

# STANDARD SPECIFICATIONS FOR CONSTRUCTION

## CITY OF SALIDA



PREPARED BY CITY OF SALIDA  
DEPARTMENT OF PUBLIC WORKS

January 2023



SECTION 01100  
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Summary of Work.
- B. Scope
- C. Definitions.
- D. Authority of City.
- E. Work by City.
- F. Contractor's Responsibility.
- G. Contractor's Use of Site.
- H. Work sequence.

1.2 Summary of Work

- A. Public Improvements within City Right-of-Way

1.3 SCOPE

- A. Specifications and requirements set forth to be used in the design and construction or repair of water mains, streets, pavements, curb and gutter, sidewalks, storm sewers, culverts, and installation of utilities or any other work performed within the public right of way for approval and acceptance by the City of Salida.
- B. Excavation and restoration standards are required to preserve the integrity, operational safety, and function of the City rights-of-way.

1.4 DEFINITIONS

- A. City: Shall mean the City of Salida, Colorado and personnel with the authority to act on behalf of the City of Salida.
- B. Engineer: Shall mean the authorized professional engineer and designated representatives acting on behalf of the City, including but not limited to inspectors in the field.
- C. Public Works Inspector: Shall mean the Public Works Inspector of the City of Salida, Colorado and authorized representatives acting on behalf of the City or the Public Works Inspector.
- D. Right-of-Way (ROW or R-O-W): Shall mean the area on, below, or above a public roadway, highway, street, path way, bicycle lane and public sidewalk in which the City

has an interest, including other dedicated rights of ways for travel purposes and utility easements of the City.

- E. Contractor: Shall mean a person, partnership, or corporation approved to work in the City of Salida in accordance with the requirements of the laws and codes of the City of Salida.
- F. Excavate: Shall mean to dig into or in any way remove or physically disturb or penetrate any part of a right of way.
- G. Best Management Practices (BMPs): schedules of activities, prohibitions of practices, maintenance procedures, and other management practice to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage.

#### 1.5 AUTHORITY OF CITY

- A. City shall have authority to ascertain that all construction of facilities is equal to or better than the minimum construction requirements set forth in these specifications.
- B. City and Engineer have authority to assign an inspector to check any and all work, including materials to be incorporated in the work, excavation, bedding, backfill, and all construction methods and practice.
- C. Inspectors are assigned to assist the Contractor to comply with these specifications and have the authority to reject defective or inferior materials and workmanship and to suspend work until the conditions in question are corrected.

#### 1.6 WORK BY CITY

- A. Work includes (non-specific to current project):
  - 1. Tapping of existing water mains (note that contractors installing infrastructure for new developments shall tap mains under City guidance).
  - 2. Blowing off and testing of chlorine residual for new water mains.
  - 3. Observe pressure testing of water mains to be accepted by the City.
  - 4. Operating existing valves and appurtenances in existing system required for construction, including filling and flushing mains to be accepted by the City.

5. Note that the City retains the right at its discretion to hire a Geotechnical Engineer or Civil Engineer to provide inspection services for new infrastructure being installed in new developments and the cost of the services to be reimbursed by the development owner.

#### 1.7 CONTRACTOR RESPONSIBILITY

- A. Contractor shall be responsible to read and fully comply with all the provisions of these specifications and General Clauses.
- B. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to public and private facilities, people, and property.
- C. Contractor shall perform work in a manner subject to current Occupational Safety and Health Administration and State of Colorado safety requirements. It shall be the responsibility of the Contractor to fully comply with these regulations.
- D. Contractor shall provide adequate construction signing, flagmen, barricades, etc., to warn vehicular and pedestrian traffic of work in progress and divert traffic as may be required during the course of the construction per approved traffic plan. All signing shall conform to the Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD). Contractor shall notify the respective local emergency response agencies 48 hours in advance of the closure of any street or access restrictions. This includes but is not limited to: Fire, Police, School District, and other affected organizations such as CDOT or the County.
- E. Contractor shall notify the City of Salida Water Distribution Supervisor at least 36 hours prior to a planned water service interruption, request for valve/hydrant operation, testing of mains, or other requested service provided by the City. The Contractor will be required to provide door hangers and coordinate shut-down times with affected property and/or business owners.
- F. Contractor shall protect all existing facilities and utilities within the work area and shall be liable for any damage to any such facilities and utilities due to Contractor's activities.
- G. Contractor shall follow all state and/or NPDES requirements for storm water and be responsible for permitting, installing BMPs, and management of facilities.
- H. Sanitary facilities for the use of project personnel shall be properly secured, located, erected and maintained by the CONTRACTOR.
- I. Contractor shall provide 48 hours notice in starting work activities on public improvements.
- J. Contractor is responsible for Quality Control.
- K. Contractor shall provide the City with Material Submittals as requested prior to the start of work.
- L. For infrastructure to be accepted by the City or New Developments, the Contractor shall provide the City with Engineer Stamped Drawings prior to the start of construction that have been reviewed and approved by the City Engineer.

- M. All removed concrete shall be re-placed by the end of the week unless approved otherwise.

1.8 CONTRACTOR'S USE OF SITE

- A. Limit use of site to allow:
  - 1. City occupancy.
  - 2. Work by City.
  - 3. Use of site by the public.

1.9 WORK SEQUENCE

- A. Construct Work in stages to accommodate City's occupancy requirements during construction period. Coordinate construction schedule and operations with Engineer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

## SECTION 01300

### SUBMITTALS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Product options
- B. Product submittals
- C. Product substitution procedures

##### 1.2 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

##### 1.3 PRODUCT SUBMITTALS

- A. Submit one pdf electronic copy of each submittal utilizing the City's submittal transmittal form to the City Engineer and Director of Public Works electronically to the specified Cloud based project file. The Contractor must submit the submittal signed, no submittals from vendors.
- B. Product submittals are required for all construction related to subdivisions, new utility main installation, and all water mains and any other project the City deems is significant enough to warrant or as required by Specifications.
- C. Duplicate submittals will not be required if a copy is already on file with City.
- D. All submittals shall be approved prior to construction of any public infrastructure. All submittals shall be submitted at the beginning of the project unless specifically approved for later submittal.
- E. Submittals include but are not limited to:
  - 1. All piping, fittings, appurtenances for water and sewer.
  - 2. Aggregate gradation and proctors to be used for bedding and backfill.
  - 3. Concrete and asphalt materials
  - 4. All other materials utilized during construction of infrastructure
  - 5. Road closure plans and schedules
  - 6. Draft press releases for work activities

#### 1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Specifications.
- C. A request constitutes a representation that Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  - 2. Will provide same warranty for Substitution as for specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to City.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Engineer for review or redesign services associated with re-approval by City.
- D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Specifications or prior agreements and requirements.
- E. Substitution Submittal Procedure:
  - 1. Submit one electronic request for Substitution for consideration. Limit each request to one proposed Substitution.
  - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

Not Used.

END OF SECTION



SECTION 01600  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by City.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700  
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contractor Responsibilities.
- B. Construction Facilities.
- C. Protection of Utilities.
- D. Closeout procedures.
- E. Cleaning & site maintenance.
- F. Construction schedule, testing, and inspections.
- G. Restoration.
- H. Control of vehicular and pedestrian traffic.
- I. Protecting installed construction.
- J. Project record documents.
- K. Discovery of historical items.
- L. Construction site erosion.

## 1.2 CONTRACTOR RESPONSIBILITIES

- A. Contractor shall obtain an excavation permit with the City of Salida prior to the beginning of any work operations within the City rights of way.
- B. Contractor shall assume responsibility for disposing of removed vegetation, tree material, soil, asphalt, concrete, and other surplus materials not specifically identified to be retained by the City per Federal, State and Local regulations at Contractor's expense.
- C. Contractor shall assume responsibility for performing all work in a workmanlike manner with due care being taken to avoid unnecessary damage to property. Contractor shall be responsible for all damage resulting from carelessness or work performed in an irresponsible or unworkmanlike manner.
- D. Contractor shall obtain all utility locates prior to excavating, and shall be liable for all damages to existing structures and utilities and shall save the City harmless for any liability or expense for injuries, damages, or repairs.
- E. Contractor shall perform all work not covered in the Specifications to applicable industry standards.
- F. Contractor shall conform to all applicable State and local Codes and Ordinances.
- G. Contractor shall provide all construction surveying and/or staking as deemed necessary to complete the project as intended per the Specifications and approved plans.

## 1.3 CONSTRUCTION FACILITIES

- A. Provide and place all traffic control signs, barricades, and devices during the total construction time of the work, including time for concrete curing. Temporary fencing or other adequate measures to control pedestrian access to construction area shall be maintained.
- B. Contractor's construction activities are restricted to the area within the City rights of way and City owned property boundaries as near as practical and within any specified construction easements within private property, which are obtained by the City or the Contractor. All reasonable efforts shall be made to maintain access for property owners and residents and their business patrons to and from private property within the site.
- C. Protect all private and public property located within the construction site. All property disturbed by Contractor during construction will, at Contractor's expense, be repaired or replaced and left in as good a condition as originally found.
- D. All temporary utilities such as electricity, sanitation services, heating, or other services required for construction and other facilities such as safety equipment, fire extinguishers, warning signs, lights, or special equipment shall be supplied as needed by the Contractor at his expense.
- E. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Protect site from puddling or uncontrolled running water. Provide sumps, water barriers as required to protect site from soil erosion and other potential damage to work, such as storm water accumulating on site from upstream.

#### 1.4 PROTECTION OF UTILITIES

- A. The Contractor shall protect all public utilities encountered. These may include telephone lines, culverts, buried cables, power lines, water lines, sewer lines, irrigation laterals, gas lines and other overhead and underground utilities.
- B. Before any excavation or work is begun in the vicinity of the above-named utilities, each utility company or department concerned must be notified in advance of such work, and such work shall not be done until an authorized representative of the utility concerned is on the premises.
- C. The Contractor shall be held liable for all damages to any and all public utilities encountered on this project, which damages are due to the Contractor's operations. Such damages shall include all physical damages to utilities and also all damages due to the interruption of service of such utilities, when such damages and interruptions are caused by the Contractor's operations.
- D. Where alterations or moving of utilities is not required to permit construction of the work, the Contractor shall take such measures as the utility entity may direct to properly protect these utilities throughout his construction activities and shall cooperate at all times with the proper authorities and/or Owner in maintaining service of the above-named utilities affected by the work.
- E. The cost of damages due to the Contractor's operations, the cost of moving water or sewer service lines and the cost of protecting the utilities, where alteration or moving is not required to permit construction of the work, shall be paid for by the Contractor.
- F. Should any pipelines, water lines, gas mains, electrical conduits, sewer pipes, overhead wiring, telephone lines, buried cables, power lines, or any other such utilities not specifically mentioned and provided for elsewhere as a part of this document, have to be moved, repaired, reconditioned or revised due to construction, or moved temporarily to permit construction of work, the party or parties owning and operating such utilities shall perform the actual work of moving, repairing, reconditioning or revising such utilities, unless other agreements are reached with the utility companies involved.

- G. Local utility companies and contact information:
  - 1. Utility Notification Center of Colorado (UNCC)  
12600 W. Colfax Ave. Ste: B310  
Lakewood, Colorado 80215  
Phone: 811  
Admin: 303-232-1991  
Fax: 303-234-1712
  - 2. Local Utility Companies Are:
    - a. Atmos Energy (Natural Gas)
    - b. Xcel Energy (Electricity)
    - c. Century Link ( Phone)
    - d. Spectrum (Cable)
    - e. City of Salida Water & Sewer (Note City of Salida is the Sewer utility for the Town of Poncha Springs)

## 1.5 CLOSEOUT PROCEDURES

- A. Contact City for final inspection.
- B. Provide submittals required by City.
- C. Provide as-built plans required by City:
  - 1. As-built plans shall be submitted for all subdivisions, new utility main installation, and all water mains and any other project the City deems is significant enough to warrant.
  - 2. Four copies of as-built plans for completed construction shall be submitted on 24-inch X 36-inch sheets (minimum scale of drawing, 1 inch = 50 feet) to Engineer.
- D. Plans must be submitted digitally in DWG or DXF format. All plans must be projected to Colorado State Plane Central Zone coordinates (NAD 1983) with appropriate scale factor.
- E. Drawings of Record Criteria:
  - 1. "As-Built/Drawing of Record" means a drawing, or series of drawings, that depict improvements as they were actually constructed, and that are drawn to the same scale, with the same detail, accuracy, format and form as the drawings that were submitted for original approval. Information on the project facilities shall indicate sufficient horizontal and vertical dimensional data so that the constructed improvements may be located and delineated.
  - 2. "As-Built/Drawing of Records" are required of any set of plans approved by the City Engineer. It is the applicant's responsibility to make arrangements with the Engineer of Record for the preparation and submittal of the "As-Built/Drawing of Records".
  - 3. In order to effectively comply with this requirement, it will be necessary for the Engineer of Record to provide a periodic review and inspection of the installation of those facilities within the project. The engineer may supplement his review and inspection of the project by utilizing information taken from a valid survey.
  - 4. The Engineer of Record, or other such Registered Professional Engineer as may apply, shall submit to the City the required number (no less than 3) of certified "As-built" or "As-Built/Drawing of Record" on media required by the City signed and stamped within 60 days of the final walk-through inspection.

5. If any errors or omissions are discovered by the City within the "As-Built/Drawing of Record", the engineer of record shall make corrections and resubmit the plans within 30 days of notice by the City.
6. The "As-Built/Drawing of Record" shall contain a certification from an Engineer registered in the State of Colorado that indicates that the project has been substantially completed in accordance with the approved plans and specifications, or that the deviations noted on the "As-Built/Drawing of Record" will not prevent the project from complying with the design function of the project.
7. "As-Built/Drawing of Record" shall be submitted in the same page format as the original approved plans. If revision requires the addition of a new sheet, it shall be added to the back of the existing set and the entire set renumbered accordingly. All pages must be included in the same order as the original and marked "As-Built/Drawing of Record" regardless of whether any revision applies to any particular page or not. If no changes occurred, simply write "As-Built/Drawing of Record" on the drawing.

#### 1.6 CLEANING & SITE MAINTENANCE

- A. Public streets within the work site must be washed and swept on a daily basis or otherwise, according to the discretion of the Engineer. Anytime during the course of the Work, Contractor shall, at the discretion of the Engineer, wash, sprinkle, or wet down streets or alleys, including areas affected by work detours and construction traffic.
- B. Execute final clean up of site prior to final project assessment.
- C. Clean debris from right of way and drainage systems.
- D. Clean site; sweep paved areas, rake clean landscaped surfaces; provide access at all driveways and cross streets.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

#### 1.7 CONSTRUCTION SCHEDULE, TESTING, AND INSPECTIONS

- A. At least 24 hours prior to the start of any work, Contractor shall furnish a submittal of construction schedule to facilitate scheduling required inspections according to the specifications and to minimize the Contractor's wait time.
- B. Reports will be submitted by independent firm or City representative to Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements. Testing does not relieve Contractor from performing Work to requirements.
- C. Retesting required because of non-conformance to specified requirements shall be performed on instructions by the Engineer and will be done at Contractor's expense.
- D. Contractor shall be responsible for supplying the City of Salida, at the Contractor's expense, with suitable soils tests from a licensed independent soils testing laboratory, with gradation and proctor density data for any material used in the work for backfill.
- E. Add in requirement for stamped submittals Geotech, pavement & concrete designs & final package

- F. Contractor shall be responsible for obtaining three soil tests of the existing sub grade material from a licensed independent soils testing laboratory, with gradation and Proctor density data for concrete pavement installation. Additional testing shall be repeated at the direction of the Public Works Inspector or Engineer at Contractor's expense if necessary to reflect changing soil conditions.
- G. Contractor may, at its expense, employ the services of an independent testing service to test the base course and pavement during and after installation.
- H. The City will employ an independent inspection laboratory to take random core samples of finished HMA pavement to be measured for thickness and density or finished PCC pavement for thickness & strength. Final acceptance will be based on the average thickness and density/strength determined by the core samples.

#### 1.8 RESTORATION

- A. All excavations and improvements shall be completely restored within a period of twenty-one days subsequent to acceptance of backfill and compaction.
- B. If restoration is not complete by the end of the required time, the City will schedule to complete the restoration at Contractor's expense, after a nine-day advance notice to Contractor.
- C. Restoration during times of inclement weather may be delayed at the direction of the Public Works Inspector. Temporary measures may be implemented, including but not limited to a cold asphalt patch to be replaced when weather permits.

#### 1.9 CONTROL OF VEHICULAR AND PEDESTRIAN TRAFFIC

- A. Contractor shall be permitted to close the roadways to traffic during construction activities, if it is necessary.
- B. Contractor shall accommodate adjacent property owners and businesses by providing access and parking within the street right-of-way as near to properties as possible, except during paving operations when residents will be expected to walk.
- C. Contractor shall be fully responsible for providing qualified personnel to provide and place all traffic control signs and devices during the total construction time of the project.
- D. Contractor shall provide traffic control that shall conform to the intent and instructions provided by the Engineer, the City of Salida Public Works Department and the Manual of Uniform Traffic Control Devices (MUTCD).
- E. Contractor is responsible for notifying the Police Department, the Fire District, and all emergency and ambulance service providers of any street closures or blockages, due to construction, prior to beginning any such activity. Contractor shall also maintain the means at all times to provide emergency access routes to all properties located along the construction site when needed.

#### 1.10 CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL MEASURES

- A. Contractors and subcontractors must implement Best Management Practices (BMPs) to reduce pollutants in any storm water runoff from construction activities that result in a



land disturbance of greater than or equal to one acre. Reduction of pollutants in storm water discharges from construction activity disturbing less than one acre must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. Contractors are further required to control construction site waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality. These activities must be in compliance with all applicable State and local laws and regulations.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

Not Used.

END OF SECTION



## SECTION 02060

### AGGREGATE

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Coarse aggregate materials.
  - 2. Fine aggregate materials.
  - 3. Blended aggregate materials.
  
- B. Related Sections:
  - 1. Section 02320 - Backfill.
  - 2. Section 02324 - Trenching.
  - 3. Section 02512 - Site Water Distribution.
  - 4. Section 02630 - Storm Drainage.
  - 5. Section 02740 - Flexible Pavement.
  - 6. Section 02750 - Rigid Pavement.
  - 7. Section 03300 - Cast-in-Place Concrete.

##### 1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
  
- C. American Society for Testing and Materials:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).

##### 1.3 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers.
  
- B. Copies of all Proctor density curves and test results showing exact location of sample collection and test sites must be furnished to Engineer as a submittal prior to the delivery or use on the site.
  
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with City of Salida standard.
- C. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. **Coarse Aggregate Class 6 (Road Base):** Aggregates for Class 6 base shall be crushed stone, or crushed gravel, natural gravel, material which conforms to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus 75 µm (No. 200) sieve fraction to the minus No. 40 sieve fraction, stated in 2.2.2 of AASHTO M 147, shall not apply. The requirements for the Los Angeles wear test (AASHTO T 96) shall apply to Class 6 Aggregate.. Aggregate for class 6 base shall meet the grading requirements of Table 703-3 for the class specified for the project, unless otherwise specified. The liquid limit shall be as shown in Table 703-3 and the plasticity index shall not exceed six when the aggregate is tested in accordance with AASHTO T89 and T 90 respectively. See Table 1 for sieve size requirements. The Material sized between the #4 sieve and the 3/4" sieve must be a minimum of 60% angular material, i.e. crushed stone or gravel with angular surfaces. 60% of the material shall pass the Fractured Faces Test for which 2 or more faces shall be fractured surfaces.
- B. **Coarse Aggregate Class 1 – Class 5 Bases.** Aggregates for bases shall be crushed stone, crushed slag, crushed gravel, natural gravel, or crushed reclaimed concrete or asphalt material which conforms to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus 75 µm (No. 200) sieve fraction to the minus No. 40 sieve fraction, stated in 2.2.2 of AASHTO M 147, shall not apply. The requirements for the Los Angeles wear test (AASHTO T 96) shall not apply to Class 1, 2, and 3. Aggregate for bases shall meet the grading requirements of Table 703-3 for the class specified for the project, unless otherwise specified. The liquid limit shall be as shown in Table 703-3 and the plasticity index shall not exceed six when the aggregate is tested in accordance with AASHTO T89 and T 90 respectively. . See Table 1 for sieve size requirements.

- C. Gradation Table for Class 1-7 Bases

Sieve Size	Mass Percent Passing Square Mesh Sieves						
	LL not greater than 235			LL not greater than 30			
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7

150mm (6")			100				
100mm (4")		100					
75mm (3")		95-100					
60mm (2 ½")	100				mate		
50mm (2")	95-100			100			
37.5mm (2")				90-100	100		
25mm (1")					95-100		100
19mm (¾")				50-90		100	
4.75mm (#4)	30-65			30-50	30-70	30-65	
2.36mm (#8)						25-55	20-85
75 µm (#200)	3-15	3-15	20 Max	3-12	3-15	3-12	5-15

- D. Coarse Aggregate Type A1: No. 67 (Gravel): free of clay, shale, organic matter; within the following limits: 2005 CDOT Standard Specifications for Road and Bridge Construction, within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
¾ inch	90 to 100
⅜ inch	20 to 55
No. 4	0 to 10
No. 8	0 to 5

## 2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A2 (Sand): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; within the following limits: 2011 CDOT Standard Specifications for Road and Bridge Construction, within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
¾ inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

## 2.3 BLENDED AGGREGATE MATERIALS

- A. For use only as directed by Engineer.
- B. Blended Aggregate Type A3 (Ordinary Backfill or Select Borrow Material):
1. Ordinary Backfill - on-site material that has been excavated from the trench, which may actually contain soil, except for rubbish, frozen material, broken pavement, large stones, or other consolidated material greater than 3 inches in diameter, organic muck, or other materials considered deleterious by Engineer. Expansive clays of a plastic nature will not be considered suitable.

2. Select Borrow Material - well-graded mixture of sound mineral aggregate containing sufficient, proper bonding material which may include recycled materials; within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4	100

#### 2.4 CRUSHED DRAIN ROCK

- A. Crushed drain rock (angular) 1" minus shall be used for stabilizing wet/saturated trench conditions.
- B. ¾" or ½" minus washed drain rock shall be used for pipe bedding.

#### 2.5 SOURCE QUALITY CONTROL

- A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- B. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- C. Blended Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- D. When tests indicate, materials do not meet specified requirements, change material and retest.
- E. Testing shall use the Standard Proctor method. Alternatives such as Modified Proctor or Relative Density based on necessity due to material type may be used with the permission of the Engineer so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.

### PART 3 EXECUTION

#### 3.1 EXCAVATION

- A. Excavate aggregate materials from on-site locations indicated when directed by Engineer as specified in Section 02315 and Section 02324.
- B. Stockpile excavated material meeting requirements for aggregate materials when directed by Engineer.
- C. Remove excess excavated materials, not intended for reuse, from site.

#### 3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.

- C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

### 3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

### 3.4 EXAMINATION

- A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

### 3.5 AGGREGATE BASE COURSE

- A. Scarify sub grade 6-inches minimum and compact to 95 percent Modified Proctor.
- B. Compact disturbed load-bearing soil to 95 percent Modified Proctor prior to placement of fabric or base course material.
- C. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- D. Do not place fill on soft, muddy, or frozen surfaces.
- E. GEOTEXTILE FABRIC PLACEMENT (If specified on drawings)
  - 1. Install fabric on native sub grade below aggregate base course.
  - 2. The fabric shall be unrolled parallel to the alignment of the roadway.
  - 3. Folds and wrinkles not associated with roadway curves shall be removed prior to covering fabric.
  - 4. The fabric shall be pinned, stapled, or secured in place by small piles of fill prior to covering to prevent movement.
  - 5. Mechanical equipment shall not be allowed to operate on the surface to the fabric.
  - 6. Minimum overlap along fabric seams shall be as specified by the design engineer but not less than 1 foot longitudinally and 3 feet transversally.
  - 7. The specification for the geotextile fabric shall be specified by the Engineer on the construction drawings.
- F. AGGREGATE PLACEMENT
  - 1. Place aggregate in maximum 8 inch layers and compact to 95 percent, maximum dry density, ASTM D698, Modified Proctor. Lift size may be increased when it is demonstrated that compaction requirements can be met using other methods. The Engineer will make final determination on the thickness of each lift in the field.
  - 2. Level and contour surfaces to elevations and gradients indicated.
  - 3. Maintain optimum moisture content, plus or minus ( ± ) 3 percent, of fill materials to attain required compaction density.

4. Use adequate hand operated mechanical tamping equipment in areas inaccessible to larger compaction equipment.

G. TOLERANCES

1. Maximum Variation From Thickness: 1/2 inch.
2. Maximum Variation From Elevation: 1/4 inch.

H. FIELD QUALITY CONTROL

1. Compaction Testing: In accordance with ASTM D1557.
2. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest
3. Compaction Testing for Bedding and Backfill:
  - a. The City may choose to contract directly with a testing firm or can require the Owner or Contractor to hire an independent, licensed materials engineer experienced in soil analysis and evaluation to perform required compaction tests in accordance with ASTM D698. Copies of all Proctor curves and test results showing exact location of sample collection and test sites must be furnished to Engineer. Engineer shall be informed prior to testing and he may designate areas of testing.
  - b. Performed in accordance with ASTM D1557.
  - c. Testing is to be done at various elevations in trench, which may require excavation by Contractor after backfill is installed.
  - d. Frequency of Compaction Tests will be specified by Engineer in field but shall be no less than every 200 feet at every 1 foot of depth of the backfill or anytime the means and methods of compaction change.
  - e. Testing shall use the Modified Proctor method. Alternatives such as Standard Proctor or Relative Density based on necessity due to material type may be used with the permission of the Engineer so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.

I. SCHEDULES

1. Under Curb and Gutter, Cross Pans, Driveway Aprons, and Asphalt Patch:
  - a. Compact placed aggregate materials uniformly, 6 inches thick, over sub grade.
  - b. Exclude Class 6 base course material installed for all curb & gutter tied to concrete pavement. Subgrade treatment for the attached curb & gutter shall be the same as for the concrete pavement.
  - c. Design engineer shall verify minimum requirements are adequate based on site conditions and propose changes to City accordingly for approval.
2. Under Sidewalk:
  - a. Compact placed aggregate materials uniformly, 4 inches thick, over sub grade.
  - b. Compact placed aggregate materials uniformly, 6 inches thick in driveways and under sidewalk adjacent to mountable curb and gutter, over sub grade.
  - c. Design engineer shall verify minimum requirements are adequate based on site conditions and propose necessary changes to City accordingly for approval.
3. Under Asphalt Pavement:
  - a. Compact placed aggregate materials uniformly, depth as shown on drawings which shall be no less than standard details.



- b. Design engineer shall verify minimum requirements are adequate based on site conditions and propose necessary changes to City accordingly for approval.
  - c. City Engineer shall approve final Blue Top of material by string line or other methods prior to laying of asphalt.
4. Under Concrete Pavement:
- a. Compact placed aggregate materials uniformly, to thickness indicated by Engineer if required, over subgrade.
  - b. Design engineer shall verify minimum requirements are adequate based on site conditions and propose necessary changes to City accordingly for approval.

END OF SECTION



## SECTION 02222

### DEMOLITION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Demolishing designated structures within City rights of way.
  - 2. Protecting items designated to remain.
  - 3. Removing demolished materials.
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate.
  - 2. Section 02315 - Excavation.
  - 3. Section 02320 - Backfill.

##### 1.2 QUALITY ASSURANCE

- A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.
- B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.
- D. Perform Work in accordance with the City of Salida standards.

##### 1.3 QUALIFICATIONS

- A. Demolition Firm: Company specializing in performing work of this section with documented experience.

##### 1.4 PRE-DEMOLITION MEETINGS

- A. Convene minimum one day prior to commencing work of this section.

##### 1.5 SCHEDULING

- A. Schedule Work to precede site excavation work and new construction.
- B. Describe demolition removal procedures and schedule.

#### PART 2 PRODUCTS

Not Used.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Document condition of adjacent structures indicated to remain.
- B. Make arrangements with adjacent property owners and Engineer to survey existing surrounding structures and property.

### 3.2 PREPARATION

- A. Notify affected utility companies before starting work and comply with their requirements.
- B. Mark location of utilities.
- C. Do not close or obstruct roadways, sidewalks, or hydrants without permission.
- D. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.
- E. Protect existing landscaping materials, trees, appurtenances, structures, and fences indicated to remain.
- F. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

### 3.3 DEMOLITION REQUIREMENTS

- A. Use of explosives is not permitted.
- B. Conduct demolition to minimize interference with adjacent structures. Cease operations immediately when adjacent structures appear to be in danger. Notify authority having jurisdiction and Engineer. Do not resume operations until directed.
- C. Conduct operations with minimum interference to public or private accesses. Maintain egress and access for adjacent property at all times.
- D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- E. Sprinkle Work with water to minimize dust. Provide hoses and water connections required for this purpose.
- F. Provide other equipment as necessary to complete demolition work including, but not limited to, steel and concrete cutting equipment, pneumatic concrete breakers, anchoring devices, excavation, loading, lifting, and public safety equipment.

### 3.4 DEMOLITION

- A. Remove designated structures within area of new construction.
- B. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01600.
- C. Backfill areas excavated due to demolition, in accordance with Section 02320.
- D. Rough grade and compact areas affected by demolition to maintain site grades and contours.
- E. Continuously clean-up and remove demolished materials from site. Do not allow materials to accumulate on site.
- F. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION



## SECTION 02315

### EXCAVATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating for curb and gutter.
  - 2. Excavating for paving, roads, and parking areas.
  - 3. Excavating for slabs-on-grade, including cross-pans.
  - 4. Excavating for site structures.
  - 5. Excavating for sidewalks.
  
- B. Related Sections:
  - 1. Section 02721 - Aggregate Base Course.
  - 2. Section 02740 - Flexible Pavement.
  - 3. Section 02750 - Rigid Pavement.
  - 4. Section 03300 - Cast-in-Place Concrete.

##### 1.2 QUALITY ASSURANCE

- A. Perform Work in accordance with City of Salida Standards.
- B. Maintain one copy of each document on site.
- C. Perform work to local utility standards when working within 6 inches of utility lines.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

##### 3.1 PREPARATION

- A. Notify affected utility companies before starting work and comply with their requirements.
- B. Mark location of utilities.
- C. Identify required lines, levels, contours, and datum.
- D. Notify utility company to remove and relocate utilities.
- E. Protect utilities indicated to remain from damage.
- F. Protect plant life, lawns, landscaping, driveways, and other features that are to remain.

- G. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

### 3.2 EXCAVATION

- A. Excavate subsoil to accommodate slabs-on-grade, paving, sidewalks, curb and gutter, cross-pans, culvert, drain inlets and construction operations.
- B. Remove old concrete, pavement, and related debris and dispose of in an approved disposal site. Interior sections to be removed shall be saw-cut at sufficient depth at control joints, or where designated, to avoid breaking, disturbing, or chipping adjacent concrete or pavement. Saw-cut, remove, and replace the existing asphalt pavement a minimum of 1-foot from the curb and gutter unless the pavement is determined to be in "sound" condition as determined by the Engineer.
- C. Exposed edges of existing sidewalk shall be ramped as necessary to provide a reasonably safe and accessible walkway if excavation is to be left open for any length of time prior to reconstruction.
- D. Remove all disturbed load bearing soil, which no longer has its original bearing capacity.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Trim excavation. Remove loose matter.
- G. Remove lumped subsoil, roots, stumps, loose dirt, broken asphalt or concrete, boulders, and large rock.
- H. Notify Engineer of unexpected subsurface conditions.
- I. Correct areas over-excavated with material as directed by Engineer.
- J. Remove excess and unsuitable material from site.
- K. Repair or replace items indicated to remain damaged by excavation.

### 3.3 FIELD QUALITY CONTROL

- A. Request visual inspection of bearing surfaces by Engineer or Public Works Inspector before installing subsequent work.

### 3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION



## SECTION 02320

### BACKFILL

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Backfilling site structures to subgrade elevations.
  - 2. Fill under structures.
  - 3. Fill for over-excavation.
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate
  - 2. Section 02315 - Excavation.

##### 1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Society for Testing and Materials:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1557 - Modified Test Method for Density of Soil in Place by the Sand-Cone Method.

##### 1.3 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers.
  
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

## PART 2 PRODUCTS

### 2.1 FILL MATERIALS

- A. Road Base: Type Class 6 as specified in Section 02060.
- B. Trench Backfill under existing and proposed streets: Type Class 6 or Class 1. Class 1 may be native materials crushed or screened to 3-inch minus.
- C. Ordinary Backfill: As specified in Section 02060 or on Drawings, only as directed by Engineer.
- D. Stabilizing Material: Minimum of 1 ½ inch, uniformly graded, clean rock, or as directed by Engineer.
- E. Rip Rap: 12" minus well-graded rock.
- F. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:
  - 1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.
  - 2. Slump – 6 inch minimum, 8 inch maximum
  - 3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify subgrade is suitable for placement of backfill.
- B. Verify structural ability of unsupported walls to support loads imposed by fill.

### 3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill approved by the project engineer and compact to density equal to or greater than requirements for subsequent fill material.

### 3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place aggregate in maximum 8 inch layers and compact to 95 percent, maximum dry density, ASTM 1557, Modified Proctor or ASTM D698 Standard Proctor, except for the top 4 feet of trench, which shall be compacted to 95 percent, maximum dry density, ASTM D1557, Modified Proctor or ASTM D698 Standard Proctor. Lift size may be increased when it is demonstrated that compaction requirements can be met using other methods. The Engineer will make final determination on the thickness of each lift in the field.
- D. Use smaller mechanical tamping equipment in areas inaccessible to compaction equipment.
- E. Place fill material in continuous layers and compact in accordance with schedule at end of this section.
- F. Employ placement method that does not disturb or damage other work.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Backfill against supported walls. Do not backfill against unsupported walls.
- I. Backfill simultaneously on each side of unsupported walls until supports are in place.
- J. Make gradual grade changes. Blend slope into level areas.
- K. Remove surplus backfill materials from site.
- L. Leave fill material stockpile areas free of excess fill materials.
- M. Rip rap shall be placed and stacked in manner that creates a stable slope that will not impede flow of water.

### 3.4 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

### 3.5 FIELD QUALITY CONTROL

- A. Compaction Testing: In accordance with ASTM D1557 or D698.
- B. When tests indicate, Work does not meet specified requirements, remove Work, replace, compact, and retest
- C. Compaction Testing for Bedding and Backfill:
  - 1. The City may hire an independent, licensed engineer experienced soils analysis and evaluation to perform required tests in accordance with ASTM D1557 or D698 and charge the owner/contractor for the expense or require the owner/contractor to hire the licensed engineer and approve the direct distribution of test reports to the City for review. Copies of test results showing exact location of sample collection and test sites must be furnished to Engineer. Engineer shall be informed prior to testing and he may designate areas of testing.
  - 2. Testing is to be done at various elevations in trench, which may require excavation by Contractor after backfill is installed.
  - 3. Frequency of Compaction Tests will be specified by Engineer in field but shall be no less than every 200 feet at every 1 foot of depth of the backfill or anytime the means and methods of compaction change. A lesser frequency may be approved by Engineer if successful and consistent results are being achieved in the field.
  - 4. Testing shall use the Modified Proctor method. Alternatives such as Standard Proctor or Relative Density based on necessity due to material type may be used with the permission of the Engineer so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.
  - 5. The density test results shall be reported by the Geotechnical Engineer to the City Engineer and to the Contractor at the time of testing.
  - 6. The Contractor shall report to the City when the work has progressed to a point where it is ready to be tested. The Contractor shall provide the City with adequate advance notice (generally 24 hours) to allow scheduling of testing. The City shall decide whether to take tests at any given depth or section, and shall schedule testing so as to minimize interference with the Contractor's operations. The Contractor shall adjust his operations to allow access to the backfill for testing. Notwithstanding the Contractor's opinion of readiness for testing, if a lift of backfill is being placed, the previous lift shall be considered ready to test, and may be tested at the City's discretion.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

### 3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.
- B. All areas showing signs of settlement shall be filled and maintained by Contractor during all construction phases and warranty period.
- C. When Contractor is notified by the City or Engineer that any backfill is hazardous, the condition shall be corrected at once.

- D. Compacted fills must be adequately protected during cold weather construction activities. Any frozen fill should be thawed or removed, recompact and tested as directed by the project engineer or the City.

### 3.7 SCHEDULE

- A. Fill Behind Abutment and Wing Walls:
  - 1. Fill Type Class 6, from bottom of excavation to top of walls, compact uniformly to 97 percent of maximum density.
- B. Fill Wing Walls (ditch side):
  - 1. Fill Rip Rap, from ditch bottom to top of adjacent disturbed soil, stacked tight and stable.
- C. Fill Under Footings, Inlets, Manholes, Vaults, and other Concrete Structures:
  - 1. Fill Flow Fill, 18 inch thick to required elevations for the width of the footing.
  - 2. See Section 02630.
- D. Fill Under and Around Cast in Place Concrete:
  - 1. See Section 03300.
- E. Fill Over and Around Utilities:
  - 1. See Section 02324, 02512, 02630.
- F. Fill to Correct Over-excavation and Unstable Subgrades:
  - 1. Flow Fill, flush to required elevation, or material

END OF SECTION



## SECTION 02324

### TRENCHING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating trenches for site utility lines including domestic water lines.
  - 2. Compacted fill from top of utility bedding to top of trench.
  - 3. Backfilling and compaction of trenches.
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate.
  - 2. Section 02512 - Site Water Distribution: Site water lines including domestic water lines.

##### 1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Society for Testing and Materials:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1557 -Modified Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 4. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

##### 1.3 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

#### 1.4 SUBMITTALS

- A. Obtain City of Salida Excavation Permit prior to any excavation.
- B. Excavation Protection Plan: as required by applicable codes, laws, and standards.
- C. Materials Source: Submit name of imported fill materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with City of Salida and industry standards.
- B. Maintain one copy of each required document on site.

#### 1.6 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Colorado.

#### 1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to work.

#### 1.8 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.
- B. Verify locations, types, and sizes of existing facilities that will be integrated with project Work.



## PART 2 PRODUCTS

### 2.1 FILL MATERIALS

- A. Road Base: Type Class 6 as specified in Section 02060.
- B. Trench Backfill under existing and proposed streets: Type Class 6 or Class 1. Class 1 may be native materials crushed or screened to 3-inch minus. Material must be approved prior to use by the City or the City's Engineer. A wheel roll test with a loaded single axle dump truck may be used to test trench compaction if approved by the City or City Engineer if not testable by nuclear gage.
- C. Stabilizing Material: Minimum of 1 ½ inch, uniformly graded, clean rock, or as directed by Engineer.
- D. Blended Aggregate: Type A3 as specified in Section 02060. This backfill shall be allowed under new streets in approved subdivisions. A geotechnical engineer shall design all backfill. The developer's engineer shall provide oversight of installation and compaction including compaction testing. Native soil shall be allowed for the top 2 foot of trench backfill when trench is under an open drainage/irrigation channel for the purpose of sealing the channel and minimizing leakage.
- E. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:
  - 1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.
  - 2. Slump – 6 inch minimum, 8 inch maximum
  - 3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

## PART 3 EXECUTION

### 3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
  - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use staking for alignment and elevation of water mains to establish lines and grades.

### 3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities indicated to remain.
- E. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.
- F. Prior to excavation in paved areas, the pavement shall be cut in such a manner as to effect a smooth, straight edge and a vertical face 12 inches minimum beyond the trench wall.

### 3.3 TRENCHING

- A. Excavate subsoil by open cut to the depth required, unless written permission is given by Engineer to do otherwise, for utilities at the required locations.
- B. Remove lumped subsoil, boulders, and rock.
- C. When rock or hard clay is encountered, the trench shall be over-excavated 6 inches.
- D. Excavation performed within 24 inches of existing utility service shall be done in accordance with utility's requirements.
- E. Do not advance open trench more than 200 feet ahead of installed pipe, unless Engineer determines a shorter length is necessary for the safety of the public.
- F. Cut trenches to the width necessary to permit the pipe to be laid, jointed properly, inspected, and backfilled properly. No trench shall have a width of less than the diameter of the pipe plus 12 inches. The maximum clear trench width, measured 1 foot above the top of the pipe barrel shall not be greater than that shown in the following table unless otherwise specified:

<u>Pipe Diameter (inches)</u>	<u>Maximum Trench Width (inches)</u>
6	32
8	32
10	32
12	32
16	36

20	44
24	48
30	56
36	64

- G. When maximum trench widths are exceeded and Engineer determines that the design load limits of the pipe are exceeded, the Contractor will be required to either cradle the pipe in concrete or to use a pipe of a stronger class.
- H. Remove water or materials that interfere with Work. Contractor shall provide and maintain at all times ample means and devices to promptly and properly dispose of all water entering trench excavation. Water shall be disposed of in a suitable manner without damage to adjacent property or without a menace to public health and convenience. Unless authorized, in writing, trench water shall not be allowed to enter any water or sewer lines. Protect pipeline against damage from water in the event of a storm or pump failure.
- I. Excavate trenches to depth indicated on Drawings. The trench shall be excavated to a depth below the established grade equal to 1/8 the outside diameter of the pipe, but not less than 4 inches. Provide uniform and continuous bearing and support for bedding material and pipe. A continuous trough shall be excavated to receive the bottom quadrant of the pipe barrel and bell ends. Excavate adequate space for required restraints, valves, and fittings prior to placing pipe in trench.
- J. Do not interfere with the bearing soil of foundations of existing structures.
- K. When Project conditions permit, slope side walls of excavation starting 1 foot above top of pipe. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.
- L. When subsurface materials at bottom of trench are loose, soft, or otherwise unsuitable, excavate to greater depth as directed by Engineer until suitable material is encountered. It shall be replaced, as directed by Engineer, with approved backfill material and methods to provide a suitable foundation for the pipe, which may include 1 ½ inch clean rock.
- M. Trim excavation. Remove loose matter.
- N. Correct areas over-excavated with compacted backfill as specified for authorized excavation as directed by Engineer.
- O. Remove excess subsoil, not intended for reuse, from site. Top soil shall be removed and piled separately for use in finish grading the site. Excavated material that is suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the trench to avoid over-loading and to prevent slides or cave-ins.
- P. Boring, Tunneling, and Jacking:

1. Not permitted under existing sidewalk, curb and gutter, or other structures, where depth of trench and soil conditions permit.
2. Written permission by Engineer is required.
3. Tunneling will not be permitted for distances greater than 10 feet.
4. When jacking is required, only persons experienced in such work, using suitable equipment, shall perform the operation.
5. Flow-fill shall be used as backfill under any structure that has had material excavated from beneath them, been jacked, or for any tunnel.

### 3.4 SHEETING AND SHORING

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Design sheeting and shoring to be removed at completion of excavation work.
- C. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

### 3.5 BEDDING

- A. Bedding installation and material shall be in accordance to the utility's specifications. All water lines shall be bedded in crushed drain rock bedding material per Section 2060.

### 3.6 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen, non-organic, or otherwise suitable fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Place fill material in continuous layers and compact in accordance with City of Salida Standard Detail. Flow-fill may be used from 4 inches above the pipe barrel to the top of the trench.
- D. Compact backfill material to 95 percent, maximum dry density, ASTM D1557, Modified Proctor, or D698 Standard Proctor, except for the top 4 feet of the trench, which shall be compacted to 95 percent, maximum dry density, ASTM D1557 Modified Proctor or D698 Standard Proctor. Wheel roll test may be approved by City or City Engineer if nuclear gage is not usable for Class 1 material.

- E. Lifts will not exceed 8 inches in depth unless a sheep's foot compactor or a hydraulic plate compactor (headshaker) mounted on excavation equipment of adequate size is used. Lift size may be increased by using this compaction equipment when it is demonstrated that compaction requirements can be met. Engineer will make final determination on the thickness of each lift in the field. Only equipment designed for the purposes of compaction shall be used.
- F. Employ placement method that does not disturb or damage utilities in trench, and other existing structures or facilities.
- G. Maintain optimum moisture content, plus or minus (  $\pm$  ) 3 percent, of fill materials to attain required compaction density.
- H. Do not leave more than 25 feet of trench open at end of working day.
- I. Protect open trench to prevent danger to the public.

### 3.7 SURFACE RESTORATION

- A. Pavement (either asphalt or concrete), curb and gutter, sidewalks, drainage culverts, headwalls, etc., or other improved surfaces that have been removed during the course of work shall be restored to a condition as equal to or better than that prior to removal and to the same elevation and alignment.
- B. The subgrade for all restored surfaces shall be thoroughly compacted by mechanical or hand tampers weighing not less 20 pounds, by vibratory rollers, or by other means of compaction approved by Engineer.
- C. Surface restoration shall be per current applicable City of Salida Specifications and Standard and subject to review by Engineer.
- D. Where excavation occurs in paved areas, the pavement shall be repaired as required in Sections 00710, 02740, 02750, and 03300.

### 3.8 FIELD QUALITY CONTROL

- A. Compaction Testing: In accordance with ASTM D698.
- B. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest
- C. Compaction Testing for Bedding and Backfill:
  - 1. The City may hire an independent, licensed engineer experienced in soil analysis and evaluation to perform required compaction tests and require the owner/contractor to reimburse the City for the expense or may require the owner/contractor to hire an independent testing firm. Copies of all Proctor curves and test results showing exact location of sample collection and test sites must be furnished to City or City Engineer as

directed. Engineer shall be informed prior to testing and he may designate areas of testing.

2. Performed by City personnel or City Engineer for wheel roll tests.
3. Testing is to be done at various elevations in trench, which may require excavation by Contractor after backfill is installed.
4. Frequency of Compaction Tests will be specified by Engineer in field but shall be no less than every 200 feet at every 1 foot of depth of the trench or anytime the means and methods of compaction change.
5. Testing shall use the Modified Proctor method. Alternatives such as Standard Proctor or Relative Density based on necessity due to material type may be used with the permission of the Engineer so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.

### 3.9 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.
- B. All areas showing signs of settlement shall be filled and maintained by Contractor during all construction phases and for a period of 1 years following the date of final acceptance.
- C. When Contractor is notified by the City or Engineer that any backfill is hazardous, the condition shall be corrected at once.

END OF SECTION

SECTION 02412  
SITE SANITARY SEWER

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings for site sewer lines including.
  - 2. Manholes
  - 3. Laterals
  - 4. Pipe markers.
  - 5. Bedding and cover materials.
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate: Aggregate for backfill in trenches.
  - 2. Section 02324 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Society for Testing and Materials:
  - 1. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
  - 2. ASTM D1557 - Modified Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 3. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.3 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, manholes, and accessories.
  
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents "AS BUILTS": Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
  
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with City of Salida standards.

- B. Maintain one copy of each document on site.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Pipes, fittings, valves, and accessories shall be loaded and unloaded or otherwise handled in such a manner as to minimize the possibility of damage prior to installation. All materials shall be stored at the construction site in such a way as to prevent damage and to assure they are kept as clean as possible prior to installation.

### PART 2 PRODUCTS

#### 2.1 SEWER PIPING

- A. PVC Pipe: ASTM D-3034
  - 1. Fittings: SDR 35
  - 2. Couplings: Mission SS hardback sleeve
  - 3. Joints: Pipe joint assemblies shall be bell and spigot with an O-ring rubber gasket, or solvent weld for clean-outs.
  - 4. Taps on new mains shall be factory wye's. Predco or saddle tap approved on a case by case basis.
  - 5. Size:
    - a. The minimum size of any new sewer main within the collection system shall be eight (8) inches in diameter.
    - b. Larger sizes shall be required as needed to provide proper flow capacity or velocity.
  - 6. Thickness: SDR35 meeting ASTM D3034.
  - 7. Use/Location: Allowed for use in entire system.

#### 2.2 PIPE MARKERS

- A. AT SURFACE- Marking Posts: Marking posts shall be installed per manufacturer's instructions above the water main, in rural unpaved areas to be determined by Engineer, every 200 feet and at every valve and bend. The posts shall be "Rhino 3-Rail" or approved equal. The posts shall be green in color and have UV stable, all-weather decals affixed that are marked with the international "No-Dig" symbol and have a highly visible white and blue warning that reads "WARNING SEWER PIPELINE, BEFORE DIGGING IN THIS AREA CALL CITY Salida". Decals shall measure 2-7/8" X 14".

#### 2.3 MANHOLES

- A. GENERAL: Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all pipe intersections; and at intervals of not more than 350 feet apart. All dead end manholes where future sewer main extension is anticipated shall have line laid through the manhole a maximum of one (1) pipe length with the size designated by the City, and shall be plugged with an approved plug provided by the Contractor.



- B. **BARREL SIZE:** The internal diameter of the manhole barrel shall not be less than forty-eight (48) inches for sewers of sizes eighteen (18) inch or less; sixty (60) inches for sizes twenty-one (21) to forty-eight (48) inch; seventy-two (72) inches for sizes larger than forty-eight (48) inch.
- C. **PRECAST MANHOLES:** Precast manhole barrels and cones shall be manufactured in conformity with ASTM C478, and shall be so marked by the manufacturer.
- D. **CAST-IN-PLACE MANHOLE BASES:** Concrete used in cast-in-place manholes and manhole bases shall have a twenty eight (28) day strength of 4000 psi and shall contain not less than six (6) sacks of Portland Cement per cubic yard.
- E. **MANHOLE STEPS:** Shall be provided.
- F. **FRAMES AND COVERS:** Manhole frames, rings and covers shall be HS-20 traffic rated, twenty-four (24) inch I.D., meet the standards of ASTM A48 class 35 as manufactured by the Neenah Foundry Company, Neenah Wisconsin or Castings Inc. Grand Junction Colorado, or approved equal. The cover shall fit the ring in accordance with the manufacturer's dimensions. Covers with more than one lifting hole will not be accepted. The lifting notch shall be on the covers edge and not in the center and shall not allow surface water to enter the manhole. Frames and grates shall meet an AASHTO HS20 traffic load rating.
- G. **MANHOLE SEALANT:** All joints between manhole sections and pipe openings shall be sealed with an approved watertight sealant ("Rub-R-Nek", or equal). Manholes in areas with high water tables shall be coated on the exterior with an approved watertight sealant. Grade rings and cover rings shall be sealed to the top of the cone with "Rub-R-Nek".
- H. **CONCRETE COLLARS:** All manholes shall have concrete collars installed per the Standard Detail. This includes manhole in gravel areas such as alleys.

2.4 **BEDDING AND COVER MATERIALS**

- A. **Bedding:** Crushed drain rock as specified in Section 02060.
- B. **Road Base:** Type Class 6 as specified in Section 02060.
- C. **Flow-Fill:** Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:
  - 1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.
  - 2. Slump – 6 inch minimum, 8 inch maximum
  - 3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

2.5 **CONCRETE ENCASEMENTS**

- A. Concrete for sewer pipe encasements shall have a minimum cement content of five (5) sacks per cubic yard and a maximum water content of five (5) gallons per sack of cement

and shall have a minimum compressive strength of 4000 psi in twenty-eight (28) days. Minimum reinforcing for concrete encasements shall be 4 each #4 bars, continuous for the length of the casing, spaced equidistance apart radially.

- B. Minimum reinforcing for concrete encasements shall be 4 each #4 bars, continuous for the length of the casing, spaced equidistance apart radially.

## 2.6 ACCESSORIES

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify connections and municipal utility water main size, location, and invert as indicated on Drawings.

### 3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

### 3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02324 for Work of this Section.
- B. Minimum support for the pipe shall be directed by the Engineer to meet conditions in the field. No pipe shall be installed when the Engineer has determined that the trench conditions are unsuitable.
- C. Prior to placing concrete for cradles or encasements, temporary supports consisting of concrete blocks shall be used to support the pipe in place. Not more than two supports shall be used for each pipe length, one on either end. Inspection by Engineer is required prior to placement of concrete.
- D. Place bedding material at trench bottom per City of Salida Standard Details, level fill materials under pipe in one continuous layer not less than 4 inches compacted depth up to 6 inches above the top of the pipe; compact to 95 percent, maximum dry density, ASTM D1557, Standard Proctor.
- E. Place fill material in accordance with Section 02324.

### 3.4 PIPE

- A. Carefully lower pipe and fittings into trench in such a manner as to prevent damage to the water main materials and protective coatings and linings.

- B. Prevent foreign material from entering pipe or joint space while it is installed. During installation, no debris, tools, clothing, or other materials shall be placed in the pipe. At times when installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or as directed by the Engineer. If water is in trench, the plug shall remain in place until the trench is pumped completely dry.
- C. VERTICAL CLEARANCE BELOW WATER LINES - Where sewer lines cross water mains or come within ten (10) horizontal feet of each other, the sewer pipe shall be a minimum of eighteen (18) inches clear distance vertically below the water main. If this clear distance is not feasible, the sewer pipe section must be designed and constructed so as to protect the water main.
- D. VERTICAL CLEARANCE ABOVE WATER LINE - Should a situation exist where a sewer main must be constructed crossing above a water main, the minimum clear distance vertically shall be eighteen (18) inches, and the sewer pipe section shall be designed & constructed so as to protect the water main.
- E. WATER LINE PROTECTION OPTIONS:
  - 1. The sewer pipe shall be encased in reinforced concrete at least 6" all around the pipe, for at least 10' horizontal perpendicular distance on either side of the water main.
    - a. No encasements shall be poured until the City has observed and approved the pipe to be encased and its supports.
  - 2. The sewer pipe shall be sealed within another, larger continuous (joint free) pipe, for at least 10' horizontal perpendicular distance on either side of the water main. The sewer pipe shall be sealed within the encasement pipe with non-shrink concrete grout extending at least 6" into the larger pipe.

### 3.5 CONCRETE ENCASEMENTS

- A. Prior to placing the concrete for cradles or encasements, temporary supports consisting of concrete blocks or bricks shall be used to support the pipe in place. Not more than two (2) supports shall be used for each pipe length, with one adjacent to the shoulder of the bell and the other near the spigot end.
- B. SERVICE LINE PROTECTION
  - 1. These requirements for water line protection from sewer lines shall be equally applicable to force mains and sewer service connections.
- C. Sewer mains shall be placed under traveled portion of roadway if possible. Provide staking for alignment and elevation a minimum of 50 feet apart and for location of manholes.
- D. Install pipe with a preferred 7-feet of cover, and a minimum of 3.5-feet of cover from top of the pipe to the final finished grade of street with written approval from City.
- E. If for any reason, required cover cannot be maintained over existing installed sewer mains and services; the mains and service lines so affected shall be relocated at the expense of the developer/owner.
- F. Push-On Joint Pipe:
  - 1. Remove all oil, grit, excess coating, and foreign material from inside of bell and outside of spigot.

2. Flex the circular rubber gasket inward and insert in the recess of the bell. Apply a thin film of gasket lubricant to the inside surface of the gasket and the spigot end of the pipe.
  3. Install the spigot end of pipe in bell without letting it contact the ground. Push the joint together. Pipe that is not furnished with a depth mark shall be marked prior to assembly to assure that spigot is installed to the proper depth.
  4. Field cut spigot ends shall be filed and ground smooth and angled to resemble the original manufactured end.
- G. Install pipe to allow for expansion and contraction without stressing pipe or joints per pipe specifications.
- H. Backfill trench in accordance with Section 02324 and per City of Salida Standard Detail.

### 3.6 INSTALLATION - MANHOLES

- A. **CONSTRUCTION:** Manholes shall be installed or constructed at the locations and to the elevations indicated on the drawings. Manholes shall be backfilled using a class 6 road base or approved alternate. The City's written approval shall be required prior to installation of any non-standard size, shape, or type manholes.
- B. **ADJUST MANHOLE RING & COVER TO GRADE:** The cone section shall not extend closer than eight (8) inches and not more than ten (10) inches from the top of the manhole cover. Precast concrete adjustment rings or HDPE adjusting rings meeting ASTM D-4976 shall be used on top of the cone to support and adjust the manhole ring & cover to the required final grade.
- C. **SEAL PIPE ENDS TO MANHOLE:** Where the sewer main enters the manhole, appropriate measures shall be taken to prevent any infiltration of groundwater into the system.
- D. **MANHOLE BASES:** Manhole bases shall be constructed as shown on the Standard Manhole Detail drawing. Inverts shall be cast with uniform curves and smooth surfaces. The floor of the manhole outside of the channel shall be finished smooth surface and shall slope to the channel. The minimum thickness of the base shall not be less than eight (8) inches under the invert of the manhole channel. A cast in place base must be approved on a case-by-case basis prior to installation.
- E. **CONTINUOUS PIPE THROUGH MANHOLE (INVERTS):** The PVC sewer line may be laid continuously through manhole locations wherever grade and alignment permit. After the invert has been cast, the upper half of the pipe shall be cut out, for at least 36" and the bottom cleaned. Precast inverts may be used when approved by the City. Inverts through the manhole shall be smooth and manhole bottoms shall slope to the sewer invert by a minimum of 2" from manhole wall. If the PVC pipe is not continuous through a manhole the invert shall provide a minimum of 0.1 ft. drop in a straight run, 0.2 ft. drop in a manhole angled at 45 degrees or less and a 0.3 ft. drop in manholes angled greater than 45 degrees.
- F. **CONNECTIONS TO EXISTING MANHOLES:** Sewer pipe connection to existing manholes where there is no existing pipe stubbed out shall be made in such a manner that the finished work will conform as nearly as practicable to the requirements specified for new manholes. The new sewer shall be designed and located so flowline will be as close to possible to the top of the existing pipe. The Contractor shall break out as small

an opening in the existing manhole as practical to insert the new sewer pipe. The existing concrete foundation bench shall be chipped to fit the new pipe. Non-shrink cement grout shall be used as necessary to smoothly finish the new invert and to seal the new line so the junction is watertight. Flowlines shall be constructed in a professional manner, finished smooth, and shaped to provide directional control of the flow.

- G. OUTSIDE DROP MANHOLES: Whenever the elevation difference between the incoming sewer invert and the invert of the manhole cannot be accommodated to the City's satisfaction by a transition in the invert, an outside drop shall be constructed in accordance with the City Standard Detail.

### 3.7 SERVICE CONNECTIONS

- A. SEWER SERVICE LATERALS: All sewer service laterals shall be installed by contractor. Connections to sewer mains shall be performed by the City under the direction of the Public Works Department. The exception is on new subdivisions, whereas the contractor shall make all connections prior to acceptance by the city. All connections shall be inspected by the Public Works Department during construction and while being tested.
- B. FULL BODY WYE'S: New sanitary sewer mains shall utilize full body wye fittings, so tap is at a location of 45 degrees to the horizontal. New sanitary sewer mains shall use ASTM D3034 PVC wye fittings for all service line connections. Installation of Predco service taps are also permitted. Pressure testing and inspection of main will occur once all service connection have been made. Services shall be capped for pressure testing.
- C. SERVICE SIZE & SLOPE: Service laterals for individual residences, and for multi-family residences of up to 4 units, shall be 4" PVC, ASTM D 3034 Schedule 40, installed on a grade of not less than 1%. Service laterals for multi-family residences of more than 4 units, and for commercial or industrial usage, will be individually sized by the Project Engineer based on flow predictions and the International Plumbing Code. All service sizes larger than 4 inches shall be connected to the main by the installation of a manhole.
- D. SERVICE LOCATION: Service lines are to be installed at standardized locations throughout the subdivision, preferably near the center of the lot away from the power, phone, & TV utilities which tend to congregate at lot corners. Service lines shall be installed to a point inside the property line, and 2' beyond the dedicated easement, and shall be capped or plugged with a fitting suitable to withstand pressure testing.
- E. SERVICE LOCATIONS TO BE STAKED: The Project Engineer shall place a grade stake locating each sewer service before it is installed. Both the Wye and the end of the service shall be so staked. The actual installed location of service wye's, and the ends of the service laterals shall be measured and recorded by the Project Engineer on the As-Built Drawings, using street station numbers and perpendicular offset distances from centerline.
- F. SERVICE LOCATIONS TO BE MARKED: The end of the installed service line shall be marked with a 4" x 4" timber post or 4" PVC sewer pipe, painted green, extending from the bottom of the service line to a point approximately 18" above grade.
- G. EXISTING LINE TAP: New taps to an existing sewer line shall be done with Predco Hub Style Tap Saddle & Epoxy HUB TAP SADDLES (connect with donut) 4" HUB TAP SADDLE PART# HTS4/E - Hub saddle 4" with epoxy HTS4 or approved equal. Tap is to

be made at an angle of 45 degrees to the centerline of the pipe unless approved otherwise by the City Public Works Director in advance.

- H. DISCONNECTION OF EXISTING SEWER TAPS: Disconnection of sewer service lines shall be responsibility of the property owner. Disconnection shall take place within 2 feet of the main. The side closest to the main shall be plugged with concrete and capped. An inspection shall be performed by the City Public Works Department prior to backfill.

### 3.8 ABANDONMENT

- A. Existing sewer mains indicated by the Engineer shall be abandoned and pipe ends shall be plugged with 1-foot of concrete as directed.
- B. Existing manholes to be abandoned shall be removed as a whole, including invert, and shall be backfilled with in accordance with Section 02320.

### 3.9 FIELD QUALITY CONTROL

- A. Engineer and City personnel will perform Field inspecting and testing unless otherwise indicated.
- B. In addition to any deficiencies covered by ASTM D3034, PVC that has any of the following visual defects will not be accepted:
  - 1. Straightness: Any joint of pipe which has a camber (perpendicular offset from a straight line) of more than one half inch (1/2") in the length of the joint. Pipe with camber of less than 1/2" shall be installed with the curves laid horizontally alternating left and right.
  - 2. Pipe which is sufficiently out-of-round to prohibit proper jointing.
  - 3. Improperly formed bell and spigot ends.
  - 4. Fractured, cracked, chipped, or otherwise damaged pipe.
  - 5. Pipe that has been damaged during shipment or handling.
  - 6. The interior and exterior surfaces of all PVC pipe shall be uniform in color, shall not have been "sunburned" during long term outside storage, and shall be smooth and free of scratches or blisters.
- C. The city will not approve any pipeline installation if there is any infiltration along any length of the pipeline or at manholes. Approved testing method is pressure testing and visual observations prior to placing in service.
- D. Low Pressure test: All sections of sewer pipeline, including service laterals, shall be tested for integrity by low pressure air testing in accordance with the recommendations of the Uni-Bell 5<sup>th</sup> Edition (or latest version) Handbook of PVC Pipe Design and Construction guideline. Any section that fails to hold pressure within .5 psi for the test interval, in accordance with the test protocol, shall be repaired at the Contractor's expense.
  - (a) Backfill: The pipeline shall be backfilled sufficiently to restrain the pipe laterally & vertically.
  - (b) Test Pressure: The sewer pipeline will be plugged at each pair of manholes, and pressurized with compressed air to 3.6 psi +/- .1 psi above groundwater pressure, if any.
  - (c) Maximum Pressure Drop: Loss of air pressure during the test interval, defined below, shall not exceed .5 psi. The test interval shall be the sum of

the test time for the main line plus test time for the service laterals, in accordance with the accompanying table:

**MINIMUM TEST INTERVAL**

(MINUTES)

SEWER MAIN AIR TEST FOR A 0.5 PSI MAXIMUM PRESSURE DROP

Pipe Diam.	Pipeline Length							
	100'	150'	200'	250'	300'	350'	400'	450'
4"	1:53	1:50	1:50	1:50	1:50	1:50	1:50	1:50
6"	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8"	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10"	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12"	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15"	7:05	7:05	8:54	11:00	13:21	15:35	17:48	20:02

- E. VACUUM TESTING OF MANHOLES: Manhole Vacuum Testing Manholes in areas of known or suspected areas of groundwater shall be vacuum tested after assembly and backfilling.

Care shall be taken to effect a seal between the vacuum base and the manhole rim. Pipe plugs shall be secured to prevent movement while the vacuum is drawn.

A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded. Acceptance shall be defined as when the time to drop to 9 inches meets or exceeds the values shown in the table below. If the manhole fails the test, necessary repairs shall be performed. Repairs and repair procedures must be acceptable to the Director of Public Works.

If preformed plastic gaskets are pulled out during the vacuum test, the manhole shall be disassembled and the gaskets shall be replaced. Manholes and pipe lines shall not have any visible leaks. Manholes that fail tests shall be repaired and retested until satisfactory results are obtained.

Minimum Test Times for Manholes			
Depth (ft)	Diameter (in.)		
	48"	60"	72"
Time (s)			
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

- F. VERTICAL PIPE DEFLECTION: At any time prior to Final Acceptance of the project, the City representative, at his discretion, may measure any section of the sewer pipeline for vertical ring deflection. This is typically accomplished by pulling a mandrel through the pipeline. Maximum ring deflection of the pipeline under load shall be limited to 5% of the vertical internal pipe diameter. All pipe deflection exceeding 5% shall be repaired or replaced by the Contractor at no expense to the City.
- G. VIDEO INSPECTION: Prior to final acceptance the contractor shall submit to the City a copy of the video inspection NASSCO v6 PACP format of the sewer pipeline prior to being placed in service. The video inspection shall show footages and all taps and manholes. This video inspection shall become the property of the City of Salida and shall be used to determine condition of installation. Deficiencies discovered during the video inspection shall be the contractor's responsibility to correct.
- H. Manholes shall be vacuum tested to ensure no infiltration performed in any areas with high groundwater and the City at its discretion may require vacuum testing on a project. A copy of test showing results shall be submitted prior to acceptance.
- I. Compaction testing for bedding and backfill in accordance with Section 02324.
- J. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- K. Before backfilling any sewer service line or new main line within City right-of-way, the Public Works Department must be contacted for an inspection. This applies to both new



installation and repairs. Failure to call for an inspection will result in re-excavating and re-backfilling the line at the Contractor's or property owner's expense, in order that the work can be properly inspected.

- L. Public Works personnel will make sewer taps and inspections between the hours of 8:00AM and 3:00PM, Monday through Friday. No taps or inspections will be done after 3:00PM.
- M. Pipe shall be installed at the depths, grades, and locations shown on the approved drawings. A pipeline laser shall be used to establish line and grade for the excavator and the pipe layers. Trained, qualified personnel using appropriate surveying equipment and methods shall set the laser to line and grade. The City may order cessation of work if the Contractor fails to provide trained and qualified personnel to set the laser.
- N. The pipeline may be placed in operation after all required cleaning, testing, and inspection have been completed and written permission has been granted by the Engineer. During the warranty period, any defects in the system resulting from defective materials, poor workmanship, or any other cause attributable to the Contractor shall be corrected at his expense and to the satisfaction of the Engineer. Should the Contractor fail to respond within 48 hours after written notification of any deficiency, the City may complete the work and bill the Contractor. In emergency situations, the City shall take whatever steps necessary to correct the problem.

END OF SECTION



SECTION 02512  
SITE WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings for site water lines including domestic water lines.
  - 2. Valves.
  - 3. Hydrants.
  - 4. Pipe markers.
  - 5. Precast concrete vault.
  - 6. Bedding and cover materials.
  - 7. Water System Accessories.
  
- B. Related Sections:
  - 1. Section 02060 - Aggregate: Aggregate for backfill in trenches.
  - 2. Section 02324 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Society for Testing and Materials:
  - 1. ASTM A536 – Standard Specification for Ductile Iron Castings.
  - 2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  - 3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
  - 4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 5. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
  
- C. American Water Works Association:
  - 1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - 2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 3. AWWA C110 – Ductile-Iron and Gray-Iron Fittings, 3-inch Through 48-inch for Water and Other Liquids.
  - 4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - 6. AWWA C153 – Ductile-Iron Compact Fittings, 3-inch Through 16-inch, for Water and Other Liquids.
  - 7. AWWA C205 – Cement-Mortar Protective Lining and Coating for Steel Water

- 8. Pipe- 4-inch and larger- shop applied.
- 8. AWWA C207 – Steel Pipe Flanges for Waterworks Service – Sizes 4-inch Through 144-inch.
- 9. AWWA C502 - Dry-Barrel Fire Hydrants.
- 10. AWWA C504 - Rubber-Sealed Butterfly Valves.
- 11. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
- 12. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- 13. AWWA C605 – Underground installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- 14. AWWA C651 – Disinfecting Water Mains.
- 15. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
- 16. AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch.

- D. Underwriters Laboratories Inc.:
  - 1. UL 246 - Hydrants for Fire - Protection Service.

### 1.3 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents “AS BUILTS”: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with City of Salida standards.
- B. Maintain one copy of each document on site.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Pipes, fittings, valves, and accessories shall be loaded and unloaded or otherwise handled in such a manner as to minimize the possibility of damage prior to installation. All materials shall be stored at the construction site in such a way as to prevent damage and to assure they are kept as clean as possible prior to installation.

## PART 2 PRODUCTS

## 2.1 WATER PIPING

- A. The City reserves the right to require ductile iron piping for sections of new water main within the developed portion of the City that will connect to ductile iron on both ends.
- B. Water main extensions shall be designed to make continuous loops, connecting to the City water system in at least two points wherever possible to provide alternate sources of supply.
- C. Ductile Iron Pipe: AWWA C151 and C104, Pressure Class 350, exceptions by Engineer may include Class 50 Tyton Joint or Class 52.
  - 1. Fittings: Ductile iron, compact, AWWA C153, manufactured/cast in U.S.A.
  - 2. Joints: AWWA C110, C111, and C153, push on single rubber gasket, mechanical joint restraints ("Mega-lug", retainer gland) for all connections to valves and fittings.
  - 3. Jackets: AWWA C105 polyethylene jacket, half lapped, 8 mil (0.008 inch), polyethylene tape.
  - 4. Coatings & Linings: AWWA C205, cement-mortar lining, bituminous seal coating.
  - 5. Size:
    - a. The minimum size of any new water main within the distribution system shall be eight (8) inches in diameter.
    - b. In location where the Engineer determines that a water main must be larger than eight (8) inches in diameter, the water main shall be of such size as specified by the City or recommended by the Engineer.
    - c. Larger sizes shall be required as needed to provide proper distribution flow, pressure, and fire protection.
  - 6. Use/Location: Allowed for use in entire system. Shall be polyethylene encased to AWWA C105 at all locations north of Arkansas River and south of Arkansas River only when aggressive or "hot" soils are shown to exist.
- D. High Density Polyethylene (services)
  - 1. Pipe shall be DR9 pressure class 200 psi, C.T.S.
  - 2. Fittings: Compression per Approved Materials List with stainless steel stiffener.
  - 3. Size: Up to 2-inch. Pipe shall be sized to maintain same I.D. as CTS and may require upsizing with reducers.
    - a.  $\frac{3}{4}$ -inch taps would require a 1-inch compression fitting to connect to a 1-inch HDPE service at the corporation stop and up to the MIP connection on the meter pit. Curb stop valves to be 1-inch.
  - 4. All HDPE piping shall be installed with tracer wire per City specifications.

- E. PVC Pipe: AWWA C900 and C905,
  - 1. Fittings: AWWA C111, cast iron, wrapped, manufactured/cast in U.S.A.
  - 2. Joints: ASTM D3139 compression gasket ring, AWWA C153 and C900, mechanical joint restraints ("Mega-lug") for all connections to valves and fittings.
  - 3. Jackets: Fittings and valves only, AWWA C105 polyethylene jacket, half lapped, 8 mil (0.008 inch), polyethylene tape.
  - 4. Size:
    - a. The minimum size of any new water main within the distribution system shall be eight (8) inches in diameter.
    - b. In location where the Engineer determines that a water main must be larger than eight (8) inches in diameter, the water main shall be of such size as specified by the City or recommended by the Engineer.
    - c. Larger sizes shall be required as needed to provide proper distribution flow, pressure, and fire protection.
  - 5. Thickness: DR-18.
  - 6. Use/Location: Allowed for use in entire system.

## 2.2 VALVES

- A. GATE VALVES
  - 1. Valves: Manufactured/cast in U.S.A.
  - 2. 4-12 inches: AWWA C509, iron body, resilient seat, open left, non-rising stem with 2 inch square nut, single wedge, MJ.
  - 3. Accessories: Manufactured/cast in U.S.A.
- B. BUTTERFLY VALVES
  - 1. Valves: Manufactured/cast in U.S.A.
  - 2. 16 inches or larger: AWWA C504, iron body, bronze disc, resilient replaceable seat, open left, non-rising stem with 2 inch square nut, MJ.
  - 3. Accessories: Manufactured/cast in U.S.A.
- C. CONCRETE COLLARS
  - 1. All valves shall have concrete collars with #4 rebar

## 2.3 HYDRANT

- A. Manufacturers per Approved Materials List.
- B. Hydrants shall be domestic hydrants for casting, parts, and manufacturing.
- C. Hydrants shall be supplied with a Storz adapter on the 4-1/2" pumper nozzle.
- D. Hydrant: AWWA C502, UL 246, dry barrel type, traffic "break away" type, safety stem coupling, frangible bolts or safety flange allowing full rotation of nozzle section, main valve opening 5 ¼ inch minimum, 6-inch mechanical joint inlet, 1 ½ inch pentagon operating nut, open left.
- E. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.
- F. Hose and Steamer Connection: 2 hose nozzles, 1 pumper nozzle, national standard threads with storz adapter, mechanical lock-in device on nozzles, 1 ½ inch pentagon nut on caps.
- G. Finish: Factory applied powder coated Red in color to match existing hydrants in system.

## 2.4 PIPE MARKERS

### A. UNDERGROUND

- 1. All piping shall be installed with a continuous, Direct Burial #12 AWG Solid (.0808" diameter) tracer wire, 45 mil high molecular weight-high density **blue polyethylene jacket** complying with ASTM-D-1248, 30 volt rating for location purposes by means of an electronic line tracer. Tracer wire installed in directional drill installations shall be steel core hard drawn 1,150 pounds average tensile break load. Tracer wire shall be Copperhead Industries, LLC, or approved equal by Engineer.
- 2. The wire shall be placed above the water pipeline and HDPE service lines.
- 3. For open cut installation the wire shall be taped to the pipeline at 25-foot intervals. The wire shall be terminated at the tracer wire box. Tracer wire box shall be located within one foot of valve box and set to same grade as valve box, or as requested in the field by Engineer. All splices in tracer wire shall be made with waterproof split bolt connectors.
- 4. All tracer wire terminals at valve locations shall be inserted into valve box one foot below grade. Valve box shall have ¼ hole and 18-inch of tracer shall be in box. All tracer wire terminals at hydrant locations shall be Copperhead Snakepit Magnetized Tracer Connection Cobra T3 (blue for potable water) manufactured by Copperhead Industries LLC, or approved equal by the Engineer; HDPE or SS bracket to mount to hydrant flange and 2 feet of ¾-inch stainless steel conduit.
- 5. Terminals at fire hydrants shall have dual terminals on lid and grounded using a 1 lb Magnesium grounding anode per manufacturer's installation requirements. Anode shall be placed at approximately same elevation as water main. 1 lb Magnesium anodes shall also be placed at ends of tracer wire for future connection.
- 1. Upon completion of the tracer wire installation, the Contractor shall demonstrate to the CITY that the wire is continuous and unbroken through the entire run of the pipe by providing full signal conductivity when energizing for the entire run. If the wire is broken, the Contractor shall repair or replace it.

B. AT SURFACE

1. Marking posts shall be installed per manufacturer's instructions above the water main, in rural unpaved areas to be determined by Engineer, every 200 feet and at every valve and bend. The posts shall be "Rhino 3-Rail" or approved equal. The posts shall be blue in color and have UV stable, all-weather decals affixed that are marked with the international "No-Dig" symbol and have a highly visible white and blue warning that reads "WARNING WATER PIPELINE, BEFORE DIGGING IN THIS AREA CALL CITY Salida". Decals shall measure 2-7/8" X 14".

2.5 BEDDING AND COVER MATERIALS

- A. Bedding: Crushed drain rock as specified in Section 02060.
- B. Road Base: Type Class 6 as specified in Section 02060.
- C. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:
  1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.
  2. Slump – 6 inch minimum, 8 inch maximum
  3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

2.6 ACCESSORIES

- A. Concrete for Thrust Restraints, Cradles, Valve Blocking, and Encasements:
  1. Refer to City of Salida Standard Detail for restraint sizing.
  2. Concrete: compressive strength of 4000 psi in 28 days.
- B. Bell Joint Restraint: ductile iron, ASTM A536, split ring for sizes greater than 12 inch.
  1. PVC pipe: restraint mechanism shall consist of a plurality of individually activated gripping surfaces to maximize restraint capability, EBAA Iron series 1600 or 2800 respectively.
  2. DI pipe: restraint mechanism shall consist of a wedge action restraint ring on the spigot joint to a ductile iron follower gland behind the bell, EBAA Iron series 1700.
- C. Bolts: Cor-ten steel by U.S. Steel Company or approved equal.
- D. Tapping Sleeves: 304 stainless steel including bolts and nuts with full circle gasket, AWWA C207 Class D ANSI 150# flange drilling pattern with gasket, Stainless Steel per Approved Materials List, drilling size on size taps requires a 1/2 inch undersize shell cutter.
- E. Valve boxes: 5 1/4 inch diameter screw type, per Approved Materials List, "WATER" shall be cast in valve box covers, bonnet required for valves 12 inches or larger.
- F. Tapping Saddles: Nylon coated, ductile iron, double stainless steel straps, per Approved Materials List.



- G. Corporations: Ball type, CC threaded, compression, per Approved Materials List.
- H. Curb Stops: Compression, per Approved Materials List.
- I. Valve Blocking: solid concrete blocks, 4-inch x 8-inch x 16-inch minimum.
- J. Meter Pits: The location of meter pits will be determined by the Director of Public Works based on a case by case basis.
  - 1. Meter pits shall be installed between the back edge of the curb and the front edge of the sidewalk in the parkway utility easement, when APPROVED in advance. Where no curb, gutter and sidewalk exist, Public Works shall determine the location of the meter pits.
  - 2. Meter pits shall be Thermal Coil meter pits as manufactured by Mueller Company or approved equal. They shall include a closed cell insulating pad.
  - 3. Meter pits in traffic areas, parking areas or driveways shall have a H20 traffic rated lid and concrete collar or be integrated into the driveway concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify connections and municipal utility water main size, location, and invert as indicated on Drawings.

3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.3 BORING

- A. A qualified contractor shall perform boring with proper boring equipment.
- B. Water pipe shall be installed through a steel sleeve under irrigation canals, railroads, creeks, waterways, and other structures designated by the Engineer.
- C. Steel sleeve shall be of Standard Weight, Schedule 30 steel, with a diameter adequate to receive the pipe bells and insulators.
- D. Corrosion resistant coated casing insulators with steel bands and glass reinforced plastic runners shall be installed and centered within the sleeve according to the manufacturer's instructions at the maximum allowed spacing.
- E. Rubber end seals with stainless steel bands, clamps, and screws shall be installed on both ends of the sleeve

### 3.4 BEDDING

- A. Excavate pipe trench in accordance with Section 02324 for Work of this Section.
- B. Minimum support for the pipe shall be directed by the Engineer to meet conditions in the field. No pipe shall be installed when the Engineer has determined that the trench conditions are unsuitable.
- C. Prior to placing concrete for cradles or encasements, temporary supports consisting of concrete blocks shall be used to support the pipe in place. Not more than two supports shall be used for each pipe length, one on either end. Inspection by Engineer is required prior to placement of concrete.
- D. Place bedding material at trench bottom per City of Salida Standard Details, level fill materials under pipe in one continuous layer not less than 4 inches compacted depth up to 6 inches above the top of the pipe; compact to 92 percent, maximum dry density, ASTM D698, Standard Proctor.
- E. Place fill material in accordance with Section 02324.

### 3.5 INSTALLATION - PIPE

- A. Carefully lower pipe and fittings into trench in such a manner as to prevent damage to the water main materials and protective coatings and linings.
- B. Prevent foreign material from entering pipe or joint space while it is installed. During installation, no debris, tools, clothing, or other materials shall be placed in the pipe. At times when installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or as directed by the Engineer. If water is in trench, the plug shall remain in place until the trench is pumped completely dry.
- C. Maintain separation of water main from sewer piping a minimum of 10 feet horizontal and 2-ft vertical separation and shall meet local and state standards for separation requirements. At no time shall a bell or spigot PVC pipe joint be located within 5 feet of the centerline of a sanitary sewer pipe trench.
- D. When water pipeline crosses a sanitary service, perform work in accordance with City of Salida Standard Details. The Contractor shall physically locate the centerline of the existing sewer main and center of a full pipe joint (nominal joint length of 20 linear feet) across the sewer main (+/- 1-foot from the center of the joint). Crossings shall likely require the Contractor to cut and re-bevel the end of the previously laid pipe joint to fit. New water main shall be installed a minimum of 6-inches above the top of the existing sewer main pipe. The water main shall be blocked on both sides of the sewer pipe with concrete blocks resting on undisturbed native soil. Bedding and backfill materials within 3-feet either side of the intersection of water and sewer pipe shall be lightly compacted (less than 95% Standard Proctor density) until the water main is backfilled to approximately 6-inches above the top of the pipe, at which point normal compaction shall begin.
- E. Water mains shall be installed so that a continuous loop is provided for an alternate source of supply where deemed practical by the City.
- F. Water mains shall be placed under traveled portion of roadway if possible. Provide

staking for alignment and elevation of water mains a minimum of 50 feet apart and for location of hydrants.

- G. Install pipe with 5-feet of cover from top of the pipe to the final finished grade of street.
- H. If for any reason, required cover cannot be maintained over existing installed water mains or water service lines; the mains and service lines so affected shall be relocated at the expense of the developer/owner.

I. Mechanical Joint Fittings:

- 1. Install ductile iron piping and fittings per AWWA C600 and PVC piping and fittings per AWWA 605.
- 2. All fittings and valves shall be wrapped/encased with polyethylene jacket per AWWA C105.
- 3. There shall be a minimum of 18 inches of pipe between all valves and fittings.
- 4. Remove all oil, grit, excess coating, and foreign material from inside the fitting. Slip the follower gland on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. Place the rubber gasket on the spigot end with the thick edges toward the gland. Push the entire section of pipe forward to seat the spigot in the socket end of the fitting. Press the gasket into place within the socket. Move the follower gland along the pipe into position for bolting. Insert all the bolts and "finger" tighten nuts. Tighten nuts spaced 180 degrees apart alternately in order to produce an equal pressure on all parts of the gland. Tighten all nuts with a torque limiting wrench according to the following torques:

<u>Bolt Size (inch)</u>	<u>Torque (ft-lb)</u>
5/8	40-60
3/4	60-90
1	70-100
1 ½	90-120

J. Push-On Joint Pipe:

- 1. Remove all oil, grit, excess coating, and foreign material from inside of bell and outside of spigot.
- 2. Flex the circular rubber gasket inward and insert in the recess of the bell. Apply a thin film of gasket lubricant to the inside surface of the gasket and the spigot end of the pipe.
- 3. Install the spigot end of pipe in bell without letting it contact the ground. Push the joint together. Pipe that is not furnished with a depth mark shall be marked prior to assembly to assure that spigot is installed to the proper depth.
- 4. Field cut spigot ends shall be filed and ground smooth and angled to resemble the original manufactured end.

K. Water mains shall be designed to be restrained mechanically without the use of thrust blocks when at all possible:

- 1. Design of number and placement of mechanical joint restraints shall be by a licensed professional engineer.
- 2. Install "Mega-Lug" fittings or retainer glands on all fittings and valves. Form and place concrete for thrust restraints at elbow or change of direction of pipe main in addition to mechanical restraints.
- 3. At a minimum, install a bell joint restraint when a bell end is within 14 feet of a fitting or valve. Also, the last section of pipe at a dead end shall have a bell joint restraint, in addition to adequate blocking, if the section is less than 14 feet. Pipe

- sizes larger than 8 inch diameter will have different requirements.
4. A closed valve that will be pressure tested against shall be considered as a dead end.
  5. Locking gaskets (if available) may be substituted for bell joint restraints where applicable with the Engineer's approval.
- L. Route pipe in straight line at a constant depth. When pipe is laid on a grade of 10 percent or greater, the laying shall start at the lower elevation and shall proceed uphill with the bell ends of the pipe uphill.
- M. Install pipe to allow for expansion and contraction without stressing pipe or joints per pipe specifications.
- N. Concrete Thrust Restraints (when applicable):
1. Form and place concrete for pipe thrust restraints at change of pipe direction when required by Engineer or not otherwise restrained.
  2. Place concrete to permit full access to pipe and pipe accessories against undisturbed trench wall.
  3. Use plastic "bond breaker" between concrete restraint and pipe or fitting.
  4. Allow concrete restraint to cure for 12 hours before continuing backfill operations.
  5. Per City of Salida Standard Detail.
- O. Install trace wire continuously to the top of PVC pipe taped at intervals to keep it on top of pipe during backfill operations; coordinate with Section 02324. Bring trace wire to surface at every hydrant and valve location and at locations indicated by Engineer.
- P. Backfill trench in accordance with Section 02324 and per City of Salida Standard Detail.

### 3.6 INSTALLATION - VALVES AND HYDRANTS

- A. Install valves at locations indicated on Drawings.
- B. Valve boxes shall have a square concrete collar installed flush with pavement. Collar shall be 8-inch x 16-inch x 16-inch and shall one diamond shaped #5 rebar with 3-in clearance.
- C. Set valves on blocking placed on subsoil.
- D. Valves up to and including 8 inch: install solid concrete blocks, 4-inch x 8-inch x 16-inch minimum.
- E. Valves 10 & 12 inch: blocks under 10-inch and 12-inch butterfly valves shall be pre-cast concrete 3-foot wide X 3-foot wide and 6-inches thick. The blocks shall be constructed with concrete of a compressive strength of 3500 psi at 28 days and reinforcement of #4, grade 40 deformed bar at 12-inch o.c. each way. Smaller blocks will be stacked tightly onto the pre-cast block up to the bottom of the valve operator nut of all butterfly valves. Flow-fill in addition to blocking shall be installed a minimum of 8 inches under valve up to the spring line of the pipe.
1. Valves greater than 12 inch: blocks under valves shall be pre-cast concrete 4-foot wide X 4-foot wide and 6-inches thick. The blocks shall be constructed with concrete of a compressive strength of 3500 psi at 28 days and reinforcement of #4, grade 40 deformed bar at 12-inch o.c. each way. Flow-fill in addition to blocking shall be installed a minimum of 8 inches under valve up to the spring

- line of the pipe.
2. The Engineer may specify for valves of all sizes cast-in-place concrete blocking.
- F. Center and plumb valve box over valve. Set box cover flush with finished grade. Boxes in paved areas shall have a 2'x2' square concrete collar with #5 rebar, 2" clearance, and concrete jointing for each quadrant.
  - G. Install hydrants at locations indicated on Plans and as required by the Fire Department and Public Works Director. Hydrants shall be a maximum of 500 feet apart, generally at each intersection, and located in conformance with the Uniform Fire Code.
  - H. When a drainage ditch deeper than 2 feet exists between a hydrant and the roadway, a culvert of appropriate size of at least 10 feet in length shall be installed centered on the hydrant per Specifications.
  - I. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
  - J. Set hydrants to grade, with nozzles at least 16 inches above ground. Breakaway flanges shall be at an approved height per manufacturer's recommendations.
  - K. Connect hydrant to water main with a 6-inch branch line (using the least amount of joints possible) controlled by an independent 6-inch gate valve. Locate control valve per Detail.
  - L. Provide drain gravel 12 inches square by 12 inches deep (in clay or other impervious soil, pit shall be 36 inches square by 36 inches deep) filled with 1 ½ inch washed gravel with a waterproof barrier on top between pit and backfill. Encase elbow of hydrant in gravel to 12 inches above drain opening.

### 3.7 INSTALLATION - METERS

- A. Install Work in accordance with City of Salida standards and Standard Details or as shown on Drawings.
- B. Meter pits shall be installed between the back edge of the curb and the front edge of the sidewalk in the parkway utility easement, when APPROVED in advance. Where no curb, gutter and sidewalk exist, Public Works shall determine the location of the meter pits.

### 3.8 SERVICE CONNECTIONS

- A. City of Salida Water Department personnel will perform the installation of taps on the water main. All required shoring and safety measures shall be in place prior to City personnel entering the trench to make the taps. The Contractor shall perform excavation, backfill, compaction, and maintenance of trenches for the water main taps and service lines.
- B. Where it is required to reconnect the existing tap to the new water main, the Contractor shall extend the existing service line to the new main. Where the Contractor encounters existing galvanized steel or lead pipe water service lines, the Contractor shall completely replace such lines with type K copper tubing of equal diameter or larger (¾ inch minimum). This work shall include miscellaneous fittings for connection to the existing curb stop or water meter, or coupling connection at the edge of the street R-O-W, as approved by the Engineer.

- C. No service line splices are be allowed to be installed under a newly constructed, reconstructed, or over-layed street.
- D. Service lines shall be placed with 5-ft of cover based on finished grade and shall be installed in tracer wire per City specifications. Depths less than 5-ft shall be insulated and receive prior written approval by the Director of Public Works.
- E. Tapping saddles are not required on ductile iron water mains.
- F. Taps will not be made by City until the water main has been tested and accepted. The city Public Works Department will make all taps 1-inch and smaller. Taps larger than 1-inch shall be made by the Contractor and by a technician approved by the City. The City will not tap any Steel Lines.
- G. Taps will be placed in the top quadrant of the water main at a 45 degree angle no closer than 18 inches to another tap, fitting, valve, or a spigot/bell end of pipe.
- H. A minimum of 1 foot of new pipe must be installed on the outside of a new pit on the customer side. A point 2 inches past the curb stop on the house side is the end of City responsibility for service lines.
- I. Saddle nuts shall be tightened evenly with the following torque:
 

<u>Bolt Size (inch)</u>	<u>Torque (ft-lb)</u>
5/16	10-12
1/2	25-30
5/8	50-60

### 3.9 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system per AWWA C651 and CDPHE standards before placing new water main in service. All new development shall pay the expense for any and all tests associated with a new line.
- B. Five (5) gram calcium hypochlorite tablets containing 65%available chlorine by weight shall be used to disinfect water lines. Tablets shall be placed in each section of pipe and also in each hydrant, hydrant branch, and other appurtenances. The tablets shall be attached by adhesive to the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position should be marked on the pipe to assure installation at the top of the circle.
- C. Chlorine residual shall not be less than 50 ppm in the water after 24 hours standing in the pipe. The line shall be re-chlorinated and re-tested until the residual requirement is met.
- D. All valves or other appurtenances shall be operated while the line is filled with the chlorination agent.

### 3.10 FILLING AND FLUSHING DOMESTIC WATER PIPING SYSTEM

- A. It may be necessary to install temporary blow-offs to facilitate blowing off and disinfecting the new water mains before the mains can be tied into the City water system. The Contractor shall furnish all materials, labor, and equipment to install and remove the temporary blow-offs. For each blow-off, the Contractor shall install the required assembly as approved by the Engineer (as the blow-off is temporary).

- B. Taps shall be made to expel air in locations at high points where no hydrant or blow-off is installed. The Engineer shall specify the size and number of taps. Such taps shall be plugged when testing is complete. Permanent high points in the water main shall have air and vacuum valves and vaults installed.
- C. All dead end portions of the main that are to be tied into existing mains after completion shall be fitted with temporary blocking of sufficient strength to withstand required test pressures.
- D. Filling and flushing of mains shall be performed by City of Salida Water Department personnel.
- E. All backfill operations shall be complete and all permanent concrete thrust blocks in place for a minimum of 24 hours prior to any filling or flushing operations.
- F. Following chlorination, all treated water shall be flushed from the pipeline until, upon test by City personnel, the water is proved comparable in quality to the water served to the public from the existing system.

### 3.11 ABANDONMENT

- A. Existing water mains indicated by the Engineer shall be abandoned as directed.
- B. Existing water valves shall be removed if necessary to install the new main or can be left in place. Valves left in place shall have their valve boxes removed and the resulting void filled with flow fill.
- C. Existing fire hydrants to be abandoned shall be removed as a whole assembly by disconnecting it at the lateral without damage to the assembly or surrounding structures and landscape. The hydrant shall be salvaged by delivering it to the Water Department yard if directed, otherwise shall be disposed of at Contractor's expense.
- D. Services shall be abandoned by removing the corporation stop and installing a threaded plug. Work shall be inspected by the City.

### 3.12 FIELD QUALITY CONTROL

- A. Engineer and City personnel will perform Field inspecting and testing unless otherwise indicated.
- B. Bacteriological tests shall be paid for by the owner/developer prior to placing lines in service. The City shall observe tests and review results prior to placing lines in service.
- C. Pressure testing shall be scheduled upon receipt of a negative coliform bacteria test result.
- D. Pressure test system:
  1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, the City will conduct, in presence of Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600 & AWWA C605.
  2. The Contractor shall accept full responsibility for testing against any existing valves, fire hydrants, or other appurtenances.

3. The City will provide equipment required to perform leakage and hydrostatic pressure tests.
4. Test Pressure: Not less than 150 psi or 1.5 times in excess of maximum static pressure, whichever is greater.
5. Conduct hydrostatic test for at least two-hour duration.
6. Pressure shall not vary by more than 5 psi during the hydrostatic pressure test.
7. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks installed and plug pipe openings.
8. The City personnel will slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
9. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
- 10.
11. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7,400}$$

- L = allowable, in gallons per hour
- N = number of joints in section to be tested
- D = nominal diameter of pipe, in inches
- P = average test pressure during leakage test, in pounds per square inch (gauge)

12. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

- E. Compaction testing for bedding and backfill in accordance with Section 02324.
- F. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

The pipeline may be placed in operation after all required cleaning, testing, and inspection have been completed and written permission has been granted by the Engineer. During the warranty period, any defects in the system resulting from defective materials, poor workmanship, or any other cause attributable to the Contractor shall be corrected at his expense and to the satisfaction of the Engineer. Should the Contractor fail to respond within 48 hours after written notification of any deficiency, the City may complete the work and bill the Contractor. In emergency situations, the City shall take whatever steps necessary to correct the problem.

END OF SECTION



## Approved Materials List for Water and Sewer

### Valve and Curb Boxes

AY McDonald	5601-5	4'-5' Curb Box
Tyler Domestic HD or East Jordan	6850 (5-ft)	Main Line Valve Box

### Frost Free Meter Pits/Yoke Fittings

Ford, Mueller, or AY McDonald	Frost Free Coil Pit	Meter Pit
Ford, Mueller, or AY McDonald	Adjustable Frost Free Coil Pit	Adjustable Meter Pit

\*Shall include 4.5-ft pit with MIP compression fitting, ¾ FIP pack joint adaptor at connection to pit

\*\*2-inch recessed hole for transmitter in locking lid, dual check, ball valve on setter.

\*\*\*Application in parkway or concrete shall have a traffic rated ring and lid.

### Ring/Lid

Mueller or approved equal	70097-98	Ring/Lid (2-inch recessed hole)
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### Other Meter Setters/Yoke

Ford or AY McDonald	Straight Line	Int. Setter with Comp Fittings
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\*Internal setter shall only be permitted written upon approval of Public Works Director prior to building permit application

### Corp and Curb Valves

Ford	F-1000 (¾ cc to 1" pack joint)	Corporation Stop Valve
Ford	B33-444 w/Pack Joint	Curb Valve

\*1-inch min curb valves

### Service Lines

High Density Polyethylene	1-inch min C.T.S. DR9	Service Lines
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### Compressions Fittings

Ford or AY	Pack Joint	CTS Compression Fittings
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### Main Line Valves

AVK/Mueller	C509/515	Resilient Wedge Gate Valve
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### Fire Hydrants and Adaptors

Waterous	Pacer W-67, 5-ft bury	5-1/4" Dry Barrel Hydrant
Mueller	A403, 5-ft bury	5-1/4" Dry Barrel Hydrant
Storz	4-1/2" with flapper	Pumper Nozzle Adaptor

### Sanitary Sewer Fittings

PVC SDR 26	O-ring bell and spigot	Pipe and Fittings
Mission/Fernco	Stainless steel band	Couplings
Predco/Flex Connection-Joints	Epoxy	Taps



## SECTION 02630

### STORM DRAINAGE

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Storm drainage piping including irrigation lines within City rights of way.
  - 2. Accessories.
  - 3. Catch basins.
  - 4. Cleanouts.
  - 5. Manholes.
  - 6. Head Walls.
  - 7. Bedding and cover materials.
  
- B. Related Sections:
  - 1. Section 02060 – Aggregate.
  - 2. Section 02324 – Trenching.
  - 3. Section 03300 - Cast-in-Place Concrete.

##### 1.2 REFERENCES

- A. Urban Storm Drainage Criteria Manual (UDFCD).
  
- B. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  - 2. CDOT M & S Standards 2011.
  
- C. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
  - 3. ACI 305 - Hot Weather Concreting.
  - 4. ACI 306 - Cold Weather Concreting.
  - 5. ACI 318 - Building Code Requirements for Structural Concrete.
  
- D. ACI 306 - Cold Weather Concreting.
  
- E. Concrete Reinforcing Steel Institute:
  - 1. CRSI Manual of Standard Practice.

- F. American Society for Testing and Materials:
  - 1. ASTM C76.
  - 2. ASTM C443.
  - 3. ASTM C478.
  - 4. ASTM C923.
  - 5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 6. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  - 7. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

### 1.3 SUBMITTALS

- A. Product Data: Submit data indicating pipe, pipe accessories, and shop drawings for inlet boxes, manhole covers, steps, and grates.
- B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
  - 1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with 2011 CDOT Standard Specifications for Road and Bridge Construction, CDOT M&S Standards 2012, and City of Salida Standards.
- B. Maintain one copy of each document on site.
- C. Video Inspection, at Engineer's discretion, shall be required per Engineer's inspection criteria for all new storm sewer installed.

## PART 2 PRODUCTS

### 2.1 STORM DRAINAGE PIPING

- A. Reinforced Concrete Pipe: ASTM C76; mesh or bar reinforcement; inside nominal diameter of 12-inches minimum, bell and spigot ends.
  - 1. Fittings: Reinforced concrete.
  - 2. Joints: ASTM C443, rubber compression gasket

- B. Plastic Pipe: ASTM D3350, High Density Polyethylene (HDPE) material, A.D.S. N-12, corrugated, smooth wall interior, inside nominal diameters of 12-inches minimum, bell and spigot style ends.
  - 1. Fittings: Same material and manufacturer.
  - 2. Joints: rubber o-ring gasket, silt-tight.

## 2.2 ACCESSORIES

- A. Pipe and Structure Grout: Specified in Section 03300.
- B. Rip Rap Grout: 70 percent sand, 30 percent 3/8 inch aggregate, 6-9 inch slump, 5-8 percent entrained air, minimum compressive strength 3500 psi.
- C. Reinforcement: Specified in Section 03300.

## 2.3 CATCH BASINS/INLETS AND CLEAN OUTS

- A. Inlet Box & Grate:
  - 1. Construction: Pre-cast, HS-20 loading, DOT specifications.
  - 2. Grate & Frame: HS-20 loading – heavy duty, bicycle safe.
  - 3. Nominal Minimum Inside Dimension: 2 x 2 foot.
- B. Type R Inlet:
  - 1. Construction: Pre-cast, according Colorado Department of Transportation M&S Standards 2000.
  - 2. Nominal Minimum Inside Dimension: 3.5 x 3.5 foot.
- C. Concrete Clean Out:
  - 1. Construction: Cast-in-place, HS-20 loading.
  - 2. Lid: Approved 3/8" inch steel cut to fit.
  - 3. Nominal Minimum Inside Diameter: 2 x 2 foot.

## 2.4 MANHOLE

- A. Construction: Pre-cast, ASTM C478, HS-20 loading.
- B. Lid: Neenah R-1706-1.
- C. Steps: Aluminum or gray iron and cast in place when concrete is cast and be 9 ¼ inch x 12 ½ inch. As an alternate, steps may be polypropylene (M.A. Industries PS2-PFS or equal) and can be press fit into preformed holes.
- D. Nominal Minimum Inside Diameter: for manholes 6 feet or less in depth - 4 foot, for manholes greater than 6 feet in depth - 6 foot.
- E. Manhole Sections: Reinforced pre-cast concrete as specified in Drawings in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

## 2.5 HEAD WALL

- A. Concrete: Specified in Section 03300.
- B. Reinforcement: Specified in Section 03300.

## 2.6 PRE-CAST CONCRETE

- A. Provide all units shown in Plans and as needed for a complete and proper installation.
- B. Design Criteria- Design units in accordance with:
  - 1. ACI 304 and 318.
  - 2. CRSI Manual of Standard Practice.
  - 3. Applicable ASTM Standards.

## 2.7 BEDDING AND COVER MATERIALS

- A. Bedding: Flow Fill as specified in Section 02320 or uniformly graded rock wrapped in drainage fabric or Fill Type Class 6 as specified in Section 02060, see City of Salida Standard Detail W-3.
- B. Cover and Backfill: Fill Type Class 6 as specified in Section 02060 or Flow Fill as specified in Section 02320.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

### 3.2 PREPARATION

- A. Remove old culvert, and related debris and dispose of.
- B. Hand trim excavations to required elevations. Correct over excavation with material as directed by Engineer.
- C. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

### 3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02324 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

### 3.4 INSTALLATION - PIPE

- A. Per City of Salida Standard Detail.
- B. Install pipe, fittings, and accessories as indicated in accordance with ASTM D2321 with the exception that minimum cover shall be 1 foot. Seal joints watertight.
- C. Place pipe on minimum 4 inch deep bed of Type Class 6 aggregate.
- D. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.
- E. Install aggregate at sides and over top of pipe as indicated. Install top cover to minimum compacted thickness of 12 inches, compact to 97 percent according to ASTM D698.

### 3.5 INSTALLATION - CATCH BASINS, CLEANOUTS, AND MANHOLES

- A. Lift pre-cast structures at lifting points designated by manufacturer.
- B. When lowering manholes and drainage structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
- C. Form bottom of excavation clean and smooth to correct elevation, install and compact bedding material. Flow fill can be used in place of bedding material, as specified in Section 02320.
- D. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections according Section 03300.

- E. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- F. Set pre-cast structures bearing firmly and fully on bedding.
- G. Move pre-cast boxes into position in a manner that is not detrimental to the construction of the concrete or reinforcement.
- H. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- I. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
- J. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.
- K. Mount grate/lid and frame level in grout, secured to top section to elevation indicated.
- L. Install aggregate at sides and around box as indicated on Drawings. Compact to 97 percent according to ASTM D698.
- M. Grout flow line inverts and pipe connections the full wall width.
- N. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- O. Pipes stubbed into boxes shall be saw-cut to length such that ends do not protrude into the interior of the box in excess of 4 inches.
- P. Manholes shall be placed a minimum of every 500 feet and at connections under the traveled roadway.
- Q. Cleanouts shall be placed a minimum of every 50 feet and at connections outside the traveled roadway.

### 3.6 HEAD WALL

- A. Install required reinforcement as indicated.
- B. Form and place concrete to the dimensions indicated according to Section 03300.



3.7 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing aggregate cover over pipe.
- B. Compaction Testing: In accordance with ASTM D698.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.8 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
  - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
  - 2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION



SECTION 02740  
FLEXIBLE PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Hot Mix Asphalt (HMA) pavement.
  - 2. Hot Mix Asphalt (HMA) pavement overlay..
  - 3. Crack Seal
  - 4. Micro Slurry (2-coat)
  - 5. Emulsified Aggregate Slurry
  - 6. Chip Seal with Fog Coat
  - 7. Chip Seal with Cape
  
- B. Related Sections:
  - 1. Section 02315 – Excavation.
  - 2. Section 02721 – Aggregate Base Course.

1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Society for Testing and Materials:
  - 1. ASTM D276.
  - 2. ASTM D3776.
  - 3. ASTM D4632.
  
- C. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M140.
  - 2. AASHTO M208.

1.3 PERFORMANCE REQUIREMENTS

- A. Paving: Designed for residential streets, 92-96 percent (Theoretical -Rice Value) maximum density.

1.4 SUBMITTALS

- A. Product Data: Submit product information and mix design for approval prior to paving..
  
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with 2011 CDOT Standard Specifications for Road and Bridge Construction and City of Salida Standards.
- B. Mixing Plant: Conform to 2011 CDOT Standard Specifications for Road and Bridge Construction.
- C. Obtain materials from same source throughout.
- D. Maintain one copy of each document on site.

## 1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with documented experience.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Hot Mix Asphalt Pavement (HMA): Asphaltic cement binder- PG 64-22, uniformly mixed, well-graded aggregate- Grading SX for collector or arterial streets as determined by Engineer, ½ Inch or Type II for local streets, 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 401, 403, 702, and 703.
- B. Aggregate for Wearing Course Mix: ½ inch maximum well-graded aggregate as determined by Engineer.
- C. Tack Coat: Emulsified asphalt with the same asphaltic cement as pavement mix, SSI or equal. In accordance with requirements of AASHTO M140 or M208.
- D. Paving Fabric: Nonwoven geotextile, grab strength of 100 lbs(450 N), 4.2 oz/yd<sup>2</sup>(140 g/m<sup>2</sup>), ultimate elongation of 50%, and melting point at 300 degrees F(149 degrees C). In accordance with requirements of ASTM D 4632, 3776, & 276.

## 2.2 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design with aggregate gradation and mix proportioning for review prior to beginning of Work. Design shall not be dated prior than three years before work start date.
- B. Thickness and density shall be determined by calculating the average of the results of core samples taken by an independent testing laboratory. The City or City Engineer shall determine the coring frequency, if not noted it shall be on core per 350 feet

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted aggregate base course is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct by string lining with City Engineer.
- C. Verify manhole frames and valve boxes are installed in correct position and elevation.

### 3.2 BASE COURSE

- A. Fine grade and compact aggregate base course to maximum material density per Section 2721.

### 3.3 PREPARATION – EXISTING PAVEMENT

- A. Remove additional pavement to a painted lane stripe, gutter pan, an existing pavement patch, or an edge of the pavement if such street feature is within the two feet of the second cut.
- B. Existing adjacent pavement shall be cut square and vertical after placement of base course and prior to placement of new pavement. Milled edges are acceptable so long as the milled face is vertical and the edge is generally straight with a deviation of +/- 1 inch for every 10 feet.
- C. Patching on streets in which a trench has been excavated shall consist of a 'T' patch. 'T' patch will be done so that after trench is filled and compacted a strip of asphalt twelve (12) inches wider than trench shall be cutout and replaced with new asphalt. Patch depth shall be the design depth of asphalt but in no case less than 3 inches. On all cuts within the City ROW the pavement shall be saw cut.
- D. Existing pavement shall be rotomilled where indicated and cleaned free of all dirt, water, oil, dust, vegetation, and debris prior to placement of overlay.

### 3.4 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 407.
- B. Apply tack coat on all adjacent asphalt and concrete contact surfaces as well as cold joints or cold overlays at uniform rate.
- C. Apply tack coat to contact surfaces of curbs, gutters, and cross-pans.
- D. Coat surfaces of manhole and valve box lids with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.
- E. Apply tack coat on all asphalt, gravel base course when curb and gutter is not present, and surfaces that are to be overlaid at uniform rate. Residual coverage shall be between 0.15 to 0.30 gallon/square yard. The spray width of the tack coat shall be 6 inches greater than the fabric width. Additional tack shall be applied at fabric joints.

### 3.5 PREPARATION – OVERLAY PAVING FABRIC

- A. Paving fabric shall be laid with automated lay-down equipment where physically possible.
- B. The paving fabric shall be free of wrinkles and air pockets.
- C. Paving fabric shall be installed after the tack coat “breaks” but while it is still soft.
- D. Transverse and longitudinal joints should be overlapped at least 4 inches with the top flap in the direction of the paving

### 3.6 PLACING ASPHALT PAVEMENT

- A. Paving shall begin immediately after fabric lay down.
- B. Install Work in accordance with 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 401 & 403.
- C. The pavement shall be installed in lifts not exceeding 3 inches in compacted depth for 3 inch depth pavement and not exceeding 2” for 4” or more depth pavement.
- D. Place asphalt within 24 hours of applying primer or tack coat.
- E. Place asphalt with a self contained, self-propelled paving machine of sufficient width. Hand placement, without separation, is permissible for small patches.
- F. Large surface aggregate shall be raked and struck off to leave a smooth, finely graded surface.
- G. The asphalt material shall be placed to the grade and thickness required for compaction after rolling such that the final grade is ¼ inch above all adjacent asphalt and concrete edges.

- H. Compact pavement by rolling to 92-96 Rice (Theoretical) percent or greater density using the number, weight, and type of rollers required providing the maximum density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
  - I. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- 3.7 CRACK SEALING
- A. Crack sealing of streets in accordance with ASTM D6690 Type II Deery 102 (Or Approved Equal) and CDOT Specifications for Construction Section 408 and 702.06.
- 3.8 MICRO SLURRY
- A. Chip sealing of streets in accordance with CDOT Specifications for Construction Section 409 and 411. See CDOT revisions dated 2016 (409cas).
  - B. Crack sealing of roadway shall be completed in accordance with specifications prior to seal coat. Work shall be incidental to seal coat.
- 3.9 EMULSIFIED AGGREGATE SLURRY
- A. Chip sealing of streets in accordance with CDOT Specifications for Construction Section 409 and 411. See CDOT revisions dated 2016 (409cas).
  - B. Crack sealing of roadway shall be completed in accordance with specifications prior to seal coat. Work shall be incidental to seal coat.
- 3.10 3/8" CHIP SEAL WITH FOG COAT
- A. Chip sealing of streets in accordance with CDOT Specifications for Construction Section 409 and 411. See CDOT revisions dated 2016 (409cas).
  - B. Crack sealing of roadway shall be completed in accordance with specifications prior to seal coat. Work shall be incidental to seal coat.
  - C. For 3/8-inch chip the application rate should be 0.38 +/- 0.02 gal/sq yd for emulsion. Cover coat should be 20 +/-3 lbs/sq yd for aggregate.
  - D. The asphalt emulsion shall be CRS-2P.
- 3.11 CHIP SEAL WITH CAPE
- A. Chip sealing of streets in accordance with CDOT Specifications for Construction Section 409 and 411. See CDOT revisions dated 2016 (409cas).
  - B. Crack sealing of roadway shall be completed in accordance with specifications prior to seal coat. Work shall be incidental to seal coat.

### 3.12 TOLERANCES

- A. Flatness: Maximum variation of 3/16 inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/2 inch.
- C. Variation from Indicated Elevation: Within 1/4 inch.

### 3.13 PROTECTION OF FINISHED WORK AND CLEAN-UP

- A. Immediately after placement, protect pavement from mechanical injury.
- B. All excess asphalt products or chips shall be swept up and removed from site.
- C. All facilities which may include concrete valve and manhole boxes, meter rings/lids, and other facilities in the work area shall be neatly covered during work and uncovered and cleaned after work is completed.
- D. Contractor is responsible for working with property owners to coordinate work activities and remove vehicles from work zone.

### 3.14 SCHEDULES

- A. HMA pavement: Single course of 3 inch minimum compacted thickness or as shown on Drawings.
- B. HMA pavement overlay: Single course of 2 inch minimum compacted thickness unless specified otherwise.

END OF SECTION



SECTION 02750  
RIGID PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Portland Cement Concrete (PCC) pavement.
  
- B. Related Sections:
  - 1. Section 02315 – Excavation.
  - 2. Section 02721 – Aggregate Base Course
  - 3. Section 03300 – Cast-in-Place Concrete

1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. Current CDOT Standard Specifications for Road and Bridge Construction.
  
- B. American Concrete Pavement Association (ACPA):
  - 1. Municipal Concrete Pavement Manual.
  
- C. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
  - 3. ACI 305 - Hot Weather Concreting.
  - 4. ACI 306 - Cold Weather Concreting.
  - 5. ACI 318 - Building Code Requirements for Structural Concrete.
  
- D. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M31.
  
- E. American Society for Testing and Materials:
  - 1. ASTM C39.
  - 2. ASTM C78.
  - 3. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - 4. ASTM C1107.
  - 5. ASTM D5893.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Paving: Designed for parking, residential streets, and main street arteries.
- B. Concrete Pavement: Required compressive strength shall be 4000 psi at 28 days per ASTM C39. Required flexural strength (modulus of rupture) shall be 600 psi at 28 days per ASTM C78, third-point loading.
- C. Surface Tolerances: Surface deviation shall not be in excess of 3/16 inch in 10 feet.
- D. Thickness Tolerances: Thickness shall not be 1/2 inch more or less than that specified for an average of no more than 30 percent of the area of the slab.
- E. Elevation Tolerances: Variation from indicated elevation within 1/4 inch.
- F. Cracking: All cracking shall occur within cut or hand tooled control joints.

### 1.4 SUBMITTALS

- A. Product Data: Submit data on joint filler, admixtures, and curing compounds.
- B. Concrete Mix Design: Submit current mix design with aggregate gradation, cylinder compression test results, and mix proportioning prior to beginning work. Design shall not be dated prior to two years before start date, which is indicated on the Notice to Proceed.
- C. Delivery Tickets: Submit concrete delivery tickets, indicating mix I.D. number, time water was added, elapsed time from when water was added and concrete placed, and amounts of additional water added.
- D. Work Schedule: Submit schedule to allow at least 24 hours notice of work to be performed or concrete poured to allow for appropriate schedules for testing and inspection.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI, ACPA, Section 03300, and the City of Salida standards.
- B. Maintain one copy of each document on site.
- C. Obtain cementitious and aggregate materials from same source throughout.

### 1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with documented experience.

### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen unless approved by Engineer..

- B. Concrete placed in cold weather conditions shall be done in accordance with ACI 306.
- C. Conform to ACI 305 when concreting during hot weather.

## PART 2 PRODUCTS

### 2.1 FORM MATERIALS

- A. Form Materials: As specified in Section 03300.

### 2.2 REINFORCEMENT

- A. Reinforcing Joint Steel: AASHTO M31; 40 ksi yield grade; #4; deformed billet steel bars; 24 inches long.
- B. Reinforcing (Transverse Construction Joint) Steel: AASHTO M31; 40 ksi yield grade; #5; smooth billet steel bars; 12 inches long; lubricated one end.

### 2.3 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 03300

### 2.4 ACCESSORIES

- A. Bonding Agent: Two component, moisture insensitive epoxy.
- B. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 in 48 hours and 7,000 psi in 28 days.
- C. Curing Compound: membrane forming, ASTM C309.
- D. Joint Sealers: Crafcro Roadsaver Silicone (SL) Sealant Part No. 34903 installed with approved backer rod, meeting requirements of ASTM D5893.

### 2.5 CONCRETE MIX

- A. Concrete Mix and Delivery: As specified in Section 03300.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Per Section 03300.

### 3.2 SUBBASE

- A. Aggregate Subbase: Fine grade and compact to 97% Standard Proctor.

### 3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole, catch basin, and valve box frames with oil to prevent bond with concrete pavement.
- C. Notify Engineer and schedule testing minimum 24 hours prior to commencement of concreting operations.

### 3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B.
- C. Engineer to inspect forms prior to concrete pour.
- D. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- E. Only one half of the street width shall be formed and placed at a time, with a longitudinal construction joint in the center of the street.

### 3.5 REINFORCEMENT

- A. Place reinforcement as indicated. Do not deviate from required position.
- B. Reinforcement to be inspected prior to pour.
- C. Place reinforcement to achieve pavement and curb alignment as detailed.
- D. Place, support, and secure reinforcement against displacement.
- E. Provide doweled joints as indicated at interruptions of concrete (construction joint), at curb and gutter, and all longitudinal joints.

### 3.6 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and 304, and ACPA Municipal Concrete Pavement Manual.
- B. Place concrete using mechanical screed, slipform or form paving type equipment, which will strike off, consolidate, and finish the pavement to the required cross section. A minimum 10 foot bull float or "bump cutter" shall be used following any paving equipment.
- C. Ensure reinforcement, inserts, embedded parts, formed joints and manhole or valve box lids are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

- E. Use a vibrator of proper speed and size to properly consolidate the concrete when screeding by hand or using a bridge deck finisher.

### 3.7 JOINTS

- A. Place joints at 12 foot intervals maximum both directions. Align curb, gutter, and sidewalk joints when at all possible.
- B. Joints shall be constructed by sawing concrete after it has set or by hand forming in the plastic concrete with an appropriate jointing tool. The tranverse joints at 48 foot intervals shall be hand tooled before the concrete has set.
- C. Sawing shall begin as soon as the concrete has hardened sufficiently as to not allow raveling and before uncontrolled cracking occurs. Sawing shall take place regardless of time of day or weather conditions to assure proper joints.
- D. Saw cut contraction joints to the width and depth indicated.

### 3.8 FINISHING

- A. Paving: Heavy broom.
- B. Direction of Texturing: Transverse to pavement direction.

### 3.9 JOINT SEALING

- A. Proper cleaning and preparation of joints shall be completed prior to sealing operations, including but not limited to sandblasting per the sealant manufacturer's instructions. A clean joint shall be dry and have no visible signs of residual sealant or debris on the joint face, and will leave no residual cement powder or dust on your finger after rubbing the joint face.
- B. All joints, including between pavement and curb and gutter, shall be sealed with joint sealant and backer rod.
- C. Do not install sealant when temperature is below the dew point. If rain or other inclement weather occurs during joint preparation or sealing, all operations should cease and sufficient time must be allowed so that the joints are dry prior to starting or continuing the sealing operation.
- D. A field adhesion test must be performed on a test section as follows:
  - 1. Make a knife cut horizontally from one side of the joint to the other.
  - 2. Make two vertical cuts (from horizontal cut) approximately 3-inches long, at both sides of the joint.
  - 3. Place a mark 1-inch from the point where the 3-inch cuts stop.
  - 4. Grasp the 2-inch piece of sealant firmly just beyond the 1-inch mark and pull at a 90-degree angle.
  - 5. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut along one side of the joint, checking adhesion to the opposite side and then repeating for the other surface.
  - 6. The adhesion test is considered passing when 1-inch of sealant is elongated to 4-inches without bond loss.

### 3.10 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with ACI 301.
- B. Provide free access to Work and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
- D. Tests of concrete may be performed at random to ensure conformance with specified requirements. Engineer may request cylinder compressions, slump, aggregate sieve designation and deleterious substance tests to be performed by a qualified designee.
- E. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

### 3.11 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, wind, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Apply curing compound to unformed surfaces immediately after finishing, not to exceed 300 SF per gallon.
- D. Remove forms only after concrete has attained sufficient strength to support all dead and live loads.
- E. Contractor shall provide barricading or personnel as necessary to protect freshly finished concrete from vandalism or other damage.
- F. Do not permit vehicular traffic over pavement for 7 days minimum after finishing.

### 3.12 SCHEDULES

- A. Pavement: Single course of 6-inch thickness minimum. Design engineer shall verify minimum requirements are adequate based on site conditions and propose necessary changes to Engineer accordingly for approval.

END OF SECTION

SECTION 02924  
SEEDING & REVEGETATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Topsoil.
  - 2. Seeding & Landscaping.
  - 3. Maintenance & Warranty.

1.2 REFERENCES

- A. Urban Storm Drainage Criteria Manual (UDFCD).
- B. 1999 CDOT Standard Specifications for Road and Bridge Construction.
- C. Erosion Control Technology Council (ECTC).
- D. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

- A. Product Data: Submit product information and design.
  - 1. Provide submittal of topsoil with proper analysis from independent soils laboratory prior to delivery.
  - 2. Submittals shall include seed mixes, mulches, soil amendments, methods, etc. The Contractor shall also submit an irrigation plan.
  - 3. If specified materials are not obtainable, submit non-availability to City, together with a proposal for use of equivalent material.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. All seed shall be furnished in containers clearly labeled to show name and address of supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, guaranteed percentage of purity and germination, and the pounds of pure live seed of each species.
- B. Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations and Colorado State Seeding laws.
- C. A satisfactory stand of plantings not requiring reseeding shall be defined as a minimum of 50 grass seedlings per square foot or 70% of the prior disturbed landscaped growth.

## 1.5 QUALIFICATIONS

- A. Manufacturer/Installer: Company specializing in performing work of this section with documented experience.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Topsoil shall be surface soil, fertile, friable, natural loam reasonably free of subsoil, clay lumps, brush, weeds, and other litter and free of roots, stumps, stones larger than 2 inches in any dimension, and other extraneous or toxic matter harmful to plant growth. Topsoil shall conform to 1999 CDOT Standard Specifications for Road and Bridge Construction, Section 207.02.
- B. Specific fertilizer and amendments recommendations shall be provided by a licensed, certified soil-testing company.
- C. Erosion Control Blankets (ECBs) shall be used in areas with slopes steeper than 3:1. ECBs shall be temporary/biodegradable (life span = 18-24 months) and meet the guidelines of the Erosion Control Technology Council (ECTC). ECBs shall meet the specifications of ASTM D5199, D5261, D1117, D1388, and D5035. ECBs shall be installed according to manufacturer's requirements and in a way that is not detrimental to the seeding and germination process. A product and installation submittal shall be delivered to Engineer for approval prior to installation of ECBs.
- D. Hay mulch shall be used in areas with slopes of 3:1 or flatter. Hay mulch shall consist of clean field hay and shall not contain seeds of noxious weeds. Hay in such an advanced state of decomposition as to smother or retard the growth of grass will not be accepted. The hay mulch shall have a minimum of 60% of the hay stubble 10 inches or longer upon completion of the crimping operation.
- E. Mulch tackifier shall be applied to all hay mulched areas at a rate of 100 lbs/acre and shall consist of a free-flowing non-corrosive powder produced from the natural plant gum of *Plantago Insularis* (Desert Indianwheat). The powder shall possess the following properties:

Protein Content		1.6%
Ash Content	2.7%	
Fiber Content	4.0%	
pH (1% solution)	6.8%	
Settleable Soils		5.0%
- F. Grass Seed Mix:
  - 1. Contractor shall submit mix on a case-by-case basis.



## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify placement with Engineer.
- B. All disturbed areas within the extents of the project shall be reclaimed, reseeded, and mulched according the Plans and Specifications.

### 3.2 SITE PREPARATION

- A. Landscape work shall proceed as rapidly as portions of the site become available, within season limitations.
- B. Rip existing soil to a minimum depth of 6 inches in one direction using an agricultural ripper with tines spaced at no greater than 18 inches.
- C. Remove all rubble, stones and extraneous material over 4 inches in diameter.
- D. Spread the amendment over the entire area to be landscaped and incorporate into the top 4 inches of soil by dicing or rotating until a uniform mixture is obtained with no pockets of soil or amendments remaining.
- E. Developer/Contractor shall supply fertilizer, erosion control, and mulch as required to meet the requirements.

### 3.3 SEEDING

- A. Seeding shall occur after spring thaw and before consistent ground freeze. At no time will seed be sown when the surface of the ground is frozen.
- B. Slopes 3:1 or flatter:
  - 1. Seeded by mechanical power drawn "Grass" drills equipped with agitator in the seed box, double disc opener, and depth bands followed by packer wheels. Drills shall have a depth of  $\frac{1}{2}$  -  $\frac{3}{4}$  inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application.
  - 2. Areas will be mulched with hay mulch after seeding within 24 hours uniformly at a rate of 2 tons per acre. The mulch shall then be crimped with a crimper. Crimping shall be performed on the contour. Areas not mulched within 24 hours shall be reseeded prior to mulching.
  - 3. Upon completion of mulching, organic tackifier shall be applied.
- C. Slopes steeper than 3:1:
  - 1. Seeded by hydraulic seeders.

2. Areas will be mulched with 100% virgin wood cellulose fiber mulch after seeding within 24 hours uniformly at a rate of 2000 lbs/acre. Areas not mulched within 24 hours shall be reseeded prior to mulching.
  3. Hydraulic mulching shall not be done in the presence of free surface water.
- D. Seeding may be accomplished on small areas not accessible to machine methods by approved methods.
  - E. Seed shall not be sown during windy weather.
  - F. All broadcast seed shall be “raked in” or covered with at least ¼ inch of soil.
  - G. Seed shall be applied at a minimum rate of 15 lbs/acre.

#### 3.4 MAINTENANCE & WARRANTY

- A. Maintenance and irrigation of seed and established plants is the responsibility of the Developer/Contractor for the full warranty period. At any time, during the maintenance period, that the City determines corrective work and replacement materials are necessary in accordance with the Contract, the Contractor shall take corrective measures within 10 days of notice by the City.
- B. Maintenance shall include irrigation by the Developer/Contractor.
- C. The Developer/Contractor shall submit a plan for irrigation, which may include pumps, temporary sprinkler pipes, sprinklers, siphon pipes, gate pipe, etc.

END OF SECTION

SECTION 03300  
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
  - 1. Rigid Pavement (PCC).
  - 2. Curb and Gutter.
  - 3. Driveway Aprons.
  - 4. Sidewalk and Sidewalk Ramps.
  - 5. Cross-Pans.
  
- B. Related Sections:
  - 1. Section 02060 – Aggregate Materials.
  - 2. Section 02315 – Excavation.
  - 3. Section 02721 – Aggregate Base Course.
  - 4. Section 02740 – Rigid Pavement.

1.2 REFERENCES

- A. Colorado Department of Transportation:
  - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
  
- B. Concrete Reinforcing Steel Institute:
  - 1. CRSI – Manual of Standard Practice.
  - 2. CRSI – Placing Reinforcing Bars.
  
- C. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 304.
  - 3. ACI 305 - Hot Weather Concreting.
  - 4. ACI 306 - Standard Specification for Cold Weather Concreting.
  - 5. ACI 318 - Building Code Requirements for Structural Concrete.
  
- D. American Society for Testing and Materials:
  - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 2. ASTM C67 - Standard Test Methods for Sampling & Testing Brick and Structural Clay Tile.
  - 3. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 4. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
  - 5. ASTM C150 - Standard Specification for Portland Cement.
  - 6. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 7. ASTM C309.
  - 8. ASTM A615.
  - 9. ASTM C902 - Standard Specification for Pedestrian and Light Traffic Paving Brick.
  - 10. ASTM C936 - Standard Specification for Solid Concrete Interlocking Paving Units.

11. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

E. Americans With Disabilities Act Accessibility Guidelines (ADAAG).

F. Public Rights-of-Way Access Advisory Committee (PROWAAC).

### 1.3 SUBMITTALS

A. Product Data: Submit data on joint filler, admixtures, accessories and curing compounds.

B. Concrete Mix Design: Submit current mix design with aggregate gradation, cylinder compression test results, and mix proportioning prior to beginning work. Design shall not be dated prior to three years before start date, which is indicated on the Notice to Proceed.

C. Delivery Tickets: Submit concrete delivery tickets, indicating mix I.D. number, time water was added, elapsed time from when water was added and concrete placed, and amounts of additional water added.

D. Work Schedule: Submit schedule to allow at least 24 hours notice of work to be performed or concrete poured to allow for appropriate schedules for testing and inspection.

### 1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

### 1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of each document on site.

C. Acquire cement and aggregate from one source for Work.

### 1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F unless approved by Engineer, or surface is wet or frozen.

B. Concrete placed in cold weather conditions shall be done in accordance with ACI 306.

C. Conform to ACI 305 when concreting during hot weather.

## PART 2 PRODUCTS

### 2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type II – Moderate, low alkali, maximum tricalcium aluminate content of 8%.
- B. Aggregates: ASTM C33; 2 percent maximum soft particles.
- C. Water: Clean; not detrimental to concrete; free of oils, acids, alkalis, salts, or organic materials.

### 2.2 ADMIXTURES

- A. Furnish materials in accordance with 2011 CDOT Standard Specifications for Road and Bridge Construction.
- B. Air Entrainment: ASTM C260.
- C. Fly Ash: Substitution of percent of cement material shall be determined and approved by the City Engineer. The maximum allowed is 20%.

### 2.3 ACCESSORIES

- A. Bonding Agent: Two component, moisture insensitive epoxy.
- B. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 in 48 hours and 7,000 psi in 28 days.
- C. Curing Compound: membrane forming, ASTM C309;
- D. Detectable Warning Paver: ASTM C67, C902, C936; ADA compliant; compressive strength of 8000 psi or greater, water absorption maximum of 5%; Pavestone 2004 ADA Compliant Detectable Warning Paver, providing a minimum visual contrast of 70 percent in light reflectance between the paver and adjoining surface, i.e. Red for grey sidewalks, Pewter for red sidewalks.
- E. Paver Bedding and Joint Sand: ASTM C33 for Bedding Sand; ASTM C144 for Joint Sand; clean, non-plastic, free of deleterious or foreign material.

### 2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Expansion Joint Devices: resilient filler strip with hardness to permit plus or minus 25 percent joint movement with full recovery.

### 2.5 FORM MATERIALS

- A. Forms shall be straight, uniform width and thickness, waterproof, free from knots, offsets, holes, dents, and other surface defects.

## 2.6 REINFORCEMENT

- A. Reinforcing Joint Steel (Cross Pans): ASTM A615; 40 ksi yield grade, as specified; #5 as specified; deformed billet steel bars; chairs and spacers sized and shaped for strength and support reinforcement.
- B. Reinforcing Joint Steel (Driveway Aprons): ASTM A615; 40 ksi yield grade, as specified; #5 as specified; deformed billet steel bars; chairs and spacers sized and shaped for strength and support reinforcement.
- C. Reinforcing Joint Steel (Pavement or Cross Pan Repair): ASTM A615; 60 ksi yield grade, as specified; #5 as specified; smooth billet steel bars; 12-inches long.
- D. Tie Wire: 16 gage minimum; annealed type.
- E. Rigid Pavement (PCC):
  - 1. See Section 02750.

## 2.7 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.
- B. Provide concrete to the following criteria: Conform to Class B or BZ of Section 601.02 and 601.03 of the 2011 CDOT Standard Specifications for Road and Bridge Construction.
- C. Rigid Pavement (PCC): Conform to Class P, with No. 67 or 57 coarse aggregate, of Section 601.02 and 601.03 of the 2011 CDOT Standard Specifications for Road and Bridge Construction. See Section 02750.
- D. Final mix shall contain a minimum of 565 pounds of cement per cubic yard of concrete, with a water-cement ratio not to exceed 0.45.
- E. Slump shall be 4 inches  $\pm$  1 inch. Slump may be altered by City Engineer if slip forming is used.
- F. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved through submittal process.
  - 1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
  - 2. Use calcium chloride only when directed by Engineer.
  - 3. Use set retarding admixtures during hot weather.
  - 4. Add air-entraining agent to normal weight concrete mix for work exposed to exterior.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.

- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.
- C. The Engineer prior to concrete placement shall approve final form grades.

### 3.2 PREPARATION

- A. Excavate and prepare base course according to Section 2315.
- B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- C. In locations where new concrete is doweled to existing work, i.e. pavement or cross pan repair, drill holes, 3/4-inch diameter, 12-inches o.c. in existing concrete, clear out holes using compressed air, fill holes with epoxy, and insert steel dowels. Coat exposed portion of dowels with grease.
- D. Place expansion material and reinforcement in required locations. Locate reinforcing splices, not indicated on drawings, at point of minimum stress. Splice according to ACI 318, Class B tension splice.
- E. Place any conduit and repair any cables or pipelines.
- F. Place forms to straight-line grade at specified elevations. Maintain or facilitate storm water drainage with driveway, sidewalk, curb and gutter, and cross-pan grading. Forms shall be placed around all concrete work. Pouring concrete directly against asphalt edge will not be allowed. Horizontal lines shall be smooth and straight. Curved forms shall be placed at uniform distance from radius point. Standard curb face shall be formed and not hand shaped.
- G. Remove all loose dirt, mud, debris, and other loose materials from inside forms.

### 3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304.
- B. Notify Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Place concrete continuously between predetermined expansion, control, and construction joints.
- F. All curb and gutter shall be formed and placed by machine when physically possible.
- G. Do not interrupt successive placement; do not permit cold joints to occur.

- H. Saw cut joints within 12 hours after placing, using 3/16 inch thick blade or hand tool; cut into 1/4 depth of slab thickness; straight and perpendicular to edges; match existing joint patterns per Engineer where applicable. Locate joints at changes in grade or line, corners, or other points of stress.
- I. Screed slabs on grade to drain; sidewalks shall not have a cross slope of more than 2 percent.

### 3.4 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with a broomed, uniformed finish free of visual cavities or defects. Finish edges with edging trowel.

### 3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Apply curing compound to unformed surfaces after finishing, not to exceed 300 SF per gallon.
- D. Remove forms only after concrete has attained sufficient strength to support all dead and live loads.
- E. Contractor shall provide barricading or personnel as necessary to protect freshly finished concrete from vandalism or other damage.

### 3.6 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with ACI 301.
- B. Provide free access to Work and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
- D. When tests indicate Work does not meet specified requirements, remove Work and replace.
- E. Concrete Testing:
  - 1. The City may hire an independent, licensed engineer experienced in concrete analysis and evaluation to perform required tests in accordance with ACI and charge the owner/contractor for the expense or require the owner/contractor to hire the licensed engineer and approve the direct distribution of test reports to the City for review. Copies of test results showing exact location of sample collection and test sites must be furnished to Engineer. Engineer shall be informed prior to testing and he may designate areas of testing.
  - 2. Engineer may request additional cylinder compressions, slump, aggregate sieve designation, thickness, and deleterious substance tests to be performed by a qualified designee.



3. Tests of concrete may be performed at random to ensure conformance with specified requirements.
  4. 24 hour notice is required for schedule of concrete testing.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

### 3.7 PATCHING AND REPAIR

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- C. Patch imperfections as directed by Engineer using specified grout and epoxy.
- D. For repair of internal sections of pavement or cross pans, entire panels must be removed joint to joint by carefully saw-cutting and hammering out discarded concrete so as not to chip, crack, or otherwise damage adjacent concrete. Removal of no more than one half of or less than one third of concrete pavement panel will be allowed as long as transverse saw-cuts are continued completely to both outside edges of the pavement. If the saw-cut for the partial panel removal is longitudinal to the pavement than upon completion of curing operations but prior to opening of pavement to traffic, the pavement shall be cored with a 6-inch diameter core at the terminus of the longitudinal saw-cut to include the entire "T" joint intersection. The core shall then be removed and the remaining hole filled and repaired with non-shrink grout.
- E. Pavement panels broken into three or more pieces shall be removed and replaced.
- F. Pavement panels containing random and wandering cracks shall be removed and replaced.
- G. Pavement panels containing a single longitudinal or transverse crack not having vertical separation and is no closer than 1 foot to but generally parallel, for the width or length of the panel, to any tooled or sawed joint, shall be routed or "vee'd" out with appropriate tools and sealed in the same manner as the pavement.
- H. Concrete pavement shall be cut back a minimum of 1 foot from the trench wall. Contractor shall repair any damage due to settlement of the pavement subgrade due to operations in the trench. Voids under pavement shall be repaired by pavement removal and replacement or by drilling and injecting an approved non-shrink hydraulic cement grout into the empty spaces.
- I. Concrete pavement shall be resealed in accordance with Section 02750 after repair. Old sealant must be removed by methods approved by Engineer prior to resealing.

### 3.8 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Failed air or strength tests.

- C. Engineer will determine repair or replacement of defective concrete.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

### 3.9 DETECTABLE WARNING AND WELL

- A. Spread sand evenly in the well area defined and screed the sand to an appropriate embedment depth as directed by Engineer.
- B. Screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers.
- C. Pavers shall be placed in a running bond pattern. Domes shall be aligned to create a square grid in the predominant direction of travel. Pavers shall be installed such that the base of the truncated dome is approximately 1/8 inch above the adjoining surface, allowing for settlement with a smooth transition between the sidewalk and detectable warning.
- D. A vibrating plate compactor shall be used to embed the pavers into the sand. The size and type of compactor shall be in accordance with the paver manufacturer's recommendations, or as directed by the Engineer. Replace any pavers damaged during the compaction operations.
- E. Joint spacing between paver units shall be in accordance with the manufacturer's recommendations, or as approved by the Engineer. Joints shall be filled completely with joint sand. Excess sand shall be removed by sweeping.
- F. Bedding sand may be used for joint sand, requiring more effort in compaction and sweeping to fill the joints. Joint sand shall never be used for bedding sand.

### 3.10 SITE WORK

- A. Backfill suitable topsoil around all new concrete adjacent to existing earth or sodded areas to conform to new elevations. Topsoil shall conform to 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 207.02. Generally, install lightly compacted topsoil to within 1 inch of top of concrete, grade and rake out clumps to leave smooth. No rocks or cobble allowed adjacent to concrete work.
- B. Backfill with approved aggregate material and asphalt patch.
- C. Remove all roots, wood chips, excess concrete, trash or other debris, or excess materials generated from work from the site, leaving site clean and basically complete.

### 3.11 SCHEDULE

- A. Sidewalk:
  - 1. Concrete 4 inches thick minimum, over base course.
  - 2. Concrete 6 inches thick minimum, over base course: through driveways and alleys and sidewalk adjacent to mountable curb and gutter.
- B. PCC Pavement:

1. Concrete 6 inches thick minimum, over base course: a professional licensed engineer shall design final installed thickness.
- C. Cross pan:
1. Concrete 8 inches thick minimum, over base course.

END OF SECTION



## SECTION 10440

### STREET SIGNS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Design.
  - 2. Appurtenances.
  - 3. Placement.

##### 1.2 REFERENCES

- A. Model Traffic Code for Colorado 2003
- B. Manual on Uniform Traffic Control Devices 2003 (MUTCD)
- C. Standard Highway Signs 2004
- D. US Department of Transportation, Federal Highway Administration (FHWA)

##### 1.3 SUBMITTALS

- A. Product Data: Submit product information and design.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

##### 1.4 QUALITY ASSURANCE

- A. Design and install Street Name Signs in accordance with all applicable Local, State, and Federal Standards.

##### 1.5 QUALIFICATIONS

- A. Manufacturer/Installer: Company specializing in performing work of this section with documented experience.

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. Sign: Steel Blank- 00, Sheeting- Retroreflective (FHWA-RD-03-081) High Intensity Prismatic ASTM Sheeting Type III or better, Color- per MUTCD. Size as determined by Engineer.
- B. Street Name Signs: white legend, white border, green background, Design & Lettering- all capitals, Standard Highway Signs D3, MUTCD.
- C. Appurtenances: Up Right Post- 11-ft, 14-gauge, 2-5/16-inch diameter, galvanized steel with yellow powder coating; Anchor Post- 27-in, 12-gauge, 2-3/8-inch diameter with wedge;Bolts- 5/16-inch nylon locking bold for sign to post.

## PART 3 EXECUTION

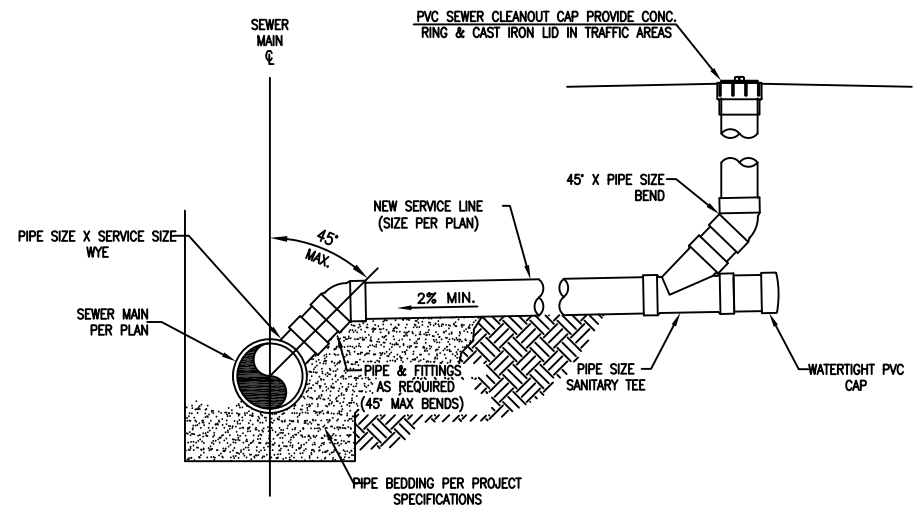
### 3.1 EXAMINATION

- A. Verify placement with Engineer.
- B. Verify locations of underground utilities.

### 3.2 INSTALLING SIGN

- A. Post Installation- drive anchor post 2-feet minimum into ground. Bolt up right post to anchor post, 2 bolts minimum.
- B. Location and Mounting- MUTCD Part 2.

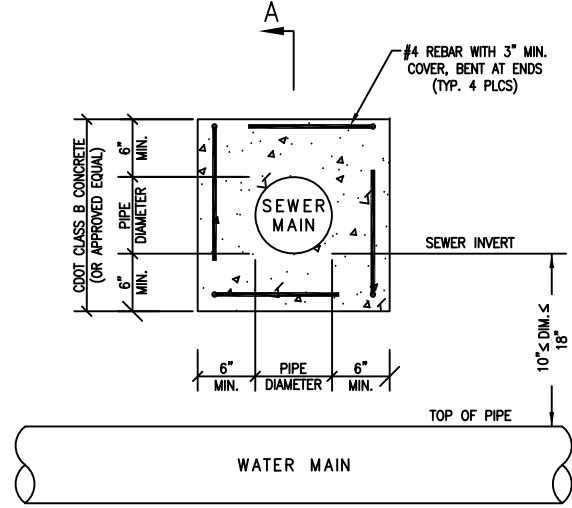
END OF SECTION



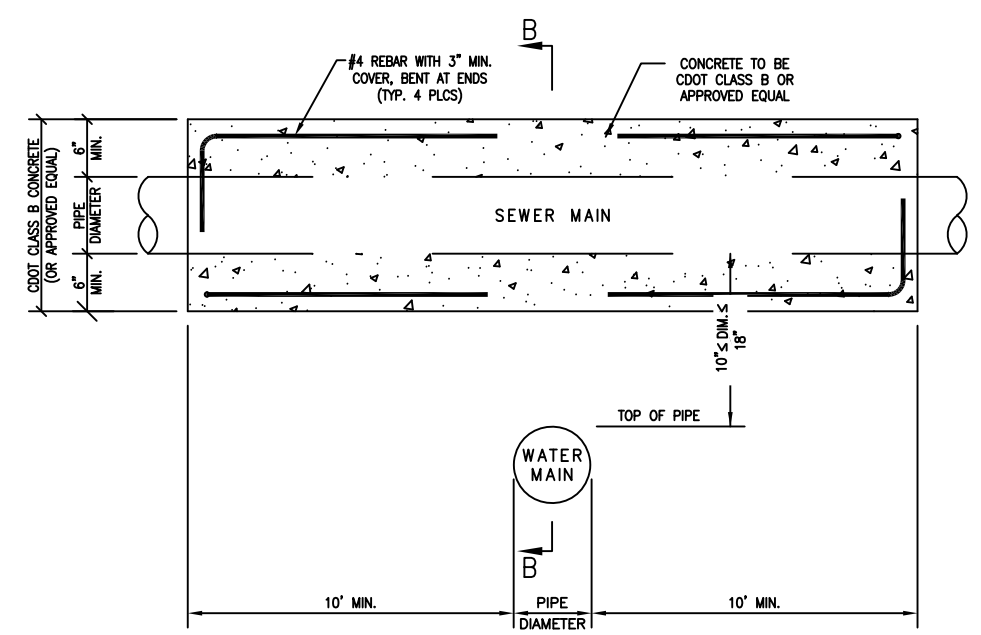
**S**  
**3** SEWER SERVICE TAP  
DETAIL

**STREET MANHOLE RING & COVER:**  
DEETER 1266 OR APPROVED EQUAL  
Street MH Ring & Cover 290 Lb. Min.  
Street Manhole Ring & Cover to be Machined.

**GENERAL NOTE:**  
Precast Manholes Shall Conform  
to ASTM Specification C 478, with  
Revisions.  
\* SANITARY OR STORM SEWER



SECTION B-B

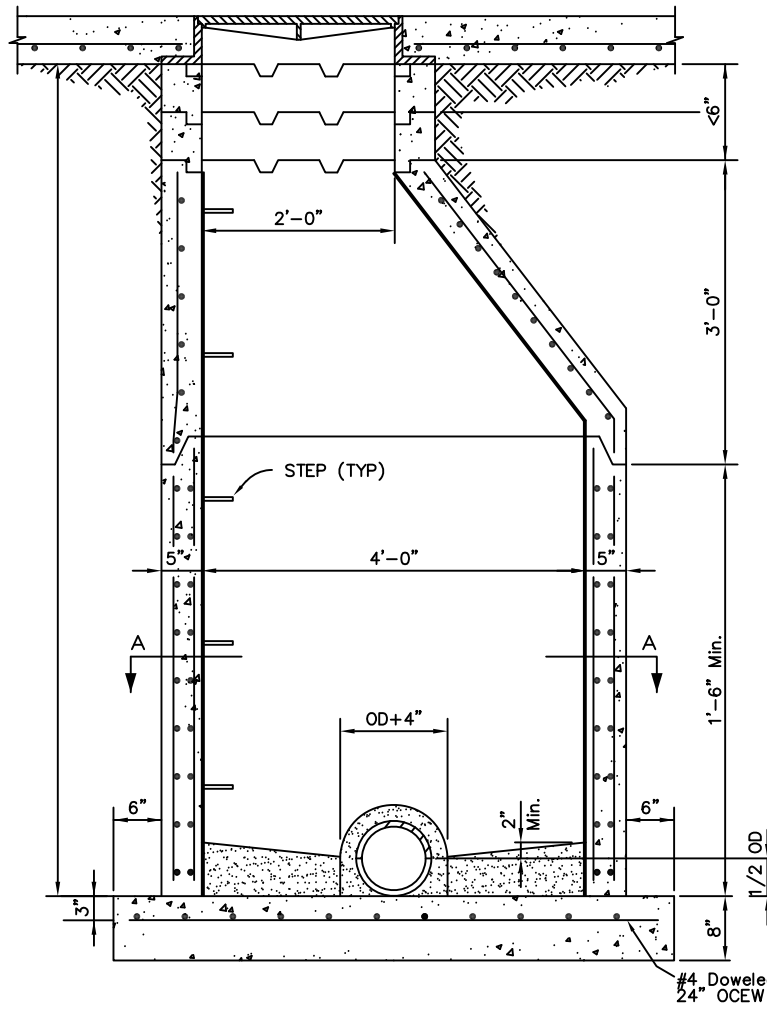


SECTION A-A

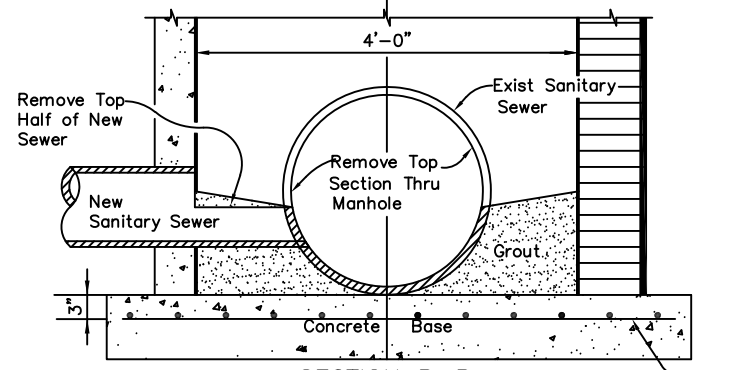
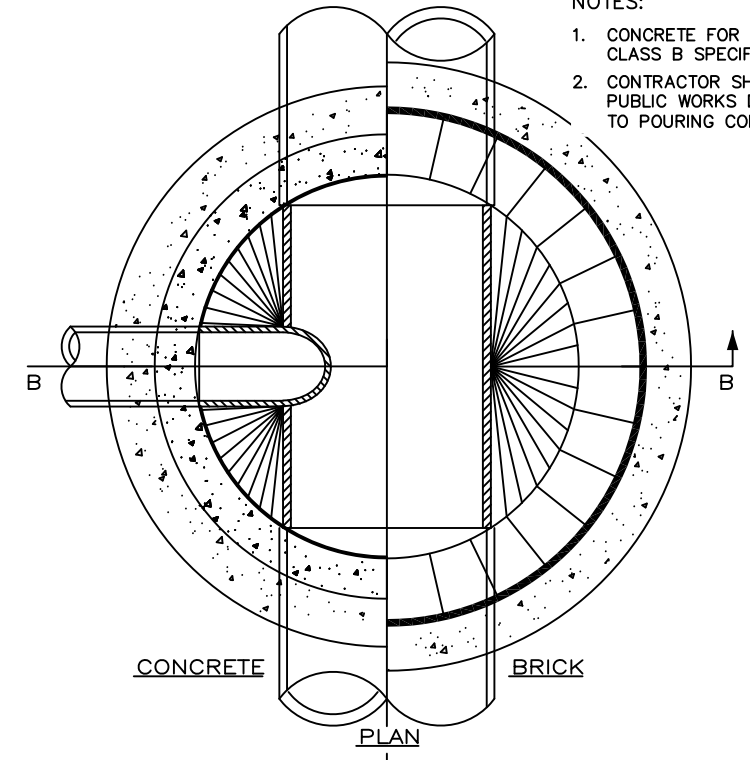
**NOTES:**

1. CONCRETE FOR ENCASEMENT SHALL MEET CDOT CLASS B SPECIFICATIONS.
2. CONTRACTOR SHALL CONTACT THE CITY OF SALIDA PUBLIC WORKS DEPARTMENT FOR INSPECTION PRIOR TO POURING CONCRETE AND/OR BACKFILLING.

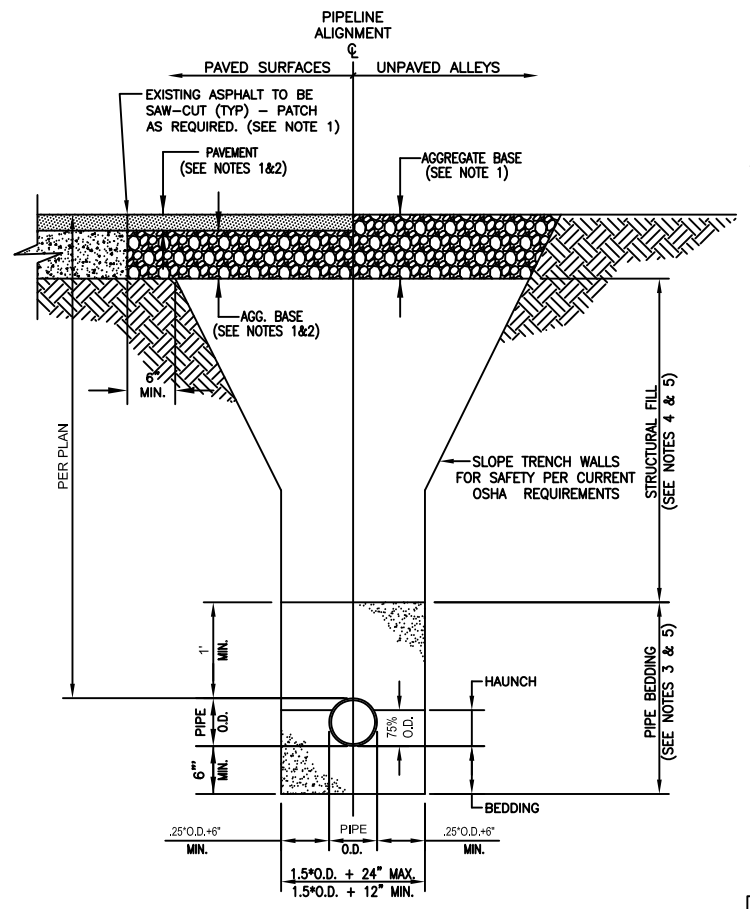
**S**  
**2** CONCRETE SEWER ENCASEMENT  
DETAIL



**S**  
**1** MANHOLE STANDARD  
DETAIL



SECTION B-B  
NEW SEWER CONNECTION  
(Manhole Connected over Exist SS Main)



**S**  
**4** TRENCH CROSS-SECTION  
DETAIL

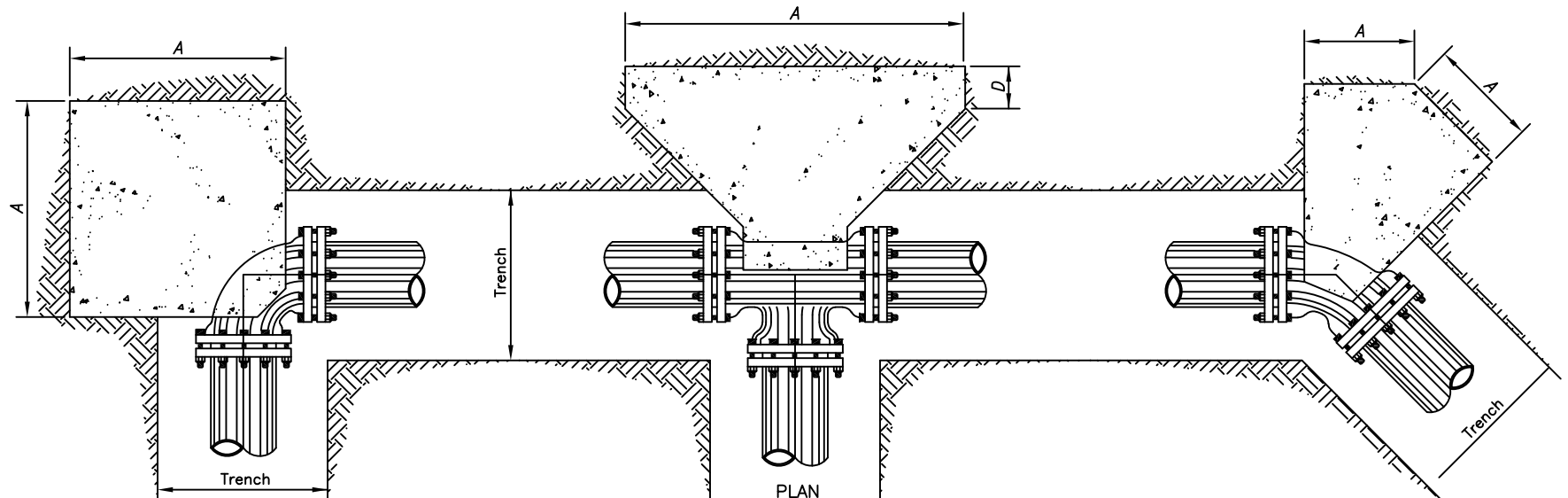
**TRENCH SECTION NOTES**

1. ASPHALT AND ALLEY PATCHING SHALL COMPLY WITH THE APPROPRIATE CITY OF SALIDA PATCHING STANDARDS.
2. NEW ASPHALT OR ASPHALT OVERLAYS SHALL COMPLY WITH THE PROJECT SPECIFIC STANDARDS PROVIDED IN THE STREET AND/OR ASPHALT PATCHING NOTES.
3. PIPE BEDDING SHALL MEET CRUSHED DRAIN ROCK CITY OF SALIDA STANDARDS FOR CONSTRUCTION SECTION 2060.
4. STRUCTURAL FILL SHALL MEET CDOT CLASS 1 AGGREGATE BASE SPECIFICATIONS.
5. FILL AND BEDDING MATERIAL TO BE PLACED IN 8-INCH MAXIMUM LIFTS (COMPACTED DEPTH) TO THE FOLLOWING MINIMUM PERCENTAGES UNLESS NOTED OTHERWISE:
  - A. STREETS, PARKING LOTS & ALLEYS: 95% MODIFIED PROCTOR (ASTM D1557)
  - B. UTILITY EASEMENTS OUTSIDE THE STREET SECTION: 90% MODIFIED PROCTOR (ASTM 1557).
  - C. UNDEVELOPED LAND: 80% MODIFIED PROCTOR (ASTM 1557).
6. THIS DETAIL IS FOR "DRY" TRENCH CONDITIONS, "WET TRENCH CONDITIONS" CONTRACTOR SHALL PROVIDE A MINIMUM 4" OF 1.5 INCH MINUS WASHED ROCK UNDER PIPE BEDDING MATERIAL WRAPPED WITH FILTER FABRIC (MIRIF 140N OR APPROVED EQUAL).
7. EXCAVATED MATERIAL CONTAINING RUBBISH, FROZEN MATERIAL, ORGANIC DEBRIS, ASPHALT, CONCRETE OR OTHER DELETERIOUS MATERIALS NOT SUITABLE FOR STRUCTURAL FILL SHALL BECOME THE PROPERTY OF THE CONTRACTOR. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF MATERIAL IN A FASHION THAT COMPLIES WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. THE OWNER MAY REQUIRE DOCUMENTATION OF PROPER DISPOSAL AS A CONDITION OF FINAL PAYMENT.
8. SEE WATER AND/OR SEWER GENERAL NOTES FOR PIPE SPECIFICATIONS.

	CITY OF SALIDA, COLORADO PUBLIC WORKS	
	STANDARD DETAILS SANITARY OR STORM SEWER DETAILS	
	DATE: Dec 2022	SCALE: Not to Scale
FILENAME: 10_SALIDA_Sanitary_Sewer_Details.dwg	BY: MCL	SHEET:



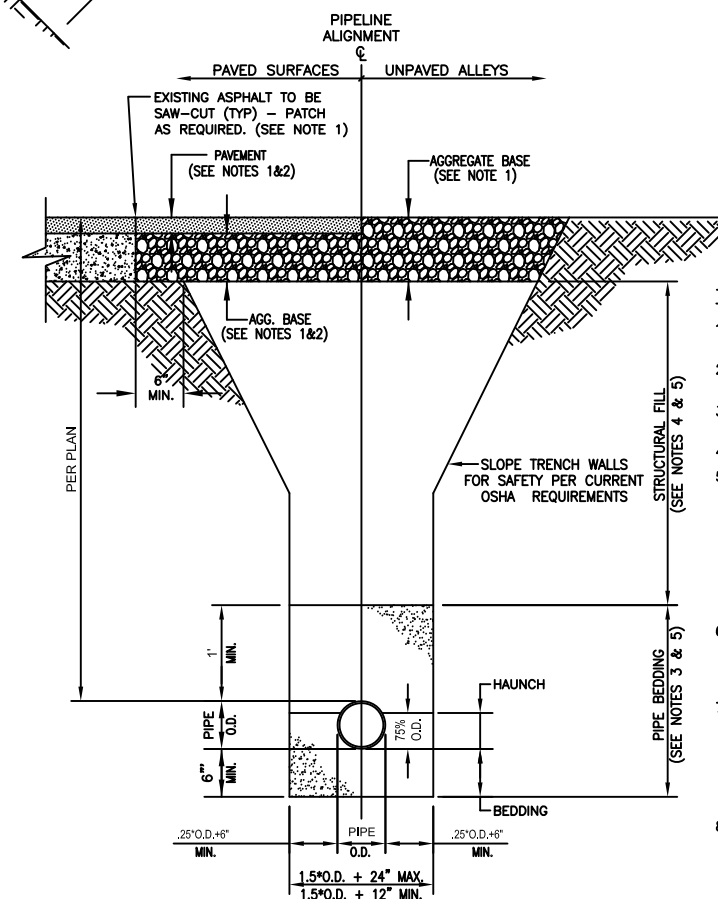




WD 1 THRUST BLOCK DETAIL

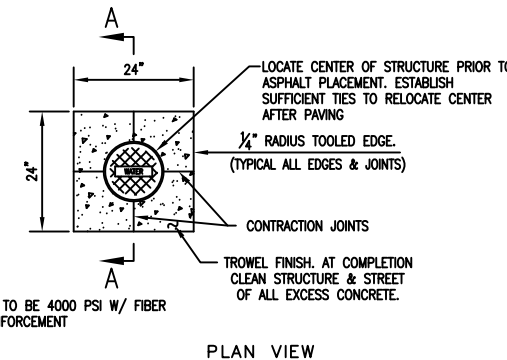
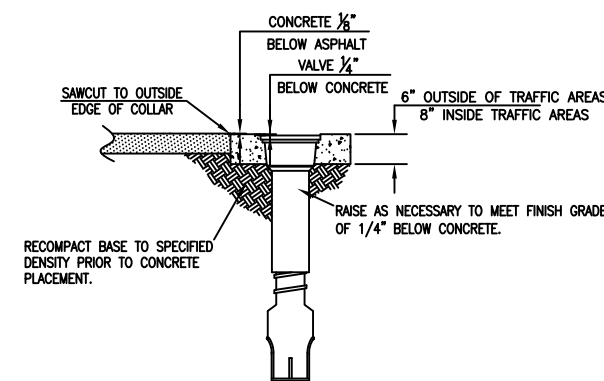
**BLOCKING SCHEDULE  
WATER DISTRIBUTION FITTINGS**

PIPE "D"	TEES & PLUGS			90°			45°			22.5°		
	A	B	C	A	B	C	A	B	C	A	B	C
4	16	12	16	12	16	12	16	12	16	12	16	12
6	18	12	18	12	18	12	18	12	18	12	18	12
8	24	16	24	16	24	16	24	16	24	16	24	16
10	30	20	30	16	30	20	30	20	30	20	30	20
12	36	24	36	18	36	24	36	24	36	24	36	24
16	48	32	48	18	48	32	48	32	48	32	48	32
20	60	40	60	18	60	40	60	40	60	40	60	40
24	72	48	72	18	72	48	72	48	72	48	72	48
30	96	64	96	18	96	64	96	64	96	64	96	64

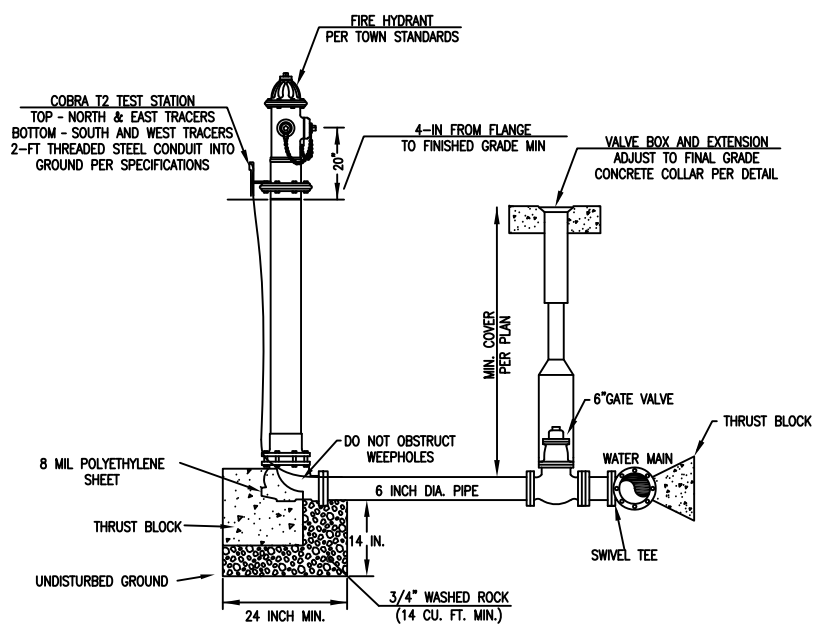


TRENCH SECTION NOTES

- ASPHALT AND ALLEY PATCHING SHALL COMPLY WITH THE APPROPRIATE CITY OF SALIDA PATCHING STANDARDS.
- NEW ASPHALT OR ASPHALT OVERLAYS SHALL COMPLY WITH THE PROJECT SPECIFIC STANDARDS PROVIDED IN THE STREET AND/OR ASPHALT PATCHING NOTES.
- PIPE BEDDING SHALL MEET CRUSHED DRAIN ROCK CITY OF SALIDA STANDARDS FOR CONSTRUCTION SECTION 2060.
- STRUCTURAL FILL SHALL MEET CDOT CLASS 1 AGGREGATE BASE SPECIFICATIONS.
- FILL AND BEDDING MATERIAL TO BE PLACED IN 8-INCH MAXIMUM LIFTS (COMPACTED DEPTH) TO THE FOLLOWING MINIMUM PERCENTAGES UNLESS NOTED OTHERWISE:
  - A. STREETS, PARKING LOTS & ALLEYS: 95% MODIFIED PROCTOR (ASTM D1557)
  - B. UTILITY EASEMENTS OUTSIDE THE STREET SECTION: 90% MODIFIED PROCTOR (ASTM 1557).
  - C. UNDEVELOPED LAND: 80% MODIFIED PROCTOR (ASTM 1557).
- THIS DETAIL IS FOR "DRY" TRENCH CONDITIONS, "WET TRENCH CONDITIONS CONTRACTOR SHALL PROVIDE A MINIMUM 4" OF 1.5 INCH MINUS WASHED ROCK UNDER PIPE BEDDING MATERIAL WRAPPED WITH FILTER FABRIC (MIRIFI 140N OR APPROVED EQUAL).
- EXCAVATED MATERIAL CONTAINING RUBBISH, FROZEN MATERIAL, ORGANIC DEBRIS, ASPHALT, CONCRETE OR OTHER DELETERIOUS MATERIALS NOT SUITABLE FOR STRUCTURAL FILL SHALL BECOME THE PROPERTY OF THE CONTRACTOR. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF MATERIAL IN A FASHION THAT COMPLIES WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. THE OWNER MAY REQUIRE DOCUMENTATION OF PROPER DISPOSAL AS A CONDITION OF FINAL PAYMENT.
- SEE WATER AND/OR SEWER GENERAL NOTES FOR PIPE SPECIFICATIONS.



WD 3 WATER VALVE CONCRETE COLLAR DETAIL



WD 2 FIRE HYDRANT ASSEMBLY DETAIL

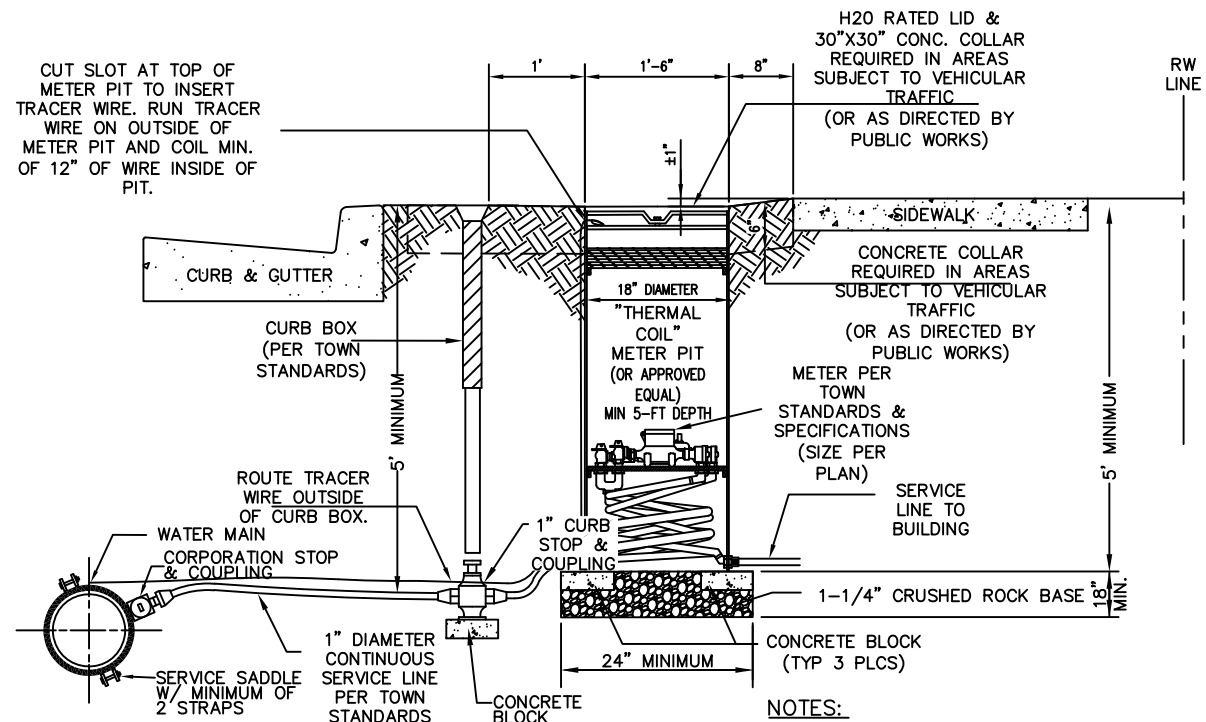
WD 4 TRENCH CROSS-SECTION DETAIL

GENERAL NOTES

- Water Lines Shall Have A Minimum Cover Of 4'-6" Or More As Shown On Profiles.
- All Valves On Mains & Fire Hydrant Leads Shall Be Installed With Valve Box Assemblies.
- The Size Of Valve Box Assembly To Be Installed Shall Be Determined By The Type And Size Of Valve.
- Valve Box Caps Shall Have The Word "water" Cast In The Top.

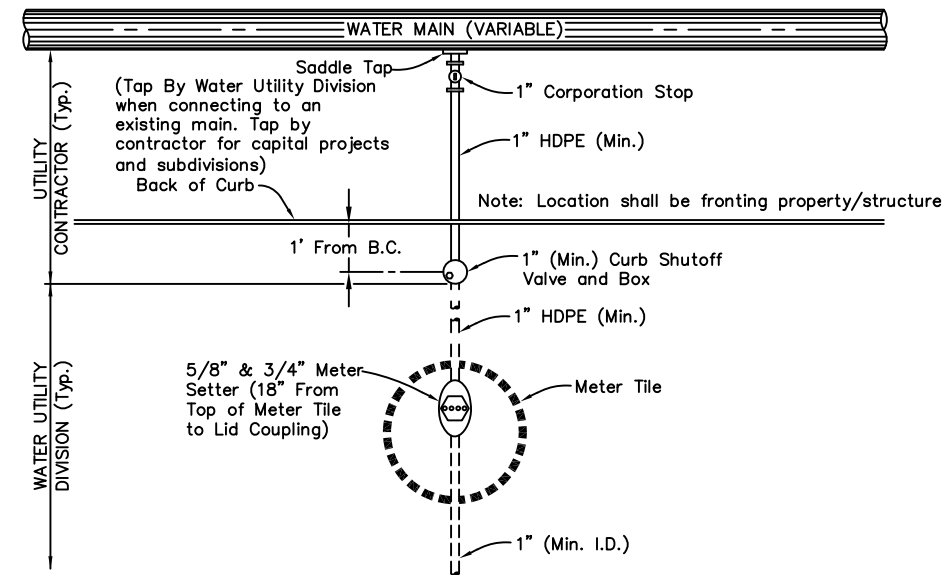
	CITY OF SALIDA, COLORADO PUBLIC WORKS	
	STANDARD DETAILS WATER DISTRIBUTION DETAILS	
	DATE: Dec 2022	SCALE: Not to Scale
FILENAME: 11_Salida_Water_Distribution_Details.dwg		SHEET: BT



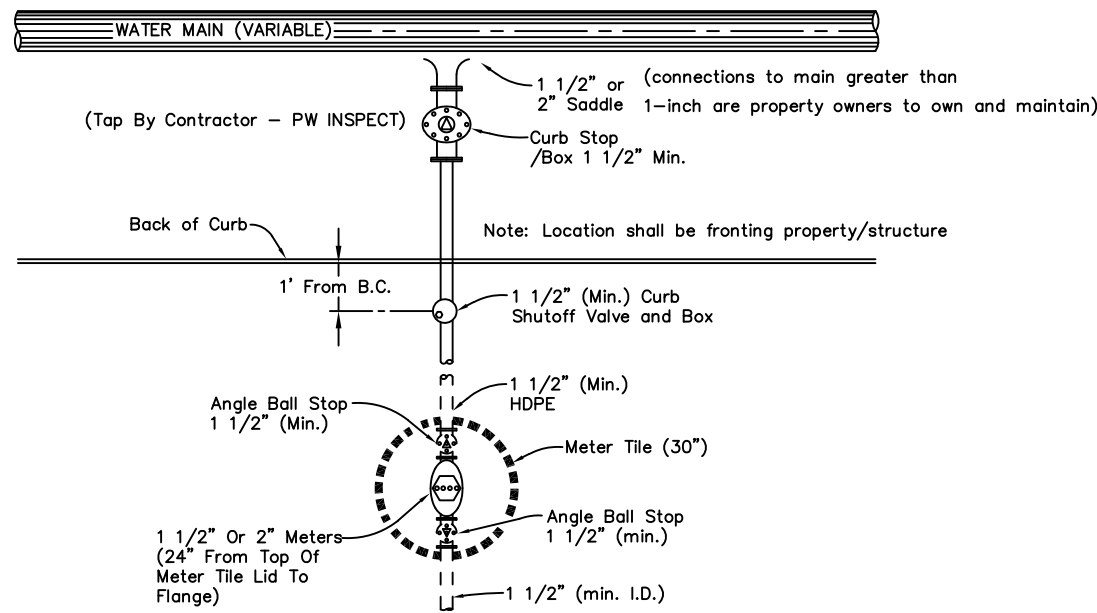


- NOTES:**
- 1-1/2 INCH HDPE DR9 CTS PIPE TO 3/4"x1" MIP TO COMPRESSION FITTING ON METER PIT.
  - CURB STOP SHALL HAVE 1-INCH BODY.
  - INSTALL TRACER WIRE PER SPECIFICATIONS
  - SETTER RING TO BE LOCATED AT LOWEST LEVEL
  - 6-INCH INSULATION PLUG TO BE PROVIDED WITH STOPPED 18-IN FROM TOP

WS 1 SERVICE AND METER PIT (TYP) DETAIL

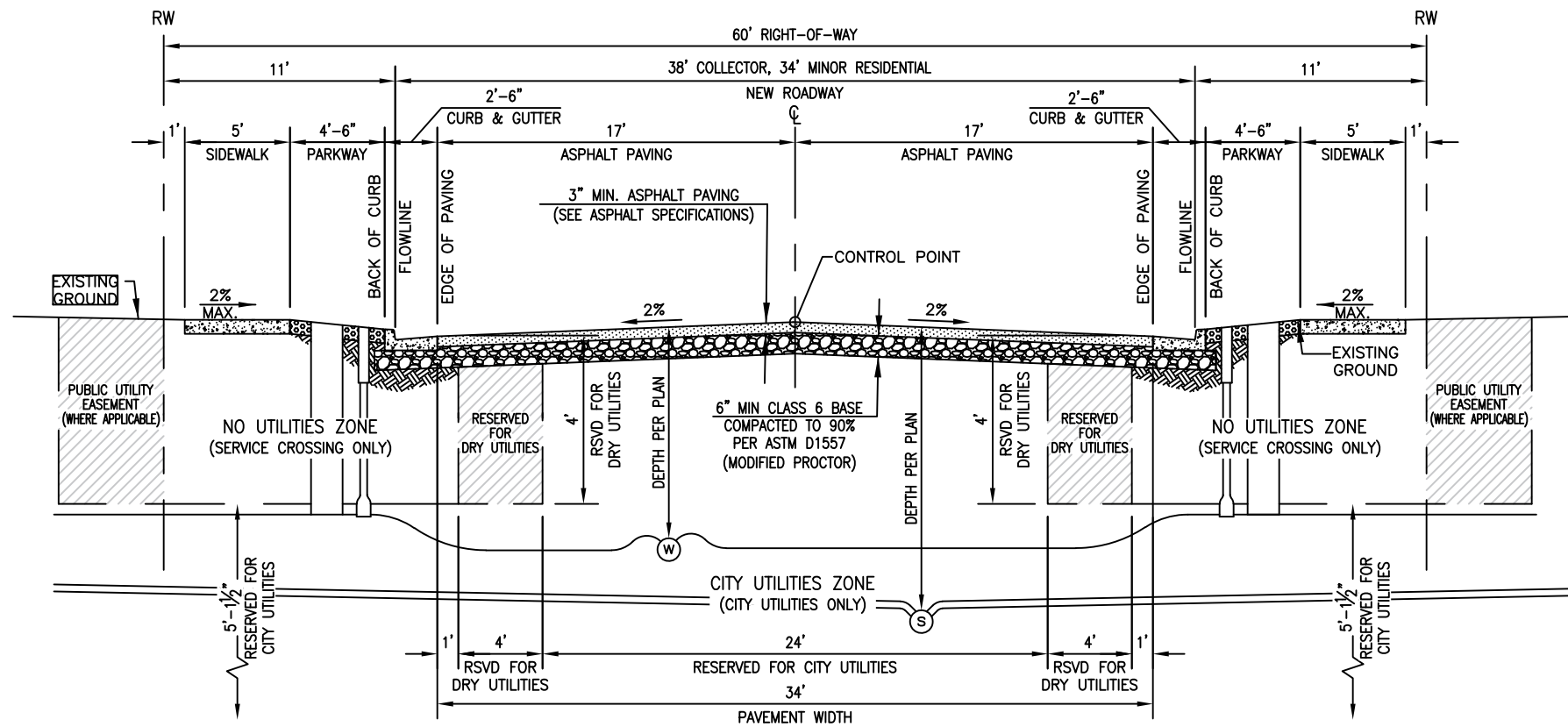


WS 2 1-IN AND SMALLER METER DETAIL

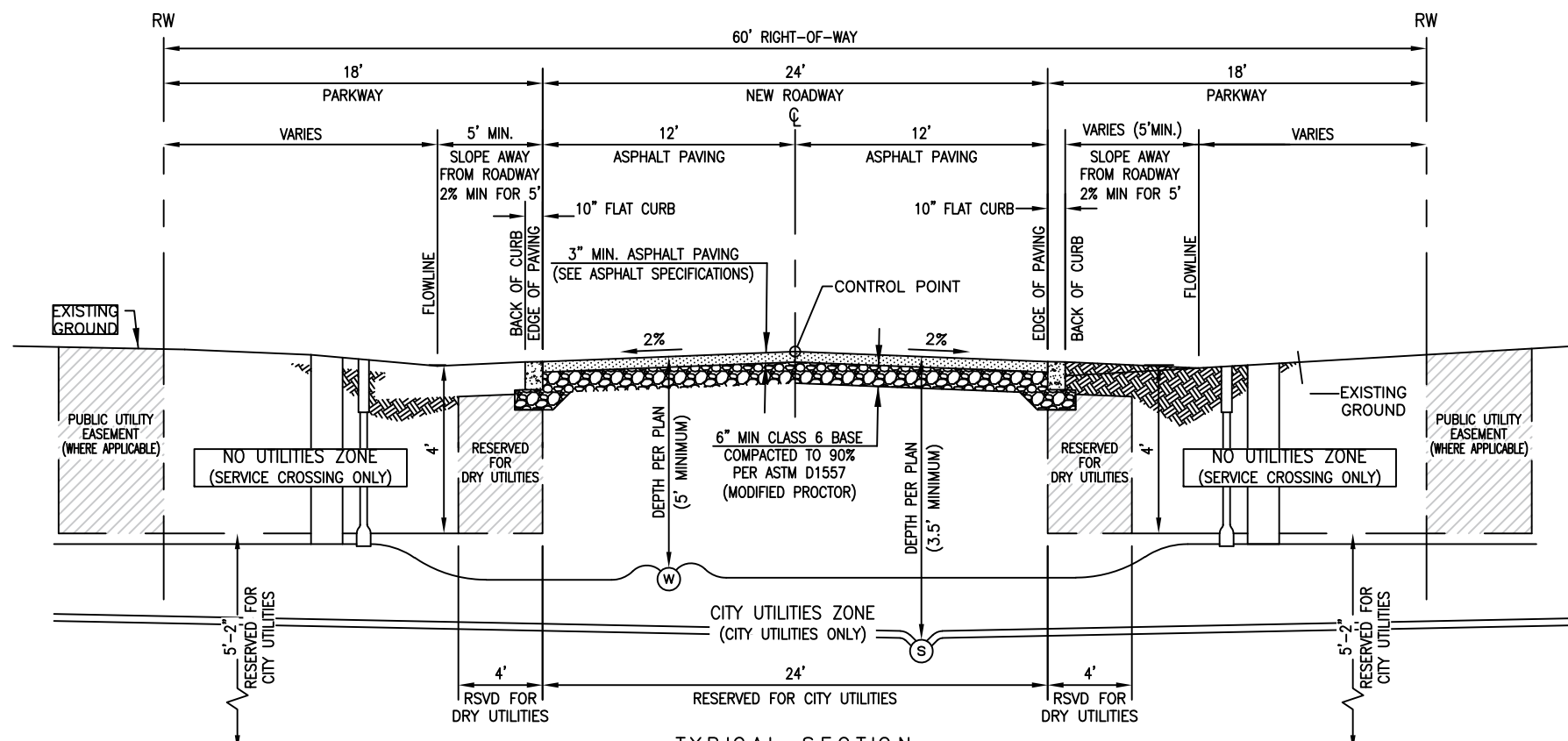


WS 3 1-1/2 AND 2-INCH METER DETAIL






TYPICAL SECTION  
LOCAL RESIDENTIAL STREET  
PRIMARY STREET



TYPICAL SECTION  
LOCAL RESIDENTIAL STREET  
SECONDARY STREET

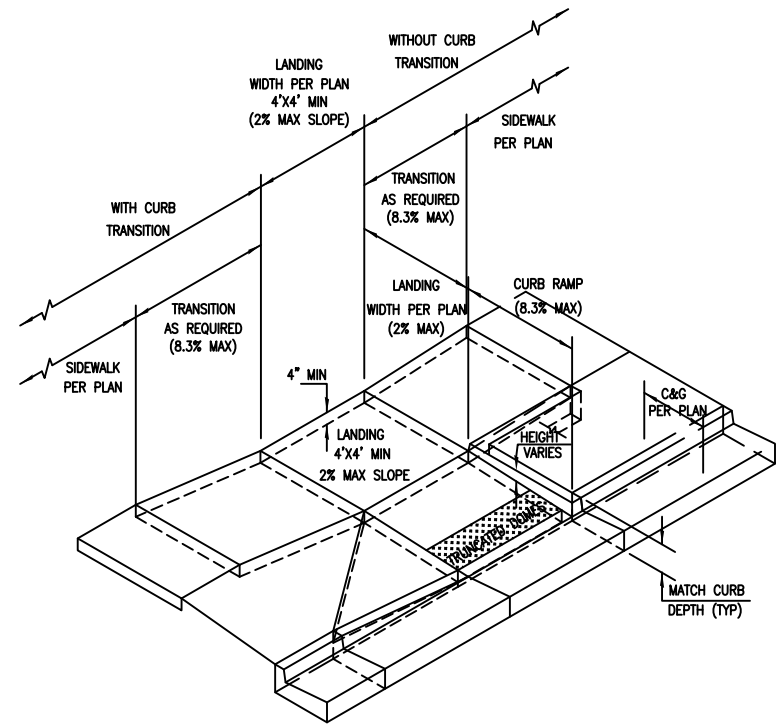
NOTES:

1. DETERMINATION OF STREET TYPE (I.E. PRIMARY, SECONDARY) IS TO BE DETERMINED BY SALIDA PUBLIC WORKS AND PLANNING STAFF.
2. SEE THE CITY OF SALIDA "STANDARD SPECIFICATIONS FOR CONSTRUCTION" FOR REQUIRED MATERIALS SPECIFICATIONS

	CITY OF SALIDA, COLORADO PUBLIC WORKS		
	STANDARD DETAILS STREET DETAILS		
	DATE: Dec 2022	SCALE: Not to Scale	SHEET: BY: MCL

FILENAME: 14\_SALIDA\_Street\_Details.dwg



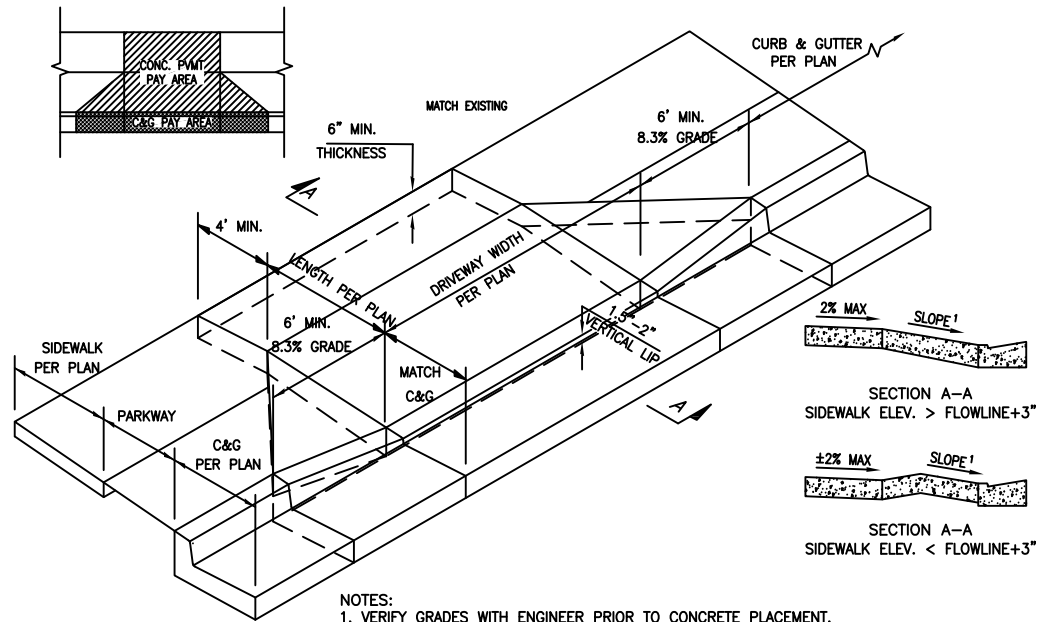


**NOTES:**

1. TRUNCATED DOMES SHALL BE 24 INCHES WIDE AND EXTEND THE FULL WIDTH OF THE ACCESS RAMP.
2. TRUNCATED DOMES SHALL BE EMBEDDED IN THE FRESH CONCRETE WITH NO AIR SPACE BETWEEN THE CONCRETE AND THE BOTTOM OF THE PLATE. JOINT TO BE TOWELED AT PERIMETER OF DOMES.
3. TRUNCATED DOMES SHALL BE CONSTRUCTED OF UNPAINTED CAST IRON CONFORMING TO ASTM A-48 CLASS 30B.

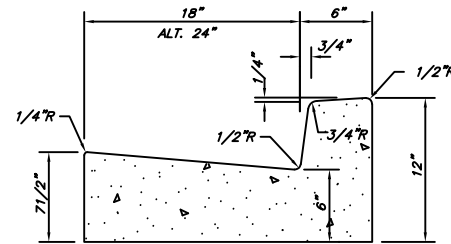
\*TYPE 1 PERMITTED ONLY WITH PRIOR APPROVAL BY PUBLIC WORKS  
TYPE 2 SHALL BE STANDARD

**ST ADA CURB RAMP - TYPE 1**  
DETAIL

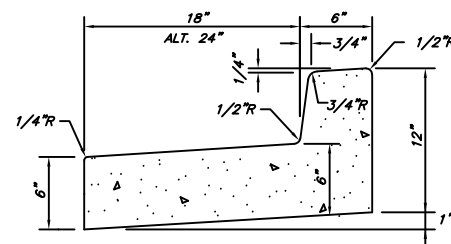


**NOTES:**  
1. VERIFY GRADES WITH ENGINEER PRIOR TO CONCRETE PLACEMENT.

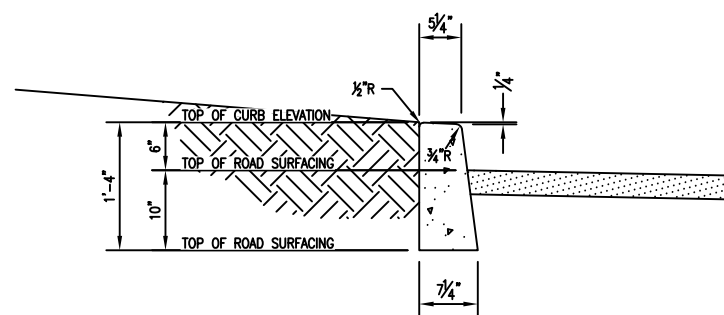
**ST TYPE 1 DRIVEWAY**  
DETAIL



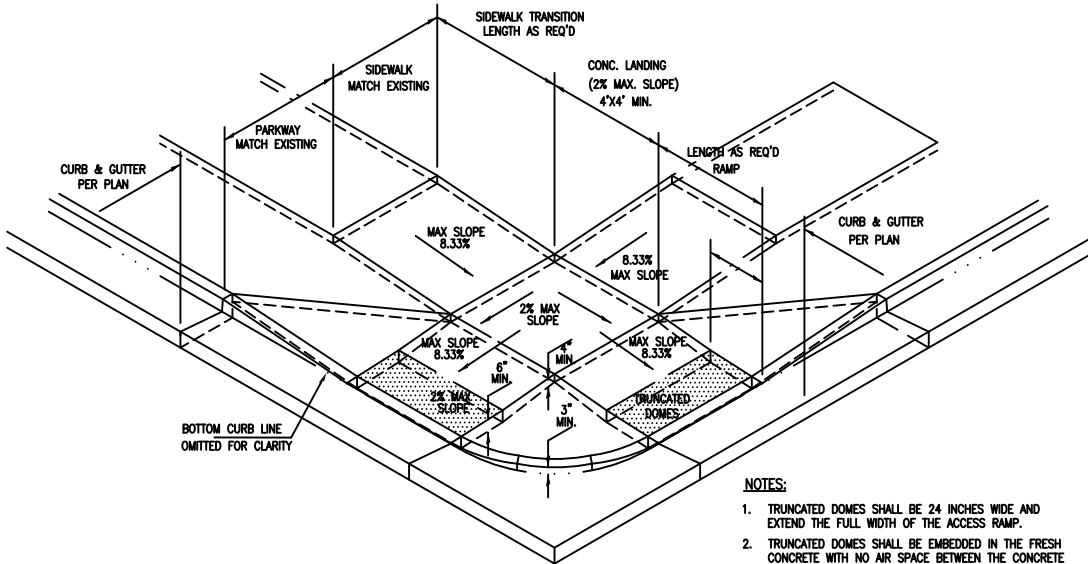
**ST STANDARD 24-IN CURB AND GUTTER**  
DETAIL



**ST INVERTED 24-IN CURB AND GUTTER**  
DETAIL



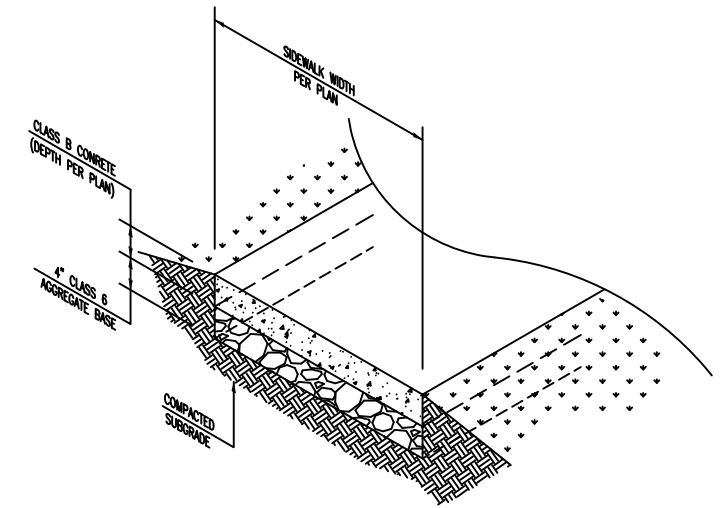
**ST 6-IN VERTICAL CURB**  
DETAIL



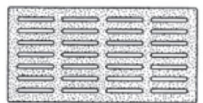
**NOTES:**

1. TRUNCATED DOMES SHALL BE 24 INCHES WIDE AND EXTEND THE FULL WIDTH OF THE ACCESS RAMP.
2. TRUNCATED DOMES SHALL BE EMBEDDED IN THE FRESH CONCRETE WITH NO AIR SPACE BETWEEN THE CONCRETE AND THE BOTTOM OF THE PLATE.
3. TRUNCATED DOMES SHALL BE CONSTRUCTED OF UNPAINTED CAST IRON CONFORMING TO ASTM A-48 CLASS 30B.

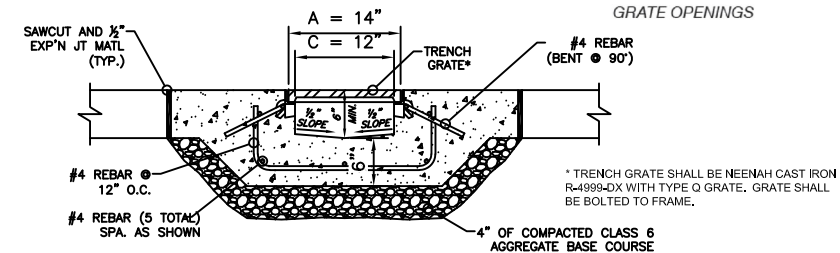
**ST ADA CURB RAMP - TYPE 2**  
DETAIL



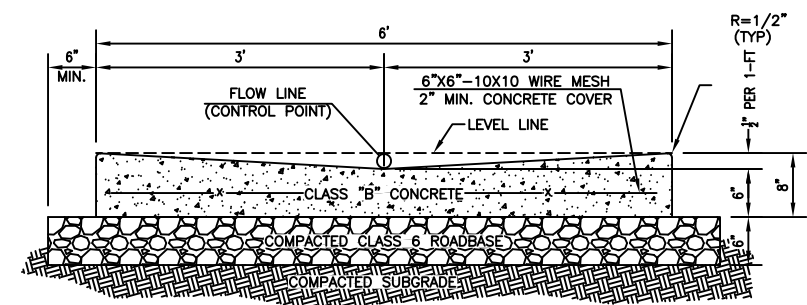
**ST SIDEWALK**  
DETAIL



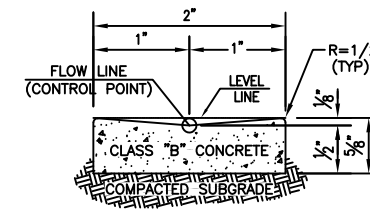
**TYPE Q**  
GRATE OPENINGS



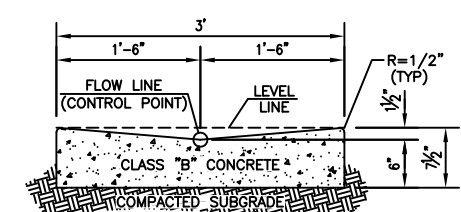
**ST SIDEWALK TRENCH DRAIN**  
DETAIL



**ST 6-FT PAN**  
DETAIL



**ST 2-FT PAN**  
DETAIL



**ST 4-FT PAN**  
DETAIL