Minimum Street Spacing:** Spacing between streets, as measured from centerline to centerline, shall equal or exceed the minimum distances shown in Table 2-7, "Minimum Street Spacing," of these Standards.

Table 2-7: Minimum Street Spacing

Street Type	Minimum Street Spacing
Local	150 feet
Collector	300 feet
Arterial	500 feet

- (c) **Street Spacing for Signalized Intersections:** Signalized intersections shall be spaced at half-mile intervals, although other locations may be approved by the Director if adequate signal progression can be maintained.

- (e)(d) **Corner Radii:** The minimum property line corner and flowline radii at intersections shall meet or exceed the minimum radii specifications shown in Table 2-8, "Minimum Intersection Radii," of these Standards.

Table 2-8: Minimum Intersection Radii

Street Type	Minimum Flowline Radius	Minimum Property Radius
Local	25 feet	15 feet
Collector	30 feet	15 feet
Arterial	30 feet	10 feet

- (6) **Road Width Transition Tapers:** Where two street sections of different widths are to be connected, a transition taper is required between the outside traveled edge of the two sections. The length of the transition taper shall be calculated using the following equation:

$$L = WS$$

Where: S = Speed in MPH
L = Length in feet
W = Width of offset in feet

This transition is not

to be used in the design of left turn storage lanes or speed change lanes.

- (7) **Left Turn Lanes**

(a) **Storage Length:** Left turn lane storage length shall be determined based on traffic volumes using the Leisch nomographs provided in the ITE *Guidelines for Major Urban Street Design*. The left turn lane storage length shall not be less than 50 feet. Where dual left turn lanes are provided, the lane storage length shall be based on at least 60 percent of the single lane storage length.

(b) **Lane Change Taper:** Left turn lane change tapers shall be calculated using the equation for bay tapers in Subsection (8).

- (8) **Speed Change Lanes:** Speed change lanes required for transitional access to turning lanes shall be designed according to the design standards provided in the ITE "Guidelines for Major Urban Street Design," as follows:

(a) **Bay Tapers:** Bay tapers are required for the lane transition from the travel lane into a turn lane. The bay taper length shall be calculated using the following equation:

$$L = WS / 3$$

Where: S = Speed in MPH
L = Length in feet
W = Width of offset in feet

(b) **Approach Tapers:** Approach tapers are required to transition the position of travel lanes to accommodate turn lanes. The approach taper length shall be calculated using the following equation:

$$L = WS^2 / 60$$

Where: S = Speed in MPH
L = Length in feet
W = Width of offset in feet

- (9) **Cul-de-sacs:** Where allowed, cul-de-sacs shall have a minimum pavement diameter of 90 feet, curb face to curb face, and a minimum right-of-way diameter

of 115 feet, except for residential streets approved pursuant to Chapter 9-5, "Subdivisions, 9-12, "Subdivisions," B.R.C. 1981, and Section 2.09, "Residential Streets." Cul-de-sacs are prohibited on arterial and collector streets, and are strongly discouraged on local and residential streets. The Director may permit cul-de-sacs where there is no other possible street or driveway access to a property from a public right-of-way, or if a cul-de-sac would avoid direct property access to a collector or arterial.

(E) Vertical Alignment

- (1) **Minimum Street Grade:** All street grades shall equal or exceed the minimum street grade of 0.5 percent.
- (2) **Maximum Street Grade:** Street grades shall not exceed the maximum street grades shown in Table 2-9, "Maximum Street Grades," of these Standards.

Table 2-9: Maximum Street Grades

Street Type	Maximum Street Grade
Local	8%
Collector	6%
Arterial	5%
Intersection Approach (Minimum 50')	4%
Signalized Intersection Approach (Min. 50')	2%

- (3) **Design Controls for Vertical Curves:** Design control for sag and crest vertical curves, (based on a design speed of 30 mph) shall meet the specifications shown in Table 2-10, "Vertical Curve Design Control," of these Standards. For design speeds in excess of 30 mph, design control shall be in accordance with the current edition of "A Policy on Geometric Design of Highways and Streets," 1990 edition, prepared by the American Association of State Highway and Transportation Officials.

Table 2-10: Vertical Curve Design Control

Algebraic Difference in Grades	Sag Curve Minimum Vertical Curve Length	Crest Curve Minimum Vertical Curve Length
0.5 - 1.0 %	50 feet	100 feet
1.0 - 3.0 %	100 feet	100 feet
3.0 - 5.0 %	200 feet	150 feet
5.0 - 7.0 %	300 feet	200 feet

7.0 - 8.0 %	300 feet	300 feet
Min. Vert. Sight Distance	N/A	250 feet

- (4) **Vertical Sight Distance:** Vertical curve sight distance shall equal or exceed 250 feet. Greater vertical sight distance may be required by the Director to ensure safe travel and street crossings for all transportation modes.

(F) Sight Distance

All streets and alleys shall provide adequate sight distance as set forth under Section 9-3.3-59-9-7, "Sight Distance Triangles," B.R.C. 1981.

(G) Medians

The Director will require raised medians on new arterial streets. Raised medians may be permitted on all streets subject to review and approval by the Director.

- (1) **Median Widths:** Medians shall be at least 4 feet wide, curb face to curb face. If left turn lanes are installed in the median, the median width adjacent to the left turn storage lanes shall be 4 feet and the median width at the start of the left turn lane bay taper shall be at least 14 feet wide, curb face to curb face. Median design widths shall conform to Table 2-11, "Median Width Design Standards," of these Standards.

Table 2-11: Median Width Design Standards

Function	Minimum Width	Recommended Width
Separation of Opposing Traffic	4 feet*	10 feet*
Pedestrian Refuge or Traffic Control Device Location	6 feet*	14 feet
Medians Separating Left Turn Lanes	14 feet	20 feet

* NOTE: Cannot accommodate left-turn lanes

- (2) **Landscaping in Medians:** Landscaping in medians shall comply with the requirements of Chapter 3, "Streetscaping," of these Standards.

(H) Vertical Clearance of Structures

At least 17.5 feet of vertical clearance shall be provided for all overhead structures. Vertical clearance is measured from the crown of the street to the lowest portion of the structure on all streets and alleys.

2.08 Sidewalks

(A) Required

Sidewalks are required on both sides of all new streets, except for residential streets that were approved without required sidewalks pursuant to Chapter 9-5, "~~Subdivisions~~, 9-12, "Subdivisions," B.R.C. 1981, and Section 2.09, "Residential Streets."

(B) Conformance with the Transportation Master Plan

Off-street sidewalks may be required as part of any project or development proposal in conformance with ~~Section 6.1, "Pedestrian Policy Plan,"~~ in the TMP.

(C) Compliance with Americans with Disabilities Act (ADA)

All public sidewalks shall comply with the requirements of the ADA's "Standards for Accessible Design," which includes without limitation sidewalk widths, grades, locations, markings, surface treatments, and access ramps.

(D) Minimum Widths

Sidewalk widths shall conform to the dimensions shown in Table 2-12, "Minimum Sidewalk Widths," of these Standards.

Table 2-12: Minimum Sidewalk Widths

Minimum Sidewalk Width			
	Adjacent Land Use		
Street Type	Commercial/Retail	Commercial/Industrial	Residential
Local	12	5	4
Collector	12	5	5
Arterial	12	8	8

Note: All off-street multi-use/bike paths designated in the Transportation Master Plan shall be 12 feet wide.

(E) Vertical Grades

The vertical grade of a sidewalk shall not exceed 8.33 percent, a ratio of 12 feet

horizontal to 1 foot vertical (12:1).

At sidewalk locations adjacent to transit stops or transfer points, the Director may require wider sidewalk sections to provide for adequate passenger storage areas.

(F) Vertical Clearance

A minimum 8 foot vertical clearance shall be provided between all sidewalk and multi-use path surfaces and any overhead encroachments.

2.09 Residential Streets

(A) Purpose

- (1) The residential street standards were developed to allow a variety of choices in the creation of new transportation corridors within the urban environment under conditions that will not compromise the safety and function of the city street system. Traditionally streets have provided the following:
 - (a) Corridors for pedestrian, bicycle, transit, and motor vehicle movement;
 - (b) Parking for vehicles;
 - (c) Fire, police, and emergency access;
 - (d) Locations for public utilities networks including water supply, sewage, electricity, telecommunications and gas services, and refuse disposal; and
 - (e) Postal and other delivery services.
- (2) These standards recognize that streets, if appropriately designed, may provide additional community amenities including landscape buffers, attractive public gathering spaces, opportunities for neighborhood interaction, public art, view corridors, and potential avenues for new technologies.

(B) Scope

(1) Location of Streets

- (a) These standards are intended to be used for new streets in undeveloped areas of the city.
- (b) Where infill development in the existing developed portions of the city requires the creation of new streets, these alternative standards may be used if the Director finds, after completing the review process described in Section (C) below, that the new streets will not impair the functions of the surrounding transportation system nor negatively impact the character of the surrounding existing development.

- (c) Further, the Director may determine that these standards are appropriate for redesigning and reconfiguring existing streets. Because the public cost of retrofitting, reconfiguring, or redesigning existing streets is often expensive, decisions about reconstruction of individual streets in accordance with these standards shall be made pursuant to the city's Capital Improvements Program process.

(2) **Methods of Review**

- (a) Permitted: The following street types may be developed without review:
 - (i) Residential collector street
 - (ii) Residential street
 - (iii) Residential alley
- (b) By Director Review: Residential streets listed in paragraph (B)(2)(a) and the street types listed below may be developed upon approval by the Director under the criteria outlined in Section (C) below.
 - (i) Rural residential street
 - (ii) Access street
 - (iii) Access lane
- (c) By Site Review: Those underlined criteria and specifications in the following residential street standards may be appropriate for modification under certain limited circumstances. Developments requesting such modifications shall meet all of the requirements of Section ~~9-4-119-2-14~~, "Site Review," B.R.C. 1981, in addition to the criteria outlined in Subsection (C), "Director Review," below.

- (3) **Cumulative Standards**: These street standards are intended to be used in combination with Section 2.079, "Street Geometric Design," of these Standards. Where the standards in this section are silent, the criteria or specifications contained in Section 2.079 shall control.

(C) **Director Review**

- (1) **Application**: As part of a subdivision application, the applicant for residential street construction approval shall include plans that depict the building envelopes of all proposed structures, and the location of proposed trees, street furniture, fire hydrants, meter pits, utility cabinets, or pedestrians in the right-of-way.
- (2) **Criteria**: The Director will consider the following factors in determining whether an alternative street design is appropriate in a particular location:
 - (a) Urban Design: The street should contribute to the creation of an attractive community and to a clearly defined sense of place. Streets shall be designed with due attention to building spacing and setbacks, green

spaces, attractive materials, plantings, and landscaping. Pavement and right-of-way widths that are less than the Residential Street standard should provide a benefit to the community that includes improved safety, improved site design, the creation of street canopies through landscaping, and secondary lot access through the use of alleys. Rural Residential streets shall be consistent with the existing character of the area, or with an approved subcommunity or area plan.

- (b) Street Function: The street should be designed according to its function. This may require a diversity of street types, each serving a role in a hierarchical system. The street pattern and any reduced pavement or right-of-way widths should provide acceptable levels of accessibility, safety and convenience for all street users, including emergency service providers. The pattern shall discourage residential streets from operating as pass through traffic routes for externally generated traffic, while minimizing the length of time local drivers need to spend in a low-speed environment.
- (c) Connectivity: The neighborhood street pattern should be simple, and logical, with the following characteristics:
 - (i) "No outlet" streets will be highly discouraged and allowed only when street connectivity is unachievable:
 - (ii) The street pattern provides for safe and convenient movements for pedestrians, bicycles, and motor vehicles, including transit.
- (d) Design Speed: The design of the streets will control vehicular speeds under normal driving conditions to that specified in the residential street standards, while maintaining reasonable access for emergency vehicles.
- (e) Minimize Maintenance Costs: The street will not create additional city obligations for maintenance and repair that exceed a standard street section.
- (f) Adequate Parking: The site design provides for adequate on-street and off-street parking to serve the area.
- (g) Infill Streets: In the case of infill development, the residential street design will not impair the functioning of, and will have a compatible transition to, the surrounding street system and will not negatively impact the character of the surrounding existing development. No additional density may result from approval of the reduced rights-of-way provided for in the case of Access Streets, Access Lanes, or Residential Alleys.

(D) Residential Street Sections

Five residential street sections and a residential alley may be applied to the design of residential neighborhoods as part of subdivisions approved pursuant to Chapter 9-5,

~~“Subdivisions 9-12, “Subdivisions,”~~ B.R.C. 1981. Residential streets shall be designed in compliance with the standards outlined in Table 2-13, “Residential Street Design Standards,” “Technical Drawings 2.63 - 2.68,” Chapter 11, of these Standards, and the requirements of this Section.

- (1) **Residential Collector Street:** The residential collector street collects and distributes neighborhood traffic from residential streets to community collector and arterial transportation systems, and provides access to individual properties. The residential collector street is designed for residential streets where anticipated traffic volumes range from 1,000 to 2,500 vehicle trips per day. In addition to the requirements outlined in Table 2-13, “Residential Street Design Standards,” and “Technical Drawing 2.63,” Chapter 11, the residential collector street shall be designed to meet the following minimum standards:
 - (a) Parking: On-street parking is allowed on both sides.
 - (b) Bicycle Facilities: Additional street and right-of-way width shall be provided where onstreet bicycle lanes are required by a City-adopted subcommunity or area plan, the TMP, or the BVCP.
 - (c) Provision of Alleys: Where alleys are provided or required to be provided under a City-adopted subcommunity or area plan, onsite parking spaces shall be accessed from the alley and not the street.
 - (d) Emergency Response: Residential collectors exceeding 500 feet in length from any intersection shall provide a secondary emergency access at 500-foot intervals.

- (2) **Residential Street:** The residential street is designed to provide access to individual properties as well as access to the higher classification street network. The residential street provides for neighborhood circulation and may carry neighborhood traffic and through movements. The residential street is designed to carry traffic volumes in the range of 500 to 1,000 vehicles per day. ~~In addition to the requirements outlined in Table 2-13, “Residential Street Design Standards,” and “Technical Drawing 2.64,” Chapter 11, the~~ The residential street shall be designed to meet the minimum standards shown in Table 2-13, “Residential Street Design Standards,” and “Technical Drawing 2.64,” Chapter 11, of these Standards.

Table 2-13: Residential Street Design Standards

Design Standards	Residential Collector	Residential Street	Rural-Type Residential Street	Access Street	Access Lane	Residential Alley
Design Speed	25 mph	25 mph	20 mph	15 mph	10 mph	10 mph
Design Traffic Volumes (Vehicle Trips Per Day)	1,000 - 2,500	500 - 1,000	500 - 1,000	400	250	N/A
Minimum Right-of-Way	60'	60'	60'	40'	30'	16'
Minimum Pavement Section	<u>32'</u>	<u>30'</u>	22' plus 2' gravel shoulders	26'	20'	12'
Sidewalk	5'	<u>4'</u>	4' where required	4'	N/A	N/A
Streetscape Planting Strip	8'	<u>8'</u>	N/A	N/A	N/A	N/A
Minimum Centerline Radius	300'	150'	150'	100'	100'	100'
Minimum Curb Radius	20'	20'	20'	10'	10'	10'
Maximum Length Between Connecting Streets	<u>500'</u>	500'	500'	<u>350'</u>	<u>350'</u>	<u>N/A</u>
Maximum Street Length - No Outlet	500'	500'	500'	<u>150'</u>	<u>150'</u>	500'
Maximum Street Length - Loop or Circle Street	<u>500'</u>	<u>500'</u>	<u>500'</u>	<u>500'</u>	<u>500'</u>	<u>500'</u>
Minimum Turn-Around Area	35' Radius	35' Radius	30' Radius or "Y" or "T" Turn	30' Radius or "Y" or "T" Turn	25' Radius or "Y" or "T" Turn	25' Radius or "Y" or "T" Turn
Emergency Response Set Up Area Intervals	N/A	N/A	N/A	150'	150'	N/A
Sidewalk Placement	Detached Required	Detached Required	Adjacent to Property	<u>Attached</u>	N/A	N/A

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Design Standards	Residential Collector	Residential Street	Rural-Type Residential Street	Access Street	Access Lane	Residential Alley
			Line Where Req'd.			
Curb and Gutter	Required	Required	N/A	Required	N/A	N/A
On-Street Parking	Allowed	Allowed	Allowed	Allowed	Allowed	Not Allowed
Minimum Lot Frontages	N/A	N/A	<u>N/A</u> <u>60' no alley</u> <u>40' w/ alley</u>	<u>60'</u> no alley <u>40'</u> w/alley	<u>60'</u>	N/A
Maximum Number of Units to be Accessed	N/A	N/A	N/A	<u>25</u> <u>snl fa</u> <u>single</u> <u>family</u>	<u>15</u> <u>snl fam</u> <u>single</u> <u>family</u>	N/A

NOTE: Residential street standards that are underlined may be varied through Section 9-4-119-2-14, "Site Review," B.R.C. 1981.

- (a) **Parking:** Parking is allowed both sides or, on residential streets where parking is restricted or prohibited, off-street parking courts providing parking spaces at a ratio of 0.5 spaces per dwelling unit shall be provided.
 - (b) **Bicycle Facilities:** Additional street and right-of-way width shall be provided where on-street bicycle lanes are required by a City-adopted subcommunity or area plan, the TMP, or the BVCP.
 - (c) **Provision of Alleys:** Where alleys are provided or required to be provided under a City-adopted subcommunity or area plan, onsite parking spaces shall be accessed from the alley and not the street.
 - (d) **Emergency Response:** Residential streets exceeding 500 feet from any intersection shall provide a secondary emergency access at 500-foot intervals.
- (3) **Rural Residential Street:** The rural residential street is designed to provide access to individual properties as well as access to the higher classification street network. The rural residential street provides for neighborhood traffic and through movements, and is designed to carry traffic volumes in the range of 500 to 1,000 vehicles per day. The rural residential street shall be provided where prescribed by a City-adopted subcommunity or area plan to maintain the rural character of an area or neighborhood. The rural residential street is a curbless

paved street section, with gravel shoulders for parking and open roadside ditches for drainage. In addition to the requirements outlined in Table 2-13, "Residential Street Design Standards," and "Technical Drawing 2.65," Chapter 11, the rural residential street shall be designed to meet the following standards:

- (a) Parking: Allowed on both sides of the street.
 - (b) Turnaround Standard (No Outlet Streets): If a "Y" or "T" turnaround is proposed in place of a standard cul-de-sac bulb turnaround, the "Y" or "T" turnaround shall be designed 60 feet long and 20 feet wide. The turnaround area (including sidewalks if required) shall be contained within the dedicated right-of-way.
 - (c) Provision for Future Sidewalks: If sidewalks are not required at the time of initial street construction, adequate space in the right-of-way shall be reserved for a future sidewalk and commitments from adjacent property owners to participate in assessment districts shall be obtained, so that sidewalks can be added and funded in the future when they are appropriate.
 - (d) Sidewalk Placement (Where Required): Sidewalks shall be required where vehicular traffic volumes are anticipated to exceed 1,000 trips per day, on routes to school, and as prescribed by a City-adopted subcommunity or area plan. Sidewalks shall be placed outside of the paved roadway and drainage ditch, and inside the right-of-way line.
 - (e) Roadside Drainage Ditches: Sideslopes along roadside drainage ditches shall be 4:1, and driveway culverts, at least 12 inches in diameter with flared end sections or headwalls, shall be installed by owners at driveways.
 - (f) Land Use Requirements: Lot frontages shall be at least 60 feet wide, unless alley access is provided. Lot frontages with alley access shall be at least 40 feet wide. Two onsite parking spaces, meeting all City requirements, shall be provided on each single-family lot.
 - (g) Provision of Alleys: Where alleys are provided or required to be provided under a City-adopted subcommunity or area plan, onsite parking spaces shall be accessed from the alley and not the street.
 - (h) Emergency Response: Rural residential streets exceeding 500 feet from any intersection shall provide a secondary emergency access at 500-foot intervals.
- (4) **Access Street**: The access street provides public access to no more than 25 single-family dwelling units, where anticipated vehicular volumes would not exceed 400 trips per day. The access street is narrow, to ensure slower speeds for vehicular travel, and provides sidewalks along both sides of the street. In addition to the requirements outlined in Table 2-13, "Residential Street Design Standards," and "Technical Drawing 2.66," Chapter 11, the access street shall comply with the

following minimum standards:

- (a) Parking: Parking is allowed on both sides of the street or, if parking is not provided on-street, a parking court at a ratio of 0.5 spaces per dwelling unit is required.
 - (b) "L" Intersections: "L" intersections may be permitted as part of subdivision, and are subject to approval by the Director. Where permitted, "L" intersections shall have at least a 150-foot-long tangent street section from the intersection to the closest curvature and a minimum corner radius of 50 feet.
 - (c) Circle or Loop Street: If a circle or loop street is proposed as part of subdivision, the street shall connect to a higher classification street, or connect to two separate perpendicular or offset higher classification streets.
 - (d) Turnaround Standard (No outlet streets): If a "Y" or "T" turnaround is proposed in place of a standard cul-de-sac bulb turnaround, the "Y" or "T" turnaround shall be designed with a 60 foot length, 20 foot width. The turnaround area (including sidewalks if required) shall be contained within dedicated right-of-way.
 - (e) Land Use Requirements: A residential access street shall connect to a higher classification street. Lot frontages shall be at least 60 feet wide, unless alley access is provided. Lot frontages with alley access shall be at least 40 feet wide. Two onsite parking spaces, meeting all City requirements, shall be provided on each single-family lot.
 - (f) Provision of Alleys: Where alleys are provided or required to be provided under a City-adopted subcommunity or area plan, onsite parking spaces shall be accessed from the alley and not the street.
 - (g) Emergency Response: Access streets exceeding 175 feet from any intersection shall provide a fire apparatus setup area at 150 foot intervals. The setup area shall provide at least 30 foot long, 25 foot wide clear zone, and is subject to approval by the Fire Department.
- (5) **Access Lane**: The access lane provides public access to no more than 15 single family dwelling units, where anticipated vehicular traffic volumes would not exceed 250 trips per day. The access lane is a narrow "shared street" for all modes of travel (vehicular, bicycle, and pedestrian), without curb and gutter or sidewalks, and must connect with a higher classification street. In addition to the requirements outlined in Table 2-13, "Residential Street Design Standards," and "Technical Drawing 2.67," Chapter 11, the access lane shall comply with the following minimum standards:
- (a) Parking: Parking is allowed.
 - (b) "L" Intersections: "L" intersections shall have a minimum 150-foot long

tangent street section from the intersection to the closest curvature and a minimum corner radius of 50 feet.

- (c) Circle or Loop Street: A circle or loop street shall connect to a higher classification street, or connect to two separate perpendicular or offset higher classification streets.
 - (d) Turnaround Standard (No outlet streets): A "Y" or "T" turnaround shall be designed with a 60 foot length, 20 foot width. The turnaround area (including sidewalks if required) shall be contained within dedicated right-of-way.
 - (e) Land Use Requirements: An access lane shall connect to a higher classification street. Lot frontages shall be at least 60 feet wide. Two onsite parking spaces, meeting all City requirements, shall be provided on each single-family lot. If the minimum lot frontage requirement is not met, additional parking spaces shall be provided at a ratio of 0.5 spaces per dwelling unit as a part of the subdivision. These required spaces shall be located on private property.
 - (f) Right-of-Way Landscaping: Landscaping other than ground cover or low shrubbery shall be placed outside of the right-of-way.
 - (g) Emergency Response: Access streets exceeding 175 feet from any intersection shall provide a fire apparatus setup area at 150 foot intervals. The setup area shall provide a minimum 30-foot long, 25 foot wide clear zone, and is subject to approval by the Fire Department.
- (6) **Residential Alley**: The residential alley is to provide secondary vehicular access to the rear of lots in detached single-family dwelling subdivisions with narrow street frontages, in order to limit curb cuts from the street and increase on-street parking. Alleys are most beneficial when lot widths are narrower than 50 feet. In addition to the requirements outlined in Table 2-13, "Residential Street Design Standards," and "Technical Drawing 2.68," Chapter 11, the residential alley shall be designed to meet the following minimum land use requirements: Backup distance for parking and garage access from the alley shall be 24 feet, including the 16-foot alley right-of-way width, and the remaining backup distance shall be provided on the lot being served.

2.10 Emergency Access Lanes

(A) Emergency Access Required

All industrial, commercial, and residential developments shall provide adequate emergency vehicle access. Adequate emergency access is a minimum 20 foot wide unobstructed fire apparatus access road with an unobstructed vertical clearance of 13.5 feet, and meets all applicable standards as set forth in ~~Section 902, "Fire Department Access," of the 1997 Uniform Fire Code~~ Chapter 10-8, "Fire Prevention Code," B.R.C. 1981.

(B) When Emergency Access Lane is Required

When adequate emergency access is not available from a public street, an applicant for construction approval shall construct an emergency access lane. Emergency access lanes must accommodate all emergency vehicles, including fire equipment.

(C) Secondary Emergency Access

Secondary emergency access lanes shall be provided to structures whenever the distance to the nearest public street equals or exceeds 500 feet. Secondary access lanes shall conform to all design requirements specified for emergency access lanes.

(D) Local Emergency Access Lane Standards

In addition to the emergency access standards set forth in ~~Section 902, "Fire Department Access," of the 1997 Uniform Fire Code~~ Chapter 10-8, "Fire Prevention Code," B.R.C. 1981, an emergency access lane shall equal or exceed the following standards:

- (1) **Direct Route:** Emergency access lanes shall provide the shortest practical direct access to points of concern, and be entirely contained within a minimum, continuous 20 foot wide emergency access easement or public right-of-way.
- (2) **Distance From Structure:** Emergency access lanes shall be provided whenever a structure is located more than 150 feet from fire apparatus access.
- (3) **Surface:** An emergency access lane shall consist of either of the following:
 - (a) Two concrete strips at least 4 feet wide, with a 4-foot separation between them. Vegetation other than grass shall not be permitted in the separation area.
 - (b) A minimum continuous paved surface width of 12 feet.
- (4) **Radius:** An emergency access lane shall provide a minimum turning radius of 25 feet, or the radius needed to accommodate an SU-30 vehicle.
- (5) **Turnarounds:** If the length of the emergency access lane exceeds 150 feet (without an outlet accessible to emergency vehicles), then a turnaround with a minimum radius of 45 feet shall be provided.
- (6) **Grade:** The grade for an emergency access lane shall not exceed five percent. Exceptions may be allowed with specific approval from the City of Boulder Fire Chief where this standard cannot be met due to topographical conditions. ~~In no case shall the maximum grade for an emergency access lane exceed 8 percent.~~
- (7) **Vertical Clearance:** Vertical clearance from the surface of the emergency access lane shall be at least 13.5 feet.

(E) Unobstructed Access

Emergency access lanes shall be kept free and clear of all obstructions. If the Director or Fire Chief determines that barriers are needed to prevent automobile traffic from using an emergency access lane, then the applicant for construction approval shall install traffic bollards. Traffic bollard designs shall provide for immediate access of emergency vehicles, without requiring these vehicles to stop and maneuver around, or unlock, any structures. The Director and Fire Chief shall have final approval of all bollard designs.

(F) Access Identification

Signs and pavement markings will be required if necessary by the Director and Fire Chief to delineate and identify emergency access lanes. All signage for emergency access lanes shall conform with the specifications in the MUTCD.

2.11 Bicycle Facilities and Multi-Use Path Design

(A) Conformance with Bicycle System Plan

The arrangement, type, and location of all bicycle paths, trails, and routes shall conform with the "Bicycle System Plan" section in the TMP. All new construction shall conform to the standards for bicycle lane facilities outlined in this section, the "Guide for the Development of Bicycle Facilities" prepared by the American Association of State Highway and Transportation Officials and the "Regulatory Negotiation Committee on Outdoor Developed Areas" prepared by the United States Architectural and Transportation Barriers Compliance Board (Access Board).

(B) On-Street Bike Lanes - Streets Without On-Street Parking

Bicycle lanes on new streets without on-street parking shall be at least 5 feet wide, exclusive of the curb pan, or 6.5 feet from the face of any curb. On existing streets where on-street bike lanes are being added and available right-of-way or improvements space is restricted, the width of the bicycle lane may be reduced to at least 5 feet wide, inclusive of the curb pan.

(C) On-Street Bike Lanes - Streets With On-Street Parking

Bicycle lanes on new streets with on-street parking shall be at least 6.5 feet wide, exclusive of the parking lane, or 14.3 feet from the face of any curb. On existing streets where on-street bike lanes are being added and available right-of-way or improvements space is restricted, the width of the bicycle lane may be reduced to at least 5 feet wide, exclusive of the parking lane, or 12 feet from the face of any curb.

(D) **Off-Street Bike Paths or Trails**

Design for off-street bike lanes, trails or paths shall conform to the design guidelines detailed in the City's "Greenways Design Guidelines" adopted as part of the Tributary Greenways Master Plan. Off-street bike lanes, trails or paths shall be at least 10 feet wide with an inside edge radius of at least 15 feet and shall conform to "Technical Drawing 2-04.B2.02D," Chapter 11, of these Standards.

(E) **Bicycle Parking**

Bicycle parking should be located in a visible and prominent location that is lit at night and physically separated from automobile parking to prevent vehicles from intruding into the bike parking area. All bicycle parking constructed in the City of Boulder shall conform to the provisions in the Section 9-3.3-139-6(g), "Bicycle Parking," B.R.C. 1981 or as adopted in any subcommunity or area improvement plan.

- (1) **Bicycle Racks Parking in Public Right-of-Way:** Bicycle parking racks located in the public right-of-way shall be designed using either the inverted "U" standard or the Cora style rack. A minimum aisle of 5 feet shall be provided for bikes to maneuver in when accessing the rack. All racks shall be attached to a concrete base using a high security tamper proof anchor such as a mushroom head carbon steel expansion anchor "spike" #5550 as manufactured by Rawl or an equivalent theft-proof device.

The inverted U rack is designed to park two bicycles, facing opposite directions, parallel to the rack. For the rack to meet its design specification of parking two bikes, it must be installed according to the specifications below, otherwise it will be considered to provide parking for one bike. The inverted U standard may be installed with the following conditions:

- (a) Where the U rack is installed oriented parallel to a wall or curb, at least 2.53.0 feet shall be provided between the parallel wall or curb and the center of the rack. Where a bike rack is located near a curb with "head-in" automobile parking, a minimum distance of 5 feet from the curb to the center of the rack is required to avoid damage to bicycles or racks by automobiles extending across the curb over the sidewalk.
- (b) Where the U rack is installed oriented perpendicular to a wall or curb, a minimum distance of 4 feet from the wall or curb to the center of the rack will be provided to allow two bikes to access and use the rack.
- (c) Where placed side-by-side, bike racks shall be placed at least 3.5 feet apart to accommodate ease of access to the racks.
- (d) Where placed in a line such as a series of 2 or more and U-racks parallel to a wall, U racks will be separated by a minimum distance of 10 feet between the centers of the racks to allow access to both sides of the rack.

2.12 Street Lighting

(A) Scope

The provisions of this section shall apply to public and private streets, and are subject to the restrictions outlined in the Section ~~9-3.3-179-9-16~~, "Illumination Lighting, Outdoor," B.R.C. 1981.

(B) Guidelines for Street Lighting

(1) Street Light Requests

- (a) Public Service Company (PSC) of Colorado is responsible for providing street lighting as requested by the City.
- (b) Before considering new or additional local street light requests, the City will require unanimous consent of all affected owners of property within 100 feet of proposed street light locations and the support of at least 51 percent of the total number of owners of properties within 500 feet of proposed locations.

- (2) **Costs:** The installation costs of street light fixtures, excluding those that provide a demonstrated safety need, shall be paid by the applicant requesting the installation. The City will assume continued maintenance and energy costs associated with new installations.

- (3) **Priorities for Installation:** Streetlights may be provided on the basis of identified traffic need with priorities established as follows:

- (a) Reduction of an identified night time traffic accident problem correctable through street light installation.
- (b) Major traffic corridors with significant turning movement conflicts and night time pedestrian activity.
- (c) Major traffic corridors with significant night-time turning movement conflicts.
- (d) Arterial and collector intersections and/or horizontal or vertical alignment changes.
- (e) Residential street lighting.
- (f) Commercial alleys with significant night-time pedestrian activity.

- (4) **Design:** Street lights installed in public rights-of-way shall be an energy efficient lighting source (high pressure sodium or metal halide) with a minimum of ambient or reflected light (full cut-off fixtures). The City has adopted the Illuminating Engineering Society's (IES) American National Standard Practice for Roadway Lighting as the design standard for all city streets, with the following modifications:

- (a) Expressway and Arterial: Street lighting shall be based on IES standards.
- (b) Other Streets: Street lighting may be provided at intersections and identified pedestrian crossings only. Lighting may be considered at locations with demonstrated needs based on changes in horizontal or vertical alignments. Fixtures shall be 70-watt power unless street width or other conditions justify higher wattage.
- (c) Alleys: Except for alleys in commercial areas with significant night time pedestrian activity, the city will not provide alley lighting.
- (d) Private Driveways: Street lighting installed at the intersection of private driveways and city streets shall be installed using City standards, be located outside of the public right-of-way, and all costs for installation, maintenance, and continued energy expenditures shall be the responsibility of the applicant requesting the lighting installation.

(C) Easements

Adequate rights-of-way or utility easements shall be dedicated to the City to allow PSC of Colorado to install street lights. Facilities with detached bike paths or sidewalks may use a combined signage, utility, and pedestrian easement for placement of the street lights between the curb and bikeway provided that the requirement for 2 feet of horizontal clearance from the sidewalk or bike path is met. Where a bike path or sidewalk is attached to the street curb and gutter, street lights shall be placed behind the sidewalk or path within a minimum 3-foot wide utility easement. Utility easements for street lights are not exclusive, and may be landscaped or used for parking subject to City approval. If there is an exclusive gas easement behind an attached walk or path, the street lights shall be located beyond that easement in an additional three-foot wide easement or the gas easement shall be relocated.

CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS

CHAPTER 8
TRANSPORTATION STANDARDS

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8.01 Adoption of ~~Standards~~ of the Colorado Department of Transportation (CDOT) Specifications with Modifications

The current ~~version~~ edition of the “Colorado Department of Transportation’s “Standard Specifications for Road and Bridge Construction” is hereby adopted by reference in these Standards as the City of Boulder transportation construction standards, except as specifically amended by the provisions of this chapter.

(A) **Section 401, Plant Mix Pavements - General**

(1) **Subsection 401.02, “Composition of Mixtures,”** is amended to incorporate the following additions:

- (a) A job-mix formula shall be submitted to the Director of Public Works for approval prior to placing any hot bituminous pavement. The formula shall indicate the aggregate gradation, asphalt cement content, hydrated lime content, and optimum density. If requested by the Director, a sample of the aggregate and asphalt cement shall be submitted for approval (for test purposes) prior to placing any hot bituminous pavement.
- (b) The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the aggregate, and a single temperature for the mixture at the discharge point of the plant.
- (c) When submitting the job-mix formula, the contractor shall supply certified test results on all asphalt cements, aggregates, and mixes used for hot bituminous pavement, and certify that all materials meet or exceed all required specifications and tests.
- (d) The Director reserves the right to sample materials and mixtures throughout project construction to determine whether specifications and requirements have been met and to confirm the certified test results. The contractor is responsible for providing a bituminous mixture that meets the job formula and specifications.
- (e) The contractor shall be responsible for providing adequate field testing of materials used on the project and providing copies of the test results to the City to assure compliance with these specifications.
- (f) The top layer of hot bituminous pavement shall not contain any reclaimed asphalt material, unless approved by the Director.

(2) **Subsection 401.11, “Tack Coat,”** is amended to incorporate the following additions:

- (a) A tack coat shall be evenly applied to all existing asphalt or concrete surfaces that will be in contact with asphalt prior to hot bituminous pavement placement. A slow-setting, diluted emulsion shall be used,

diluted with one part water to one part asphalt emulsion. The rate of application shall be 0.1 gallons per square yard of diluted asphalt emulsion. Before dilution, the emulsified asphalt shall comply with AASHTO M140 or M208.

- (b) Only the amount of tack coat necessary for the day's operation is to be placed on the surface. All traffic not essential to the work shall be kept off the tack coat.
- (3) **Subsection 401.12, "Surface Conditioning,"** is amended to incorporate the following addition: All vegetation shall be removed from any existing surface to be overlaid.
- (4) **Subsection 401.16, "Spreading and Finishing,"** is amended to incorporate the following additions:
 - (a) The bituminous mixture shall be placed with an asphalt paver if possible. The contractor shall receive permission from the Director to use placement methods other than a paver. The lift thickness shall be at least twice the maximum particle size for the hot bituminous pavement mix. The maximum lift thickness for the final lift shall be 2 inches, unless otherwise approved by the Director.
 - (b) Areas to be patched shall be excavated and squared to a neat line, leaving the sides of the excavation vertical. Prior to placement of the patch, the exposed sides of the existing pavement shall be thoroughly coated with slow-setting Emulsified Asphalt. Hot bituminous pavement shall then be placed and compacted in succeeding layers; no layer shall be more than 3 inches deep.

(B) Section 403, Hot Bituminous Pavement

- (1) **Subsection 403.02, "Materials,"** is amended to incorporate the following additions:
 - (a) Design mixes shall be established using the Marshall Method of compaction. The method will be applied based on street classification according to Table 8-1, "Marshall Method by Street Classification."

Table 8-1: Marshall Method by Street Classification

Design Method	Laboratory Compaction	Street Classification
Marshall Method, ASTM D 1559 Asphalt Institute MS-2	50 blows per side	Local, Collector, and Minor Arterial (ESAL < 1 million)
Marshall Method, ASTM D 1559 Asphalt Institute MS-2	75 blows per side	Major Arterial (ESAL < 1 million)

- (b) The design mix for hot bituminous pavement shall conform to Table 8-2,

“Hot Bituminous Pavement Design Mix,” and Table 8-3, “Minimum Voids in the Mineral Aggregate (VMA).”

- (c) The addition of any recycled material is subject to approval by the Director prior to use in any asphalt mix. All mixes including recycled material shall meet all standard specifications and contain no more than 10% recycled material.
- (d) Hot bituminous pavement for patching shall be Grading C with AC-10 asphalt cement.
- (e) A minimum of one percent hydrated lime by weight of the combined aggregate shall be added to all aggregate for hot bituminous pavement.

Table 8-2: Hot Bituminous Pavement Design Mix

Property	Test Method	Value
Voids, Percent	MS-2; AASHTO T269	3-5
Stability, Minimum	MS-2; AASHTO T245	1800
Flow (0.01")	MS-2; AASHTO T245	8-16
Aggregate retained on the No. 4 Sieve with at least two Fractured Faces % Min.	CP-45	70
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman) Min.	AASHTO T283	80
Minimum Dry Split Tensile Strength, PSI	AASHTO T283	30
Voids in Mineral Aggregate, VMA, % Min.	MS-2	See Table 8.01-3
Grade of Asphalt Cement		AC-10

Table 8-3: Minimum Voids in the Mineral Aggregate (VMA)

Nominal Maximum Size*, Inches (mm)**	Design Air Voids **		
	3.0%	4.0%	5.0%
1 ½ (37.5)	11	12	13
1 (25.0)	12	13	14
¾ (19.0)	13	14	15
½ (12.5)	14	15	16
3/8 (9.5)	15	16	17

* The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%.

** Interpolate specified VMA values for design air voids between those listed.

(C) Section 608, Sidewalks and Multi-Use Paths

- (1) Subsection 608.03(e), "Joints," is amended to incorporate the following additions:

All jointing of bikepath, bikeway, and bike trail concrete pavement shall be saw cut at the nearest contraction joint and shall be removed and replaced full width. No partial removal and replacement will be allowed. No longitudinal joints will be allowed in either sidewalk or bikepath concrete pavements.

- (2) Subsection 608.03(g), "Pedestrian/Bike traffic," is added as follows:

~~A well signed, safe, functional detour for pedestrians shall be provided whenever a sidewalk is to be obstructed or blocked due to construction or any other activity. The proposed detour shall be approved by the city prior to construction or blockage of the sidewalk.~~

~~Sidewalks adjacent to any development type construction activity of any kind shall be maintained at all times in an unobstructed and safe condition as set forth in Section 8-2-11, B.R.C. 1981.~~

~~A well signed, safe, functional detour for bikes and pedestrians shall be provided whenever an existing bikeway, bikepath or bike trail is obstructed or blocked due to construction. The proposed detour shall be approved by the Director prior to construction. The shall be of appropriate width as determined by the Director and shall be constructed of asphalt or concrete so that it will function and can be maintained at all times and in all weather conditions.~~

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(D) **Section 610, Median Cover Material**

- (1) **Subsection 610.02, "Materials,"** is amended to incorporate the following additions:

Patterned concrete shall be colored concrete and meet the requirements of Section 601 with the following exceptions:

Field Compressive Strength (28 days), psi (Not a specification requirement)	3000 <u>450</u> 0
Cement Content, lbs./cu. Yd., minimum	610
Max. Water/cement ratio lbs. Water/lbs. Cement	0.55 0.44
Entrained and Entrapped Air, percent	5 - 8 4 - 8
Slump, AASHTO T 119, inches	2 - 5
Coarse Aggregate, AASHTO M43	Size No. 8
Fine Aggregate, AASHTO M6, percent of total aggregate	50 - 78

- (a) An approved water reducing admixture shall be used in the mix.
- (b) The coloring agent shall be integral to the concrete mixture.
- (c) The color and pattern shall be as defined in the plans as approved by the City.
- (d) Colored wax curing membrane shall be as recommended by the supplier of the coloring agent.
- (2) **Subsection 610.03, "Construction Requirements,"** is amended to incorporate the following additions: Patterned concrete may be used for median cover material. Construction shall conform to the requirements of CDOT Subsection 608.03 with the following exceptions:
- (a) While the concrete is still plastic, a special pattern forming tool shall be applied to the concrete surface to form the specified pattern. All tears and voids resulting from the pattern forming shall be repaired.
- (b) Curing shall include application of two coats of colored wax curing membrane. The first coat shall be applied within 2 hours of finishing. The second coat shall be applied between 10 and 20 days following the first application.

(E) **Section 703, Aggregates**

Subsection 703.04, "Aggregate for Hot Plant Mix Bituminous Pavement," paragraph 3 is deleted and replaced with the following revision:

- (1) The aggregate from individual sources shall have a percentage of wear of not more than 40 when tested in accordance with AASHTO T96 after 500

revolutions. The aggregate from individual sources shall contain no more than a 1 percent deleterious material including clay lumps, vegetable matter, friable particles, and other deleterious substances tested in accordance with AASHTO T112.

- (2) For quarries or sources which contain minerals which are not of similar composition, the abrasion and friable particle requirements shall be applied to each mineral composition.
- (3) All aggregate shall meet the sodium or magnesium sulfate test in accordance with AASHTO M29.

(F) Section 612, Delineators and Reflectors

Subsection 612.02, "Materials," is amended to incorporate the following additions: All delineators shall be "~~unistrut safe hit~~" flexible, reflective delineators, and shall be anchored according to manufacturer's recommendations.

(G) Section 614, Traffic Control Devices:

- (1) **Subsection 614.02, "Sign Posts and Sign Structures,"** is amended to incorporate the following additions:

- (a) All signs must be mounted on "TELESPAR" posts or approved equal. These installations shall be per manufacturer's recommendations; and be constructed in two sections; including the base and the post.
- (b) The post size shall conform to manufacturers recommendations according to the total sign area square footage and wind loading, but in no instance shall post size be less than 2" square, 12 gauge material, affixed to base by means of two (each) drive rivets with washers on the back side of post and right or left side of post, at a length to accommodate the proper mounting height of sign to be affixed per the MUTCD.
- (c) The "TELESPAR" sign base shall be 2 ¼ x 36 inches in length and shall be driven into the ground 33 to 34 inches with 2 to 3 inches exposed above final grade.
- (d) Sign Bolts: Sign shall be affixed to post with a minimum of two (each) 5/16 x 2- ¾ inch bolts with locking nut and vandal proof (Gator Lock or approved equal) hardware on each side (front/back) with nylon washer or equivalent behind the Gator lock on the sheeting side.
- (e) Banded Sign Mount: All banding material shall be ¾ inch wide stainless Steel banding. Hardware for installation of signs less than 30" attached to a signal/light pole shall consist of a buckle bracket. For 30" or greater signs, Sign Fix is required to be mounted on the sign and & a slider

to affix sign to the banding.

(f) Other Sign Mounts: Utility wood poles can be used when the location is appropriate for signs with prior approval from the Director. The mounting hardware shall be lag bolts with washers, with nylon washer or equivalent against the sheeting side.

(g) Cantilever Mount: Cantilever mounts shall be approved by the Director prior to being used.

(h) CDOT Breakaway Post System: Signs are placed in rights-of-way under the jurisdiction of CDOT shall provide a breakaway system in accordance with CDOT standards (see M & S Standards section S-614-5).

post size shall conform to manufacturer's recommendations according to the total sign area square footage and wind loading.

(b) All traffic signs or sets of signs with a total surface area less than or equal to 1 square foot shall be installed as shown in Technical Drawing 2.93, the Type III small sign detail, in Chapter 11 of these Standards. All traffic signs (or sets of signs) with a total surface area greater than 1 1/2 square feet shall be installed as shown on Technical Drawings 2.81 and 2.82, the Type I and Type II large sign details, in Chapter 11 of these Standards.

(c) All traffic signs shall be mounted 7 feet from the top of the curb to the bottom of the sign, except the following:

(i) "KEEP RIGHT" and "ONE WAY" signs mounted in medians, which shall be mounted at a height of 5 feet, from the top of the curb to the bottom of the sign.

(ii) "NO PARKING" signs shall be mounted at a height of 6 feet, 7 inches to the bottom of the sign.

(iii) Street name signs mounted by themselves shall be mounted at the same height as if they were accompanied by a "STOP" sign.

(2) **Subsection 614.04, "Sign Panels,"** is amended to incorporate the following additions:

(a) All reflective sheeting shall be ASTM D 4956-04 Type XI Diamond Grade Cubed (DG3) or equivalent approved by the Director.

(b) All sign blanks shall be constructed using 0.100 gauge aluminum material.

(c) All public street name signs shall be constructed using extruded aluminum alloy 6063-T6, or approved equal, with 0.091 inch thick web, 0.250 inch thick edges, and square corners. All non-extruded signs shall be mounted on 0.100 gage aluminum with rounded radius corners. All public street

name signs shall be constructed using reflective sheeting stated above and have a blue background with white lettering.

- (a) ~~All reflective sheeting shall be Type IV (3M Scotchlite 3990-VIP Diamond-Grade or approved equivalent), except all "no parking" signs, which shall be Type I (Scotchlite Engineer grade, or approved equivalent). Dating stickers shall be 3M #75-0300-1370-2, or approved equal.~~
- (b) ~~All 9 inch street name signs shall be mounted on extruded aluminum alloy 6063-T6, or approved equal, with 0.091 inch thick web, 0.250 inch thick edges, and square edges. All non-extruded signs shall be mounted on 0.100 gage aluminum.~~

(H) Section 627, Pavement Marking

Subsection 627.03, "General," is amended to incorporate the following additions:

- (1) ~~All crosswalk lines shall be applied longitudinally, and shall be 24 inches wide by 10 feet long.~~
- (2) ~~White and yellow skip markings shall be 5-4 inches wide and 10 feet long with a 30 foot gap between.~~
- (2) All crosswalk lines shall be applied longitudinally, and shall be 24 inches wide by 10 feet long.
- (3) On concrete surfaces all curing compound shall be removed prior to the installation of any pavement marking.
- (4) Maintenance Striping
 - (a) All lane, center, and channelizing lines shall be striped with epoxy pavement markings at 15 mm thickness with glass beads.
 - (b) All crosswalk lines installed on asphalt surfaces shall be provided using pre-formed plastic pavement markings 3-M A-270 E/S series tape. On concrete surfaces, an equivalent pre-form thermoplastic marking can be used if approved by the Director.
 - (b) All lane use arrows on concrete surfaces shall be Premark Brand Elongated Series Contrast Arrows.
 - (c) All lane use arrows on Asphalt Surfaces shall be pre-formed plastic pavement markings, 3M Elongated L270 ES Series.
 - (ed) Adherence to manufacturer's installation recommendations (method) is required.

(45) New Striping

- (a) Approval of final lay-out is required prior to placement of pavement markings
- (b) On concrete surfaces all curing compound shall be removed prior to the installation of any pavement markings.
- (c) Adherence to manufacturer's installation recommendations is required.
- (d) All lane use arrows on concrete surfaces shall be Premark Brand Elongated Series Contrast Arrows.
- (e) All lane use arrows on Asphalt Surfaces shall be pre-formed plastic pavement markings, 3M Elongated L270 ES Series.

(I) Section 713, Traffic Control Materials

- (1) **Subsection 713.04, "Sign Panel Backgrounds,"** -is amended to incorporate the following addition: Aluminum sign panels may also have a Class II (A-1) anodic coating clear finish as defined in the "Aluminum Association Standards for Anodically Coated Aluminum Alloys for Architectural Applications."
- (2) **Subsection 713.06, "Messages,"** -is amended to incorporate the following additions:
 - (a) All street name signs on non-signalized intersections shall be 9 inches wide with 6-inch, upper-case, series D capital letters, together with 4 ¾-inch, lower-case, series D letters for the name of the street, and a 3 ½-inch, upper-case, series D capital letter together with 2 ¼-inch, lower-case, series D letters for "Avenue," "Street," 3-inch block numbers below the abbreviation of "Ave.," "St.," etc. The "Ave" etc. and block numbers shall be centered on the sign with a 1-inch separation between them. When block numbers are not used, "Ave", "St", "Rd", etc. shall be 6 inch upper case with 4 /4 inch lower case letters series D. On numbered streets, a 6-inch, series D number shall be used with 4 ¾-inch, lower-case, series D letters for "th", "st" and "nd" to be held in line with the number that it follows.
 - (b) All reflective sheeting for street name sign faces shall be Type XI IV (3-M Scotchlite - 3990 VIP Diamond Grade or approved equal) Cubed sheeting or approved equal. ~~Dating stickers shall not be placed on street name signs.~~
- (3) **Subsection 713.08, "Glass Beads for Traffic Markings,"** is amended to incorporate the following addition: All glass Glass beads shall conform to CDOT Specification #M247-81 (1990) Type I non flotation unless otherwise specified

by the Engineer be applied on Epoxy Pavement Markings Lane Lines at a rate of 15 to 18 pounds per gallon.

(4) Subsection 713.13, "Preformed Plastic Materials," is amended to incorporate the following additions:

(a) Preformed Plastic: material shall be 3M Stamark Series A270 ES for all transverse & longitudinal lines. All lane use symbols shall be 3M Stamark Series L270 ES.

(b) Preformed Plastic: (New Concrete Application) "white only" material shall be 3M Stamark Series A380I-5 ES (contrast) for all longitudinal skip lines or channelizing lines.

(5) Subsection 713.14, "Preformed Thermoplastic Material," is amended to incorporate the following additions:

(a) Preformed Thermoplastic: Materials shall be alkyl based materials for transverse & longitudinal lines, or approved equivalent.

(b) All materials shall be 90 mm thick with beads. Only preformed thermoplastic marking material listed on CDOT's approved products list may be used.

(6) Subsection 713.19, Methyl Methacrylate Pavement Marking,"
Methyl Methacrylate material shall be approved by the Director prior to being used on transportation facilities in the public right-of-way.

~~(4) Subsection 713.14, "Pavement Marking Tape," is amended to incorporate the following addition: Preformed plastic material shall be 3M Stamark Series 5730 for all transverse and longitudinal lines, or approved equal. All lane use symbols shall be 3M Stamark Series 6330, or approved equal.~~

8.02 Traffic Signals

All traffic signal design and construction shall be performed in accordance with the Section 2-2-11, "Traffic Engineering," B.R.C. 1981 and these Standards.

8.03 Traffic Signs and Striping Markings

(A) Required

The applicant for ~~construction approval~~ shall be responsible for the installation of all

traffic control devices, street name signs, and pavement markings prior to the opening or reopening of roadways, bike paths, or any public transportation facility.

(B) Signing and Striping Plan

A complete signing and striping plan shall be submitted as part of project or development construction plans, to be approved by the Director prior to installation. The plan shall specify the locations, various types, and combinations of approved signs, pavement markings, and barricades required for each project or development.

(C) Conformance with MUTCD

All signs, sign materials, and barricade warning lights shall conform to the standards set forth in the current edition of the "Manual on Uniform Traffic Control Devices (MUTCD)" (current edition), and these Standards.

(D) Materials

The quality of material used in traffic signs, type and quality of all vandal-proof sign hardware, and quality of all metal square sign posts shall be in conformance with these Standards, subject to approval by the Director.

(E) Private Street Signs

Private streets shall be signed as such and shall include the message "NO CITY MAINTENANCE." and be installed on the same support as the street name sign. Any private street name signs should be fabricated and installed according to the specifications for a public right-of-way street name sign except that the sign shall have white lettering on a green background.

8.04 Temporary Traffic Control Plan

(A) Required

The Director of Public Works may require a Temporary Traffic Control (TTC) Plan for any work that impacts a public right-of-way or easement.

(B) Intent

The purpose of this section is to establish standards and methods for handling traffic to be applied when work or work activity in the public right-of-way or public easements impedes or obstructs any mode of transportation, including but not limited to pedestrian, bicycle, transit, or vehicular traffic. These standards are intended to ensure safe and effective work areas, and warn, control, protect, and accommodate all modes of transportation.

- (e) The location of a bike rack shall maintain a minimum unobstructed sidewalk width of 6 feet from any bicycle parked properly in the bike rack.
- (f) The location of a bike rack shall maintain a minimum unobstructed distance of 3 feet from any pedestrian curb ramp to any bicycle parked properly in the bike rack.

The Cora style standard is designed to be loaded from both sides without an overlap of the handlebars of the bicycles parked on the two sides. For the rack to meet its design specification of parking bikes from both sides, it must be installed according to the conditions below, otherwise it will be considered to provide half the rated bike parking. The Cora style standard can be installed with the following conditions:

- (a) Where a bike rack is located perpendicular to a curb with "head-in" automobile parking, a minimum distance of 4-feet from the curb to the end of the rack is required to avoid damage to bicycles or racks by automobiles extending across the curb over the sidewalk.
- (b) A minimum of 10 feet of clear space is required on both sides of a Cora style rack. This provides 5 feet of space for bike parking and a 5-foot access aisle for both sides of the rack. ~~When~~ a series of racks are provided, a common 5-foot access aisle can serve two racks.
- (c) The location of a bike rack shall maintain a minimum unobstructed sidewalk width of 6 feet from any bicycle parked properly in the bike rack.
- (d) The location of a bike rack shall maintain a minimum unobstructed distance of 3 feet from any pedestrian curb ramp to any bicycle parked properly in the bike rack.

- (2) ~~**Bicycle Racks for Onsite**~~ **Onsite Bicycle Parking:** ~~Bicycle parking should generally be provided within 50 feet of the main building entrance in a visible and prominent location that is lit at night, and physically separated from automobile parking to prevent vehicles from intruding into the bike parking area. Bicycle parking should generally be provided within 50 feet of the main building entrance.~~ Racks must be installed according to the guidelines in (1) above to reach their designed parking capacity. ~~O,~~ otherwise, they shall be credited with no more than half their design capacity. Bicycle parking racks or lockers located on development or project sites or in parking lots outside of public right-of-way shall generally be selected from the following standards:

- (a) Inverted "U" Rack: The inverted "U" rack is recommended for most bike rack installations, and is one of the standards for bicycle parking in public rights-of-way as required in Subsection (1) above. Each rack provides space for two bicycles, and allows flexibility in parking by providing two supports for attaching locks. The "U" rack may be used individually where space is limited, or in clusters where space is available for

concentrated bike parking.

~~(b)~~ ~~(b)~~ Cora Style Racks: The Cora rack will accommodate more than eight bicycles and is one of the standards for bicycle parking in public rights-of-way as required in Subsection (1) above. The Cora style rack is recommended where space exists for concentrated bike parking, such as in a parking structure or lot.

~~(c)~~ Other Bike Rack Styles: Another rack style may be approved by the Director of Public Works if it meets the following criteria:

~~(i)~~ Provides at least two contact points between the rack and the bike to securely support the bike;

~~(ii)~~ Provides at least a 2 foot by 6 foot parking space for each bike without the need to lift the handlebars of one bike over those of another to park;

~~(iii)~~ Allows the frame and one wheel to be locked to the rack with a standard high security, U-shaped shackle lock.

~~(iv)~~ The rack is uncomplicated and intuitively simple for the bicyclist to use.

~~(D)~~(d) Lockers: Bicycle lockers provide secure weatherproof storage for bike parking. Lockers are recommended for employee and longer-term parking and require adequate space, since they require more area than bicycle racks.

~~Another rack style may be approved by the Director of Public Works if it meets the following criteria:~~

~~(i) Provides at least two contact points between the rack and the bike to securely support the bike;~~

~~(ii) Provides at least a 2 foot by 6 foot parking space for each bike without the need to lift the handlebars of one bike over those of another to park;~~

~~(iii) Allows the frame and one wheel to be locked to the rack with a standard high security, U shaped shackle lock.~~

~~(iv) The rack is uncomplicated and intuitively simple for the bicyclist to use.~~

(C) Transportation Master Plan

All temporary traffic control plans shall comply with the goals, policies, and standards adopted in the Transportation Master Plan (TMP).

(D) Objectives

Primary objectives of a TTC plan are as follows:

- (1) Prevent accidents and injury for both the public and for workers, by providing a safe work area.
- (2) Prevent damage to public and private property, including damage to vehicles and construction equipment.
- (3) Ensure well defined and safe traffic movements through work areas and temporary traffic control zones.
- (4) Efficiently and equitably accommodate pedestrian, bicycle, transit, and vehicular traffic.
- (5) Support mode prioritization goals established in the TMP.
- (6) Provide effective communication with the public, and
- (7) Ensure conformity with these standards for work zone temporary traffic control.

(E) Certification Requirements

- (1) Traffic Control Plans shall be prepared by or under the direct supervision of a person certified as a Traffic Control Supervisor (TCS) by the American Traffic Safety Services Association (ATSSA) or with equivalent certification as approved by the Director.
- (2) Traffic Control Plans shall be implemented under the direct supervision of a TCS, certified Traffic Control Technician (TCT), or person with equivalent certification as approved by the Director.

(F) Conformance with MUTCD

All traffic control plans, signs, sign materials, barricade warning lights, and other temporary traffic control measures shall conform to the "Manual on Uniform Traffic Control Devices" (current edition), except as specifically amended or supplemented by the provisions of these Standards.

(G) General Requirements

All proposed Traffic Control Plans shall include the following:

- (1) The location of work
- (2) A description of work to be performed
- (3) A construction schedule identifying duration and extent of impacts
- (4) A delineation of the proposed work area including any staging, storage, and delivery areas.
- (5) Proposed measures to address impacts to vehicles, bicycles, pedestrians, multi-use path facilities, transit facilities, and persons with disabilities.

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(HG) Non Standard Closures

Traffic control plans which due to their location, duration, extent, hours of operation, or impact will result in more significant impacts to the traveling public require additional information to demonstrate that impacts have been avoided, minimized, and mitigated. The Director may approve the following Non Standard closures upon finding that the applicable criteria have been met:

- (1) Work Hours: Plans which propose to close a vehicular travel lane on any weekday prior to 9 a.m. or later than 4 p.m., or on any weekend shall demonstrate that such impacts cannot be reasonably avoided or that the proposed schedule reduces impacts to the public compared to closure during normal work hours.
- (2) Multiple Vehicle Lanes: Plans which propose to close all or multiple vehicle lanes in a single direction of travel shall demonstrate that such impacts cannot be reasonably avoided through alternative scheduling or phasing of work.
- (3) Vehicular Detours: Plans which propose to detour traffic to another roadway shall demonstrate that such impacts cannot be reasonably avoided and that impacts to the detour route have been mitigated to the extent practicable. Impacts to the detour route shall be evaluated including, without limitation, intersection level of service, traffic speed and volume in residential neighborhoods and school zones, and impacts to all modes of transportation.
- (4) Flagging: Plans which propose use of flaggers shall demonstrate that the duration or scope of work is such that more permanent control measures are not practical.
- (5) Transit Facilities: Plans which propose impacts to a transit facility or transit stop must demonstrate that such impacts cannot be avoided and provide for appropriate detours and alternative stop locations.
- (6) Sidewalks: The following special considerations shall be given to proposed closures of sidewalks:
 - a) Adjacent to streets not classified as "Local" in the Transportation Master Plan;
 - b) Located in the CAGID or UHGID boundary areas;
 - c) Impacted for more than seven days;
 - d) Where no other sidewalk exists adjacent to the roadway;
 - e) Serving a school zone or transit stop, or
 - f) Requiring pedestrians to detour to a facility on a separate parallel roadway.Such proposed closures must demonstrate that impacts cannot be avoided through alternative construction methods, that the duration and extent of impacts has been minimized, and that an adequate detour has been provided.

- (7) Bicycle Lanes: Special consideration shall be given to proposed closures of on street bike lanes along roadways with a posted speed limit of 40 mph or greater; or bike lanes that involve contra-flow lanes. Such proposed closures shall demonstrate that impacts cannot be avoided through alternative construction methods, that the facility cannot be reasonably relocated through reassignment of vehicle lanes or other existing facilities, that the duration and extent of impacts has been minimized, and that an adequate detour has been provided.
- (8) Multi-Use Paths: Special consideration shall be given to proposed closures of sidewalk facilities which have been designated as multi-use paths. Such proposals shall demonstrate that impacts cannot be avoided through alternative construction methods, that the facility cannot be reasonably relocated through reassignment of vehicle lanes or other existing facilities, that the duration and extent of impacts has been minimized, and that an adequate detour has been provided. Detours routes must be of similar width and surface type to the permanent facility.
- (9) Signage: Where detours or closures impact pedestrian, bicycle, or multi-use path facilities, additional signage as required by Director shall be utilized to supplement the requirements of the MUTCD.

8.045 Fire Lane Sign Specifications

(A) **Size**

Fire lane signs shall be 12 inches by 18 inches.

(B) **Material**

Fire lane sign material shall be 0.100-inch thick aluminum alloy 6061-T6 with 3-M Scotchlite Diamond Grade Cubed (DG3) sheeting Type XI Engineer Grade Reflective Sheeting, or an approved equivalent.

(C) **Colors**

Fire lane sign colors shall be red letters on a white background. The letter on the symbol shall be black.

(D) **Wording**

Fire lane signs shall including the wording, "FIRE LANE," "~~FIRE LANE~~" with an appropriate arrow, and ~~or indicate~~ a no parking symbol ("P" with a slash).

8.056 Signing for ~~Handicapped Accessible~~ Parking

~~Handicapped Accessible~~ parking signs required for ~~handicapped accessible~~ parking spaces shall meet the following standards:

(A) **Materials**

Sign materials shall conform to the standards set forth in the MUTCD and these Standards.

(B) **Required Signs**

~~Two~~three signs shall be required for ~~handicapped~~handicapped accessible parking spaces as follows:

- (1) **Sign #1:** Sign #1 (R7-8) shall be 12 inches by 18 inches with green lettering on a white background. This sign shall read, "RESERVED PARKING", followed by a blue ~~handicapped~~handicapped accessible symbol and a green arrow indicating the stalls restricted to ~~handicapped~~handicapped accessible parking.
- (2) **Sign #2:** Sign #2 shall be ~~24~~24 inches by ~~15~~15 inches with white lettering on a blue background. This sign shall read, "VEHICLES NOT DISPLAYING THE STATE ~~HANDICAPPED~~HANDICAPPED ~~AUTSTATE~~AUTSTATE ~~AUTHORIZATION~~AUTHORIZATION MAY BE TOWED AT OWNER'S EXPENSE. FOR PERMIT INFORMATION CONTACT THE LOCAL MOTOR VEHICLE OFFICE," and shall display a symbol of accessibility.
- (3) **Sign #3:** Sign #3 shall be 12 inches by 6 inches with white numerical numbering on a blue background. This sign shall read in numerical value, "\$112.00," centered with a white border.

(C) **Sign Placement**

The ~~handicapped~~handicapped accessible parking signs shall be placed as shown on Technical Drawing 2.86, "~~Handicapped~~Handicapped Accessible Parking Sign Details," in Chapter 11 of these Standards, and are to be set directly facing or no more than 45 degrees from the line of travel of a vehicle entering the stall. These signs may be mounted on a post or may be mounted permanently on an adjacent wall using anchor bolts. Such signs shall be placed at the center of the end stalls of each ~~handicapped~~handicapped accessible parking area and at every second stall in-between.

8.07 Signing for Parking Restrictions

(A) Size

Parking restriction signs shall be 12" x 18".

(B) Material

Sign material shall be 0.100-inch thick aluminum alloy 6061-T6 with 3M DG3 (Diamond Grade Cubed) sheeting Type XI.

**CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS**

CHAPTER 11
TECHNICAL DRAWINGS

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**CITY OF BOULDER
DESIGN AND CONSTRUCTION STANDARDS**

GLOSSARY

SECTION 1: ABBREVIATIONS

Wherever the following abbreviations are used in these Design and Construction Standards (Standards), or in association with these Standards, the intent and meaning shall be as follows:

AAN	American Association of Nursery-men		Transportation Builders Association
AAR	Association of American Railroads	ASCE	American Society of Civil Engineers
AASHTO	American Association of State Highway and Transportation Officials	ASLA	American Society of Landscape Architects
ABC	Aggregate Base Course	ASME	American Society of Mechanical Engineers
AC	Asphaltic Cement	ASTM	American Society for Testing and Materials
ACI	American Concrete Institute	ATSSA	American Traffic Safety Services Association
ADT	Average Daily Trips	AWG	American Wire Gauge
AGCA	Associated General Contractors of America	AWPA	American Wood Preservers Association
AI	Asphalt Institute	AWS	American Welding Society
AIA	American Institute of Architects	AWWA	American Water Works Association
AISC	American Institute of Steel Construction	BFD	Boulder Fire Department
AISI	American Iron and Steel Institute	BMP	Best Management Practices
AITC	American Institute of Timber Construction	BRC	Boulder Revised Code, 1981
ANSI	American National Standards Institute, Inc.	CCA	Colorado Contractors Association
APWA	American Public Works Association	CDOT	Colorado Division <u>Department</u> of Transportation
ARA	American Railway Association	CFR	Code of Federal Regulations
AREA	American Railway Engineering Association	CFS	Cubic Feet pPer Second
ARTBA	American Road and	CLOMA	Conditional Letter of Map

	Amendment	DIP	Ductile Iron Pipe
CLOMR	Conditional Letter of Map Revision	DRCOG	Denver Regional Council of Governments
CMP	Corrugated Metal Pipe	DWG	Drawing
CP	Colorado Procedure	EDLA	Equivalent Daily Load Applications
CPUC	Colorado Public Utilities Commission	EIA	Electronic Industries Association
CRS	Colorado Revised Statutes, 1973, as amended	EPA	Environmental Protection Agency
CRSI	Concrete Reinforcing Steel Institute		
CUHP	Colorado Urban Hydrograph Procedure		
DHV	Design Hour Volume		
FEMA	Federal Emergency Management Agency	ISO	Cable Engineers Association Insurance Service Office
FHWA	Federal Highway Administration	ITE	Institute of Transportation Engineers
FL	Flowline		
FPS	Feet Per Second	LOMA	Letter of Map Amendment
FSS	Federal Specifications and Standards	LOMR	Letter of Map Revision
GIDM	Gallons Per Inch Diameter Per Mile	LOS	Level of Service
GPAD	Gallons Per Acre Per Day	MIL	Military Specifications
GPCD	Gallons Per Capita Per Day	MPH	Miles Per Hour
GPM	Gallons Per Minute	MUP	Master Utility Plan
HCM	Highway Capacity Manual	MUTCD	Manual on Uniform Traffic Control Devices
HBP	Hot Bituminous Pavement	NCAR	National Center for Atmospheric Research
ICBO	International Conference of Building Officials	NEC	National Electrical Code
IEEE	Institute of Electrical and Electronics Engineers	NEMA	National Electrical Manufacturers Association
IES	Illuminating Engineering Society	NESC	National Electrical Safety Code
IMSA	International Municipal Signal Association	NFPA	National Fire Protection Association
IPCEA	Insulated Power	NIST	National Institute of

NOAA	Standards and Technology National Oceanic and Atmospheric Administration	SHAC	State Highway Access Code
NPK	Nitrogen-Phosphorus- Potassium	TC	Top of Curb
NSF	National Sanitation Foundation	TIA	Telecommunications Institute of America
OSHA	Occupational Safety and Health Administration	TMP	Transportation Master Plan, City of Boulder
PC	Point of Curve	UBC	Uniform Building Code
PCC	Portland Cement Concrete or Point of Compound Curve	UDFCD	Urban Drainage and Flood Control District
PLS	Pure Live Seed	UFC	Uniform Fire Code
PMR	Physical Map Revision	UL	Underwriters Laboratories, Inc.
PRC	Point of Reverse Curve	UMC	Uniform Mechanical Code
PRV	Pressure Reducing Valve	UPC	Uniform Plumbing Code
PT	Point of Tangent	USDCM	Urban Storm Drainage Criteria Manual
RCP	Reinforced Concrete Pipe	USGS	United States Geological Survey
ROW	Right of Way	VPC	Vertical Point of Curve
SAE	Society of Automotive Engineers	VPI	Vertical Point of Intersection
SEO	State Engineer's Office	VPT	Vertical Point of Tangent

SECTION 2: DEFINITIONS

Words and phrases contained in these Standards shall be read in context and construed according to the rules of grammar and common usage. Words and phrases that have acquired a technical or particular meaning, whether by definition, adoption herein, or otherwise, are intended to be construed accordingly.

Wherever the phrases "**as directed**", "**as required**", "**as permitted**", or phrases of like meaning are used, it shall be understood that the direction, requirements or permission of the Director of Public Works (Director) is intended. Similarly, use of the words "**approved**", "**acceptable**", and "**satisfactory**" shall refer to approval of the Director.

The definitions in this Glossary apply throughout these Standards. The words or phrases

presented have the following meaning unless the context clearly indicates otherwise:

“Alteration” means a request to use a substitute or alternative material, method, or process which will perform the same function as that provided in a particular standard.

“Approach” means the portion of an intersection leg which is used by traffic approaching the intersection.

“Approved plan” means the engineering design and construction drawings for public improvements, prepared by an engineer, which has been granted final approval by the Director of Public Works in accordance with these standards.

“As-built” means an engineering drawing of record, prepared under the direction of a licensed Colorado registered professional engineer, reflecting the actual construction of public improvements in the service area, including, but not limited to, final grading, alignments, dimensioning, elevations, locations and materials sizing and type.

“Average Daily Trips (ADT)” means the volume of traffic passing through a given point during a given time period, divided by the number of days in that time period.

“Backflow” means the reversal of the direction of flow of water or mixtures of water and other liquid, gases, or other substances into the distribution pipes of a potable water supply from any source or sources caused by backpressure and/or back-siphonage.

“Backflow prevention assembly” means any approved assembly, method, or type of construction designed to prevent backflow or back-siphonage into a public water supply by isolating the owner’s water system from the public water system. In addition, see Section I. of these rules.

“Caliper” means a diameter measurement of a tree’s trunk, and is measured around the trunk of the tree, six- inches above tree base grade for one to four inch caliper trees and 12 inches above tree base grade for five to eight inch caliper trees. Trees measuring between four and five inch caliper shall be rounded off to the nearest inch.

“Capacity” means the maximum number of vehicles that have a reasonable expectation of passing over a given roadway or section of roadway in one direction during a given time period.

“Certified Backflow Prevention Device Tester” means any person who has passed a State of Colorado approved or sponsored certification examination, and who is listed as a certified backflow prevention device tester with the Colorado Department of Public Health and Environment.

“City” means the City of Boulder, a Colorado home rule city in Boulder County, Colorado.

"City water system" means the source and distribution facilities of the water system to the point of delivery to the owner water system. The source includes all components of the facilities utilized in the production, treatment, storage, and delivery of water to the distribution system. The distribution system includes the network of conduits used for the delivery of water from the source to the owner water system.

"Contractor" means a person, firm, partnership, subcontractor or corporation, licensed by the City that is responsible for the construction of approved public improvements associated with a specific project, or projects, within the City of Boulder service area. This term also includes the contractor's superintendent and on-site manager.

"Colorado Cross Connection Control Manual" means a manual published by the Colorado Department of Public Health and the Environment addressing cross connection control practices, Fourth Edition - Revised.

"Cross connection" means any physical arrangement whereby the city's water supply system is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains, or may contain, contaminated water, sewage, or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel or changeover assemblies, and other temporary or permanent assemblies through which, or because of which, backflow could occur are considered to be cross connections.

"Delay" means the stopped time per approach vehicle, in seconds per vehicle.

"Design Hour Volume" means the hourly traffic volume used for street design and capacity analysis, usually one (1) or more peak hours during a 24 hour period.

"Design Speed" means five (5) to 10 miles per hour above the proposed or desired speed limit of the facility under design.

"Design Vehicle" means that all public and private streets must be designed to accommodate an SU-30 vehicle. The definition of this vehicle type is found in AASHTO's Geometric Highway Design Standards.

"Developer" means the person, owner, firm, or corporation responsible for the development and completion of all public improvements associated with a proposed project in accordance with these standards.

"Diameter" means the diameter size measurement of a tree's trunk, and is measured around the trunk at 4.5 feet above the tree base grade for trees greater than eight (8) inch caliper.

"Director of Public Works" means the authorized City employee, or his/her designee, responsible for the enforcement of these standards and approval of the design and construction of public improvements within the City of Boulder service area, and the overall management and direction of the Public Works Department.

"Dripline" means the outermost edge of a tree's canopy, projected on the ground.

"Engineer" means the Colorado registered professional engineer responsible for the design of all public improvements submitted to the City for a proposed project in accordance with these standards, including all plans, calculations, specifications, and coordination of field surveys.

"Construction plan" means the engineering design and construction drawings for public improvements, prepared by an Engineer which has been submitted for final approval by the Director of Public Works in accordance with these standards.

"Hourly Volume" means the number of vehicles that pass over a given section of a lane or roadway during one hour.

"Inspector" means the Director of Public Works, or his/her designee, responsible for the inspection of public improvements construction.

"Level of Service (LOS)" refers to the definitions of LOS provided in the Highway Capacity Manual, "Definitions and Concepts."

"May" -means is authorized to, or a permissive condition which indicates a choice between two (2) or more alternatives.

"Modification" means a request to change or modify a standard or the parameters of a standard because the particular application may not require the degree of rigor which the standard requires.

"Peak Hour" means the concept referring to the hour of a day when the highest volume of traffic occurs on a transportation facility.

"Planting Strip" means the landscape area within a street median, the landscape planting strip between the curb and detached sidewalk, or the landscape area between the back edge of a public sidewalk (attached or detached) and the right-of-way/property line.

"Public improvements" means any public facility, system or infrastructure in the City of Boulder service area including, but not limited to: earthwork or landscaping, streets, sidewalks, bike paths, trails, parking and traffic control devices; water supply, treatment, storage and distribution systems; wastewater collection and treatment systems; and stormwater and flood

control collection and conveyance systems in public easements or right-of-way.

"Public Sign" means any sign that is posted by a governmental entity within the right-of-way for the purpose of directing traffic or parking.

"Record Set" means the engineering design and construction drawings for public improvements, sealed and signed by an engineer, approved by the Director of Public Works in accordance with these standards, and maintained on file in public records as the final approved construction document.

"Root Protection Zone" means the ground area surrounding the entire tree that extends from trunk to dripline, or a minimum of fifteen feet for column-shaped trees, whichever is greater.

"Shall" means a mandatory duty to conform to the specified standard. Where certain requirements in these standards are described with the "shall" stipulation, it is mandatory that these requirements be met or exceeded.

"Should" means an advisory condition. Where "should" is used, it is considered to be recommended or advisory, but not mandatory.

"Sidewalk, Attached" means a sidewalk and curb that are attached as one (1) continuous element.

"Sidewalk, Detached" means a sidewalk that is separated from the curb by a landscape planting strip.

"Sight Distance" means the length of roadway ahead visible to the driver. The minimum sight distance available must be long enough to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path.

"Speed Change Lane" means a separate lane for the purpose of enabling a vehicle entering or leaving a roadway to increase (acceleration lane) or decrease (deceleration lane) its speed to a rate at which it can more safely merge or diverge with through traffic. Includes tapered areas.

"Standards" means the "Design and Construction Standards" manual for the City of Boulder.

"Storage Lane" means additional length added to a deceleration lane, to store the maximum number of vehicles likely to accumulate during a critical period without interfering with the through lanes.

"Street Tree" means any tree in the public right-of-way.

"Streetscape" means landscaping design for any streetside area, generally including but not

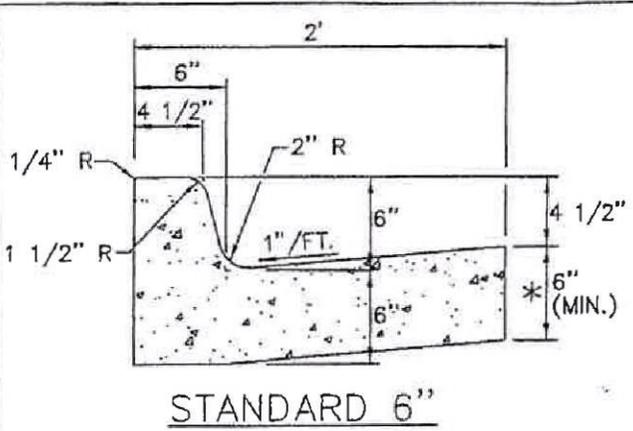
limited to planting strips and medians.

"Travel Transportation Demand Management" means any action or set of actions aimed at reducing the impact of traffic by influencing people's travel behavior.

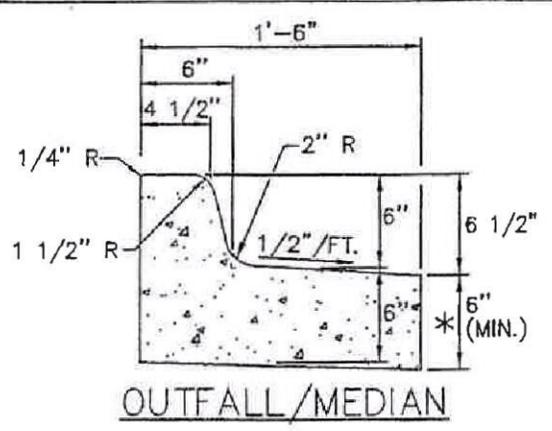
"Trips" means a vehicle moving from an origin point to a destination point. Trips are one-way.

"Waiver" means a request to delete or omit the application of a particular standard.

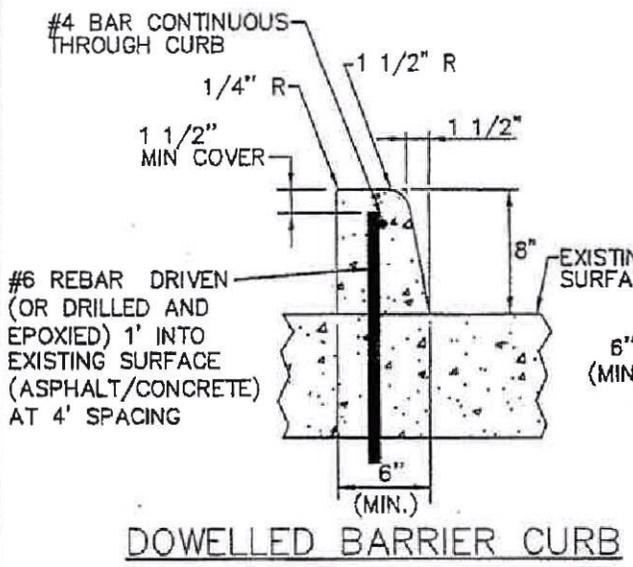
"Work" means any activity involved in the performance of constructing, installing, repairing or maintaining public improvements.



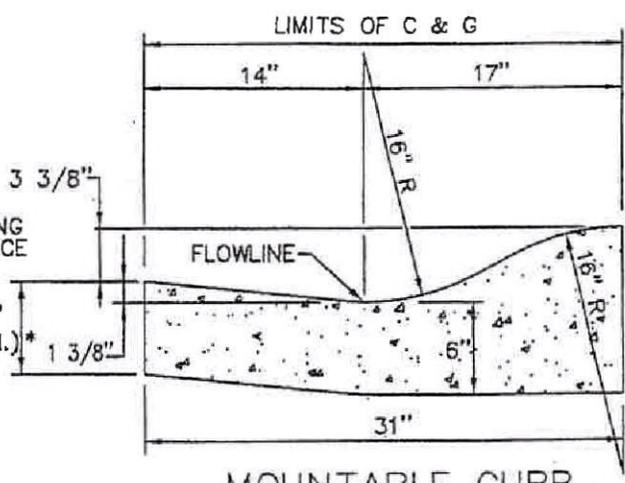
STANDARD 6"



OUTFALL/MEDIAN



DOWELLED BARRIER CURB



MOUNTABLE CURB

(NOTE: FOR USE ONLY IN DETACHED SINGLE-FAMILY RESIDENTIAL STREETS)

NOTES:

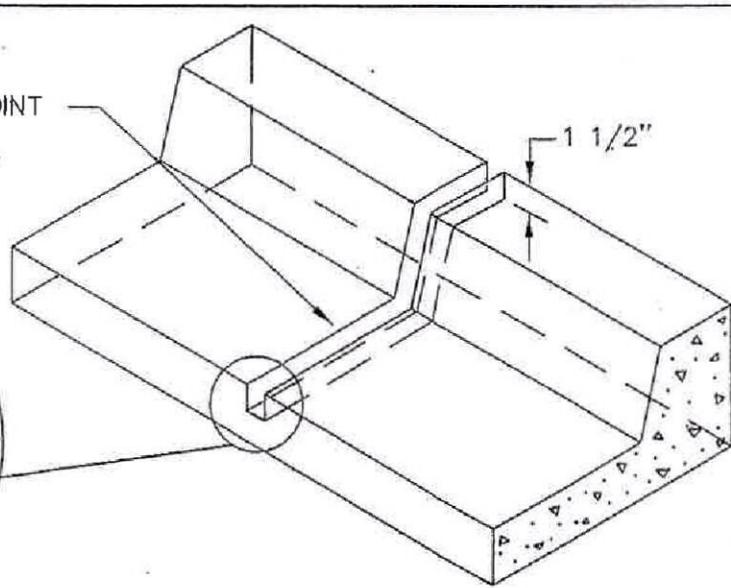
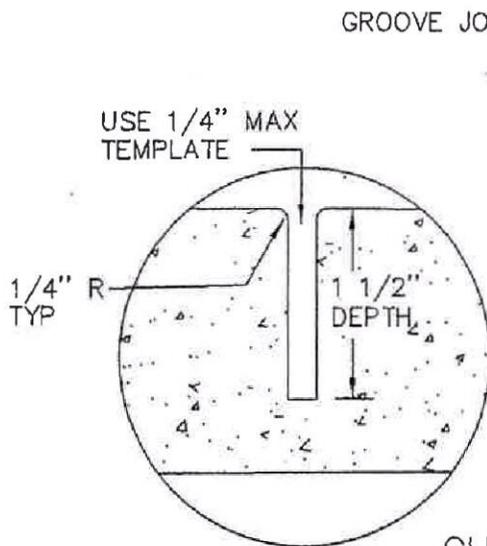
1. ALL EXPOSED CONCRETE SHALL HAVE A BROOM FINISH.
2. EXPANSION JOINTS SHALL BE INSTALLED AT 500 FOOT MAXIMUM INTERVALS SEE EXPANSION JOINT DETAIL.
3. CONTRACTION JOINTS SHALL BE INSTALLED AT END OF CURB RETURNS AND AT 10 FOOT MAXIMUM INTERVALS - SEE CURB CONTRACTION JOINT DETAIL.
4. WHEN JOINING EXISTING CURB, PROVIDE A MINIMUM OF THREE #4 x 18" DOWELS (9" EMBEDMENT) EVENLY SPACED.
- * 5. WHEN PLACING CURB ADJACENT TO CONCRETE PAVEMENT, THICKEN GUTTER TO MATCH PAVEMENT DEPTH.

DRAWN BY: JSH
 CHECKED BY: RJH
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 CURB AND GUTTER

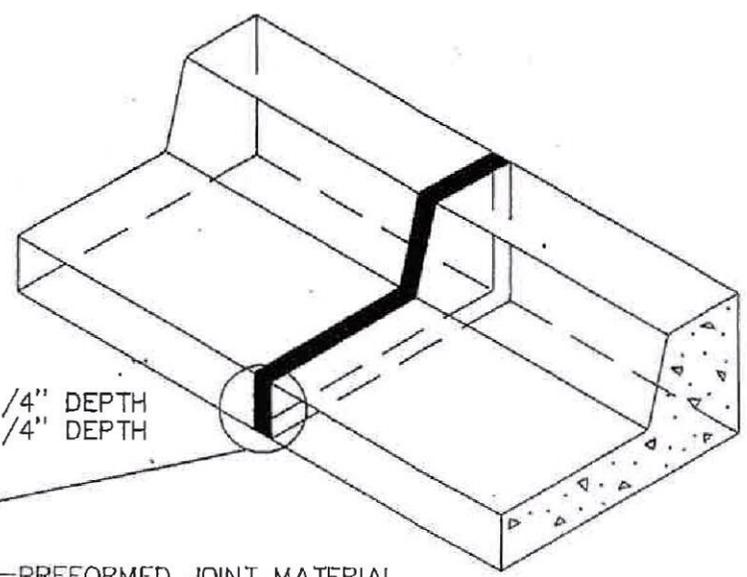
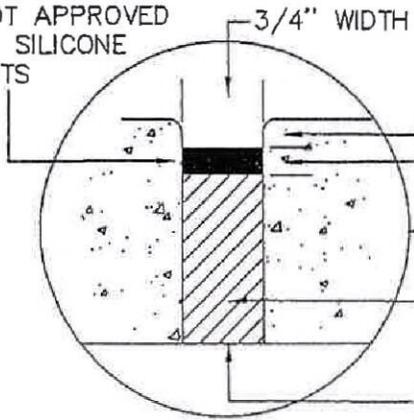
ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.01.A



CURB CONTRACTION JOINT

FILL WITH SILICONE SEALANT
SEALANT SHALL BE ON CDOT APPROVED LIST OF SILICONE SEALANTS



3/4" PRE-MOLDED, NON-EXTRUDING AND RESILIENT TYPE EXPANSION JOINT MATERIAL TO MEET ASTM SPECS D-1751 OR D-1752

CURB EXPANSION JOINT

DRAWN BY: JSH
CHECKED BY: WGH

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO

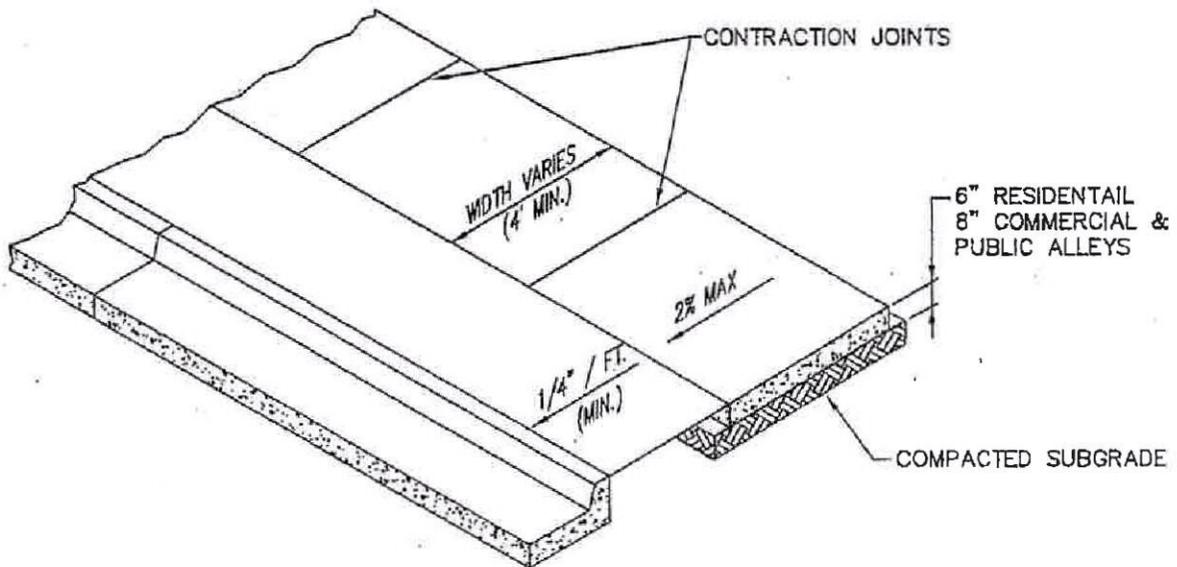
CURB AND GUTTER JOINTS

ISSUED: JULY 2, 1998
REVISED: MAY 15, 2009

DRAWING NO.
2.01.B

NOTES:

1. ALL EXPOSED CONCRETE SHALL HAVE A BROOM FINISH.
2. EXPANSION JOINTS SHALL BE INSTALLED AT 500 FOOT MAXIMUM INTERVALS AND AT FIXED STRUCTURES (INLETS, BUILDINGS). SEE CONCRETE WALK AND MULTI-USE PATH JOINT DETAILS.
3. CONTRACTION JOINTS SHALL BE INSTALLED AT 5 FOOT INTERVALS OR INTERVALS EQUAL TO SIDEWALK WIDTH. SEE CONCRETE WALK AND MULTI-USE PATH JOINT DETAILS.
4. IF SIDEWALK IS PLACED ADJACENT TO CURB AND GUTTER, CONTRACTION JOINTS SHALL LINE UP WITH CURB AND GUTTER JOINTS.
5. LONGITUDINAL JOINTS ARE NOT ALLOWED IN CONCRETE WALK OR MULTI-USE PATH.

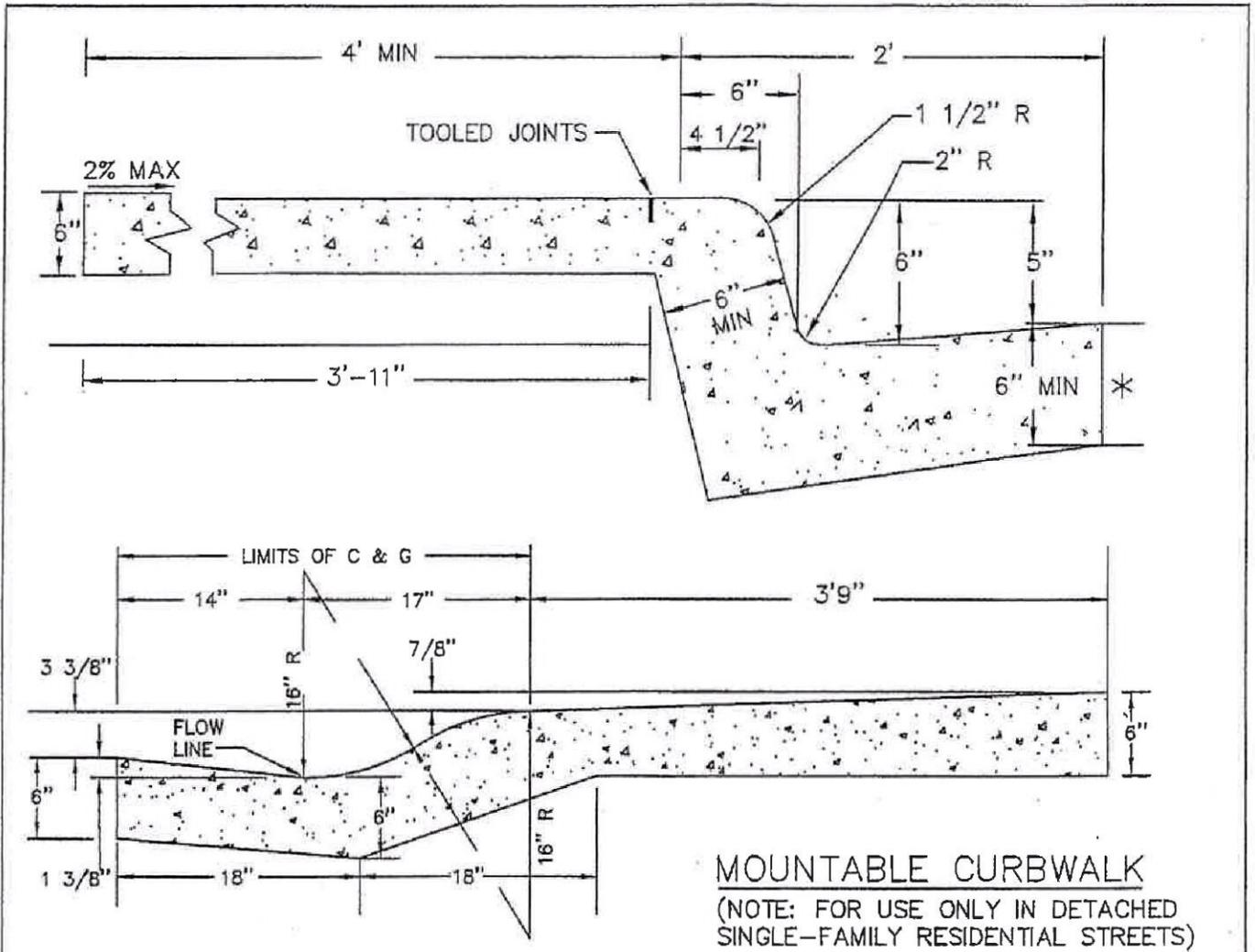


DRAWN BY: JSH
CHECKED BY: WGH
APPROVED BY:
DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
CONCRETE WALK AND
MULTI-USE PATHS

ISSUED: JULY 2, 1998
REVISED: MAY 15, 2009

DRAWING NO.
2.02.A



MOUNTABLE CURBWALK

(NOTE: FOR USE ONLY IN DETACHED SINGLE-FAMILY RESIDENTIAL STREETS)

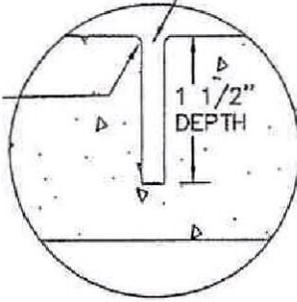
NOTES:

1. ALL EXPOSED CONCRETE SHALL HAVE A BROOM FINISH.
2. EXPANSION JOINTS SHALL BE INSTALLED AT 500 FOOT MAXIMUM INTERVALS, SEE CURB EXPANSION JOINT DETAIL.
3. CONTRACTION JOINTS SHALL BE INSTALLED AT END OF CURB RETURNS AND AT 10 FOOT MAXIMUM INTERVALS - SEE CURB CONTRACTION JOINT DETAIL.
4. WHEN JOINING EXISTING CURB, PROVIDE A MINIMUM OF THREE #4 x 16" DOWELS (9" EMBEDMENT) EVENLY SPACED.
- * 5. WHEN PLACING CURB ADJACENT TO CONCRETE PAVEMENT, THICKEN GUTTER TO MATCH PAVEMENT DEPTH.

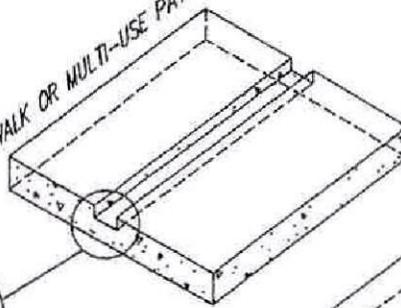
<p>DRAWN BY: JSH CHECKED BY: WGH APPROVED BY: DIRECTOR OF PUBLIC WORKS</p>	<p>CITY OF BOULDER, COLORADO</p> <p>INTEGRAL CURBWALK</p>	<p>ISSUED: JULY 2, 1998 REVISED: MAY 15, 2009 DRAWING NO. 2.02.B</p>
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USE 1/4" (MAX.) WIDTH ON WALK & CURBWALK ONLY. ALL MULTI-USE PATH CONTRACTION JOINTS SHALL BE SAWCUT.

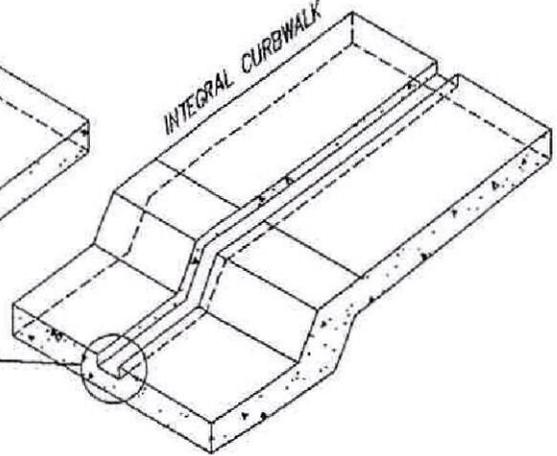
1/4" R TYP



WALK OR MULTI-USE PATH

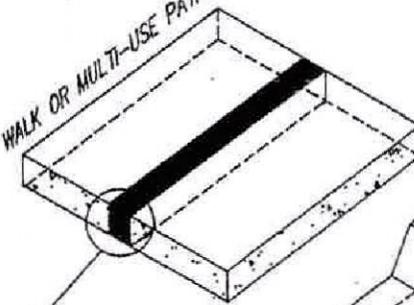


INTEGRAL CURBWALK

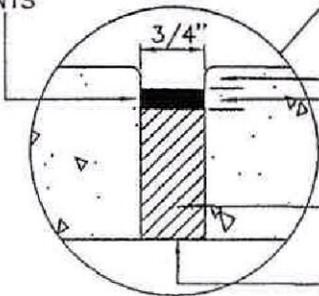
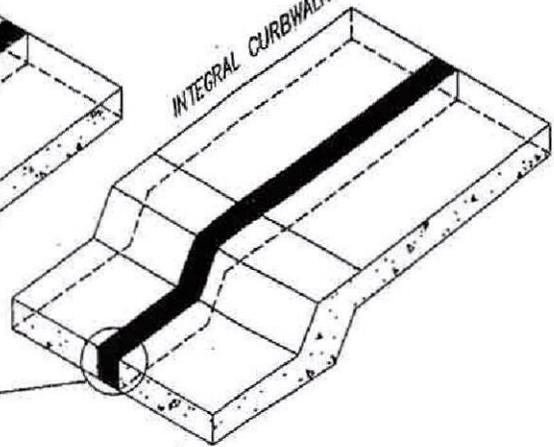


FILL WITH SILICONE SEALANT SEALANT SHALL BE ON CDOT APPROVED LIST OF SILICONE SEALANTS

WALK OR MULTI-USE PATH



INTEGRAL CURBWALK



1/4" DEPTH
1/4" DEPTH

PREFORMED JOINT MATERIAL

3/4" PRE-MOLDED, NON-EXTRUDING AND RESILIENT TYPE EXPANSION JOINT MATERIAL TO MEET ASTM SPECS D-1751 OR D-1752

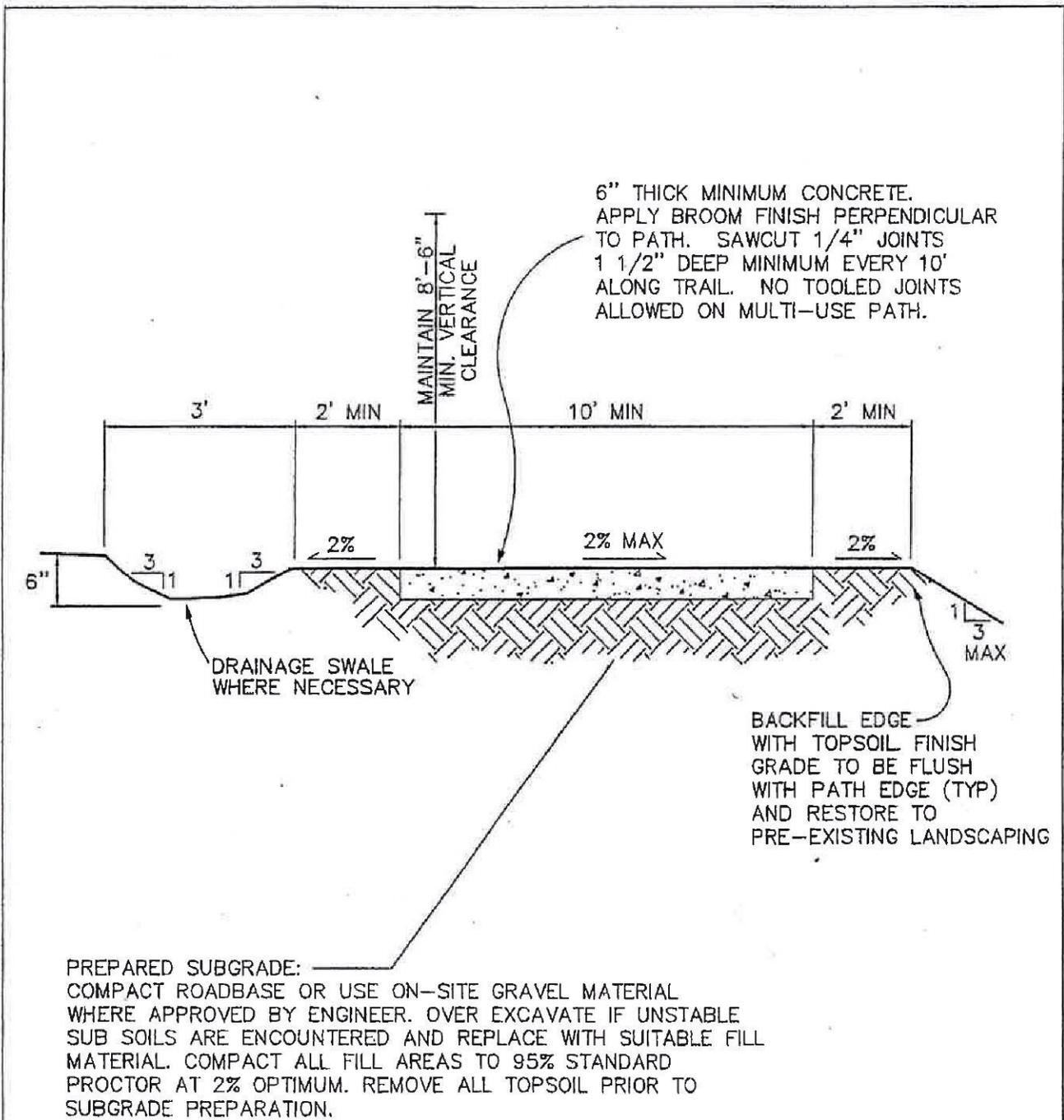
DRAWN BY: JSH
CHECKED BY: WGH

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
CONCRETE WALK AND
MULTI-USE PATH JOINTS

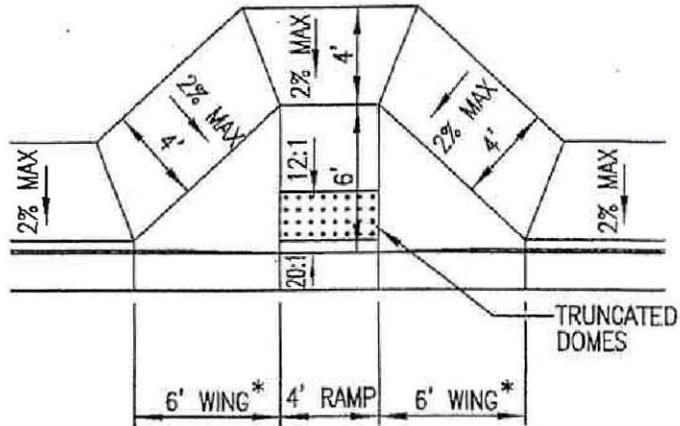
ISSUED: JULY 2, 1998
REVISED: MAY 15, 2009

DRAWING NO.
2.02.C

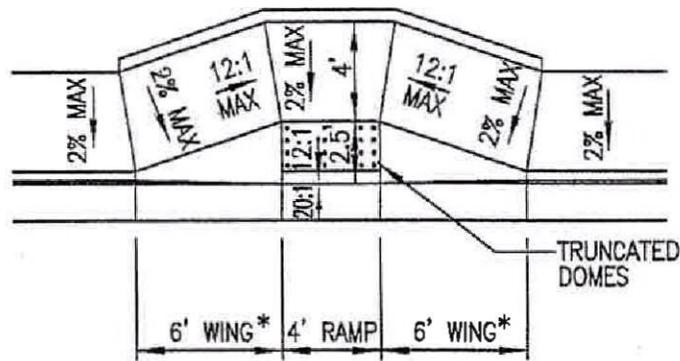


DRAWN BY: JSH CHECKED BY: RJH	CITY OF BOULDER, COLORADO MULTI-USE PATH SECTION DETAIL	ISSUED: JULY 2, 1998 REVISED: MAY 15, 2009
APPROVED BY: DIRECTOR OF PUBLIC WORKS		DRAWING NO. 2.02.D

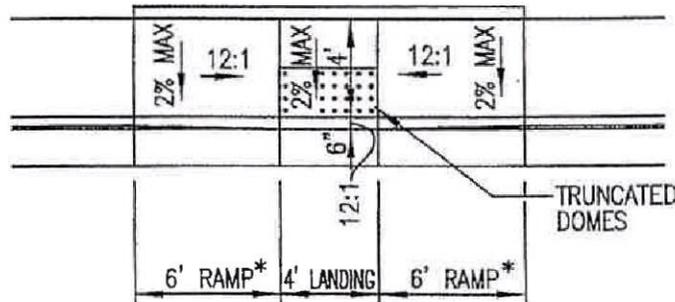
ROW INSPECTOR APPROVAL REQUIRED PRIOR TO INSTALLATION.



OPTION A



OPTION B



OPTION C

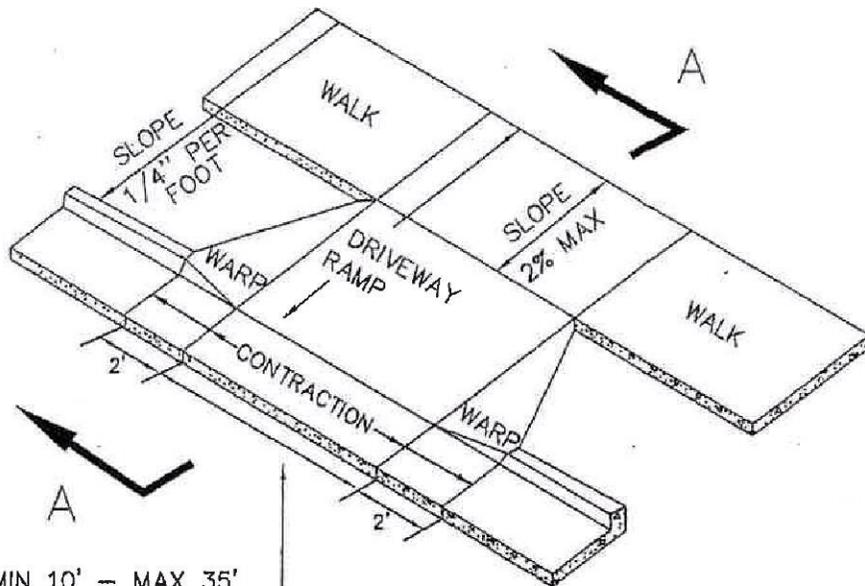
*DISTANCE MAY VARY DEPENDING ON ROADWAY GRADE.

DRAWN BY: PLS
 CHECKED BY: MJS
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 ATTACHED SIDEWALK
 CURB RAMP OPTIONS

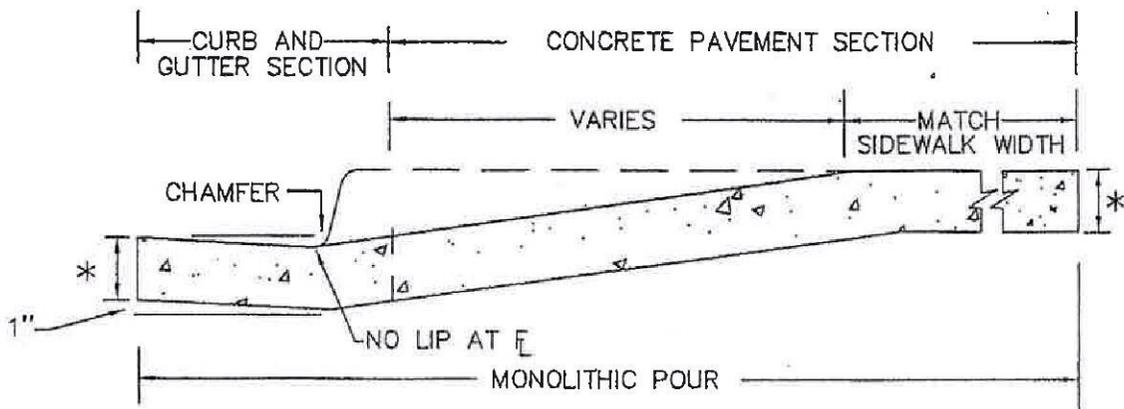
ISSUED: MAY 15, 2009
 REVISED:

DRAWING NO.
 2.07



COMMERCIAL MIN 10' - MAX 35'
 RESIDENTIAL MIN 10' - MAX 20'

NOTE: CONTRACTION JOINTS ARE REQUIRED AT EACH SIDE OF WARPED SECTION AND EVERY 10 FEET (MAXIMUM) ALONG RAMP DRIVE.



SECTION A-A

* 6" RESIDENTIAL
 8" COMMERCIAL AND PUBLIC ALLEYS

DRAWN BY: JSH
 CHECKED BY: WGH

APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

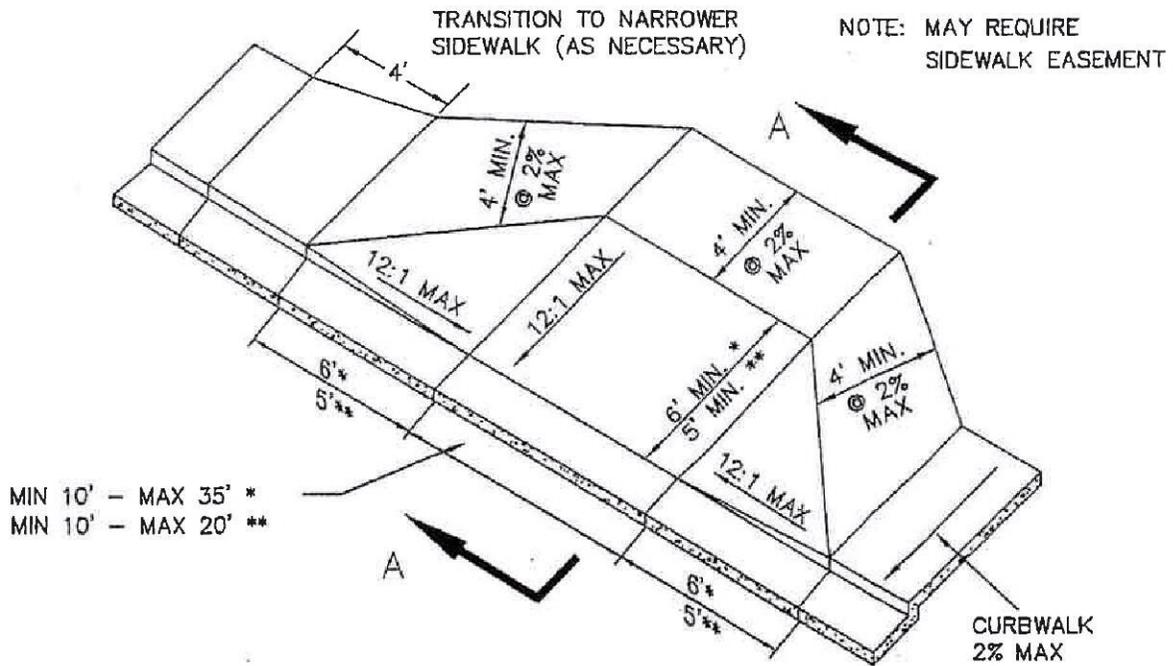
CITY OF BOULDER, COLORADO
 DRIVEWAY RAMP
 DETACHED WALK

ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

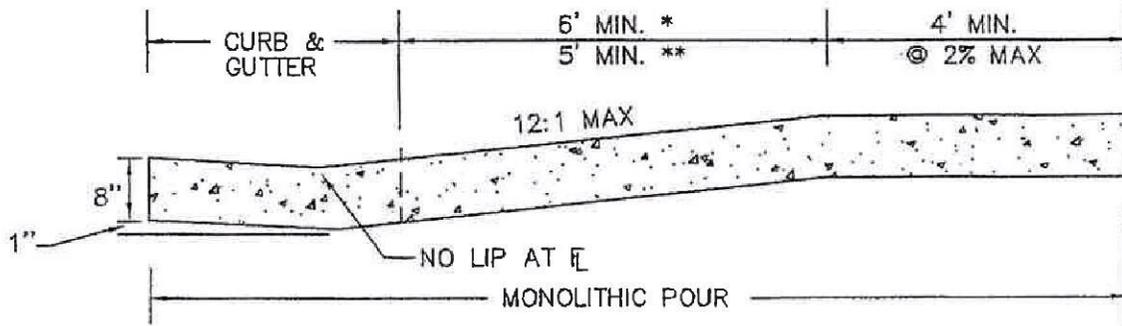
DRAWING NO.
 2.21

3H 119

ROW INSPECTOR APPROVAL REQUIRED PRIOR TO INSTALLATION.



NOTE: CONTRACTION JOINTS ARE REQUIRED AT EACH SIDE OF WARPED SECTION AND EVERY 10 FEET (MAXIMUM) ALONG RAMP DRIVE.



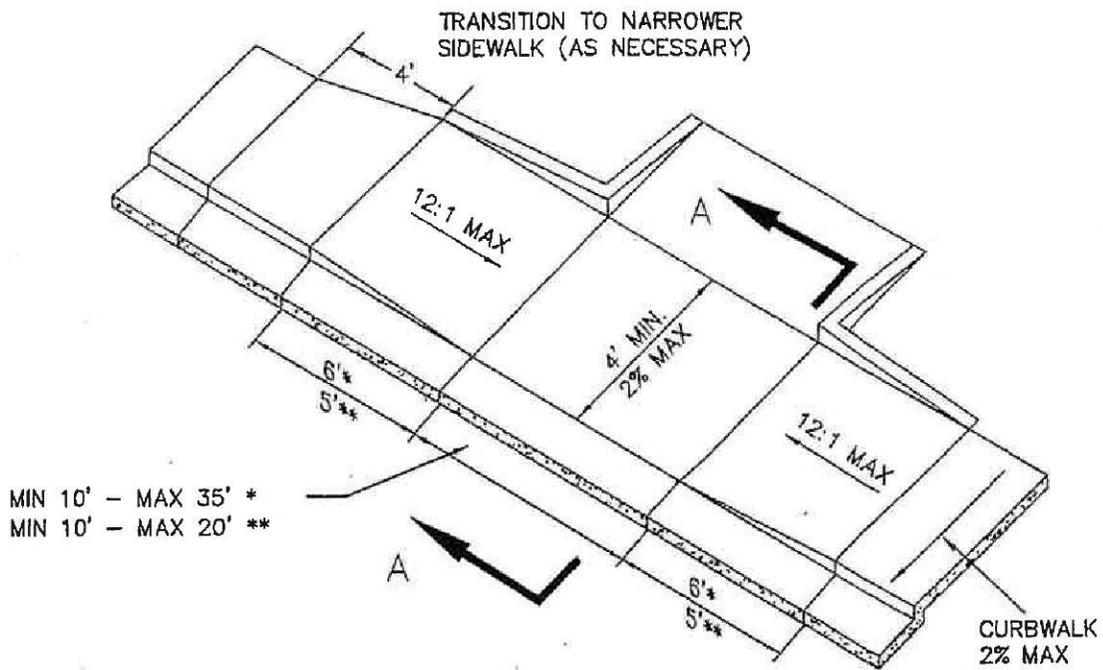
SECTION A-A

* MULTI-FAMILY RESIDENTIAL, COMMERCIAL & PUBLIC ALLEY
 ** SINGLE-FAMILY AND DUPLEX RESIDENTIAL

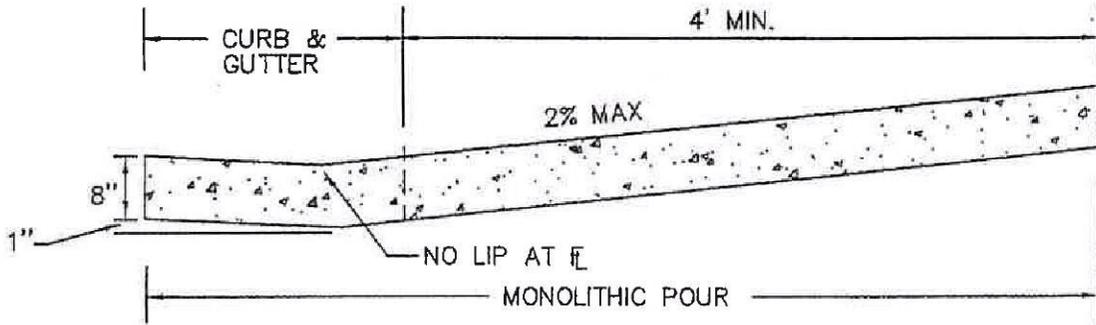
<p>DRAWN BY: SIK CHECKED BY: MJS APPROVED BY: DIRECTOR OF PUBLIC WORKS</p>	<p>CITY OF BOULDER, COLORADO DRIVEWAY RAMP CURBWALK CDOT TYPE 1</p>	<p>ISSUED: MAY 15, 2009 REVISED: DRAWING NO. 2.22.A</p>
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34 12

ROW INSPECTOR APPROVAL REQUIRED PRIOR TO INSTALLATION.



NOTE: CONTRACTION JOINTS ARE REQUIRED AT EACH SIDE OF WARPED SECTION AND EVERY 10 FEET (MAXIMUM) ALONG RAMP DRIVE.



SECTION A-A

* MULTI-FAMILY RESIDENTIAL, COMMERCIAL & PUBLIC ALLEY
 ** SINGLE-FAMILY AND DUPLEX RESIDENTIAL

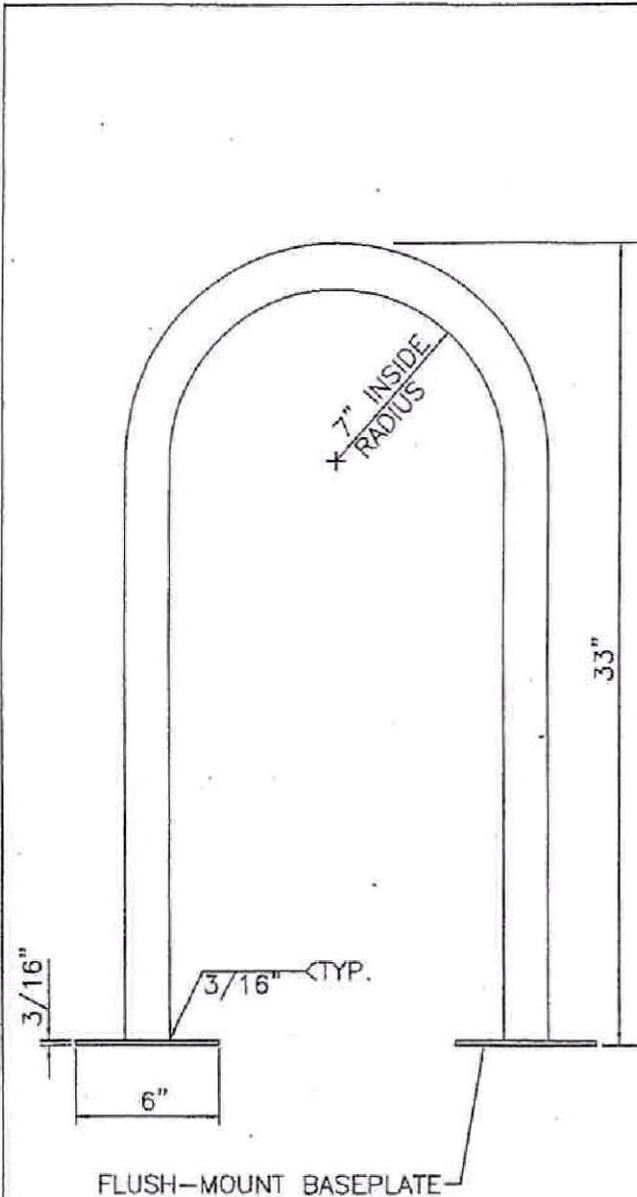
DRAWN BY: SIK
 CHECKED BY: MJS

APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 DRIVEWAY RAMP
 CURB WALK
 CDOT TYPE 2

ISSUED: MAY 15, 2009
 REVISED:

DRAWING NO.
 2.22.B



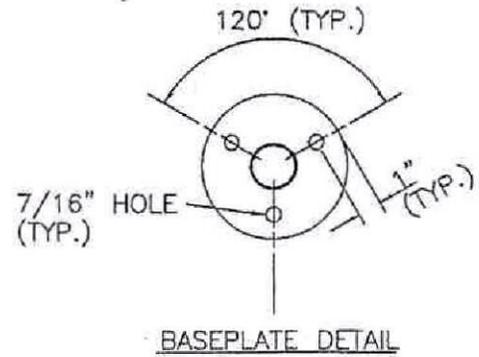
NOTES:

DIMENSIONS:

1. HEIGHT-33" FROM THE GROUND
2. CONTINUOUS BEND INSIDE RADIUS=7"

MATERIALS AND CONSTRUCTION:

1. MINIMUM OR 1 1/4" SCHEDULE 40 STEEL PIPE (1 5/8" OUTSIDE DIAMETER)
2. MAXIMUM 1 1/2" SCHEDULE 40 STEEL PIPE (2" OUTSIDE DIAMETER)
3. SOLID ONE-PIECE CONSTRUCTION; CONTINUOUS BEND; LEGS 14"-18" APART
4. GALVANIZED WITH BLACK POWDER COAT FINISH
5. FLUSH MOUNTED WITH WELDED BASE PLATES (6" DIAMETER, 3/16" THICK BASE PLATE). HIDDEN OR VANDAL-RESISTANT FASTENERS (SCREWS OR EXPANSION BOLTS)



DRAWN BY: JSH
 CHECKED BY: RJH
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 INVERTED "U"
 BICYCLE RACKS

ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.52.A

34 128

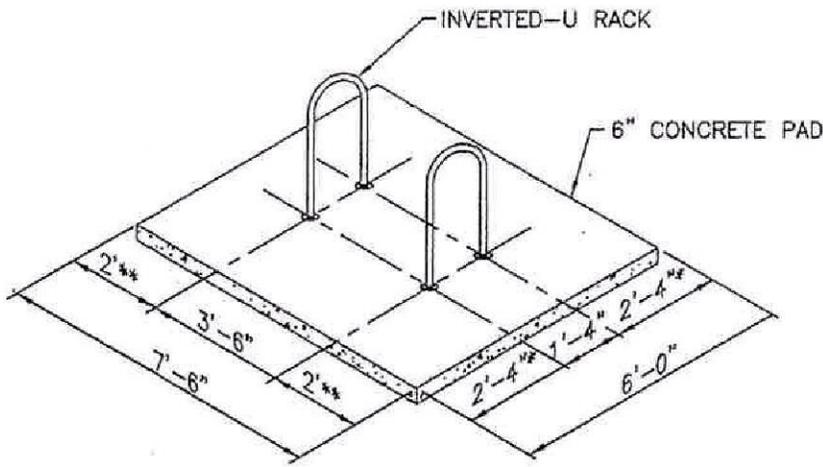
NOTES:

EXPOSED CONCRETE SURFACE TO BE BROOM FINISHED.
 PAD SIZE MAY VARY AS DIRECTED BY THE ENGINEER.
 PAD IS TO BE CONSTRUCTED WITH CLASS B CONCRETE.
 EXCAVATION AND/OR EMBANKMENT REQUIRED FOR PAD
 CONSTRUCTION WILL NOT BE PAID FOR SEPERATELY, BUT
 SHALL BE INCLUDED IN THE COST OF THE PAD. CONCRETE
 SHALL BE SLOPED AT 2% TO DRAIN.

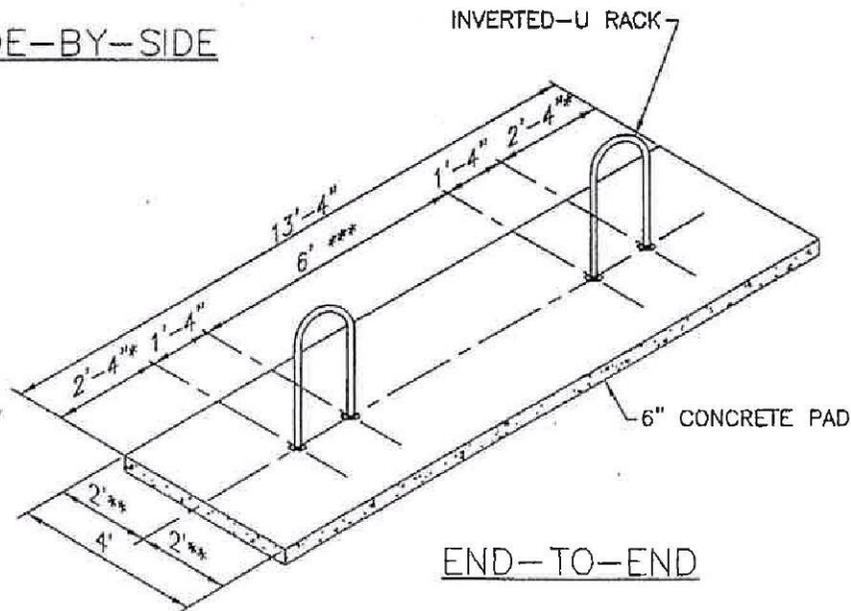
* 3'-4" MINIMUM WHEN
 INSTALLED PERPENDICULAR TO
 A WALL OR CURB.

** 3' MINIMUM WHEN INSTALLED
 PARALLEL TO A WALL OR
 CURB. 5' MINIMUM
 SEPARATION FROM CURB FACE
 WHEN INSTALLED ADJACENT TO
 A CURB WITH "HEAD-IN"
 AUTOMOBILE PARKING.

*** 10' MINIMUM IF MORE THAN
 TWO "U" RACKS IN A SERIES.



SIDE-BY-SIDE



END-TO-END

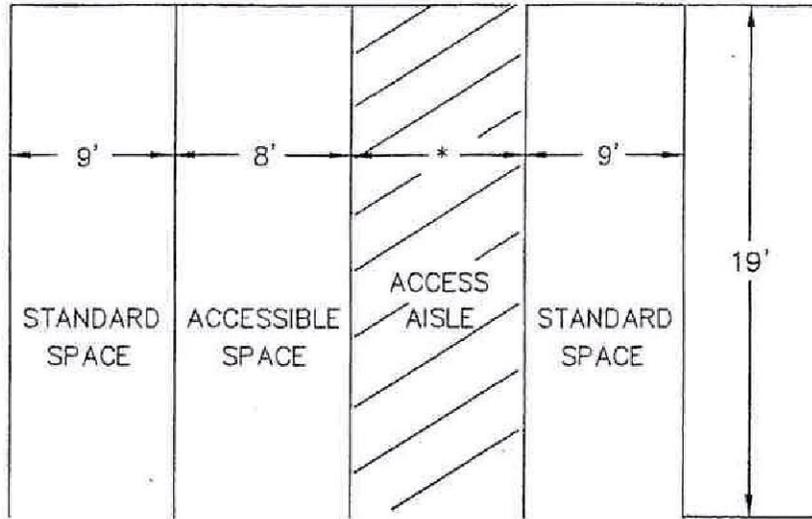
DRAWN BY: JSH
 CHECKED BY: RJH
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 INVERTED "U"
 BICYCLE RACKS

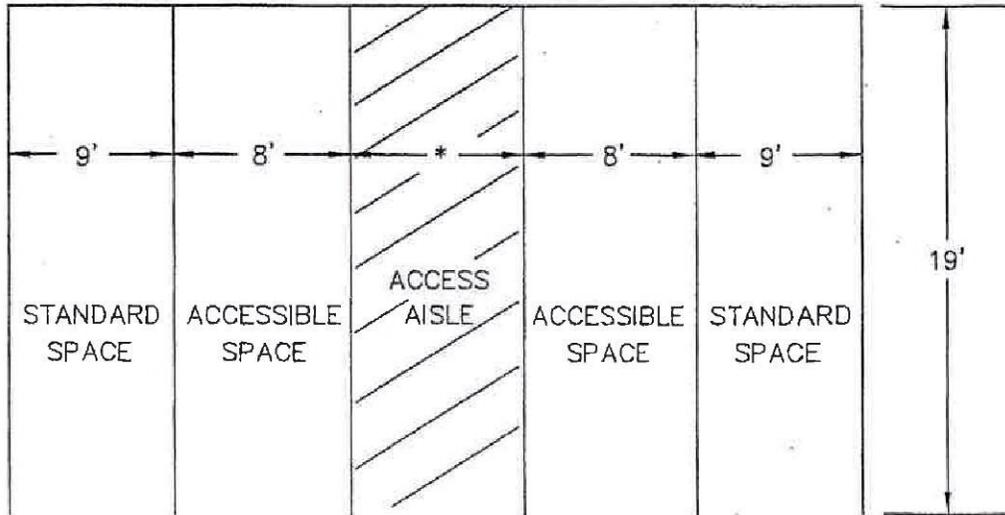
ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.52.B

* 5' MINIMUM (STANDARD)
8' MINIMUM (VAN)



* 5' MINIMUM (STANDARD)
8' MINIMUM (VAN)



DRAWN BY: JSH
CHECKED BY: MGS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO

ACCESSIBLE
PARKING STALL

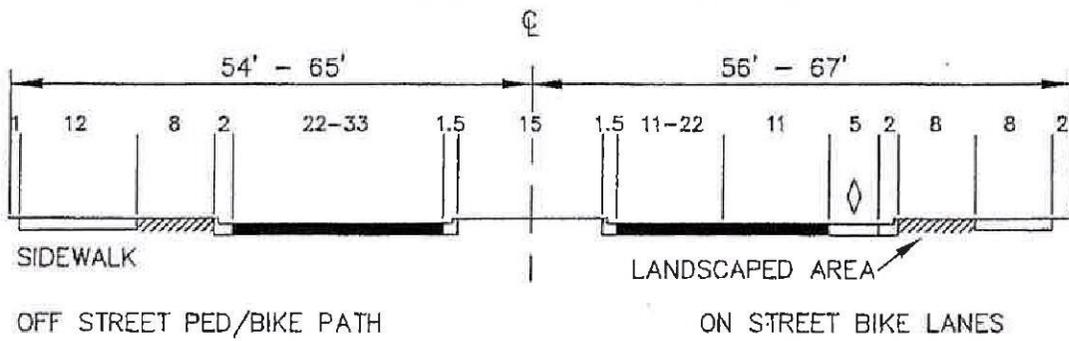
ISSUED: JULY 2, 1998
REVISED: MAY 15, 2009

DRAWING NO.

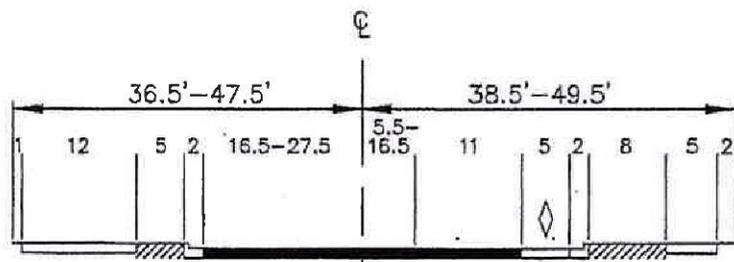
2.54

3H

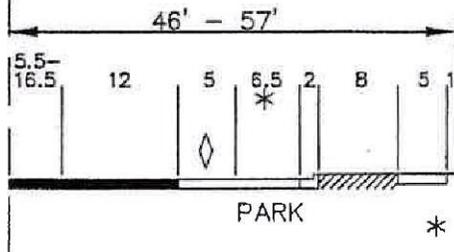
124



PRINCIPAL ARTERIAL



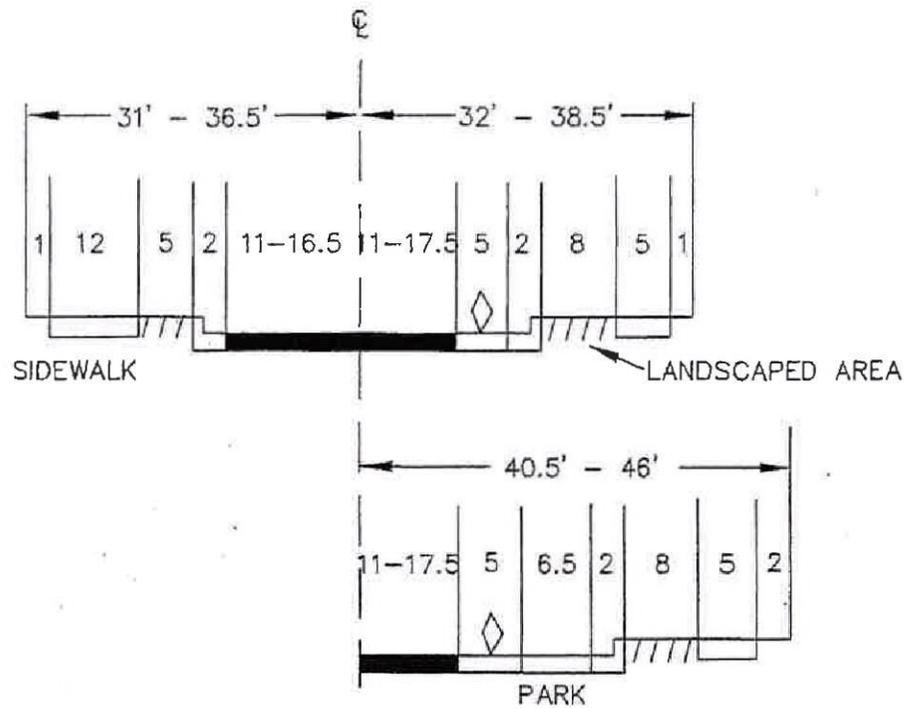
NOTE:
 ALL RIGHT-OF-WAY WIDTHS
 AND CROSS SECTIONS SHOWN
 ARE FROM INTERSECTIONS
 AND TURN LANES. ADDITIONAL
 RIGHT-OF-WAY AND LANE WIDTHS
 MAY BE REQUIRED FOR INTERSECTIONS
 AND TURN LANES.



* 9 FEET IF
 ON STATE
 HIGHWAY

MINOR ARTERIAL

DRAWN BY: JSH CHECKED BY: MGS APPROVED BY: DIRECTOR OF PUBLIC WORKS	CITY OF BOULDER, COLORADO NON-RESIDENTIAL STREET CROSS-SECTION EXAMPLES	ISSUED: JULY 2, 1998 REVISED: MAY 15, 2009 DRAWING NO. 2.61.A
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OFF STREET PED/BIKE PATH

ON STREET BIKE LANES

← ALTERNATIVE →

COLLECTOR

NOTE:

ALL RIGHT-OF-WAY WIDTHS AND CROSS SECTIONS SHOWN ARE FROM INTERSECTIONS AND TURN LANES. ADDITIONAL RIGHT-OF-WAY AND LANE WIDTHS MAY BE REQUIRED FOR INTERSECTIONS AND TURN LANES.

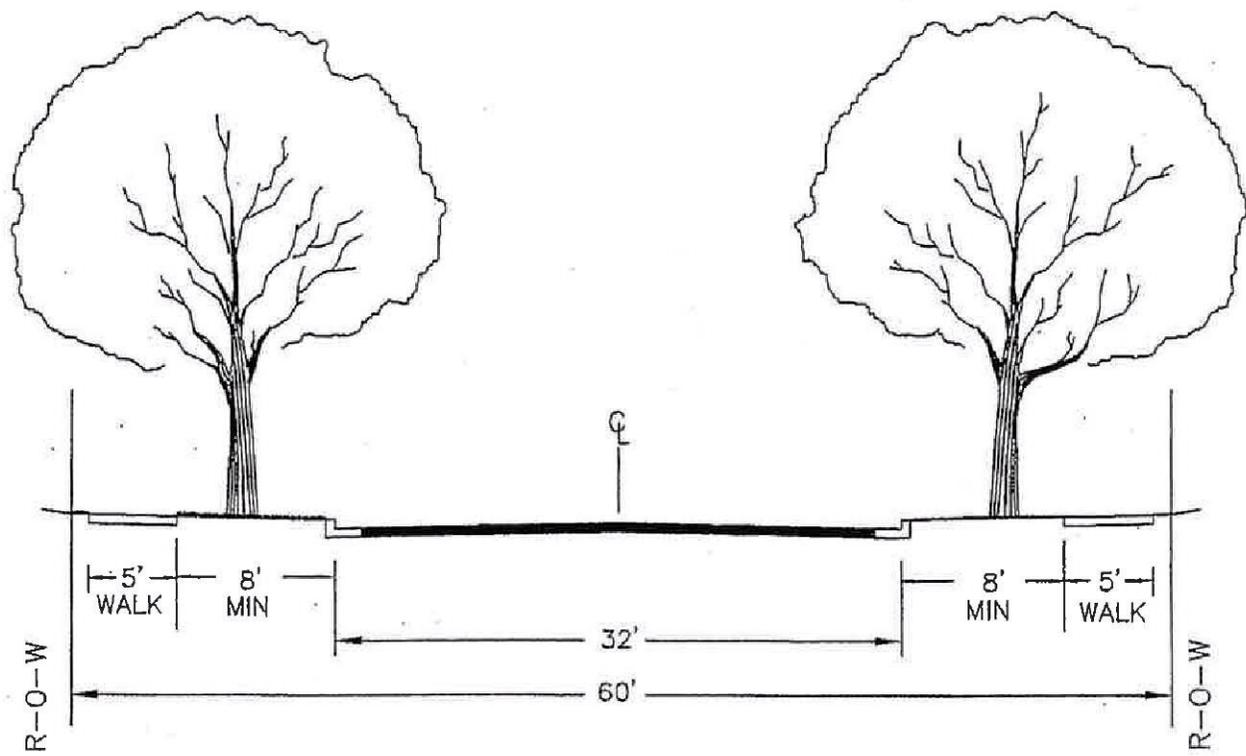
DRAWN BY: JSH
 CHECKED BY: MGS
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 NON-RESIDENTIAL
 STREET CROSS-SECTION
 EXAMPLES

ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.

2.61.B



RESIDENTIAL COLLECTOR

DRAWN BY: JSH
 CHECKED BY: RJH

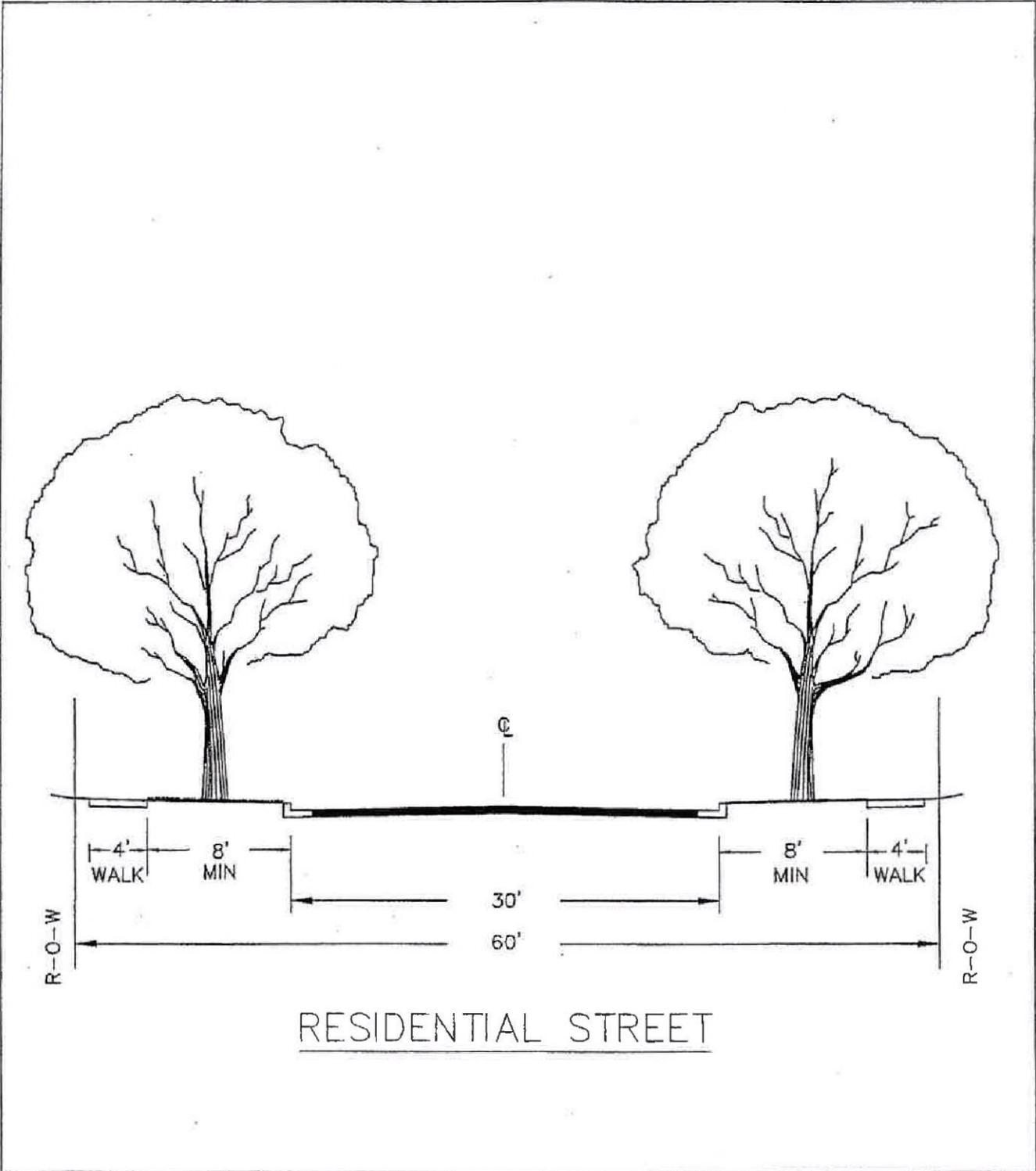
APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 RESIDENTIAL COLLECTOR
 CROSS-SECTION

ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.63

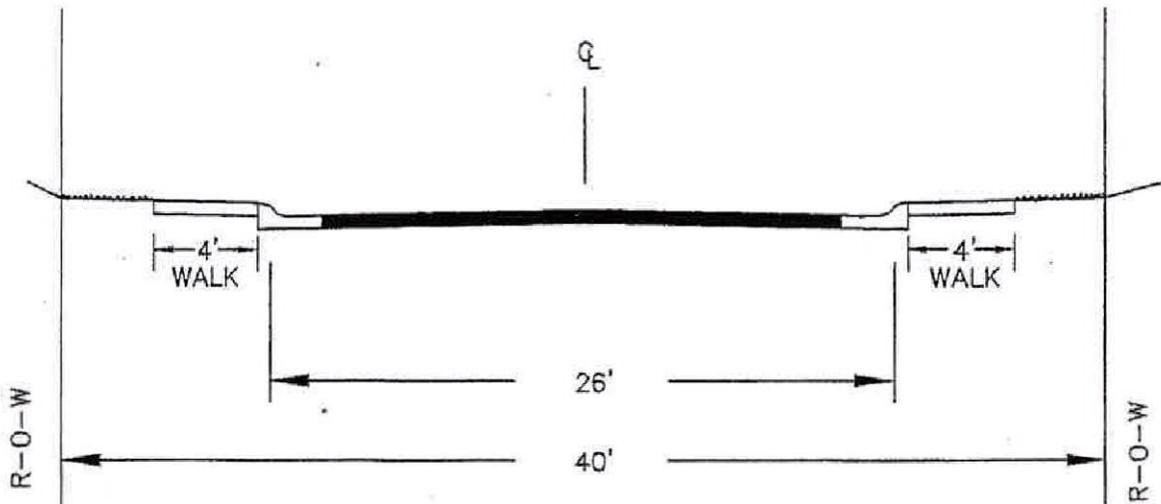
3H 127



RESIDENTIAL STREET

<p>DRAWN BY: JSH CHECKED BY: RJH</p>	<p>CITY OF BOULDER, COLORADO RESIDENTIAL STREET CROSS-SECTION</p>	<p>ISSUED: JULY 2, 1998 REVISED: MAY 15, 2009</p>
<p>APPROVED BY: DIRECTOR OF PUBLIC WORKS</p>		<p>DRAWING NO. 2.64</p>

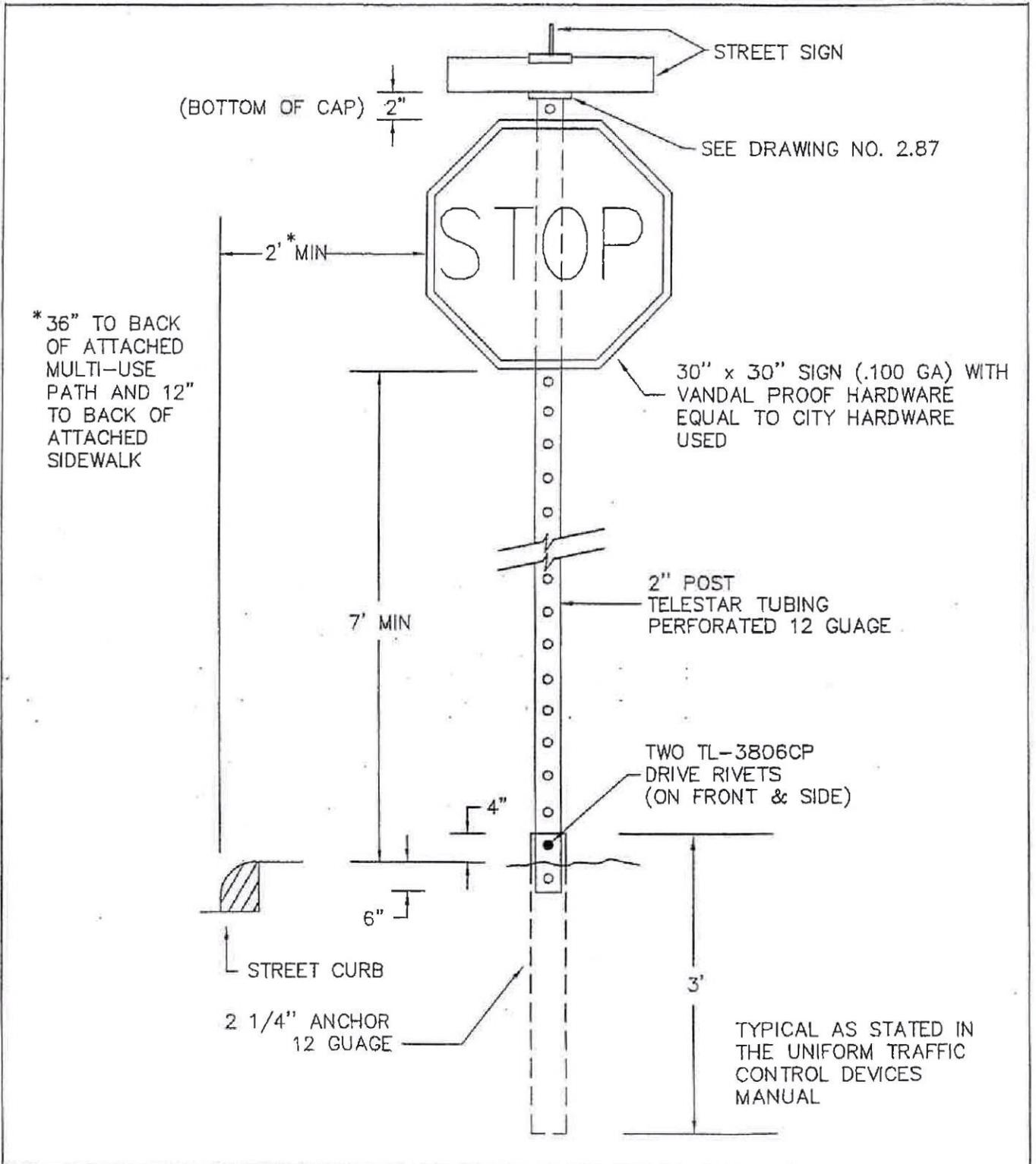
34 12



ACCESS STREET

<p>DRAWN BY: JSH CHECKED BY: RJH APPROVED BY: DIRECTOR OF PUBLIC WORKS</p>	<p>CITY OF BOULDER, COLORADO RESIDENTIAL ACCESS STREET CROSS-SECTION</p>	<p>ISSUED: JULY 2, 1998 REVISED: MAY 15, 2009 DRAWING NO. 2.66</p>
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34 129

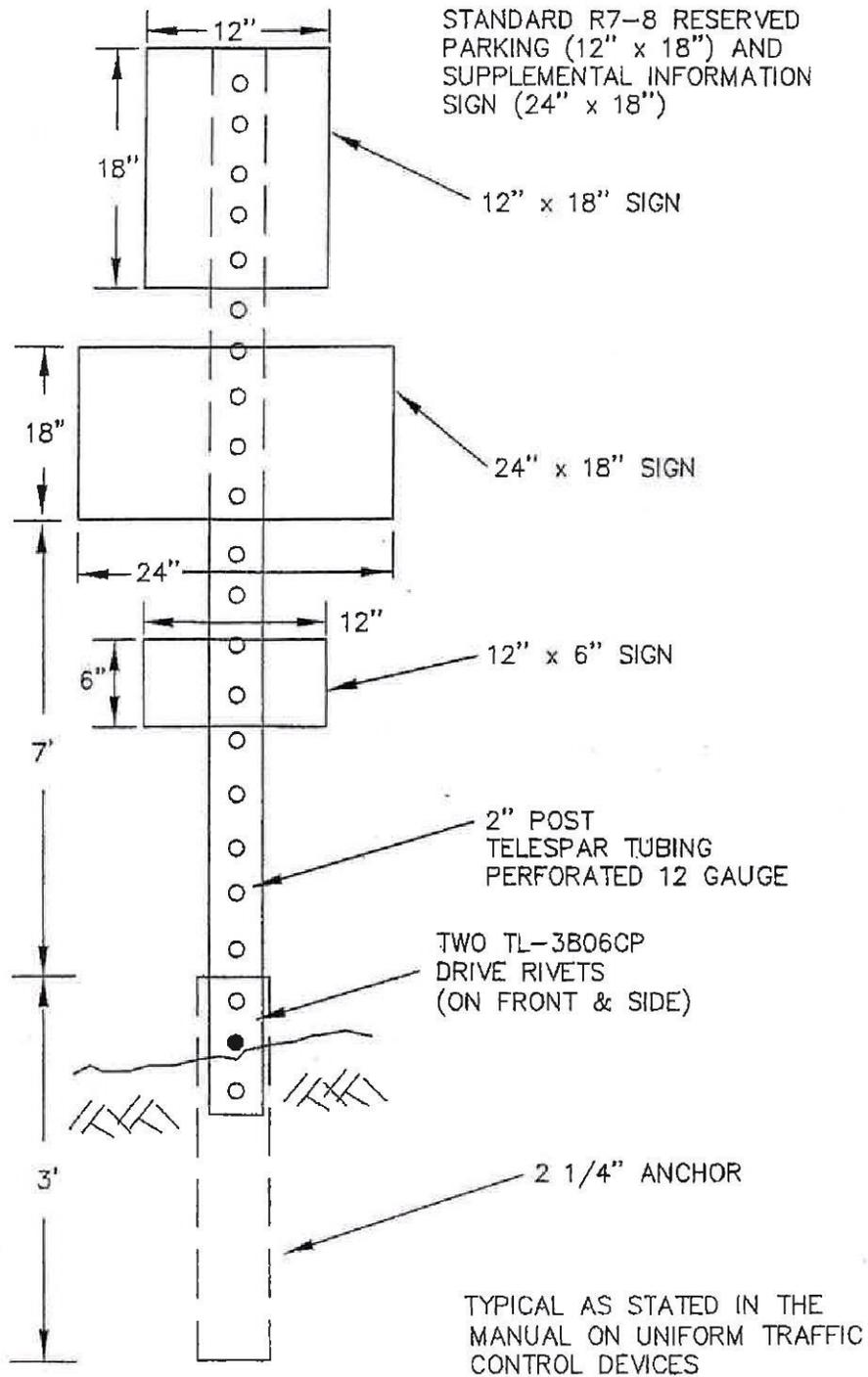


DRAWN BY: JSH
 CHECKED BY: MGS
 APPROVED BY:
 DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
 SIGN INSTALLATION
 DETAILS

ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.81



DRAWN BY: JSH
 CHECKED BY: MGS

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CITY OF BOULDER, COLORADO
 ACCESSIBLE
 PARKING
 SIGN DETAILS

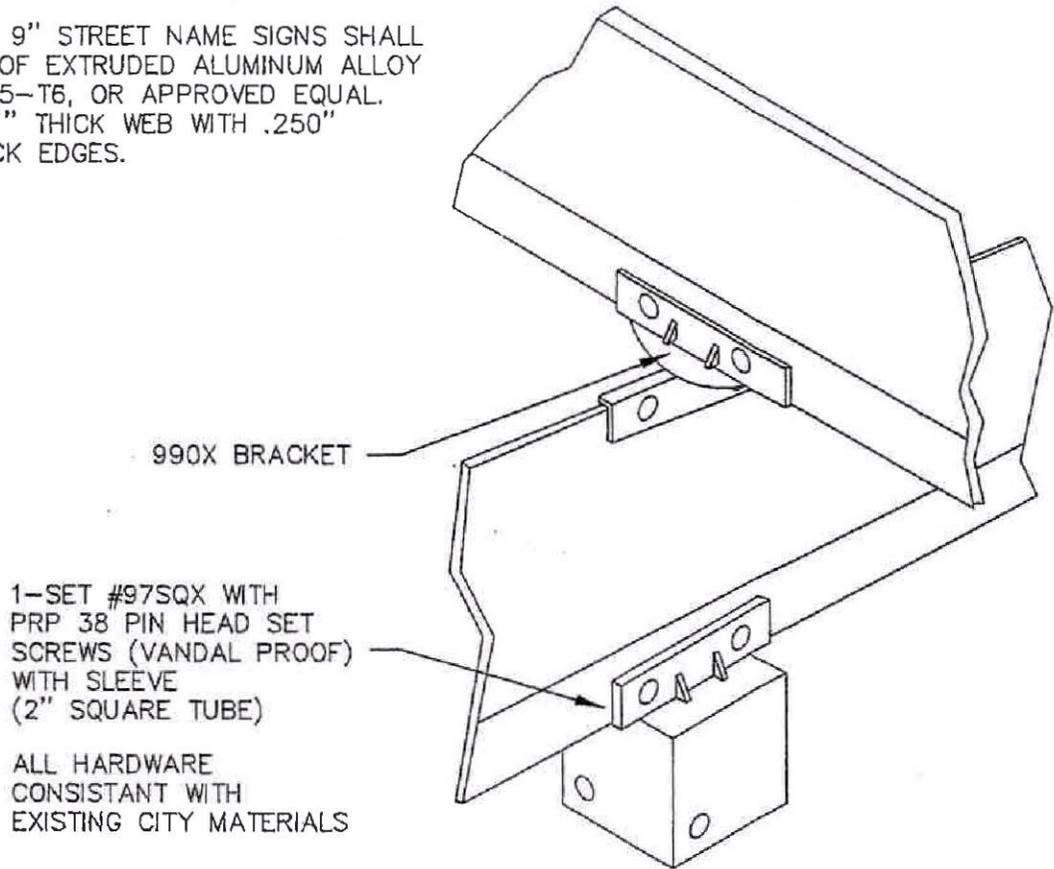
ISSUED: JULY 2, 1998
 REVISED: MAY 15, 2009

DRAWING NO.
 2.86

3H 131

NOTE:

ALL 9" STREET NAME SIGNS SHALL BE OF EXTRUDED ALUMINUM ALLOY 6065-T6, OR APPROVED EQUAL. .091" THICK WEB WITH .250" THICK EDGES.



DRAWN BY: JSH

CHECKED BY: MGS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

CITY OF BOULDER, COLORADO
STREET NAME
SIGN MOUNTING
DETAILS

ISSUED: JULY 2, 1998

REVISED: MAY 15, 2009

DRAWING NO.

2.87

3H 130