

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,” “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 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.