

**CITY OF LITTLETON
SANTA FE DRIVE AND MINERAL AVENUE
OPERATIONAL IMPROVEMENTS PROJECT
SPECIAL PROVISIONS**

The 2023 Standard Specifications for Road and Bridge Construction controls construction of this project. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plans.

PROJECT SPECIAL PROVISIONS

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PROJECT SPECIAL PROVISIONS

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Utilities

RTD Requirements – Attachment A

Date

(November 4, 2024)

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The scope of my authority to these plans, is limited to the selection of Standard Special Provision and the determination that they are appropriate for this project. The scope of my authority also extends to the Project Special Provisions on the following pages: 5-17, 20-23, 25-26, 29-44, 47, 54, 56-66, 68-78, 121-145, 149-154



The scope of my authority to these plans, is limited to the selection of Standard Special Provision and the determination that they are appropriate for this project. The scope of my authority also extends to the Project Special Provisions Sections 613 & 715 Lighting & Electrical on the following pages: 50-53, 55-67 and 146-148.



The scope of my authority to these plans, is limited to the selection of Standard Special Provision and the determination that they are appropriate for this project. The scope of my authority also extends to the Project Special Provisions on the following pages: 18-19, 48-49, 79-120.



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STANDARD SPECIAL PROVISIONS

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Revision of Section 101 – Definitions and Section 106 - Control of Materials	(January 8, 2024)	2
Revision of Sections 101 and 106 - Buy America and Build America, Buy America Requirements for Projects Containing \$500,000 or more in Federal-Aid Highway Funding	(January 8, 2024)	9
Revision of Section 105 – Asphalt Mat Density	(December 26, 2024)	1
Revision of Section 105 – Control of Work	(October 1, 2023)	1
Revision of Section 105 – Dispute Review Board and Claims for Unresolved Disputes	(October 1, 2023)	9
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Revision of Sections 105, 106, 412, and 601 – PCCP Acceptance and Recycled Concrete Aggregate	(September 30, 2024)	12
Revision of Section 106 – Check Testing	(December 26, 2024)	1
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Revision of Section 207 – Topsoil	(October 1, 2023)	9
Revision of Section 208, 213, and 216 Construction Permit Water Quality	(May 16, 2024)	24
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Revision of Section 401 – Plant Mix Pavements – General	(September 30, 2024)	4
Revision of Section 401 – Tolerances for Hot Mix Asphalt (Voids Acceptance)	(October 1, 2023)	1
Revision of Section 412 – Powered Screeds	(December 26, 2024)	1
Revision of Section 601 – Concrete Acceptance	(April 9, 2024)	4
Revision of Section 601 – Pigment in Concrete	(July 23, 2024)	1
Revision of Section 613 – Lighting Pull Box	(April 2, 2024)	5
Revision of Section 627 – Pavement Marking Paint (Temporary)	(April 2, 2024)	1
Revision of Section 630- MHT Signature Requirements	(December 26, 2024)	1
Revision of Section 713 – Retroreflectors and Drum and Tubular Marker Sheeting Requirements	(December 26, 2024)	4
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Affirmative Action Requirements Equal Employment Opportunity	(October 1, 2023)	13
Certified Payroll Requirement for Construction Contracts	(October 1, 2023)	1
Disadvantage Business Enterprise (DBE) Requirements	(October 1, 2023)	15
Minimum Wages, Colorado, U.S. Department of Labor General Decision Number CO20240006 Mod 2, Highway Construction for Adams, Arapahoe, Broomfield, Clear Creek, Elbert, Gilpin, Jefferson, and Park counties.	(January 3, 2024)	10
On the Job Training	(October 1, 2023)	6
Required Contract Provisions – Federal-Aid Construction Contracts	(October 23, 2023)	15

NOTICE TO BIDDERS

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details with an authorized Department representative. Prospective bidders shall contact one of the following listed authorized Department representatives at least 12 hours in advance of the time they wish to go over the project.

Project Manager: Matthew Matuszewski, PE
City of Littleton
Public Works
2255 West Berry Avenue
Office Phone: 303-795-3871
Cell Phone: 303-601-4783

The above referenced individual is the only representatives of the City with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

Bids will only be accepted from CDOT prequalified contractors.

All questions shall be directed to the City contacts listed above no later than the date and time listed in the Request for Bids.

ON THE JOB TRAINING CONTRACT GOAL

The Department has determined that On the Job Training shall be provided to trainees with the goal of developing full journey workers in the types of trade or classification involved. The contract goal for On the Job Trainees working in an approved training plan in this Contract has been established as follows:

The minimum number of total On the Job Training required is 1800 hours.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) CONTRACT GOAL

This is a federally-assisted construction project. As described in the CDOT DBE Standard Special Provision, the Bidder shall make good faith efforts to meet the following contract goal:

10.5 Percent DBE participation

**COMMENCEMENT AND COMPLETION OF WORK
(WORKING DAY)**

The Contractor shall commence work under the Contract on or before the 15th day following Contract execution or the 30th day following the date of award, whichever comes later, unless such time for beginning the work is changed by the Chief Engineer in the "Notice to Proceed." The Contractor shall complete all work within 400 working days per the "Notice to Proceed."

REVISION OF SECTION 101 DEFINITIONS AND TERMS

Section 101 of the Standard Specifications is hereby revised to include the following:

When the Standard Specifications make reference to CDOT, Department or personnel, such as Project Engineer or Engineer, this will be interpreted as referring to City of Littleton or the City's Project Manager or Project Engineer. The contractor shall direct all questions about the specifications to the City's Project Manager or Project Engineer.

Technical Specifications related to construction materials and methods for the work embraced under this contract shall be the 2022 Colorado Department of Transportation Standard Specifications for Road and Bridge Construction (CDOT Specifications), or as modified by these Special Provisions. Certain terms utilized in the CDOT Specifications shall be interpreted to have different meanings within the scope of this contract. A summary of redefinitions follows:

Subsection 101.02:

- "Department" shall mean the City of Littleton
- "Engineer" shall mean the City of Littleton Project Engineer or designated representative
- "Laboratory" shall mean the City of Littleton or designated representative
- "Project Engineer" shall mean the City of Littleton Project Engineer or designated representative
- "Regional Transportation Director" shall mean the City of Littleton Project Engineer or designated representative
- "State" shall mean the City of Littleton (where applicable)

**REVISION OF SECTION 102
PROJECT PLANS AND OTHER DATA**

Revise Section 102 of the Standard Specifications for this project as follows:

Subsection 102.05 shall include the following:

Supplemental data is provided in Land XML and DWG file formats. The supplemental data consists of:

- a. Horizontal Alignments
- b. Vertical Alignments
- c. Existing and Proposed surface DTMs

The City of Littleton does not warrant the supplemental data and this information is not considered to be a part of the Contract. If bidders use or modify the supplemental data in preparing a proposal or planning and prosecuting the work, all associated data is used at their own risk, and bidders are responsible for all conclusions, deductions, and inferences drawn from the original or modified supplemental data.

REVISION OF SECTION 105 CONTROL OF WORK

Section 105 of the Standard Specifications is hereby revised for this project as follows:

In Subsection 105.20 delete the second paragraph and replace with the following:

The Contractor shall provide timely response and complete all Traffic Signal Maintenance for traffic signals that are included in the contract work within the project limits. The Contractor shall respond to the project site within one hour of notification for urban highway projects. These services shall be available upon notice and provided at all times, including holidays and seasonal no-work periods. The Contractor shall provide these services beginning when time count starts for the project through final acceptance. The Contractor shall submit a Traffic Signal Maintenance Plan (TSMP) to the Engineer for acceptance at the Pre-Construction Conference. The TSMP shall include the following:

- (a) *Contact Information.* The Contractor shall designate a single contact person to be responsible for coordination and execution of the project TSMP. TSMP shall contain the Contractor's TSMP coordinator's contact information, including name and phone number, and additional contact information for all personnel assigned to perform Traffic Signal Maintenance.
- (b) *Plan Requirements.* The TSMP shall establish a specific communications process to coordinate and manage Traffic Signal Maintenance. The TSMP shall document the project's response time to confirm the requirements stated above. The TSMP coordinator shall be responsible for all communications during an incident, including notification of the Engineer, and communications with concerned stakeholders regarding when the maintenance operations are started, the estimated time frame of the repair or maintenance, the time repair has been completed, and the time normal traffic operations are resumed. A post-incident evaluation report shall be submitted to the Engineer within 48 hours of the initial incident notification. The report shall summarize the incident timeline, the repair and maintenance required, and the communication efforts made during the incident.
- (c) *Certification Documentation.* The Contractor shall adhere to the following requirements regarding Traffic Signal construction and maintenance personnel certifications. Current Certificates showing qualifications shall be documented in the TSMP to be submitted at the Pre-Construction Conference.
 - (1) A licensed Journeyman Electrician shall be on site at all times that signalization work is taking place to ensure proper construction. This shall include conduit and caisson installation.
 - (2) For work inside the traffic signal cabinet, Signal and Signal Bench Technicians shall be minimum International Municipal Signal Association (IMSA) Level II certified. This includes the completion of training in construction, corrective maintenance, and signal turn-on.

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REVISION OF SECTION 105
CONTROL OF WORK

(3) For all work external to the signal cabinet, a minimum IMSA Level I Traffic Signal Field Technician/Electrician, or Traffic Signal Bench Technician/Signal Technician, is required. A Journeyman Electrician and an IMSA Level II Traffic Signal Electrician shall be on the job site at all times that signalization work is taking place to ensure proper construction. For each Journeyman Electrician present, a maximum of 3 Apprentice Electricians will be allowed for work.

(d) *Traffic Control.* The Contractor shall perform traffic control as required until completion of the TSMP. All required traffic control contact information shall be provided in the TSMP.

The Contractor shall complete Traffic Signal Maintenance in accordance with the TSMP and all other applicable project standard specifications or special provisions.

Traffic Signal Maintenance as described above will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 105
COOPERATION BETWEEN CONTRACTORS**

Section 105 of the Standard Specifications is hereby revised for this project as follows:

Subsection 105.12 shall include the following:

Other construction agencies will be working concurrently in the vicinity of the project. Additionally, other nearby CDOT, City of Littleton, Development projects, and Douglas County will be concurrent with this one. The Contractor shall conduct the work so as not to interfere with or hinder the progress or completion of the work being performed by other agencies and contractors. All traffic control conflicts that arise between the needs of the various construction contractors and other agencies shall be brought to the attention of the Project Engineer. The Project Engineer will decide the method of resolution.

There is a likelihood that CDOT, City of Littleton, Development projects, and Douglas County (through September 30, 2025) will coordinate regular Traffic Control and Public Relations Coordination meetings to coordinate the various concurrent projects. Appropriate personnel from this project shall attend these meetings to exchange information and resolve issues.

Known concurrent projects include (this list may be incomplete):

- A. Douglas County, US 85 Project through September 30, 2025 due to current schedule. Any work ahead of this time along Santa Fe Drive shall be confirmed with Douglas County.
- B. RiverPark Development Project – Evergreen-Mineral & Santa Fe, LLC
- C. Santa Fe Park South Development Project - Toll Southwest LLC and Evergreen-Mineral & Santa Fe, LLC
- D. City of Littleton, Mineral Station East
- E. City of Littleton, Mineral Station West
- F. Xcel Energy – Electric and Gas installation on adjacent developments
- G. Lumen Technologies – Telecom installation on adjacent developments
- H. Comcast – Telecom installation on adjacent developments

REVISION OF SECTION 106
CONFORMITY OF THE CONTRACT OF HOT MIX ASPHALT

Revise Section 106 of the Standard Special Provisions for this project as follows:

Subsection 106.05 shall include the following:

For this project, Contractor process control testing of hot mix asphalt is mandatory.

**REVISION OF SECTION 106
FURNISHED MATERIAL**

Revise Section 106 of the Standard Special Provisions for this project as follows:

Delete Subsection 106.10 and replace with the following:

Material furnished by the Department and third-parties will be made available to the Contractor at the points specified in the Contract. The cost of handling and placing materials after they are made available to the Contractor shall be included in the contract price for the item.

The Contractor will be held responsible for all material received from the department and third-party utilities as identified in the contract documents until it is incorporated into the work and accepted.

Demurrage charges resulting from the Contractor's failure to accept the material at the designated time and point of delivery will be deducted from monies due the Contractor.

**REVISION OF SECTION 107
RIGHT OF WAY RESTRICTIONS**

Section 107 of the Standard Specifications is hereby revised whereby Section 107.19 shall include the following:

The Contractor is hereby made aware that at the time of bidding on this project, CDOT and the City of Littleton does not have possession of all necessary Right of Way required to complete portions of this project and has identified the following locations as “**No Work Areas**” until the Restriction Dates shown below.

Parcel Number	Ownership Name	Restriction Date
CUA-01	Regional Transportation District (RTD)	3/31/2025
TE-2	De Pietro Limited Partnership	3/31/2025

When bidding, the Contractor is advised that the Contractor shall not enter the Parcels identified above prior to the dates indicated above, unless otherwise directed in writing by the City of Littleton.

The City anticipates no delay toward completion of the project due to the restrictions imposed herein. No additional time or mobilization costs shall be granted to the Contractor for delays associated with not having possession of the above-mentioned locations prior to the dates specified above.

**REVISION OF SECTION 107
STORMWATER CONSTRUCTION PERMIT**

Section 107 of the Standard Specifications is hereby revised for this project as follows:

Subsection 107.25(c) shall include the following:

The Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) shall be obtained by the City of Littleton.

REVISION OF SECTION 108 DISINCENTIVE FOR ITS OFFLINE DEVICES

Section 108 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Throughout the duration of the project, the Contractor is responsible for all ITS devices and communications infrastructure contained within the limits of this project.

Offline, as used in this specification, is defined as time during which data or video is not being received by a Colorado Operations Center or Node Building.

CONSTRUCTION REQUIREMENTS

Anytime the Contractor plans to perform work on an ITS device and an outage is not planned, the Contractor shall notify CDOT ITS immediately upon discovery of outage. This notice, as well as advanced notices described below for planned outages, shall be provided to Jill Scott at jill.scott@state.co.us by the Project Engineer.

(a) Planned ITS Outages

A “planned outage” is considered to be any loss of device functionality or communication that can be anticipated in advance due to work activities within or related to the Project. For planned outages, CDOT ITS shall be given proper advance notice as described below. All proposed equipment, power, and all temporary communications necessary for maintaining ITS devices during construction shall be constructed and put in place prior to the cutover or reset in order to minimize downtime of devices.

- (1) **ITS Network:** The Contractor shall submit a fiber optic backbone cutover plan to CDOT ITS for review two weeks prior to performing the work, as well as a one-week advance notice to CDOT ITS of any fiber optic backbone cutover work. This cutover plan shall detail how the Contractor shall sequence the construction activities, so that the new backbone is installed and spliced into the existing devices and the node building such that 12-hours of downtime is not exceeded. CDOT’s network fibers shall be spliced first in the sequence. The fiber optic backbone splicing shall be scheduled for an overnight shift such that the ITS network shall be fully functional by 4 AM and the remaining cable is complete by 9 AM, unless otherwise approved by the Engineer. The fiber optic backbone splicing shall be scheduled on a Tuesday, Wednesday, or Thursday, except holidays, unless otherwise approved by the Engineer.

For work on node locations, the Engineer shall be notified about the need to shut down power in order to perform electrical wiring work at least 48 hours before the power needs to be shut down. Additionally, the Engineer shall be notified the day before the shutdown and on the morning of the day of the shutdown. Power shall be turned off in a responsible manner that will not harm existing node components. All necessary precautions and preparations shall be made and coordinated with CDOT prior to power being turned off. Power may not be off for a period of longer than 45 minutes unless specifically authorized by the Engineer.

- (2) **ITS Devices:** The Contractor shall provide a 72-hour advance notice to CDOT ITS to coordinate downtime for ITS devices for a planned outage in the form of a Temporary offline ITS device notification form. For planned outages where CDOT ITS receives this advance notice, the Contractor shall be charged a disincentive of \$50 per hour per each device that is offline beyond the five working day allowable offline period.

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REVISION OF SECTION 108 DISINCENTIVE FOR ITS OFFLINE DEVICES

Unplanned outages shall be in accordance with subsection (b) (2) of this project special provision. ITS field devices covered under this special provision include, but are not limited to, CCTVs, MVRDs, RWISs, TTIs, ramp meters, VMSs, and ATRs. No more than two ITS device locations shall be inoperable at any one time unless previously approved by the Engineer and CDOT ITS. The Contractor shall keep the existing network operational until the Ethernet network has been tested and approved by CDOT for device cutover.

(b) Unplanned ITS Outages

An “unplanned outage” is considered to be any loss of network communications or device functionality that CDOT ITS does not receive proper advance notice, as described above, or is due to the Contractor’s negligence, act or omission under their control.

- (1) ITS Network: If the Contractor damages a CDOT ITS fiber optic backbone, or if CDOT ITS loses communications or power to a node building or operations center as a result of the Contractor’s negligence, act or omission under their control, the Contractor shall be charged a disincentive. This first-time network disincentive rate shall be \$1,000 per hour, and an additional \$2,000 per hour for a communications or power outage that results in loss of data and video to a node building or operations center.

This disincentive rate shall increase to \$2,000 per hour the second time, and an additional \$3,000 per hour for a communications or power outage that results in loss of data and video to a node building or operations center. This increase of \$1,000 per hour will continue for any further outages to the CDOT Network.

Additionally, the Contractor shall be responsible for any charges involved with investigating such an outage and restoration of the ITS network to full working condition. These disincentive rates are in addition to any costs that may be levied by private industries for loss of communications.

- (2) ITS Devices: for unplanned outages or outages where CDOT ITS does not receive advance notification, the Contractor shall be charged a disincentive of \$50 per hour per each device that is offline beginning at the time of the outage.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

All work, materials, and equipment required to reset, reconfigure and perform cutover will not be measured and paid for separately, but shall be considered incidental to the work.

This disincentive is not a penalty, but is based on costs associated with the disruption of corridor operations, information to the traveling public, and general safety of the traveling public.

There will be no incentive paid for this work.

The disincentive will be deducted from any monies owed to the Contractor for work performed.

In addition to those disincentives described above, the Contractor shall be responsible to pay any penalties charged by private utility owners as a result of damage to their facilities.

REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)

Revise Section 202 of the Standard Specifications for this project as follows:

Delete subsection 202.09, and replace it with the following:

202.09 Removal of Asphalt Mat (Planing). Before beginning planing operations, the Contractor shall submit a planing plan and a Process Control Plan (PCP) for approval by the Engineer. The planing plan shall include at a minimum:

- (1) The number, types and sizes of planers to be used.
- (2) The width and location of each planing pass.
- (3) The number and types of brooms to be used and their locations with respect to the planers.
- (4) The proposed method for planing and wedging around existing structures such as manholes, valve boxes, and inlets.
- (5) The longitudinal and transverse typical sections for tie-ins at the end of the day.
- (6) If requested by the Engineer, a plan sheet showing the milling passes.

The PCP shall include as a minimum:

- (1) The schedule for replacing the cutting teeth.
- (2) The daily preventive maintenance schedule and checklist.
- (3) Proposed use of automatic grade controls.
- (4) The surface testing schedule for smoothness.
- (5) The process for filling distressed areas.
- (6) The schedule for testing macrotexture of the milled surface.
- (7) Corrective procedures if the milled surface does not meet the minimum macrotexture specification.
- (8) Corrective procedures if the milled surface does not meet the minimum transverse or longitudinal surface finish when measured with a 10-foot straightedge.

The Contractor shall not start the planing operation until the hot mix asphalt (HMA) mix design has been approved and a Form 43 has been signed by the Engineer.

The existing pavement shall be milled to the cross-slope as shown on the plans and shall have a surface finish that does not vary longitudinally or transversely more than $\frac{3}{8}$ inch from a 10-foot straightedge. A 10-foot straightedge shall be supplied by the Contractor.

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REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)

All milled surfaces shall be broomed with a pick-up broom, unless otherwise specified, before being opened to traffic. A sufficient number of brooms shall be used immediately after planing to remove all milled material remaining in the roadway.

If the Contractor fails to adequately clean the roadway, work shall cease until the Engineer has approved the Contractor's revised written proposal to adequately clean the roadway.

The milled surface shall have a macrotexture equal to or less than 0.170 inches for single-lift overlays and 0.215 inches for multiple-lift overlays as tested per CP 77. Milled surfaces that do not meet these criteria shall require corrective action per the PCP. The Contractor shall be responsible for testing the macrotexture of the milled surface at the location directed by the Engineer per CP 77 at a stratified random frequency of one test per 10,000 square yards or a minimum of once per work day.

At the completion of each day's work, longitudinal vertical edges greater than 1 inch shall be tapered. No transverse vertical edges will be allowed. Longitudinal milled surface tie-ins to existing pavement shall be tapered to not less than a 3:1 slope, transverse milled surface tie-ins to existing pavement shall be tapered to not less than a 50:1 slope. Transverse tapered joints may be tapered with the planing machine, a temporary asphalt ramp, or other methods approved by the Engineer. No longitudinal joint between the milled and existing surfaces shall fall between 1 to 5 feet of any lane line.

If the transverse joint is tapered with a temporary asphalt ramp, the milled surface at the joint shall be constructed as a butt joint the full depth of the lift of asphalt to be placed on the milled surface. The Contractor shall be responsible for maintaining this asphalt ramp until all corresponding HMA is placed. All work associated with this joint will not be paid for separately but shall be included in the cost of planing.

If the transverse joint is tapered with a planing machine, a butt joint shall be cut into the taper the full depth of the lift of asphalt to be placed on the milled surface before commencement of resurfacing. All work associated with this joint will not be paid for separately but shall be included in the cost of planing.

Other approved transverse joint tapers shall be maintained at the expense of the Contractor, and at a minimum shall incorporate a butt joint the full depth of the lift of asphalt to be placed on the milled surface before commencement of resurfacing.

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REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)

Distressed or irregular areas identified in the planed surface by the Engineer shall be patched.

The roadway shall be left in a safe and usable condition at the end of each work day. The Contractor shall take appropriate measures to ensure that the milled surface does not trap or hold water. All required pavement markings removed by the planing shall be restored before the roadway is opened to traffic.

All milled surfaces to be overlaid with HMA shall be covered with new asphalt within 7 working days. All areas on this project that are not overlaid within the specified working days will be assessed a lane rental fee of \$1500 occurrence for each day or fraction thereof and any required surface repairs shall be paid for by the Contractor.

All planing shall be completed full width and parallel to the travel lanes before resurfacing commences unless otherwise directed by the Engineer.

All material generated by the planing operation shall become the property of the Contractor unless otherwise noted in the Contract.

Each planer shall conform to the following:

The planer shall have sufficient power, traction and stability to maintain an accurate depth of cut. The propulsion and guidance system of the planer shall be maintained in such condition that the planer may be operated to straight and true lines.

The planer shall be capable of operating with automatic grade controls (contact or non-contact) on both sides of the machine using a 30-foot averaging system or other approved grade control systems. The use of such controls shall be described in the Contractor's PCP.

The planer shall be capable of picking up the removed material in a single operation. A self-loading conveyor shall be an integral part of the planer. Windrows will not be allowed.

Subsection 202.12 shall include the following:

Macrotexture testing, macrotexture corrective actions, planers, brooms, and all other work necessary to complete the item, Removal of Asphalt Mat (Planing), will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 202
REMOVAL OF PAVEMENT MARKING**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

CONSTRUCTION REQUIREMENTS

Subsection 202.05 shall include the following:

Pavement markings designated for removal and replacement shall be removed to a depth of 35 mils +/- 5 mils. The Contractor shall use gang stacked diamond tip blades or equivalent to create a smooth application surface to the satisfaction of the Project Engineer and have a vacuum machine on site to control dust paid for within the pay item.

The Contractor shall not perform any more removals than can be applied by the pavement marking truck during the same working day or working period.

If a rain event occurs during removal and marking application, the Contractor shall halt the removal operation and raised flexible pavement markers shall be placed at locations that have been removed but not marked while the pavement is drying prior to the marking application. Marking application shall resume when pavement is dry and has had no moisture for a minimum of 24 hours. Raised flexible pavement markers shall be installed with one marker at 40-foot centers.

Grooves shall be clean, dry, and free of laitance, oil, dirt, grease, paint, or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves and shall re-clean grooves, as necessary, prior to application of the epoxy pavement markings.

BASIS OF PAYMENT

Subsection 202.12 shall include the following:

Pay Item

Pay Unit

Removal of Pavement Marking

Square Foot

The work to groove the asphalt or concrete and clean the grooving residual or debris will not be measured and paid for separately but shall be included in the work.

Temporary markings will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 202
CLEAN VALVE BOX**

Section 202 of the Standard Specifications is hereby revised for this Project as follows:

CONSTRUCTION REQUIREMENTS

Subsection 202.02 is hereby revised to include the following:

The Contractor shall clean each valve box of all foreign debris such that the operating nut of the valve is fully accessible to operation. The Engineer will obtain the Owner's inspection and written approval before accepting the work.

BASIS OF PAYMENT

Subsection 202.12 shall include the following:

Pay Item

Pay Unit

Clean Valve Box

Each

REVISION OF SECTION 202
REMOVAL OF PIPE

Section 202 of the Standard Specifications is hereby revised as follows:

Subsection 202.11 shall include the following:

Removal of Pipe will be measured by the linear foot and shall include pipe of any material and at any depth with a diameter of 6" or larger as specified in plans.

The removal of pipe shall include all materials, equipment, and labor required to remove pipe. The work shall include but is not limited to all trenching, earthwork, backfill and disposal of pipe. Removal of pipe may require the excavation of a trench separate of proposed pipe installation.

BASIS OF PAYMENT

Subsection 202.12 shall include the following:

Pay Item

Removal of Pipe

Pay Unit

Linear Foot

**REVISION OF SECTION 203
EMBANKMENT MATERIAL (SPECIAL)**

Section 203 of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.03 shall include the following.

Embankment (Special) is included for areas not previously paved as shown in the plans. In these areas, 36 inches of moisture treatment is required. The 36 inches can be combined by fill placement, subexcavation and recompacting the overexcavated material, or in-place subgrade scarification and recompaction, or embankment fill placement.

BASIS OF PAYMENT

Subsection 203.12 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Embankment Material (Complete in Place) (Special)	Cubic Yard

**REVISION OF SECTION 210
VALVE BOX AND MANHOLE ADJUSTMENTS**

Section 210 of the Standard Specifications is hereby revised for this Project as follows:

210.10 ADJUST STRUCTURE

Subsection 210.10 hereby is revised to include the following:

The Contractor shall notify each utility company (Owner) prior to any construction that will involve the adjustment of its valve boxes or manholes.

Each Owner will mark all of its valve boxes and manholes that will be involved in the specified construction area.

Prior to commencing construction, the Contractor shall coordinate and conduct, with the Engineer and each Owner, an inspection of all impacted manholes and valve boxes. The purpose of this inspection will be to account for all valve boxes and manholes involved in the construction and determine their accessibility and condition. The Contractor shall provide traffic control for this inspection and for the final inspection. The Contractor shall coordinate construction with the Owner to allow sufficient time for the Owner to make all necessary repairs to valve boxes and manholes before construction begins in the area of the valve boxes and manholes. All parties shall agree on the condition of each valve box and manhole prior to construction.

The Contractor shall replace all valve box sections damaged or misplaced during construction with new valve box sections complying with the requirements of the Owner's specifications. The Contractor shall set each valve box to be adjusted so that it is $\frac{1}{4}$ inch to $\frac{1}{2}$ inch below the final grade of the paved surface, or to the satisfaction of the Owner, and so that it is plumb over the operating nut of the valve.

The Contractor shall adjust all manholes that require adjustment with materials conforming to the Owner's specifications. Some adjustments may require the addition, removal, or replacement of a manhole or cone section. If manhole adjustment requires a manhole cone or barrel section to be added, removed, or replaced, this work will not be considered as "Adjust Manhole", but shall be performed in accordance with the Section 210 requirements for the item "Modify Manhole" and will be paid as Adjust Manhole.

The Contractor shall prevent tools, concrete, dirt, or debris of any kind from falling into the channel of the existing manhole. The Contractor shall clean or remove debris from downstream sewer that enters as a result of the Contractor's work.

When the Project includes planing prior to resurfacing, the Contractor shall first lower all valve boxes and manholes below the surface to be planed and then adjust them up to final grade after the paving operation is complete.

Prior to the final inspection, the Contractor shall thoroughly clean all valve boxes designated for cleaning. This work shall be performed in accordance with the Section 202 requirements for the item "Clean Valve Box".

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**REVISION OF SECTION 210
VALVE BOX AND MANHOLE ADJUSTMENTS**

The Contractor shall coordinate and conduct, with the Engineer and each Owner, a final inspection upon completion of construction. This inspection shall assure that all valve boxes and manholes are in compliance with these requirements. The Engineer will obtain the Owner's written approval before accepting the work.

METHOD OF MEASUREMENT

Subsection 210.12 hereby is revised to include the following:

The Contractor will be paid separately for each valve box or manhole adjustment completed down and for each adjustment completed up.

BASIS OF PAYMENT

Subsection 210.13 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Adjust Valve Box	Each
Adjust Manhole	Each

Adjustments that include adding, removing, or replacing a manhole cone or barrel section will be paid for under the Section 210 pay item, Adjust Manhole.

Cleaning designated valve boxes will be paid for under the Section 202 pay item, Clean Valve Box

REVISION OF SECTION 210

MODIFY INLET

Section 210 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

210.01 This work consists of the modification of existing inlets to accommodate new stormwater pipe connections.

CONSTRUCTION REQUIREMENTS

210.02 Modify existing inlets at the locations as shown on the drawings. Work may include the addition of a stormwater pipe connection or the repair of a removed stormwater pipe connection. Stormwater pipe connections may be at a different elevations, locations or size of the previous Stormwater pipe connection.

Construction requirements shall meet requirements from sections 604 for all items not listed in this section.

METHOD OF MEASUREMENT

210.12 Modify inlets will be measured by the actual number of inlets modified which shall include all work required to remove portion of existing manholes and inlets as required to connect new pipes and connection of new pipe. If the rings and covers are destroyed or in the opinion of the Engineer cannot be reused, new manhole rings and covers shall be provided.

BASIS OF PAYMENT

210.13 The accepted quantities, measured as provided above, will be paid for at the contract price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Modify Inlet	Each

All materials and labor associated with the modification of the inlet will not be measured and paid for separately but included in the work. Reinforcing steel, structural concrete, grout, as well as all other materials required to complete the item shall be included in the work.

REVISION OF SECTION 217 NOXIOUS WEED MANAGEMENT

Section 217 of the Standard Specifications is hereby deleted and replaced with the following:

217.01 This work consists of furnishing and applying herbicides, providing mechanical and cultural controls to prevent or control plant growth in areas as shown on the plans or designated.

MATERIALS

217.02 All herbicide labels shall be currently registered with the Colorado Department of Agriculture and the U.S. Environmental Protection Agency. All herbicides shall be supplied to the project in labeled containers. The labels shall show the product name, chemical composition, expiration date, and directions for use.

CONSTRUCTION REQUIREMENTS

217.03 All herbicides shall be applied by a qualified applicator who is commercial pesticide applicators licensed by the Colorado Department of Agriculture as a qualified applicator. The Contractor shall furnish documentation of such licensing prior to herbicide application to the Engineer. Herbicide mixing and application shall be done in accordance with instructions on the registered product label. The Contractor shall furnish the Engineer such label information prior to mixing or application.

The Contractor shall notify the Engineer at least 24 hours prior to each herbicide application and shall indicate the time and location application will begin. Application will not be allowed on Saturdays, Sundays, or holidays unless otherwise approved by the Engineer.

Clean all construction-related equipment thoroughly before off-loading at the project site and after working with weed-contaminated soils.

Noxious weeds observed in and near the construction area will be spot treated with herbicides or mechanically removed prior to the start of construction to minimize spread.

Monitor all areas treated for noxious weeds during construction and re-treat, if necessary, to prevent re-establishment of noxious weeds. All Colorado Department of Agriculture List A noxious weeds shall be completely eradicated from the project area by the end of construction.

Herbicides shall not be applied when weather conditions, including wind conditions, are unsuitable for such work. Herbicides shall not be applied when soil is extremely dry.

Herbicide treatments shall avoid native flowering plants to minimize impacts to pollinators.

Herbicides can be used immediately adjacent to wetlands, riparian areas, and/or water bodies only if the label indicates its use is appropriate for such areas.

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REVISION OF SECTION 217

NOXIOUS WEED MANAGEMENT

Herbicide application method shall be such that plant growth outside the designated treatment areas will not be damaged. All damage caused by improper herbicide application shall be repaired at the Contractor's expense.

Noxious weed treatments shall target observed species and species listed in the in the Project Weed Management Plan Table 217.04. Additional recommended treatments for noxious weeds including those not listed in the table below, can be found on the Colorado Department of Agriculture's website at <https://www.colorado.gov/pacific/agconservation/noxious-weed-species>

Project Weed Management Plan
Table 217.04

Noxious Weed	Plant Growth Characteristics	State List ¹	Recommended Treatments
Canada thistle (<i>Cirsium arvense</i>)	Aggressive rhizomatous perennial of moist/wet sites; seeds and plant parts easily transported by construction equipment.	B	Mechanical Control: Due to the species' extensive root system, hand-pulling and tilling stimulate the growth of new plants and are not recommended. Mowing every 10 to 21 days during the growing season can be effective. Herbicide Control: Aminopyralid (Milestone), Clopyralid + Triclopyr, Amiocyclopyrachlor + chlorosulfur, or Picloram applied in spring before flowering and/or during fall regrowth. Cultural Control: Reseed with native seed mix and prevent bare ground.
Cheatgrass (<i>Bromus tectorum</i>)	Prolific seed producing winter annual; becomes a fire hazard upon maturity. Seeds easily transported by construction equipment.	C	Mechanical Control: Mowing and chopping is not recommended. Herbicide Control: Fall application of Plateau, prior to hard freeze is optimum. Can also make application during early spring growth. Or, apply Panoramic 2 SL pre-or post-emergent in later summer or early fall. Cultural Control: Reseed with native seed mix. Check seed mix for cheatgrass contaminant.

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REVISION OF SECTION 217
NOXIOUS WEED MANAGEMENT

Common mullein (<i>Verbascum Thapsus</i>)	Biennial forb. The first year of the plant it produces a basal rosette. In spring of the second year, the plant bolts an erect stem that grows 2 to 6 feet tall. The plant has a deep taproot along with a fibrous root system.	C	Mechanical: Hand pull or dig when soil is moist prior to flowering/seed production. If flowers are present, bag specimens carefully so as not to scatter seeds. Herbicide Control: Chlorosulfuron, 2,4D, Picloram, or Metsulfuron applied to rosettes in spring or fall. Cultural Control: Reseed with native seed mix in fall to compete with grass in spring.
Field bindweed (<i>Convolvulus arvensis</i>)	Long-lived perennial; Construction could increase the plants abundance due to its ability to spread rapidly on disturbed sites and to grow from root fragments.	C	Mechanical Control: Cutting, mowing, or pulling is generally not effective. Herbicide Control: Clarity + 2,4-D Amine or Roundup Ultra applied at full-bloom and/or fall. Cultural Control: Reseed with native seed mix.
Diffuse knapweed (<i>Centaurea diffusa</i>)	Biennial forb that reproduces solely by seed. During the first year of growth, appears as a rosette in spring or fall. During the second year in mid to late spring – the stem bolts, flowers, sets seed, and the plant dies. Once the plant dries up, it breaks off at ground level and becomes a tumbleweed which disperses the still viable seeds over long distances.	B	Mechanical Control: Sever the root below the soil surface. If flowers are present, bag specimens carefully so as not to scatter seeds. Mowing is most effective when plants are at full bloom. Herbicide Control: Aminocyclopyrachlor + chlorsulfuron: pre=emergence or from seedling to mid-rosette state. Aminopyralid: Spring at rosette to early bolt state and/or in fall to rosettes. Clopyralid: Apply to spring/fall rosettes before flowering stalk lengthens. Cultural Control: Reseed with native seed mix and prevent bare ground.

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**REVISION OF SECTION 217
 NOXIOUS WEED MANAGEMENT**

Hoary Cress (<i>Cardaria draba</i>)	Creeping perennial of the mustard family. Plants emerge in early spring and flowers appear May to June. Seed is set by mid-summer.	B	Mechanical Control: Repeated mowing during summer, combined with herbicides, can be effective. Herbicide Control: Chlorsulfuron (Telar) or Metsulfuron (Escort XP) applied at flowering (early spring to early summer). Imazapic (Plateau, Panoramic) can be applied at late flower to post-flower growth state (late spring to mid-summer). Cultural Control: Minimize soil disturbance and seed with native seed mix.
Houndstongue (<i>Cynoglossum officinale</i>)	Short-lived perennial or biennial forb. Produces rosettes the first year and then bolts a stout, erect stem that is 1 to 4 feet tall in the second year. Flowers are reddish-purple and droop slightly from densely clustered panicles. Grows from woody taproot 3 to 4 feet deep.	B	Mechanical Control: Cut or pull plants and remove entire root crown when plants are in the rosette stage. Mowing before seed nutlets develop can also be effective. Herbicide Control: Chlorsulfuron (Telar), Metsulfuron (Escort XP) + 2,4-D, or Metsulfuron + Chlorosulfuron (Cimarron X-tra) can be applied in spring rosette to earl flow growth stages. Cultural Control: Minimize soil disturbance and seed with native seed mix.
Leafy spurge (<i>Euphorbia esula</i>)	Deep-rooted perennial forb that spreads by both seed and extensive creeping roots. Emerges in early spring.	B	Mechanical Control: Hand pulling is not a viable option. Repeated mowing provides little long-term control Herbicide Control: Aminocyclopyrachlor + chlorsulfuron (Persepective) and Diflufenzopyr +dicamba (Overdrive, Distinct): apply in spring and/or fall Cultural Control: Reseed with native seed mix

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REVISION OF SECTION 217 NOXIOUS WEED MANAGEMENT

Redstem filaree (<i>Erodium cicutarium</i>)	Winter annual or biennial forb that has a spreading profile. Reproduces primarily by seed. Shallow rooted.	C	Mechanical Control: Hand pulling or digging when soil is moist, making sure to get the roots. Bag specimens carefully so as not to spread seeds. Herbicide Control: Metsulfuron (Escort XP) or 2,4-D + dicamba applied in the rosette stage. Cultural Control: Reseed with native seed mix and prevent establishment.
Russian olive (<i>Elaeagnus angustifolia</i>)	Deciduous tree with a deep tap root.	B	Herbicide and Mechanical Control: Cut the trunks and apply herbicide applications of Triclopyr or Glyphosate to cut trunks or cut stems. Treat seedlings in spring with picloram, dicamba or glyphosphate in combination with mechanical control. Triclopyr + Aminopyralid can be use as foliar treatment ay to September. Cultural Control: Replant with native cottonwoods or willows with native grasses.
Scotch thistle (<i>Onopardum acanthium</i>)	Large thistle grows to 12 feet tall. Extremely spiny. During the second year in mid to late spring the stem bolts, flowers, sets seed, and the plant dies. A prolific seed producer, Scotch thistle can produce up to 14,000 seeds per plant.	B	Mechanical Control: Sever the root below the soil surface. If flowers are present, bag specimens carefully so as not to scatter seeds. Mowing is most effective when plants are at full bloom. Herbicide Control: Aminopyralid, Chlorosulfuron, Mesulfuron + Chlorosulfuron, Clopyralid, or Aminocyclopyrachlor _ Chlorosufuron during rosette stage. Cultural Control: Reseed with native seed mix.
Siberian elm (<i>Ulmus pumila</i>)	Fast growing tree distinguished by small toothed leaves about 1-2 ½ in long and pointed at the tip. Mature trees may reach a height of 50-70 feet. Spread primarily via seed; roots resprout when top growth is damage. Quickly outcompetes natives.	C	Mechanical Control: Can be effective when combined with herbicide treatment. Seedlings can be grubbed with a shovel or other tool. Herbicide Control: Mid- to late summer foliar application of glyphosate or triclopyr are the most effective on Siberian elms less than 6 feet in height or on resprouts, but shall not be used where injury to nearby plantings may occur or within 30 days of planting nearby shrubs and trees. Cut-stump treatment with glyphosate is effective for larger individuals. Basal bark treatment using triclopyr can be highly effective for controlling smaller trees less than 8 ft tall with stems that are 2 to 3 inches in diameters.

¹List A Species in Colorado that are designated by the Commissioner for eradication.

List B Species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governm ents, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread o f these species.

List C Species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governm ents, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands.

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REVISION OF SECTION 217
NOXIOUS WEED MANAGEMENT

Topsoil sources shall only have herbicides applied by the spot spray method.

METHOD OF MEASUREMENT

217.05 Herbicide Treatment shall be measured by the number of person-hours required to apply herbicide, as approved by the Engineer.

Reapplication of herbicide required due to inappropriate timing of the original application will not be measured or paid for.

BASIS OF PAYMENT

217.06 The accepted quantities of herbicide treatment will be paid for at the contract unit price per square yard or per hour.

Payment will be made under:

Pay Item

Pay Unit

Herbicide Treatment

Hour

Water will not be measured and paid for separately but shall be included in the work.

Seeding shall be paid for according to 212 Seeding.

REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY CONTRACTOR'S BIOLOGIST

Section 240 is hereby added to the Standard Specifications for this project as follows:

DESCRIPTION

240.01 This work consists of protecting migratory birds during construction and construction work on structures.

MATERIALS AND CONSTRUCTION REQUIREMENTS

240.02 The Contractor shall schedule construction activity, including clearing and grubbing operations and work on structures, to avoid taking (pursue, hunt, take, capture, or kill; attempt to take, capture, kill or possess) migratory birds or their nests protected by the Migratory Bird Treaty Act (MBTA). If construction activity is to occur between February 15 and August 31, then the following specifications must be followed and the Contractor shall retain a qualified wildlife biologist to determine where nest removal may occur or will be required during construction. The wildlife biologist shall have a minimum of three years' experience conducting migratory bird surveys and implementing the requirements of the MBTA. The Contractor shall submit documentation of the biologists' education and experience to the Engineer for acceptance. A biologist with less experience may be used by the Contractor subject to the approval of the Engineer based on review of the biologist's qualifications. If all construction activities occur after August 31 and before February 15, then the requirements set forth in this specification are not required. In Colorado, most nesting and rearing activities occur between April 1 and August 31, but raptors may nest as early as February 15.

The wildlife biologist shall record the location of each protected nest, bird species, the protection method used, and the date installed. A copy of these records shall be submitted to the Engineer.

- (A) *Raptor Nest Survey*. A wildlife biologist shall conduct raptor nest surveys within 0.5 mile of the construction site prior to the start of construction and prior to each construction phase. This survey can be done with binoculars or other optics. If construction activities are located within Colorado Parks and Wildlife (CPW) recommended buffer zone for specific raptors, "NO WORK" zones shall be established around active sites during construction according to the CPW standards or as recommended by the wildlife biologist in consultation with CPW. The "NO WORK" zone shall be marked with either fencing or signing. Work shall not proceed within a "NO WORK" zone until the wildlife biologist has determined that the young have fledged, or the nest is unoccupied.
- (B) *Vegetation Removal*. When possible, vegetation shall be cleared before the time when active nests are present. Vegetation removal activities shall be timed to avoid the migratory bird breeding season which begins on April 1 and runs to August 31. All areas scheduled for clearing and grubbing between April 1 and August 31 shall first be surveyed within the work limits for active migratory bird nests. The Contractor's wildlife biologist shall also survey for active migratory bird nests within 50 feet outside work limits. Contractor personnel shall enter areas outside CDOT right of way only if a written, signed document granting permission to enter the property has been obtained from the property owner.

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REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY CONTRACTOR'S BIOLOGIST

The Contractor shall document all denials of permission to enter property. The Contractor shall avoid all active migratory bird nests. The Contractor shall avoid the area within 50 feet of the active nests or the area within the distance recommended by the biologist until all nests within that area have become inactive. Inactive nest removal and other necessary measures shall be incorporated into the work as follows:

1. *Tree and Shrub Removal or Trimming.* Tree and shrub removal or trimming shall occur before April 1 or after August 31 if possible. If tree and shrub removal or trimming will occur between April 1 and August 31, a survey for active nests shall be conducted by the wildlife biologist within the seven days immediately before the beginning of work in each area of tree and shrub removal or trimming. The survey shall be conducted for each phase of tree and shrub removal or trimming. If an active nest containing eggs or young birds is found, the tree or shrub containing the active nest shall remain undisturbed and protected until the nest becomes inactive. The nest shall be protected by placing fence (plastic) a minimum distance of 50 feet from each nest to be undisturbed. This buffer dimension may be changed if determined appropriate by the wildlife biologist and approved by the Engineer. Work shall not proceed within the fenced buffer area until the young have fledged or the nests have become inactive. If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges but will be charged as contract time.
2. *Grasses and Other Vegetation Management.* Due to the potential for encountering ground nesting birds' habitat, if work occurs between April 1 and August 31, the area shall be surveyed by a wildlife biologist within the seven days immediately before ground disturbing activities. The undisturbed ground cover to 50 feet beyond the planned disturbance, or to the right-of-way line, whichever is less, shall be maintained at a height of 6 inches or less beginning April 1 and continuing until August 31 or until the end of ground disturbance work, whichever comes first. If birds establish a nest within the survey area, an appropriate buffer of 50 feet will be established around the nest by the wildlife biologist. This buffer dimension may be changed if determined appropriate by the wildlife biologist and approved by the Engineer. The Contractor shall install fence (plastic) at the perimeter of the buffer. Work shall not proceed within the buffer until the young have fledged or the nests have become inactive. If the fence is knocked down or destroyed by the Contractor, the Engineer will suspend the work, wholly or in part, until the fence is satisfactorily repaired at the Contractor's expense. Time lost due to such suspension will not be considered a basis for adjustment of time charges, but will be charged as contract time.

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REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS
BIOLOGICAL WORK PERFORMED BY CONTRACTOR'S BIOLOGIST

(C) *Work on structures.* The Contractor shall prosecute work on structures in a manner that does not result in a taking of migratory birds protected by the Migratory Bird Treaty Act (MBTA). The Contractor shall not prosecute the work on structures during the primary breeding season, April 1 through August 31, unless he takes the following actions:

- (1) The Contractor shall remove existing nests before April 1.
- (2) During the time that the birds are trying to build or occupy their nests, between April 1 and August 31, the Contractor shall monitor the structures at least once every three days for any nesting activity.
- (3) If the birds have started to build any nests, they shall be removed before the nest is completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.
- (4) Installation of netting may be used to prevent nest building. The netting shall be monitored and repaired or replaced as needed. Netting shall consist of a mesh with openings that are $\frac{3}{4}$ inch by $\frac{3}{4}$ inch or less.

METHOD OF MEASUREMENT

240.03 Wildlife Biologist will be measured by the actual authorized number of hours a wildlife biologist is on site performing the required tasks.

Removal of nests will be measured by the actual number of man-hours spent removing inactive nests just before and during the breeding season, April 1 through August 31. During this period, the Contractor shall submit to the Engineer each week for approval a list of the workers who removed nests and the number of hours each one spent removing nests.

BASIS OF PAYMENT

240.04 The accepted quantities measured as provided above will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Wildlife Biologist	Hour
Removal of Nests	Hour

Payment for Wildlife Biologist will be full compensation for all work and materials required to complete the item, including wildlife biologist, wildlife survey, and documentation (record of nest location and protection method)

Payment for Removal of Nests will be full compensation for all work and material required to complete the work.

Clearing and grubbing will be measured and paid for per Section 201.

Removal of trees will be measured and paid for per Section 202.

Fence (plastic) shall not be paid for separately but shall be included in the cost of the work.

**REVISION OF SECTION 304
AGGREGATE BASE COURSE**

Section 304 of the Standard Specifications for this project as follows:

Subsection 304.02 shall include the following:

Materials for the subbase shall be Aggregate Base Course (Class 6) as shown in subsection 703.04.

Materials for the base course shall be Aggregate Base Course (Class 6) as shown in subsection 703.04

The aggregate base course (Class 6) must meet the gradation requirements and have a resistance value of at least 78 when tested by the Hveem Stabilometer method.

Reclaimed asphalt pavement (RAP), asphalt millings, or asphalt in any form whatsoever shall not be substituted for ABC Class 6.

Crushed concrete or concrete in any form whatsoever shall not be incorporated in the aggregate base course.

REVISION OF SECTION 306
RECONDITIONING

Section 210 of the Standard Specifications is hereby revised for this project as follows:

Replace Subsection 306.2 first sentence to:

The top 12 inches of the existing subgrade shall be reconditioned by blading and rolling.

**REVISION OF SECTION 403
 HOT MIX ASPHALT**

Revise Section 403 of the Standard Specifications for this project as follows:

Subsection 403.02 shall include the following:

The design mix for hot mix asphalt shall conform to the following:

Table 403-1							
Property	Test Method	Value For Grading					
				SX(100)	S(100)		Patching
Air Voids, percent at: N (design)	CPL 5115			3.5 – 4.5	3.5 – 4.5		3.5 – 4.5
Lab Compaction (Revolutions): N (design)	CPL 5115			100	100		100
Stability, minimum	CPL 5106			28	22		28
Aggregate Retained on the 4.75 mm (No. 4) Sieve for S, SX and SG, and on the 2.36mm (No. 8) Sieve for ST and SF with at least 2 Mechanically Induced fractured faces, % minimum*	CP 45			60	60		60
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B			80	80		80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B			205 (30)	205 (30)		205 (30)
Grade of Asphalt Cement, Top Layer							PG76-28
Grade of Asphalt Cement, Layers below Top					PG 64-22		PG64-22
Voids in the Mineral Aggregate (VMA) % minimum	CP 48			See Table 403-2	See Table 403-2		See Table 403-2
Voids Filled with Asphalt (VFA), %	AI MS-2			65-80	65-80		65-80

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**REVISION OF SECTION 403
 HOT MIX ASPHALT**

Table 403-1							
Dust to Asphalt Ratio							
Fine Gradation	CP 50			0.6 – 1.2	0.6 – 1.2		0.6 - 1.2
Coarse Gradation				0.8 – 1.6	0.8 – 1.6		0.8 – 1.6
Note: AI MS-2 = Asphalt Institute Manual Series 2 Note: Mixes with gradations having less than 40% passing the 4.75 mm (No. 4) sieve shall be approached with caution because of constructability problems. Note: Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen. Gradations for mixes with a nominal maximum aggregate size of 3/4" to 3/8" are considered a coarse gradation if they pass below the maximum density line at the #8 screen. Gradations for mixes with a nominal maximum aggregate size of #4 or smaller are considered a coarse gradation if they pass below the maximum density line at the #16 screen. *Fractured face requirements for SF may be waived by RME depending on project conditions.							

All mix designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. Form 43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0 percent below the mix design optimum. CDOT will establish the production asphalt cement and volumetric targets based on the Contractor's mix design and the relationships shown between the hot mix asphalt mixture volumetric properties and asphalt cement contents on the Form 429. CDOT may select a different AC content other than the one shown at optimum on the Contractor's mix design in order to establish the production targets as contained on the Form 43. Historically, Air Voids adjustments typically result in asphalt cement increases from 0.1 to 0.5 percent. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

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**REVISION OF SECTION 403
 HOT MIX ASPHALT**

Table 403-2

	Minimum Voids in the Mineral Aggregate (VMA)			
Nominal Maximum Size*, mm (inches)	***Design Air Voids **			
	3.5%	4.0%	4.5%	5.0%
37.5 (1½)	11.6	11.7	11.8	N/A
25.0 (1)	12.6	12.7	12.8	
19.0 (¾)	13.6	13.7	13.8	
12.5 (½)	14.6	14.7	14.8	
9.5 (⅜)	15.6	15.7	15.8	
4.75 (No. 4)	16.6	16.7	16.8	16.9
	* The Nominal Maximum Size is defined as one sieve larger than the first sieve to retain more than 10%. ** Interpolate specified VMA values for design air voids between those listed. *** Extrapolate specified VMA values for production air voids beyond those listed.			

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to the Engineer and approved before beginning the paving operations. When the Engineer determines that segregation is unacceptable, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

CDOT approved Warm Mix Asphalt (WMA) may be allowed on this project per CP 59. Unique requirements for WMA design, production and acceptance testing as documented during CDOT WMA approval shall be submitted and approved before creation of the Form 43 and before any WMA production on the project. Delays to the project due to WMA submittal and review will be considered within the Contractor's control and will be non-excusable.

The hot mix asphalt shall not contain any reclaimed asphalt pavement.

Hot mix asphalt for patching shall conform to the gradation requirements for Hot Mix Asphalt (Grading SX) (100) (PG 76-28) for the top lifts and (Grading S)(100) (PG 64-22) for the bottom lifts.

A minimum of 1 percent hydrated lime by weight of the combined aggregate shall be added to the aggregate for all hot mix asphalt.

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REVISION OF SECTION 403
HOT MIX ASPHALT

Acceptance samples shall be taken as determined by the Project Engineer

Delete subsection 403.05 and replace with the following:

403.05 The accepted quantities of hot mix asphalt will be paid for per subsection 401.22, at the contract unit price per ton for the bituminous mixture.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Hot Mix Asphalt (Grading S)(100)(PG 64-22)	Ton
Hot Mix Asphalt (Grading SX)(100)(PG76-28)	Ton
Hot Mix Asphalt (Patching)(Asphalt)	Ton

Aggregate, asphalt recycling agent, asphalt cement, additives, hydrated lime, and all other work and materials necessary to complete each hot mix asphalt item will not be paid for separately but shall be included in the unit price bid. When the pay item includes the PG binder grade, any change to the submitted mix design optimum asphalt cement content to establish production targets on the Form 43 will not be measured and paid for separately but shall be included in the work. No additional compensation will be considered or paid for any additional asphalt cement, plant modifications and additional personnel required to produce the HMA as a result in a change to the mix design asphalt cement content.

Historically, typical asphalt cement increases reflected on the Form 43 are from 0.1 to 0.5 percent. However, the Contractor should anticipate the AC increases typical of his mixes. Contractors bidding the project should anticipate this change and factor it into their unit price bid.

When the pay item does not include the PG binder grade, asphalt cement will be measured and paid for per Section 411. Asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately but shall be included in the work.

Excavation, preparation, and tack coat of areas to be patched will not be measured and paid for separately but shall be included in the work.

REVISION OF SECTION 603
CONCRETE BOX CULVERT (PRECAST) (INSTALL ONLY)

Section 603 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

Subsection 603.01 is hereby revised to include the following:

The Contractor shall install the concrete box culvert provided by the City of Littleton as shown in the plans.

The Contractor and the Project Engineer will coordinate the delivery of the box culvert from the fabricator. The Contractor shall not delay delivery that may incur storage fees charged by the fabricator. The Contractor is responsible for unloading the segments at the time of delivery. Depending on timing of the installation of the box culvert, the Contractor is also responsible for handling and storage of the segments from the time of delivery to the time of installation. The contractor has the option to store the precast segments at the project site at a location coordinated with the Project Engineer and the Evergreen Development.

Any lifting holes in the concrete box segments shall be filled with non-shrink grout to be approved by the Project Engineer. This shall be included in the cost of the work.

The Evergreen Development will be performing the Jackass Gulch channel work adjacent to the box culvert prior to the installation of the concrete box culvert and after installation. The channel work to be performed by Evergreen is in the RiverPark plan set and is available to the Contractor.

The Project Engineer will coordinate construction activities with the Contractor and with Evergreen. The Project Engineer will also coordinate the limits and extents of earthwork with the Contractor and with Evergreen.

The installation of the concrete box culvert shall be the first major construction activity after notice to proceed for this project as coordinated with the Project Engineer.

MATERIALS

Subsection 603.02 is hereby revised to include the following:

The Contractor shall inspect the box segments for defects at the time of delivery. This work shall be included in the cost of installation. The Contractor shall notify the Project Engineer for any discrepancies.

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**REVISION OF SECTION 603
CONCRETE BOX CULVERT (PRECAST) (INSTALL ONLY)**

METHOD OF MEASUREMENT

Subsection 603.12 is hereby revised to include the following:

Concrete Box Culvert will be measured by the linear foot completed in place and accepted. Transporting and unloading the concrete box culvert segments, including all equipment and labor needed, from the location on the project site to the installation area shall be included in the cost of the work.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
10x6 Foot Concrete Box Culvert (Precast) (Install Only)	LF

Payment shall be full compensation for all work and materials required to complete the installation.

Structure Excavation and Structure Backfill will be measured and paid for per Section 206.

Waterproofing (membrane) will be measured and paid for per Section 515.

Concrete Class D and Reinforcing Steel for the culvert end treatment, toewall, headwall, and nose angle will be paid for per Section 601 and 602.

**REVISION OF SECTION 603
REINFORCED CONCRETE PIPE**

Section 603 of the Standard Specifications is hereby revised for this project as follows:

Subsection 603.02 shall include the following:

Reinforced concrete pipe shall be manufactured from concrete that meets the requirements for severity of sulfate exposure Class 2 specified in subsection 601.04.

BASIS OF PAYMENT

Subsection 603.13 shall include the following:

Pay Item

Pay Unit

___Inch Reinforced Concrete Pipe (Complete in Place) Linear Feet

Delete paragraph beginning “Structure excavation and backfill...” and replace with the following:

All Reinforced Concrete Pipe will be paid for as Complete-in-Place. Structure excavation, structure backfill, and bedding material will not be measured and paid for separately but shall be included in the work.

REVISION OF SECTION 612

LOCATION MARKERS

Section 612 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

Contractor shall furnish and install location markers for identifying fiber optic cable and other utilities at locations shown on the plans.

MATERIAL

Location Marker (Fiber Optic) (Dome) shall be made of non-conductive high-density polymer, and shall be integrally white in color with an orange cap. All colors shall be stabilized against ultraviolet light such that they will not fade under continuous exposure to direct sunlight. The marker shall retain dimensional stability in temperatures ranging between -40° F and 175° F. In some instances when markers are installed on National Forest Service Lands the fiber optic marker shall be brown in color.

Concrete footing for dome marker shall be 18 x 18 x 12 inches per project detail. Concrete footing shall be Concrete Class B and shall be in accordance with Section 601.

CONSTRUCTION

Location Marker (Fiber Optic) (Dome) shall be installed at appropriate Pull Box and Manhole (TMS) locations as shown on the plans to identify both the backbone fiber cable and lateral fiber cable. To additionally designate the fiber cable, intermediate markers shall be installed at 1000-foot spacing along the running line.

The marker shall include a label with CDOT contact information and the designation of "FIBER OPTIC CABLE". The label shall have black lettering on an orange background. The label shall include the highway milepost of the Pull Box or Manhole (TMS). The mile post shall be to the nearest hundredth. This label shall be placed below the "FIBER OPTIC CABLE" warning label. In some instances when markers are installed on Forest Service Lands the dome marker label shall have black letting on a brown background. The Contractor shall provide the label submittal to the Project Engineer.

The markers shall include a label with CDOT contact information and the designation of "ELECTRICAL CABLE" or "TELEPHONE CABLE". The label shall have black lettering on an orange background. In some instances when markers are installed on Forest Service Lands the flat marker label shall have black letting on a brown background. The Contractor shall provide the label submittal to the Project Engineer.

The Contractor shall provide the Engineer with three copies of detailed As-Built drawings showing the installed locations of all markers and the associated utilities. These drawings shall include but not be limited to the following:

- (1) Type of location marker installed
- (2) Distances between location markers

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REVISION OF SECTION 612
LOCATION MARKERS

- (3) Distances between pull boxes and manholes to ITS devices
- (4) The distance and location to each CDOT utility point of service connection source point which the local utility companies have provided, including electrical power, transformer source, and telephone pedestals.

METHOD OF MEASUREMENT

Location markers, labels and footing will be measured by the actual number of markers that are placed and accepted.

BASIS OF PAYMENT

Pay Item

Pay Unit

Location Marker (Fiber Optic) (Dome)

Each

Payment will be full compensation for all work, materials and equipment required to place the markers at the locations shown on the plans, including excavation, backfill, and patching.

Concrete for footing will not be measured and paid for separately but shall be included in the Marker.

REVISION OF SECTION 613

LIGHTING

Section 613 is hereby added to the Standard Specials for this project as follows:

613.03 General. Shall include the following:

All electrical shall be installed by a Journeyman Electrician under the oversight of a Master Electrician licensed in the State of Colorado. Each Electrician shall have documented experience with this type of electrical installation. Documentation shall be supplied to the Project Engineer prior to start of any construction.

The Contractor is responsible for acquiring and posting of a state electrical permit from the Colorado state inspector's office with no additional cost to the project. Contractor shall coordinate with the state electrical inspector for all inspections and all additional Contractor work required by the inspector's office.

613.07 Conduit. Shall include the following:

Type Two Pull Box – Provide a heavy-duty, TIER 22, polymer concrete, bottomless pull/splice box with bolted cover flush mount in-grade with a minimum of 12 inches deep pea gravel base under box for drainage. Provide 12 inches wide x 4 inches deep concrete ring/collar around box to maintain level position in open landscape. Provide ground rod in pull box and bond 1#4 soft drawn bare copper conductor from ground rod through the grounding conduit in the light standard raceway to the lug at the back of the handhole in the light standard.

The Contractor shall install 1#12 AWG locate wire and 1,250lb nylon pull string with footage tape in all spare and empty conduits.

The Contractor shall be responsible for repairing damages caused by boring, trenching, cutting, drilling, etc. or performance of any related work in this contract area. Contractor shall furnish and install all barrier, pavement, landscape materials, etc. to restore the construction site outside of the pavement included in the roadway improvements to restore the construction site to pre-construction conditions.

If Boring is Required or desired over trenched - The work specified in this Section documents the approved construction methods, procedures and materials for Directional Boring, also commonly called Horizontal Directional Drilling (HDD).

General:

HDD is a trenchless method for installing a product that serves as a conduit for liquids, gasses, or as a duct for pipe, cable, or wire line products. It is a multi-stage process consisting of site preparation and restoration, equipment setup, and drilling a pilot bore along a predetermined path and then pulling the product back through the drilled space. When necessary, enlargement of the pilot bore hole may be necessary to accommodate a product larger than the pilot bore hole size. This process is referred to as back reaming and is done at the same time the product is being pulled back through the pilot bore hole.

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REVISION OF SECTION 613

LIGHTING

Accomplish alignment of the bore by proper orientation of the drill bit head as it is being pushed into the ground by a hydraulic jack. Determine orientation and tracking of the drill bit by an above ground radio detection device which picks up a radio signal generated from a transmitter located within the drill bit head. Then electronically translate the radio signal into depth and alignment. In order to minimize friction and prevent collapse of the bore hole, introduce a soil stabilizing agent (drilling fluid) into the annular bore space from the trailing end of the drill bit. The rotation of the bit in the soil wetted by the drilling fluid creates a slurry. The slurry acts to stabilize the surrounding soil and prevent collapse of the bore hole as well as provides lubrication.

Select or design drilling fluids for the site specific soil and ground water conditions. Confine free flowing (escaping) slurry or drilling fluids at the ground surface during pull back or drilling. Accomplish this by creating sump areas or vacuum operations to prevent damage or hazardous conditions in surrounding areas. Remove all residual slurry from the surface and restore the site to preconstruction conditions.

613.08 Wiring. Shall include the following:

All wiring shall be 600 Volt rated, Type: Conform to the applicable UL and ICEA Standards for the use intended. Copper conductors with 600-volt insulation unless otherwise specified or noted on the drawings. Stranded conductors for No. 8 and larger shall not be allowed unless otherwise specified or noted on the drawings. Aluminum conductors will not be permitted.

1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658
2. Insulation: Type XHHW, THWN-2/THHN insulation minimum unless otherwise specified or noted on the drawings.
3. Size: No. 12 minimum unless otherwise specified or noted on the drawings. Not less than NEC requirements for the system to be installed.
4. Color Coding: Phase, neutral and ground conductors color-coded in accordance with NEC. Connect all Conductors of the same color to the same phase conductor as follows:

120/240V-1PH-3W Color coding shall be:

1. Line 1 = Black
2. Line 2 = Red
3. Neutral = White
4. Ground = Green

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REVISION OF SECTION 613

LIGHTING

5. Unless otherwise authorized, the multiple system of electrical distribution shall be used. Conductors of the size and material specified shall be installed for control wiring, device wiring, main circuit wiring, ground wiring, service entrance wiring, and all other wiring necessary for a complete installation.
6. Conductors shall be sized to prevent a voltage drop of more than three (3) percent per feeder run. All conductors shall be installed in conduit.
7. All power circuits shall include an insulated green grounding conductor.
8. A complete grounding system shall be installed for the entire electrical installation. Grounding shall consist of ground cables, conduits, grounding rods, wire or strap, and ground fittings, as required by the National Electrical Code.

Type THWN-2 conductors shall be used for all underground conduit runs. Leave sufficient lengths of branch conductors to allow conductor splices to be extracted from handhole for maintenance. Type XHHW shall be used for the service entrance conductors (service laterals).

Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

Connectors, splices, and terminations shall be 600 volt rated, and rated for the installation locations as follows:

1. Exterior above grade weatherproof boxes and wireways installation of connectors and splices.
 - a. Shall be UL listed to 486D insulated for use in damp/wet locations.
 - b. Shall have silicone-based protection against moisture and corrosion.
 - c. The connector shall be rated at 105 degree C.
 - d. Shall be listed for exterior above grade installation.
2. Exterior below grade installation of connectors and splices.
 - a. Shall be UL listed to 486D and ANSI C119.1 insulated for use in submersible locations.
 - b. Temporary submersion up to 6' deep and direct burial applications.
 - c. Dual rated Copper/Aluminum class B and C conductors.
 - d. Operating temperature rating -45 degree C to 90 degree C (-49 degree F to 194 degree F).
 - e. Material: 6061-T6 aluminum alloy
 - f. Insulation: High dielectric strength EPDM rubber for increased chemical and abrasion protection.

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REVISION OF SECTION 613

LIGHTING

- g. Multi-lug configurations to match the number of conductor connections required. One conductor per lug or port.
- h. Removable port plugs: field cut wire insert cones to fit wire size, secures entry port closures to ensure debris prevention.
- i. Pre-filled with oxide inhibitor.

Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

Make splices, terminations, and taps that are compatible with conductor material.

Wiring at Handholes and Outlets: Install conductor at each handhole or outlet, with at least 12 inches (300 mm) of slack to allow removal from handhole or outlet for maintenance.

BASIS OF PAYMENT

613.14 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

<u>Pay Item</u>	<u>Pay Unit</u>
2 Inch Electrical Conduit (Plastic)	LF
3 Inch Electrical Conduit (Bored)	LF
Type Two Pull Box	LS
Wiring	LS

Saw cutting; trenching; excavation; backfill; jacking; drilling pits; underground electrical warning tape; removal of pavement, sidewalks, gutters, and curbs and their replacement in kind to match existing grade; and all other work necessary to complete pull box installation.

The lump sum price bid for wiring will be full compensation for all electrical circuitry necessary to complete the electrical installation of lighting. All conductors in conduit, regardless of type, are part of the wiring item and will not be measured and paid for separately.

**REVISION OF SECTION 613
WIRING (TRAFFIC SIGNALS)**

Section 613 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

This work includes furnishing and installing copper conductor cable with terminations for power source feeds between the traffic signal cabinet and the electrical power source.

Wiring shall also include coiling of cable at utility poles and appropriate pole riser hardware as required by each utility company. The signal pull boxes at the intersection of Santa Fe Drive and Nichols Avenue shall include 50 feet minimum of additional coiled wiring as shown on the plans.

METHOD OF MEASUREMENT

Copper conductor cable unit price shall be full compensation for work described above, complete and in place. Furnishing and installing wire, and all associated fittings, terminations, attachment hardware and all other hardware, labels, tools, and test equipment necessary for a complete installation

All labor, materials, equipment, labels, attachment/pole riser hardware, and permits necessary for the wiring of the electric services, cabinets, disconnect pedestals, meter/disconnect pedestals, and any materials or equipment necessary for testing shall be measured and paid for as a lump sum.

BASIS OF PAYMENT

Payment will be made under:

Pay Item

Pay Unit

Wiring

Lump Sum

REVISION OF SECTION 613
ELECTRICAL CONDUCTOR IDENTIFICATION (LIGHTING)

Section 613 of the Standard Specifications is hereby revised for this project as follows:

Section 613.08 shall include the following:

All electrical conductors shall be tagged as follows:

Electrical conductor cable tags shall be located below the termination in the base of the street light, in the pull box, in the pedestal and at the point of termination to existing facilities of the Local Utility Company supplying electrical service. The tags shall be attached with a cable tie. The information written on the tag shall include the direction and approximate length of cable feeds running from where to, etc.

Each incoming conductor shall be individually color coded with 1 tape mark, while outgoing conductors shall have 2 tape marks.

Example:

FEEDS TO PULL BOX 50' NORTH & 75' WEST THEN TO HIGHWAY SIGN	FEEDS FROM XFMR 250' SOUTH & 75' EAST 200' WEST
--	--

Uniform tags are available in a Tag Kit. The Tag Kit consists of: 100 tags, 3 part yellow with 1 hole, 100 black nylon ties and 1 black sharpie pen.

Size	2-1/2" X 5"
Standard Package	Kit
Weight, Kit, Approx.	1.5 Pounds
Color	yellow

Electrical conductor tagging will not be paid for separately, but shall be included in the cost of the electrical conduit and all associated equipment installation.

REVISION OF SECTION 613
METER POWER PEDESTAL

Section 613 is hereby added to the Standard Specials for this project as follows:

613.02 Shall include the following:

Roadway lighting materials shall conform to Section 715 and shall be compatible with the requirements of the local agency having jurisdiction.

(a) *Foundation.* Concrete Foundation Pads and Light Standard Foundations shall be cast-in-place concrete. A complete foundation includes concrete, reinforcing steel, grounding electrode, connector bolts, and anchor bolts. See plans and details for additional requirements for the meter power pedestal's foundation pad. The contractor shall provide a structural engineered stamp drawing for the meter power pedestal's concrete foundation pad.

(b) *Meter Power Pedestal.* A complete pedestal includes the enclosure and all related components, load center, grounding system, meter housing (cold sequence), meter disconnect ahead of meter, maintenance receptacle and connections to the power supply. The contractor shall install TESCO 26-000 electrical meter pedestal as coordinated with the City of Littleton and the Project Engineer.

613.03 General. Shall include the following:

All electrical shall be installed by a Journeyman Electrician under the oversight of a Master Electrician licensed in the State of Colorado. Each Electrician shall have documented experience with this type of electrical installation. Documentation shall be supplied to the Project Engineer prior to start of any construction.

The Contractor is responsible for acquiring and posting of a state electrical permit from the Colorado state inspector's office with no additional cost to the project. Contractor shall coordinate with the state electrical inspector for all inspections and all additional Contractor work required by the inspector's office.

613.09 Lighting Control Center, Meter Power Pedestal and Secondary Service Pedestals. Shall include the following:

(c) *Meter Power Pedestal* – Provide a commercial Meter/Power Pedestal and route raceway out to the ITS devices as shown on the plans and details. Provide an all-in-one meter power pedestal with meter, meter t-handle disconnect, a grounding rod system, a built-in maintenance duplex GFCI receptacle, service entrance rated, copper bus panel with main and branch breakers as indicated on the panel schedules and connections to the power supply and all interconnection conductors and raceways as shown on the plans and details.

The Contractor shall provide an electrical permit from the state of Colorado with no additional cost to the project. All inspections and corrections of work required by the state inspector shall be performed by the Contractor at no additional cost to the project.

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REVISION OF SECTION 613
METER POWER PEDESTAL

The Contractor shall coordinate with the city and/or county (where meters are located) to acquire an address for each meter shown on plans.

The Contractor shall coordinate with Xcel Energy's (builder's call line) to setup and acquire service at each meter shown on plans.

The Contractor shall furnish and install an engraved brass tag label indicating the address of the meter. Brass tag label shall conform to Xcel Energy specifications.

"Arc-Flash Hazard Warning" labels shall be furnished and installed by the electrical contractor per the National Electric Code NEC 110.16 and the NFPA 70E, and all other labels required by NFPA 70.

BASIS OF PAYMENT

613.14 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

<u>Pay Item</u>	<u>Pay Unit</u>
Meter Power Pedestal	Each
F/A Furnish & Install Electrical Service	FA

All work necessary and incidental to the installation of the meter power pedestal as shown in the plans will not be measured and paid for separately but shall be included in the work.

REVISION OF SECTION 613

DIRECTIONAL BORING

Section 613 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

This work consists of furnishing and installing sleeve(s) by directionally controlled horizontal drilling or boring equipment.

SCOPE OF WORK

- A. Fabricate, directionally drill or bore and install the sleeve(s) to the lines and grades shown on the plans.
- B. The Contractor shall deliver the sleeve(s) in a clean and operable condition.
- C. Clean up all affected sites and restore all areas.

SUBMITTALS

- A. The Contractor shall prepare a schedule for the work and submit it to the Project Engineer for approval. The schedule shall include all major tasks to be performed including the following:
 - a. Rig mobilization and setup
 - b. Pipe assembly
 - c. Pilot hole drilling
 - d. Pre-reaming
 - e. Pretesting and pigging pipe before installation
 - f. Pipe pulling
 - g. Pretesting and pigging pipe after installation
 - h. Restoration and demobilization
- B. At least 10 days prior to mobilization of equipment, the Contractor shall submit a detailed installation plan to the Project Engineer for review and approval. This plan must also include a detailed description as to contingencies for potential fissures of drilling fluid.
- C. The Contractor will supply Material Safety Data Sheets (MSDS) for all material used in making up drilling fluids. The drilling fluid composition must meet all federal, state, and local laws and environmental regulations governing the use, handling, storage, and disposal of such material.

PERMITS

- A. The Contractor shall maintain and operate all construction equipment and perform all work within designated easements, temporary construction easements, working areas, public rights-of-way, and access roads.
- B. The Contractor shall be responsible for obtaining all permits and regulatory authorizations for activities off the defined easements and working areas, including any permits required for mobilizing materials and equipment and disposal of drilling fluids and industrial debris. The Contractor will be responsible for paying all fines that may be imposed due to illegal discharge.

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REVISION OF SECTION 613

DIRECTIONAL BORING

MATERIALS

GENERAL

The Contractor shall provide all materials, equipment, and labor for completing the drill/bore and for adequate protection of the work.

EQUIPMENT AND MATERIALS TO BE FURNISHED BY CONTRACTOR

The Contractor shall furnish all equipment and material required to complete the Scope of Work which shall include but not limited to the following:

- a. Sleeving Pipe
- b. Contact grouting
- c. Drilling equipment
- d. Water pumps, hoses, fittings, storage tanks, filters, hay bales, and silt fencing (as required)
- e. Drilling fluids containment, collection, cleaning and disposal equipment, and material
- f. Fuel and lubricants
- g. Bentonite and related mixing equipment
- h. All welding equipment and materials as required
- i. All hydrostatic and pneumatic testing equipment and materials
- j. Sidebooms, cranes, backholes, trucks, and other equipment and materials necessary to load and unload sleeve(s) and to support and smoothly transition the sleeve(s) while being pulled into the reamed hole
- k. All equipment and materials necessary to restore project areas.

SLEEVING PIPE

Select the product pipe material according to the type of product indicated on the plans. The product pipe must comply with all applicable CDOT specification sections and ASTM standards depending on the purpose and material of the product pipe. Join the pipe sections so that the joined pipe sections are installable using HDD. Ensure that the joined product pipes have adequate strength and flexibility to withstand the installation stresses, overburden pressures, and operating pressures without compromising the structural stability of the pipe wall. Ensure that the product pipe meets the bend radius required for the proposed installation. Join the pipe sections so that the inner surfaces are flush and even.

The following material standards are the minimum in place standards.

Material Standards for HDD Installation		
Material Type	Non-Pressure	Pressure
Polyethylene (PE)	ASTM D 2447	ASTM 2513 ASTM D 2447
High Density Polyethylene (HDPE)	ASTM D 2447 ASTM D 3350 ASTM F714	ASTM D 2447 ASTM D 3350 ASTM F714 ASTM 2513
Polyvinyl-Chloride (PVC)	ASTM F 789	ASTM D1785 ASTM D2241
Steel	ASTM A139 Grade B ⁽¹⁾	AWWA C200 API 2B ⁽²⁾

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REVISION OF SECTION 613 DIRECTIONAL BORING

- (1) No hydrostatic test required
- (2) Dimensional tolerances only

Detection Wire: Electronic detection material for non-conductive piping products. Select tracer wire designed for HDD to conductively locate underground utility lines according to ASTM D- 1248. Use either a continuous green sheathed solid conductor copper wire line (minimum #12 AWG for external placement) or a coated conductive tape. Select a minimum 12-gauge copper clad steel wire and able to withstand the installation tension along the entire length of the line.

CONSTRUCTION REQUIREMENTS

INSTALLATION

- A. General: The Contractor shall install the section of the sleeve(s) by the horizontally drilled or bored, directionally controlled method of construction. This method shall consist of the drilling of a pilot hole within the designed tolerances for radius requirements, followed by enlargement of the hole to accommodate the product line.
- B. The Contractor shall protect the bore pits at all times during construction, including any additional protection for the traveling public; and this shall be included in the work and not paid for separately.
- C. Instrumentation: The Contractor will at all times provide and maintain instrumentation which will accurately locate the pilot hole position relative to ground surface. Drill fluid flow rate and pressure must also be monitored. The Contractor shall maintain and provide to the Project Engineer, upon request, access to the data generated by the downhole survey tools.
- D. The plans suggest utilizing a single bore estimated to be a 30-inch diameter bore with a 24-inch diameter sleeve and a 24-inch diameter bore with an 18-inch diameter sleeve. However, if the contractor elects to use side by side directional bore of two or more bores and sleeves, they shall be included in the Contractor's lump sum price for directional bore.
- E. Grouting: The Contractor shall grout the void between the outside wall of pipe and bore in accordance with details shown in the plans and Revision of Section 619 Contact Grouting.
- F. Tolerances:
 - a. Sleeve(s) installed by horizontal directional drilling or boring must be located as shown on the plans. The Contractor shall employ experienced personnel to operate the directional drilling or boring equipment personnel to operate the direction drilling or boring equipment and the monitoring and steering equipment. At the completion of the pilot hole, the Contractor shall provide the Project Engineer with the coordinates of the pilot hole as specified.
 - b. A smoothly drilled pilot hole shall follow the design centerline of the sleeve(s) profile and alignment described on the plans.
 - c. The pilot hole shall penetrate the ground surface at the approximate location shown on the plans.
 - d. The course of the pilot hole must stay within the given right-of-way at all points along the drilled route.

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REVISION OF SECTION 613

DIRECTIONAL BORING

- e. The Contractor shall have accurate working gauges, which register tensile force being used to pull the pipeline back through the reamed borehole. It is the Contractor's responsibility to prepare the reamed out hole such that pulling back operations do not exceed the tensile strength of the sleeve(s). The Contractor shall provide estimated calculations for the pulling loads and allowable loads before pull back operations begin. If during the sleeve(s) pulling process this force reaches 75% of the allowable load for the sleeve(s), the Project Engineer must be notified immediately. Logs must be kept intact referencing all forces exerted on the sleeve(s) during the project.
- f. The Contractor shall provide adequate supports along the stringing area to protect the sleeve(s) and allow free movement of the sleeve during pullback.
- g. During pullback operations, the Contractor shall monitor roller operation and use sidebooms if required to assist movement of the sleeve(s). Situations which could cause damage to the sleeve(s) material, shall be corrected immediately. Damaged sleeve(s) shall be repaired to the satisfaction of the Project Engineer or replaced by the Contractor before pulling operations resume.

DRILLING MUD AND CUTTINGS

- A. The horizontal directional drilling or boring operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to water or land areas involved during the construction process. The Contractor shall immediately contain and clean up any inadvertent returns.
- B. Disposal of drilling fluids shall be the responsibility of the Contractor and shall be conducted in compliance with all relative environmental regulations, easement and workspace agreements and permit requirements. All costs related to disposal shall be the responsibility of the Contractor.
- C. Transportation, makeup and Material Safety Data Sheets (MSDS) for drilling fluids shall be provided to the Project Engineer.
- D. Water supply is the Contractor's responsibility, whether purchased locally or hauled in.
- E. Drilling fluids must be free of all additives that will adversely effect the environment.

REAM AND PULL BACK

- A. Pre-reaming: Pre-reaming operations shall be conducted at the discretion of the horizontal directional drilling or boring Contractor. All provisions of this specification relating to simultaneous reaming and pulling back operations shall pertain to pre-reaming operations.
- B. Pulling Loads: The Contractor shall be responsible for determining safe pulling loads required for proper installation. Such loads shall be minimized as required to prevent failure of the sleeve(s) during installation.
- C. Pull Section Support: The pull section shall be supported as it proceeds during pull back so that it moves freely and the pipe material is not damaged.

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REVISION OF SECTION 613
DIRECTIONAL BORING

CLEANUP, REPAIRS AND RESTORATION

- A. The Contractor shall restore area around entry and exit pits as soon as work is completed. Fill to previous existing ground or finished grade elevation as applicable. Restore grade due to areas where settlement occurs due to subsidence prior to final acceptance of the work. Excavation and embankment shall be completed in accordance with the Section 203 of the Standard Specifications.

METHOD OF MEASUREMENT

Directional boring to complete the work will not be measured but will be paid for on a lump sum basis.

BASIS OF PAYMENT

The lump sum price for directional boring shall be full compensation to complete the work, which includes but is not limited to the following: labor, equipment, procurement, shoring, bore pit protection, sleeving pipe, contact grouting, and monitoring necessary to complete the work as shown on the plans.

Payment will be made under:

Pay Item

Pay Unit

Directional Boring

Lump Sum

REVISION OF SECTION 613 ELECTRICAL CONDUIT

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work includes furnishing and installing new High-Density Polyethylene (HDPE) and Polyvinyl Chloride (PVC) electrical conduit and fittings for use with fiber optic cable, electrical conductors, and communications cabling.

MATERIALS

All materials furnished, assembled, fabricated, or installed under this item shall be new, Underwriters Laboratories (UL) listed, corrosion resistant and National Electric Code (NEC) compliant. Materials shall be submitted to the Project Engineer for approval.

Electrical conduit shall be suitable for underground use and shall be Schedule 80 in the diameters, quantities and depths shown on the plans. Electrical conduit and fittings shall be UL listed.

HDPE conduit and fittings shall be certified by the manufacturer as meeting American National Standards Institute (ANSI) ANSI/UL 651A. PVC conduit and fittings shall be certified by the manufacturer as meeting ANSI/UL 651.

All HDPE conduit shall be low-friction, high-density conduit constructed of virgin high-density polyethylene resin. HDPE conduit shall be capable of being coiled on reels in continuous lengths, transported, stored outdoors, and subsequently used for installation, without affecting its properties or performance.

HDPE conduit used for fiber optic communications shall be orange and conduit for electrical conductors shall be red. If additional spare conduits are installed in a common trench, the additional conduits shall be blue and black with an orange stripe. PVC conduit shall be labeled to match HDPE colors.

Each conduit shall be equipped with a pull tape installed with or after all cabling for future use. The pull tape shall have a minimum tensile strength of 1800 pounds. The pull tape shall include a continuous 22 gauge tracer wire. Splices in the pull tape and tracer wire may occur inside manholes and pull boxes and shall not be permitted inside conduit. Pull tape shall be installed in conduits with electrical conductors carrying 50V or less.

The Contractor shall preform acceptance testing on all conduits installed within the ITS backbone trench whether Contractor-supplied or Zayo-supplied by pulling a mandrel through the conduit while concurrently installing the pull tape to ensure a clear path through the entire length of the conduit.

A minimum 12 gauge tracer wire shall be included in at least one conduit within all conduit banks. The tracer wire shall be orange in color. In conduit banks with multiple conduits, the 12 gauge tracer wire and pull tape shall be installed in the same conduit with the fiber optic cable.

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REVISION OF SECTION 613

ELECTRICAL CONDUIT

A 2-inch wide warning tape shall be provided in each conduit trench. The warning tape and lettering shall be chemically inert, resistant to acid and alkali, designed for installation underground, and be constructed of polyethylene plastic. The warning tape shall have a minimum nominal thickness of 4 mil. The warning tape shall be red with the repeated phrase "CAUTION ELECTRIC LINE BURIED BELOW" if any conduit in the trench is designated for use with electrical conductors. The warning tape shall be orange with the repeated phrase "CAUTION FIBER OPTIC CABLE BURIED BELOW" for all other trenches. The text shall be black printed in a single line.

CONSTRUCTION REQUIREMENTS

All conduit and fittings installation shall conform to the NEC.

Electrical Conduit (Bored) shall be HDPE and installed using a trenchless technology such as directional boring.

Prior to construction, the Contractor shall submit a trenching and boring plan to the Engineer for approval. The plan shall show the limits of the planned work areas and the areas of anticipated disturbance. All disturbances outside the planned work areas created by Contractor's operations shall be restored to their original condition at the Contractor's expense.

During construction operations, the contractor shall maintain boring logs that include the depth at specific distances along the bore. Boring logs shall be submitted on a weekly basis.

All trenches shall be backfilled by the end of each shift. Material from trenching operations shall be placed in a location that will not cause damage or obstruction to vehicular or pedestrian traffic or interfere with surface drainage.

The Contractor shall be responsible for damage due to over-excavating a trench and heaving damage to the existing asphalt and concrete mat, caused by equipment directly and by dislodging rocks or boulders. All damage from over-excavation and heaving shall be repaired at the Contractor's expense. The Contractor shall bear the cost of backfilling all over-excavated areas with the appropriate backfill material approved by the Engineer.

The Contractor shall restore all surface materials to their original condition or better, including but not limited to pavement, sidewalks, sprinkler systems, landscaping, shrubs, sod, and native vegetation that is disturbed by the conduit installation operation. All restoration shall be included in the cost of the conduit.

The Contractor shall use corrosion resistant splice couplings that comply with the NEC. All associated work to splice the conduit shall be included in the cost of the item. The coupling technology used to connect conduit ends shall require no special tools and form a watertight, airtight seal. The breaking force between segments shall exceed 250 pounds. Conduit splices shall be kept to a minimum and all such locations shall be approved and inspected by the Engineer and the authority having jurisdiction. Additional pull boxes shall not be substituted for conduit splices.

When conduit is trenched or plowed, warning tape shall be installed a minimum of 12 inches directly above the conduit and a minimum 12 inches below final grade.

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REVISION OF SECTION 613 ELECTRICAL CONDUIT

Conduits not containing cable shall be plugged with a plug that is watertight, removable, mechanical and equipped with a connection to secure a pull rope.

Conduits containing cable shall be plugged with durable and reusable split type plugs, fabricated without corrosion resistant parts. The plugs shall allow easy removal and reinstallation around in-place cables. Split type plugs shall provide a watertight and airtight seal of at least 22 pounds per square inch. They shall be installable by hand without using tools and without damaging the cable. All plugs shall be correctly sized to fit the conduit being plugged.

Conduit shall be plugged at all termination points including but not limited to pull boxes, manholes, controller cabinets, structures, poles, and node buildings.

All open conduit ends shall be plugged at the end of each shift with an approved plug.

All conduits shall terminate between two inches and four inches from the bottom or sides of pull boxes and manholes.

All conduit runs containing fiber optic cable shall have a limited number of bends. The sum of the individual bends on a single conduit run between any two pull points shall not exceed 270 degrees. No individual bend shall exceed 90 degrees. All conduit bends shall have a minimum radius of 24 inches. HDPE conduit minimum bending radius shall conform to Table 354.24 in the NEC.

New conduits may be installed into existing pull boxes, manholes and cabinet bases, and the Contractor shall carefully excavate around the existing facility and install the new conduit as shown on the plans. The Contractor shall not damage the existing facility or its contents. If the existing conduit, pull box, lid and concrete collars are damaged during conduit installation, the Contractor shall restore the damaged item or section to current CDOT requirements at no additional cost to the project. For locations where conduit is installed into existing pull boxes, manholes, and cabinet bases that are located in asphalt, concrete, or slope pavement, patching with asphalt, concrete or slope pavement will be required and shall be included in the cost of the conduit. The Contractor shall reseal all new conduit entries into an existing manhole with grout.

Conduit shall always enter a pull box, manhole, cabinet base and all other structure types from the direction of the run only.

A conduit bell end shall be installed on each conduit in pull boxes, manholes, cabinets, and pole bases. All conduits ends shall be free from sharp edges and burrs.

Conduits stubbing up through pole foundations shall be installed within 4 inches of the center of the caisson.

The Contractor shall refer to ITS As-Built Documentation and GPS specifications for documentation requirements.

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REVISION OF SECTION 613
ELECTRICAL CONDUIT

METHOD OF MEASUREMENT

Electrical Conduit will be measured by the actual linear foot of conduit installed and accepted.

Conduit shall also include all groundwork, lubricants, anchors, bands, skids, sweeps, pull rope, pull tape, copper tracer wire, adaptors, fittings, splice couplings, conduit plugs, foam sealant, installation equipment, mounting brackets and hardware, structure anchors, adhesives, labor and all other items necessary to complete the work.

BASIS OF PAYMENT

Electrical Conduit unit prices shall be full compensation for the work shown on the Plans and described above.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
2 Inch Electrical Conduit	Linear Foot
2 Inch Electrical Conduit (Bored)	Linear Foot
3 Inch Electrical Conduit	Linear Foot
3 Inch Electrical Conduit (Bored)	Linear Foot

REVISION OF SECTION 613

PULL BOXES

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Contractor shall furnish and install fiberglass reinforced polymer concrete pull boxes and concrete aprons at locations shown on the plans.

MATERIALS

Pull boxes shall be verified by a 3rd Party Nationally Recognized Independent Testing Laboratory as meeting all test provisions of American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77, 2013 Specification for Underground Enclosure Integrity, Tier 22 rating. Pull boxes shall be Underwriters Laboratories (UL) listed. Certification documents shall be submitted with material submittals.

Each pull box shall have an Electrical Marker System (EMS) locator disk manufactured into the lid for communication line locating. The locator disk shall be compatible with a CDOT cable locator utilize the APWA uniform color code standard for visual reference if disk is observable on the exterior of the lid. The locator disk shall utilize the proper locate frequency for the pull box type.

Pull boxes 24 inches by 36 inches and larger shall have removable split lids with a removable metal center support beam. Lid segment weight shall not exceed 120 pounds.

Pull box removable lids shall be provided with a skid-resistant surface and have the words "CDOT COMM", "EMS MARKER EMBEDDED IN COVER" and the tier level rating cast into the surface. Pull boxes containing electrical conductors shall have the words "CDOT ELEC", "EMS MARKER EMBEDDED IN COVER" and the tier level rating cast into the surface. Painting of words shall not be accepted. The cover shall be attached to the pull box body by means of 3/8 inch x 7 inch lag thread hex head stainless steel bolts.

One piece lids shall have a minimum of two lift slots per lid, while split lids shall have a minimum of one lift slot per lid. Test point locations shall be integrated into the pull box lids to provide for attachment of test leads of various connector types for underground conduit tracing. The minimum number of test point locations shall equal the number of conduit banks entering the pull box, up to a maximum of five test points. Pull boxes with split lids shall have the test points on one split lid section only. Pull box lids shall be furnished with 3/8 inch x 1/16 inch deep recesses at locations adjoining each test point for the application of direction arrow symbols indicating the direction of underground conduit exiting the pull box. Recesses shall be thoroughly cleaned with alcohol prior to applying arrow symbols.

Wire mesh shall be installed in a manor to completely surround the box as shown on the Plans. The wire mesh shall meet the material standard ANSI/American Society of Testing and Materials (ANSI/ASTM) A555-79 and made of T-304 stainless steel, 0.025 inch wire diameter minimum and shall have a spacing of 4 mesh per inch.

Pull boxes installed in dirt or landscaped areas shall have a Class B concrete apron or a pre-cast polymer concrete apron. Class B concrete shall be in accordance with Section 601.

Pull Boxes installed on slopes 5:1 or less shall be installed with the grade of the slope. Pull Boxes installed on slopes greater than 5:1 shall include a 2 foot leveled area surrounding the apron.

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REVISION OF SECTION 613

PULL BOXES

The pre-cast polymer concrete apron shall be skid-resistant non-metallic, non-conductive, and UV resistant, and shall include two lifting slots for placement in the field. The pre-cast polymer concrete apron shall be similar nominal dimensions of the concrete apron shown on the Plans. The gap between the pre-cast polymer concrete apron and outer wall of the pull box shall be a maximum of ¼ inch.

A 5/8 inch by 8 foot long copper coated steel ground rod is required at ITS device locations.

Pull Box (Surface Mounted) shall be aluminum type with a hinged front door and have at least a National Electrical Manufacturers Association (NEMA) 3R rating. Pull Box (Surface Mounted) shall be Underwriters Laboratories (UL) listed. Certification documents shall be submitted with material submittals. The hinged door shall be provided with both a weather tight seal and an aluminum hasp. A keyed lock shall be provided. Surface mounted pull boxes shall be of the dimensions shown on the plans.

CONSTRUCTION REQUIREMENTS

A minimum of 12 inches of ¾ inch granite-gravel shall be installed as a base for the pull box. The granite-gravel shall be free of dirt and debris and spread evenly to facilitate a level base for the pull box. The Contractor shall ensure that sufficient compacting is met prior to the installation of granite-gravel to alleviate future settling.

Wire mesh shall be installed in to completely surround the box as shown on the plans. The wire mesh shall be gently cut to allow only the entrance of the conduit through at the bottom of the box. All openings cut in the wire mesh that are larger than the diameter of the conduit shall be covered with additional wire mesh in a manner to completely surround the pull box with wire mesh.

Tracer wire shall be attached to the trace test points on the underside of the pull box lid. Each trace wire shall be attached to an individual trace point, no two wires shall be attached to the same point. The Contractor shall coil an additional 6 feet of tracer wire inside the pull box to ensure that the tracer wire will not disconnect from test points when the lids are removed.

Pull boxes shall be installed in areas that are easily accessible by maintenance personnel. The slope around the pull box in all directions shall not be steeper than 1:6.

At pull boxes installed in dirt and landscaped areas, the Contractor shall install a concrete apron or a pre-cast polymer concrete apron around the edges of the pull box. The dimensions of the concrete apron shall be as shown on Plans. Pull boxes shall not be installed above the grade of the apron. The concrete apron shall have a 1 percent slope away from the top of pull box to allow for drainage.

Pre-cast concrete aprons shall be installed per manufacturer's recommendations.

Pull Box (Surface Mounted) shall be mounted on or embedded into hard surfaces such as bridge decks, concrete barriers, retaining walls, or buildings, as shown on the plans. Surface mounted pull boxes shall be attached using 3/8 inch epoxy anchors or other methods approved by the Engineer. Surface mounted pull boxes shall not be used for ground installations. Pull tape and tracer wire shall be installed in surface mounted pull boxes.

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REVISION OF SECTION 613

PULL BOXES

METHOD OF MEASUREMENT

Pull Boxes will be measured by the actual number installed and accepted, and will include base, lid, lift slots, support beam, integrated location disk, integrated test points, arrow symbols, excavation, backfill, concrete apron, wire mesh, ground rod, and 3/4 inch granite-gravel. Pull Boxes shall also include the removal and patching of pavement, sidewalks, curb and gutters and their replacement in kind to match existing grade.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Type Two Pull Box	Each
Type Three Pull Box	Each
Type Four Pull Box	Each
Type Five Pull Box	Each

Concrete will not be measured and paid for separately but shall be included in the cost of the pull box.

**REVISION OF SECTION 614
STEEL SIGN POSTS (CITY ROW)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

MATERIALS

Section 614.02 shall include the following:

The Contractor shall furnish and install steel sign posts within the City of Littleton right-of-way that is square tubing. Tubing shall be corner welded galvanized steel conforming to ATSM specification A-653. The tube size can be 1 ¾ x 1 ¾ inch at 12 gauge or 2 x 2 inches at 14 gauge as approved by the City of Littleton and Project Engineer with a length tolerance of +/- ¼ inch.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Steel Sign Post (2x2 Inch Tubing)	Linear Foot

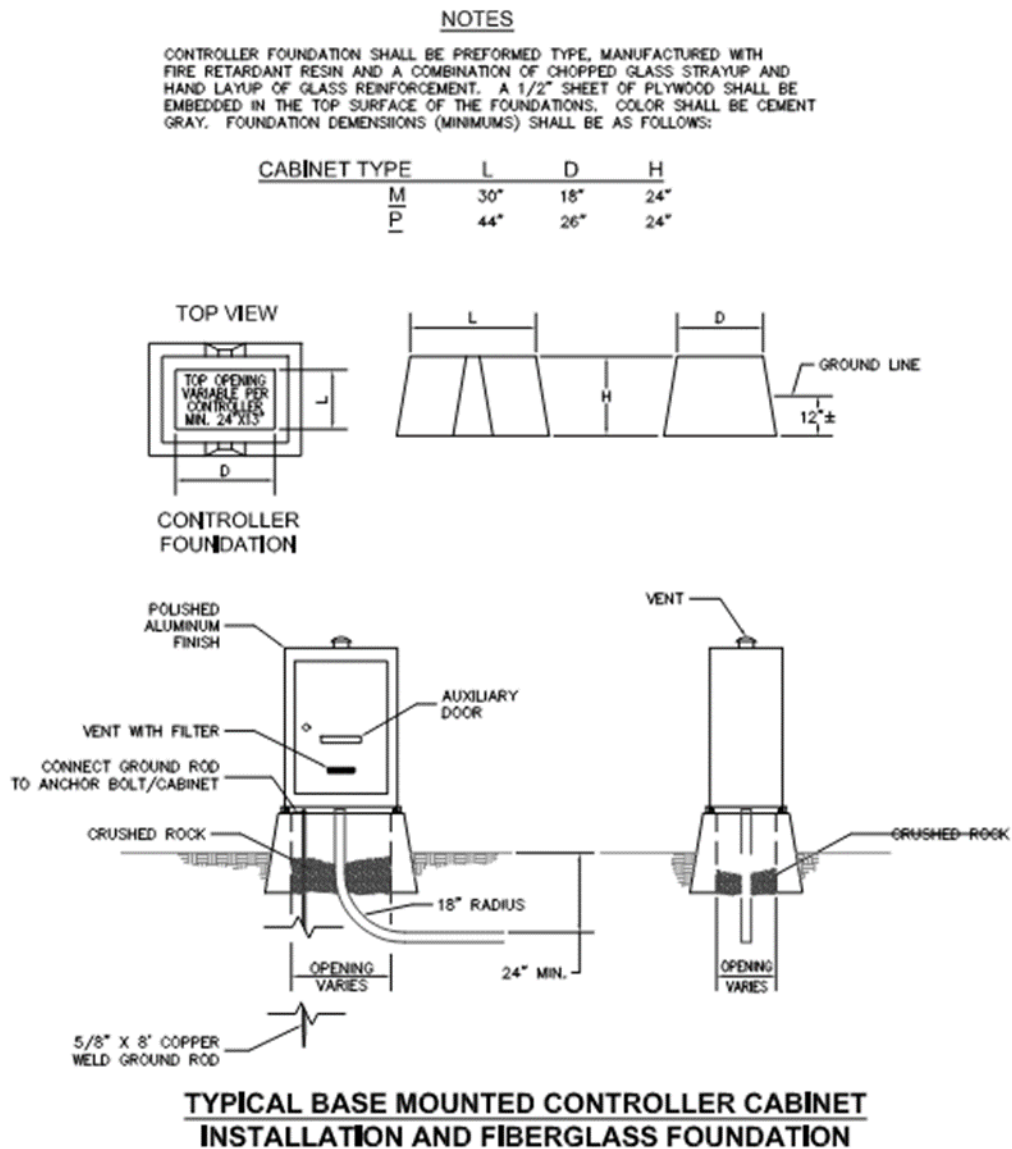
REVISION OF SECTION 614 TRAFFIC SIGNAL CABINET BASE

Section 614 of the Standard Specifications is hereby revised for this project as follows.

Subsection 614.01 shall include the following:

The Contractor shall furnish and install the base that will fit the City of Littleton's P-size traffic signal controller cabinet at the locations as shown on the plans.

Dimensions of the cabinet base are as shown in the following drawing:



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REVISION OF SECTION 614
TRAFFIC SIGNAL CABINET BASE

Subsection 614.10 shall include the following:

Prior to starting cabinet base installation, Contractor shall obtain field verification of the location of the cabinet from the Engineer.

Cabinet base installation shall include all labor and materials to completely install a new P- size cabinet base as directed in the plans. The item shall include all excavation, conduit installation and modification work, backfill and restoration of adjacent surface area.

Subsection 614.13 shall include the following:

Installation of the traffic signal cabinet base shall not be measured and paid for separately but shall be included in the cost of the item Traffic Signal Controller Cabinet.

REVISION OF SECTION 614
TRAFFIC SIGNAL CONFLICT MONITOR, CONTROLLER, AND CABINET

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.01 shall include the following:

This work shall consist of furnishing, assembling, programming, and installing a completed Traffic Signal Conflict Monitor, Controller, and Cabinet assembly. The Cabinet assembly shall be assembled in accordance with the City of Littleton Standards and Specifications, and the completed Traffic Signal Controller and Cabinet shall include but not limited to the traffic signal controller, malfunction management unit (MMU), vehicle detector amplifiers, other ancillary hardware, and traffic signal cabinet base as per these project specifications. The Contractor shall install the completed Traffic Signal Controller and Cabinet assembly at the locations as shown in the plans.

The Contractor shall provide and install as coordinated with the City of Littleton and the Project Engineer:

- Flir Acyclica DA-400 Travel Time Monitor
- Econolite TS2-1 P-44 BM 16 Vert Cabinet
- Econolite MMU2-16LE SmartMonitor
- Econolite Cobalt C-Series TS1 Controller
- All auxiliary hardware required to provide a complete system including drawer assemblies, load switches, transfer relays, termination panels, input/output files in accordance with City of Littleton Standards and Specifications

The Traffic Signal Controller Cabinet shall be in accordance with BABA requirements and the Contractor shall provide the BABA required documentation.

Subsection 614.09 shall include the following:

The Contractor shall assemble the traffic signal controller, cabinet, and other auxiliary hardware in accordance with the City of Littleton Traffic Operations criteria. The City will program the traffic signal controller with the City developed traffic signal timing. All traffic signal timing (controller programming) shall be bench tested by the Contractor with a minimum of 72-hours burn time to verify successful operation prior to installation. The Contractor shall coordinate all testing and installation procedures with the City of Littleton's Traffic Analyst. The Contractor shall contact Tim Weaver at 303-795-3834 for all testing and installation requirements.

The controller shall be installed in accordance with the details shown in the plans and in accordance with manufacturer's recommendations.

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REVISION OF SECTION 614

TRAFFIC SIGNAL CONFLICT MONITOR, CONTROLLER, AND CABINET

Subsection 614.10 shall include the following:

The Contractor shall demonstrate successful traffic signal operations at all new controller and cabinet locations to the satisfaction of the Engineer or Engineer's designee prior to acceptance of this item. The Contractor shall contact the Engineer or Engineer's designee at least 15 working days before turning on signal. Work shall include all required programming of controllers and establishing or re-establishing all required wiring connections. Phasing and timing information at each location shall be furnished to the Contractor by the City of Littleton.

All new wiring shall conform to City of Littleton and International Municipal Signal Association (IMSA) specifications.

Subsection 614.13 shall include the following:

The unit price for the installation of traffic signal controller and cabinet shall include all labor, materials, ancillary hardware, traffic signal cabinet base, wiring and wiring re-connection (including Xcel Energy power feed) required to provide and install a complete system and successful operation of the item.

Subsection 614.14 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Conflict Monitor	Each
Traffic Signal Controller Cabinet	Each
Traffic Signal Controller (Solid State) (Full Actuated) (8-Phase)	Each

**REVISION OF SECTION 614
CLOSED CIRCUIT TELEVISION CAMERA**

Section 614 of the Standard Specifications is hereby revised as follows:

Subsection 614.01 shall include the following:

This work consists of furnishing and installing a closed-circuit television camera at the locations shown on the plans.

Subsection 614.08 shall include the following:

(n) Closed Circuit Television Camera (Traffic Surveillance)

Closed circuit television camera shall be the Bosch MIC 7100i ITS PTZ Starlight Camera

Subsection 614.10 shall include the following:

The closed-circuit television camera shall be installed in accordance with the details shown in the plans and in accordance with manufacturer's recommendations. The Contractor shall make arrangements for a qualified manufacturer's representative to be on-site to ensure proper installation.

Subsection 614.13 shall include the following:

Closed circuit television cameras will be measured by the actual number of closed-circuit television cameras that are installed and accepted. All accessories and associated labor shall not be measured separately, but shall be included in the cost of the Closed Circuit Television Camera (Traffic Surveillance) item.

Subsection 614.14 shall include the following:

Payment will be full compensation for all labor, materials, accessories, and equipment required to complete the work.

Pay Item

Pay Unit

Closed Circuit Television Camera (Traffic Surveillance)

Each

Payment will be full compensation for all labor, materials, accessories, and equipment required to complete the work.

**REVISION OF SECTION 614
INTERSECTION DETECTION SYSTEM**

Section 614 of the Standard Specifications is hereby revised as follows:

Subsection 614.01 shall include the following:

This work consists of furnishing and installing An intersection detection system at the locations shown on the plans.

Subsection 614.08 shall include the following:

(o) Intersection Detection System (Gridsmart Cameras)

Intersection detection system shall be the Gridsmart Bell Camera, GS3 processor with performance plus module. The intersection detection system shall utilize vision-based tracking with a fisheye lens, provide virtual pan-tilt-zoom, and track vehicles, pedestrians, and bicycles, into and out of the intersection while providing turn movement counts.

Subsection 614.10 shall include the following:

The intersection detection system shall be installed in accordance with the details shown in the plans and in accordance with manufacturer's recommendations. The system shall be installed to provide complete intersection coverage and include all intersection approach and departure legs and crosswalks. The Contractor shall make arrangements for a qualified manufacturer's representative to be on-site to ensure proper installation.

Subsection 614.13 shall include the following:

Intersection detection system will be measured by the actual number of Intersection detection systems that are installed and accepted. All accessories and associated labor shall not be measured separately, but shall be included in the cost of the Intersection Detection System (Gridsmart Cameras) item.

Subsection 614.14 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Intersection Detection System (Gridsmart Cameras)	Each

Payment will be full compensation for all labor, materials, accessories, and equipment required to complete the work.

**REVISION OF SECTION 614
UNINTERRUPTED POWER SUPPLY**

Section 614 of the Standard Specifications is hereby revised as follows:

Subsection 614.01 shall include the following:

This work consists of furnishing and installing an uninterrupted power supply (UPS) at the locations shown on the plans.

Subsection 614.08 shall include the following:

(p) Uninterrupted Power Supply

Uninterrupted power supply shall include Clary SP-1250LX PIM or approved equal, Clary SPD-302C bypass switch or approved equal

The Traffic UPS shall consist of three major components, the Electronics Module, the Power Interface Module (PIM), and the Battery System. The user shall have the capability to program the intersection run time based on time and/or percentage of battery power before going into a flash mode of operation.

The Traffic UPS shall provide two modes of operation:. Standby; will introduce battery power upon loss of utility power, and On – Line; shall flow 100% percent of the load through the inverter 100% percent of the time. The mode of operation shall be user selectable.

Input Voltage:	75 Volts Alternating Current (VAC) to 155 VAC
Input Frequency:	60 hertz (Hz) (+/- 5%)
Output Voltage:	120 VAC (+/- 3%)
Output Frequency:	60 Hz (+/- 5%)

The user shall have the capability to program the intersection run time based on time and/or percentage of battery power before going into a flash mode of operation.

Up to the maximum rating, the Traffic UPS shall be capable of running any combination of signal heads, whether Incandescent, Light Emitting Diode (LED), or Neon, by any manufacturer, regardless of power factor, without overdriving the poorer power factor LED heads which may cause early degradation, low luminosity, or early signal failure.

Upon loss of utility power, the Traffic UPS shall insert battery power into the system via a supplied PIM. In case of UPS failure and/or battery depletion, the PIM shall ensure that the UPS will drop out and, upon return of utility power; the traffic control system will default to normal operating mode.

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REVISION OF SECTION 614
UNINTERRUPTED POWER SUPPLY

The PIM shall enable removal and replacement of the Traffic UPS without shutting down the traffic control system (i.e. “hot swap” capability). Connectors shall be equipped with a “safety interlock” feature.

The battery system shall be comprised of extreme temperature, deep cycle, Absorbed Glass Mat/ Valve Regulated Lead Acid (AGM/VRLA) batteries.

Batteries shall be certified to operate from -40°C to $+74^{\circ}\text{C}$.

The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays or brackets appropriate for the cabinet into which they will be installed.

The interconnect cable shall be protected with abrasion-resistant nylon sheathing. The interconnect cable shall connect to the base module via a quick-release circular connector.

For purposes of safety and proper operation, the circular battery connector shall have interlocking pins to prevent turn-on if batteries are not connected, and to shut off the UPS should the batteries be disconnected.

The battery system shall be certified and field proven to meet or exceed National Electrical Manufacturers Association (NEMA) temperature standards from -40°C to $+74^{\circ}\text{C}$.

Subsection 614.10 shall include the following:

The uninterrupted power supply shall be installed in accordance with the details shown in the plans and in accordance with manufacturer’s recommendations.

Subsection 614.13 shall include the following:

Uninterrupted power supply will be measured by the actual number that are installed and accepted. All accessories and associated labor shall not be measured separately and shall be included in the cost of the uninterrupted power supply item.

Subsection 614.14 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Uninterrupted Power Supply	Each

Payment will be full compensation for all labor, materials, accessories, and equipment required to complete the work.

REVISION OF SECTION 614

FIBER OPTIC TERMINATION PANEL

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing fiber optic termination panels in communication cabinets for single mode fiber optic cables.

MATERIALS

All termination panels shall be manufactured using aluminum and shall be finished with powder coat. The termination panels shall accommodate lateral fiber optic cables as shown on the plans. All termination panels shall be equipped with six port Straight Tip (ST) type bulkheads and be compliant with the Telcordia Technologies Generic Requirement (GR) GR-326 *Generic Requirements for Single Mode Optical Connectors and Jumper Assemblies, Latest Issue*. The manufacturer shall perform acceptance testing for insertion loss and return loss with the test certification provided with each patch panel.

All termination panels shall have a labeling scheme that complies with details as shown on the plans. All termination panels shall be compatible with the fiber optic cable being terminated.

The 6-port termination panel shall be a 6-port bulkhead for an existing termination panel. The Contractor shall provide bulkheads that are compatible with the existing fiber termination panel.

12 port termination panels for lateral fiber optic cables shall be provided to accommodate up to 24 ports. 12 port termination panels shall be compatible with a 19-inch equipment rack. The panels shall be provided with two six port ST type bulkheads. The panel shall be provided with covers for the remaining spaces. The termination panel shall have a slide out interior.

Bulkheads in all termination panels shall be metal. Plastic bulkheads will not be accepted.

CONSTRUCTION REQUIREMENTS

The Contractor shall install 6 port termination panel bulkheads in existing termination panels at locations called out in the plans.

12 port termination panels shall be installed within communications cabinets and shall be mounted in locations that allow for ease of access and shall not interfere with maintenance of the internal equipment. 12 port termination panels shall be installed in communications cabinet 19-inch equipment racks.

Fiber terminations shall be as shown on the plans. The Contractor shall field terminate ST type bulkhead connectors on the ends of the lateral fiber cable strands and install them on the back side of the termination panel. The terminated connectors shall be nickel-plated with a ceramic ferrule and shall be polished with a physical contact finish. Buffer tube fan out kits shall be paid for in accordance with the Revision of Section 614 – Buffer Tube Fan Out Kit.

Instead of field terminating and polishing lateral fiber optic cables, the Contractor may use a single mode fiber pigtail that is factory terminated on six port ST type bulkhead and fusion splice the pigtail to the lateral fiber optic cable. If this method is used, the termination panel shall be sized and configured to accommodate splicing of the pigtail.

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REVISION OF SECTION 614
FIBER OPTIC TERMINATION PANEL

The Contractor shall use proper strain relief inside the termination panel for the fiber cable and fiber fan out strands per the manufacturer's recommendations. The use of tape to secure the individual fanned out strands to the bottom of the termination panel shall not be allowed. The Contractor shall allow enough slack in the terminated fiber to allow for opening and closing the termination panel without disturbing the terminated fiber.

All hardware shall be installed in accordance with manufacturer's recommendations.

METHOD OF MEASUREMENT

Fiber Optic Termination Panels will be measured by the actual number of fiber optic termination panels installed and accepted and shall include all bulkheads, field terminations/splicing, covers for empty bulkhead entries, labeling panels and all materials, hardware, labor and equipment necessary to complete the work.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Fiber Optic Termination Panel (12 Fiber)	Each

REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing lateral single mode fiber optic cables as indicated on the project plans.

MATERIALS

All fiber optic cables shall be suitable for outdoor conduit installation.

All fiber optic cable shall have compatible characteristics with other proposed and existing fiber optic cables. All optical cables furnished on this project shall meet the following fiber optic industry standards:

- (1) International Telecommunications Union – Telecommunications Standardization Sector - Recommendation G.652.D
- (2) Telecommunications Industry Association (TIA) - 598-D Optical Fiber Cable Color Coding
- (3) International Organization for Standardization (ISO) - 9001
- (4) Rural Utilities Service (RUS)- Specification for filled fiber optic cables

All cables shall be new and unused non-armored outdoor cable consisting of non-dispersion shifted, low water peak single-mode fiber strands free of surface imperfections and inclusions. Each single mode fiber strand shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be of matched clad design.

(a) Fiber Strands

Fiber strands shall meet the following minimum characteristics:

- (1) Typical core diameter of $9.0\mu\text{m} \pm 1\mu\text{m}$
- (2) Cladding Diameter of $125\mu\text{m} \pm 1\mu\text{m}$
- (3) Core concentricity error: $\leq 0.6\mu\text{m}$
- (4) Cladding Noncircularity: $\leq 1.0\%$
- (5) Coating Diameter (Colored): $245 \pm 5\mu\text{m}$
- (6) Maximum Attenuation (Loose Tube): 0.35 dB/km at 1310 nm wavelength and 0.22 dB/km at 1550 nm wavelength
- (7) Mode-Field Diameter: $9.20 \pm 0.30\mu\text{m}$ at 1310 nm wavelength and $10.40 \pm 0.50\mu\text{m}$ at 1550 nm wavelength
- (8) Attenuation at the Water Peak: 0.32 to 0.34 dB/km at $1383 \pm 3\text{ nm}$ wavelength
- (9) Cutoff Wavelength: $\leq 1260\text{ nm}$
- (10) Zero Dispersion Wavelength: 1300 nm to 1324 nm
- (11) Zero Dispersion Slope: $\leq 0.092\text{ ps} / (\text{nm}^2 * \text{km})$
- (12) Polarization Mode Dispersion: $\leq 0.06\text{ ps} / \sqrt{\text{km}}$
- (13) Maximum Polarization Mode Dispersion at 0.01% distribution (PMDq): $0.20\text{ ps}/\sqrt{\text{km}}$
- (14) Maximum Fiber Dispersion: $\leq 18\text{ ps}/(\text{nm} * \text{km})$ at 1550 nm.
- (15) Fiber Curl: $\geq 4.0\text{ m}$
- (16) Proof Tensile Test: 100 kpsi ($0.69\text{ GN}/\text{m}^2$)

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

The fibers shall not adhere to the inside of the buffer tube.

The coating shall be a dual layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be capable of being mechanically stripped with a force of 0.3 to 2.0 lbf.

Each single mode fiber strand shall be color coded with distinct and recognizable colors in accordance with the TIA-598-D *Optical Fiber Cable Color Coding*.

(b) Buffer Tubes

Each buffer tube shall contain 12 fiber strands.

Optical fibers shall be placed inside a loose buffer tube.

Each buffer tube shall be color coded with distinct and recognizable colors in accordance with TIA-598-D

If fillers are required, they shall be placed in the inner layer of the fiber optic cable. The color sequences of the buffer tubes shall begin from the inside layer of and progress outward.

For backbone fiber cables containing more than 12 buffer tubes, the buffer tube stripe shall be inlaid in the buffer tube material by means of co-extrusion.

In buffer tubes containing multiple fibers, the coloring shall be stable during temperature cycling and shall not be subjected to fading or smearing onto each other or into the buffer tube gel filling material if the fiber cable is supplied with gel filling for water blocking. Colorings shall not cause fibers to stick together.

Each buffer tube shall contain water blocking swellable yarns to prevent water from entering the individual buffer tubes. Swellable water blocking material shall be non-nutritive to fungus, electrically non-conductive and homogeneous. It shall be free from dirt and foreign matter and not require cleaning prior to splicing and placement into the splice closure tray. All fiber strands shall be thoroughly cleaned prior to fiber splicing. All water blocking material shall be uniformly distributed throughout the buffer tubes.

Buffer tubes shall be stranded around a central member of the cable using a reverse oscillation stranding process.

The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of Code of Federal Regulations (CFR) 7 CFR 1755.900 – *RUS Specification for filled fiber optic cables*.

(c) Fiber Cable

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed and shall not be placed to interrupt the consecutive positioning of the buffer tubes. Fillers shall nominally match the outer diameter of fiber filled buffer tubes.

The central anti-buckling member of the cable shall consist of all dielectric, glass reinforced plastic (GRP) rod.

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REVISION OF SECTION 614 FIBER OPTIC CABLE (SINGLE MODE)

For single layer cables, a water swellable, (blocking) tape shall be applied longitudinally around the outside of the buffer tubes and fillers. The tape shall be held in place by a single polyester binder yarn. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. Water blocking material shall be applied uniformly throughout the fiber cable to inhibit the ingress of water into the cable. Gel filled water-blocking compound shall not be allowed in the cable core interstices of the fiber optic cables.

When the fiber cable is provided with dual layer buffer tubes, both the inner and outer layer shall be provided with water swellable tape.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

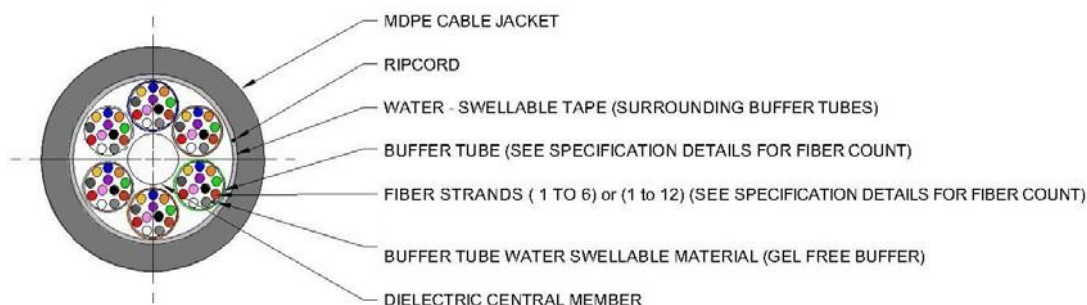
The cable shall contain at least one ripcord under the sheath for easy sheath removal.

Outer cable jacket shall have a consistent thickness throughout the entire cable length and shall be sheathed with medium density polyethylene (MDPE). Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class, Category 4, and Grades J4, E7 and E8 and shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The cable jacket shall be free of holes, splits and blisters and be of a consistent thickness.

Cable jackets shall be marked with the manufacturer's name, sequential foot markings, fiber type and count, month and year of manufacture and a telecommunication handset symbol, as required by Section 350G of the National Electrical Safety Code (NESC). The actual length of the cable shall be within 0 to 1 percent of the length markings. The marking shall be in contrasting color to the cable jacket. The height of the marking shall be easily readable.

The Contractor shall submit to the Project Engineer a detailed fiber optic cable specification sheet from the manufacturer for approval. The specification sheet shall be highlighted describing the water blocking material used for both the cable interstices and buffer tubes. Failure to fully describe the type of water blocking material shall result in the submittal being rejected and resubmitted with all highlighted information.



Specification Detail 1

Typical Cross Section of Fiber Optic Cable to Be Provided Per This Specification

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

(d) Environmental Parameters

The following minimum environmental parameters shall be met:

- (1) Shipping, storage and operating temperature range of the cable shall be; -40°F to +158°F (-40°C to +70°C)
- (2) Operating temperature range of the cable shall be; -40°F to 158°F (-40°C to +70°C)
- (3) Installation temperature range of the cable shall be; -22°F to +140°F (-30°C to +60°C)

(e) Quality Assurance

The following minimum quality assurance requirements shall be met:

- (1) All optical fibers shall be 100 percent attenuation tested in accordance with Revision of Section 614 – Test Fiber Optic Cable. The attenuation of each fiber shall be provided with each cable reel.
- (2) The cable manufacturer shall be ISO 9001 or TL 9000 registered.

(f) Packaging

The following minimum packaging parameters shall be met:

- (1) The complete cable shall be packaged for shipment on non-returnable wooden reels.
- (2) Top and bottom ends of the cable shall be available for testing.
- (3) Both ends of the cable shall be sealed to prevent the ingress of moisture.
- (4) Each reel shall have a weatherproof reel tag attached identifying the reel and cable.
- (5) Each cable shall be accompanied by a cable data sheet that contains significant information on the cable.
- (6) The cable reels shall not be stored nor shipped on their sides.

CONSTRUCTION REQUIREMENTS

Fiber optic cable shall be used for lateral cables that connect to communications cabinets. Splicing shall be conducted at device splice locations shown on the project plans or as approved by the Project Engineer.

A minimum of one week prior to fiber optic work, the Contractor shall give the Project Engineer a detailed installation and splicing Method Statement and schedule. All installation, splicing, termination, and testing shall be listed on the schedule and Method Statement and revisions shall be re-submitted to the Project Engineer immediately. Installation of the fiber optic cable shall not be permitted until the Method Statement and schedule has been approved by the Engineer.

The Contractor shall be responsible for coordinating with third parties when installing and splicing proposed fiber optic cable adjacent to existing third party owned fiber optic infrastructure and when splicing proposed fiber optic cable to existing third party owned fiber optic cable. The Contractor shall keep the Project Engineer apprised of all coordination activities it performs with third parties as it pertains to this project.

The Contractor shall conform to the requirements included in the Revision of Section 614 - Test Fiber Optic Cable.

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REVISION OF SECTION 614

FIBER OPTIC CABLE (SINGLE MODE)

The Contractor shall provide the Engineer with two copies of the cable manufacturer's installation instructions for all fiber optic cable. All installations shall be in accordance with the manufacturer's recommendations except as otherwise directed by the Engineer. All additional costs including fiber optic cable associated to damages caused by the Contractor's neglect of recommended procedures shall be the Contractor's responsibility.

The Contractor's Installation technician shall have a minimum certification in International Municipal Signal Association (IMSA) Fiber Optics for ITS, Traffic, Fire Alarm, and Communications Systems or equivalent or better fiber optics certification.

Fiber optic cable shall be installed in continuous runs as shown on the project plans. The fiber cable shall be installed in reel lengths that minimize the quantity of cable end splices. Under no conditions shall fiber optic cable be cut or spliced at intermediate points without express written direction from the Engineer.

The new fiber cable shall be installed in a manner which will not interfere with the integrity of existing cable and equipment and shall be installed in a manner which will not interfere with the maintenance of the traffic signal cable, wiring or equipment.

Blowing cable is an acceptable alternative to pulling cable. If the Contractor chooses to use this method, submittals for cable installation shall be submitted along with complete information on fiber installation equipment.

The maximum pulling tension shall be 600 pounds (2700 N) during installation (short term) and 200 pounds (890 N) long term installed.

All cables shall have a minimum bending radius based on the diameter of the cable and shall meet the following:

- (1) Under max pulling tension – 15 (Fifteen times the cable outside diameter)
- (2) Unloaded, not under tension – 10 (Ten times the cable outside diameter)

The fiber optic cable shall be installed in the conduit with a split-mesh cable grip to provide a firm hold on the exterior covering of the cable.

The manufacturer's recommended maximum allowable pull tension for cable pull lengths shall not be exceeded. The Contractor shall use a pulley system with a numerical readout indicating the cable tension. The pulley system shall be capable of alerting the installer when the cable pulling tension approaches the manufacturer's maximum allowable tension. The Contractor may supplement this procedure with a breakaway tension limiter set below the lowest recommended tensile limit of the cables being pulled. Intermediate pulleys shall be used at all pull boxes or manholes along the installation run to prevent cable damage.

If cable installation limits are met and the entire length cannot be installed completely from the shipping reel, installation shall be continued from the mid-point of the run. The Contractor shall first pull one-half of the cable from the reel at the mid-point through the conduit to one end of the run. The other half of the cable shall be removed from the reel and carefully placed on the ground in a figure eight pattern with a minimum loop diameter of 10 feet. While installing the remaining cable, care shall be taken to avoid dragging against the ground resulting in damage or excess bending of the cable. The Contractor shall not kink, twist, or bend the cable during installation coiling and uncoiling.

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REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)

The cable shall be continuously lubricated as it enters the conduit. The Contractor shall only use pulling lubricants recommended by the cable manufacturer. Liquid detergent shall not be used.

The Contractor shall furnish and install a pre-lubricated pull tape and tracer wire in the same conduit as the fiber is being installed. The pull tape and tracer wire shall conform with and be paid for under Revision of Section 613 – Electrical Conduit.

If the Contractor must install new cable in conduits that contain existing fiber optic cable or electrical wiring, the Contractor shall be responsible for all damage to the existing cables and wires. After this installation the Contractor shall perform a functional test of all the equipment connected by the existing fiber cables and electrical wiring to ensure proper working conditions. All costs associated with equipment testing and repairs shall be included in the cost of the fiber optic cable.

If an existing fiber optic cable is damaged during construction, it shall be removed from both points of termination and replaced, at no cost to the project.

In no case shall the conduit fill ratio of new conduit exceed the requirements of the National Electrical Code.

Lateral cables shall be installed in continuous runs from the backbone splice location to the communications cabinet. Odd length cables and reel ends are acceptable for lateral cables provided they are pre-tested and free of defects and are of sufficient lengths to achieve continuous runs.

Installation of lateral fiber optic cables shall include a 10-foot slack coil and a minimum of three strain relief locations within all communications cabinets and traffic signal cabinets. All fiber coils shall be measured post splice, not including the fiber in the termination panel. Strain relief shall ensure that the connectors are not subjected to the weight of the lateral cable.

All fiber optic cables shall include identification labels attached to the cable in each pull box, manhole or communications cabinet. The label shall be provided with information as shown on the Plans.

The Contractor shall coil 100 feet in the pull boxes at the Santa Fe Drive and Nichols Avenue intersection as shown on the plans, 50 feet of each fiber cable in all other pull boxes, and 100 feet in manholes.

Backbone and lateral buffer tubes and fiber strands shall be labeled on the splice tray prior to sealing of the closure.

The Contractor shall ensure that all cable coils and splice canisters are attached separately to the cable management hardware inside manholes in a manner which will allow for all splice closures to be removed separately for future maintenance purposes. In Pull Boxes, all cable coils shall be attached separately to the cable management hardware in a manner which will allow for fiber optic cable to be removed separately.

The Contractor shall terminate the lateral cable at the communications cabinet in accordance with the Revision of Section 614 – Fiber Optic Termination Panel.

The Contractor shall submit a final documentation package. The final documentation package shall include the cable manufacturer's installation procedures, technical support documentation and material documentation. These documents shall match the original submittals provided to the Engineer.

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**REVISION OF SECTION 614
FIBER OPTIC CABLE (SINGLE MODE)**

METHOD OF MEASUREMENT

Fiber Optic Cable shall be measured by the linear foot for both backbone and lateral cable and shall include all labor and materials required to install, and terminate the cable to make a complete and operational system and shall include the following items:

- (1) All splice closures and all associated materials
- (2) Identification labels for both backbone and lateral fiber cables in each pull box, manhole, communications cabinet, and network facility
- (3) As Built Documentation
- (4) Removal of fiber optic cable shall be included in the cost of pay item Fiber Optic Cable (Single Mode) (24 Fiber). Contractor shall dispose of removed fiber.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Fiber Optic Cable (Single Mode) (12 Fiber)	Linear Foot
Fiber Optic Cable (Single Mode) (144 Strands)	Linear Foot

Testing Fiber Optic Cable shall be measured and paid for separately. See Revision of Section 614 - Test Fiber Optic Cable project special provision.

**REVISION OF SECTION 614
BUFFER TUBE FAN OUT KIT**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

For this project, the Buffer Tube Fan Out Kit shall be furnished and installed on single mode fiber optic lateral cable ends in field communications cabinets.

MATERIALS

Buffer Tube Fan Out Kits shall match the number of fiber strands in the lateral fiber optic cable. Buffer tube fan-out kits shall be compatible with the fiber optic cable being terminated and shall be color-coded to match the lateral fiber strand color. Fan out kit buffer tubes shall be 900 um. The buffer tube fan out kit fiber strand length shall be sufficient for routing and placement in the termination panel. All components of the fan-out kit shall be rated for outdoor use.

CONSTRUCTION REQUIREMENTS

The Contractor shall install fiber optic buffer tube fan out kits on the lateral cable in each communications cabinet. The Contractor shall install fanned out cables on the ends of lateral fiber cable strands. Buffer tubes for lateral fiber strands shall be neatly coiled and secured within the field termination panels. Taping or leaving the buffer tubes unmanaged shall not be allowed.

METHOD OF MEASUREMENT

Buffer Tube Fan Out Kit will be measured by the actual number of buffer tube fan-out kits installed, terminated, and accepted.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Buffer Tube Fan Out Kit	Each

Payment will be full compensation for all labor, materials and equipment required to complete the work.

Termination of lateral fiber optic cable is paid for in accordance with Revision of Section 614 – Fiber Optic Termination Panel.

REVISION OF SECTION 614

TEST FIBER OPTIC CABLE

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Test Fiber Optic Cable shall include Optical Time Domain Reflectometer (OTDR) tests, spectrum analysis of fiber, and optical power meter tests of all installed fiber and modified existing fiber on the project.

MATERIALS

The Contractor shall use equipment that is calibrated biennially. A copy of the most recent certificate of calibration and all out-of-tolerance conditions shall be provided to the Project Engineer prior to the initiation of testing activities. The following equipment and information is required to perform fiber optic cable tests:

- (1) An OTDR (submit calibration certification to Project Engineer)
- (2) Optical Power Meter Equipment capable of measuring optical power in dBm (submit calibration certification to Project Engineer)
- (3) A launch box (min length – 1000 feet)
- (4) A light source at the appropriate wavelengths
- (5) Test jumpers shall be 3 feet to 12 feet long with connectors that are compatible with the light source and power meter and shall have the same fiber construction as the link segment being tested.

CONSTRUCTION REQUIREMENTS

Prior to splicing and testing on the project, the Contractor shall submit a detailed Method Statement to the Project Engineer describing the splicing and testing plan and schedule. No fiber optic splicing shall begin until the Method Statement is submitted and approved. If at any time it is determined that work began without an approved Method Statement or the work is not following the approved Method Statement, an immediate “stop work” order will be issued and work will not resume until the Method Statement has been submitted and approved. Once the splicing and testing begins, the Method Statement shall be updated if necessary, to address any changes in the originally planned and approved procedures.

The Contractor shall conduct fiber optic testing at the following stages:

- (1) Pre-installation testing – bi-directional OTDR test of every fiber on every reel after delivery of the reel
- (2) Post installation and pre-splicing test – bi-directional OTDR test of every fiber of every cable after fiber is installed in the ground
- (3) Post-splicing tests
 - i) Optical Power meter test from all fiber terminated in communications cabinets to a network facility for all fiber that is not used for CWDM on the project.
 - ii) Bi-directional OTDR test of all fiber between termination point in a network facility and cable end and between termination point in a network facility and communications cabinets for fiber that is not used for CWDM on the project
- (4) Re-testing of all stages above if initial test fails and after corrective action is taken

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REVISION OF SECTION 614

TEST FIBER OPTIC CABLE

The guidelines for fiber optic cable testing include:

1. Launch box and test jumpers must be of the same fiber core size and connector type as the cable system:
Single mode fiber 9.0 μ m (nominal) /125 μ m
2. The light source and OTDR must operate within the range of 1310 $\pm$ 10 nm and 1550 $\pm$ 20 nm single mode nominal wavelength for testing in accordance with Telecommunications Industry Association (TIA) TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
3. The power meter and the light source must be set to the same wavelength during testing.
4. The OTDR and power meter must be calibrated at each of the nominal test wavelengths and traceable to the National Institute for Standards and Technology (NIST) calibration standards.
5. The calibration of the OTDR and power meter shall conform to the requirements set forth in Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA) TIA/EIA-455-226 Calibration of Optical Time-Domain Reflectometers and TIA-455-231 Calibration of Fiber Optic Power Meters, respectively.

The Contractor shall document jacket length measurements for lateral and backbone cable at each end including splice enclosures and patch panels and at any intermediate splice points.

The Contractor shall document bare fiber slack not accounted for in jacket length.

All system connectors, adapters and jumpers shall be cleaned per manufacturer's instructions before measurements are taken.

At locations of new lateral fiber optic cable installation and at locations that require the re-installation of existing lateral fiber optic cable, the Contractor shall conduct testing from the termination panel mounted in the communications cabinet to the splicing manhole. The bi-directional test shall be conducted from the termination panel towards the splicing manhole and from the splicing manhole to the communications cabinet termination panel.

Final splicing will not begin until such time that the Contractor submits OTDR test results to the Project Engineer and the Project Engineer reviews and approves the results.

Final OTDR testing from the communications cabinet to the corresponding node building shall be conducted after the Contractor's splicing work has been completed. All issues with communications related to Contractor installation and workmanship shall be remediated by the Contractor at no additional cost to the project.

A functional test shall be made in which it is shown that each and every part of the system functions as specified or intended herein.

(a) Optical Fiber Cable Testing with OTDR

The Contractor shall perform an OTDR test of all fibers in all tubes on the reel prior to installation of the fiber. The test results shall be supplied to the Project Engineer prior to installation of the cable.

Fiber testing shall be performed on all terminated fibers from patch panel to patch panel and unterminated fibers from end to end. Additionally, mid entry splices into mainline cables require testing of all strands in the mainline cable before and after installation. Testing shall consist of a bi-directional end-to-end OTDR trace.

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REVISION OF SECTION 614
TEST FIBER OPTIC CABLE

Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.

The Contractor shall use an OTDR that is capable of storing traces electronically and shall save each final trace.

The Contractor shall use a test reel of minimum length identified in the Materials section of this Special Provision. The Contractor shall indicate the length of the test reel, in feet, for all test results.

If the fiber designation is not indicated on the trace itself, the Contractor shall provide a cross-reference table between the stored trace file name and the fiber designation.

The Contractor shall record the following information during the test procedure:

- (1) Name and contact information of person conducting the test
- (2) Type of test equipment used (manufacturer, model, serial number, calibration date and valid certification of calibration)
- (3) Date test is being performed
- (4) Optical source wavelength and spectral width
- (5) Fiber identification
- (6) Start and end point locations
- (7) Test direction
- (8) Launch conditions
- (9) Method of calculation for the attenuation or attenuation coefficient
- (10) Acceptable link attenuation
- (11) Cable manufacturer stated index of refraction for cable being tested
- (12) Jacket readings in and out of each splice vault and each pull box

(b) Optical Fiber Cable Testing with Optical Power Meter

The Contractor shall conduct an Optical Power Meter Test of each fiber installed.

Single mode segments shall be tested in one direction at both the 1310 nm and 1550 nm wavelength.

The following information shall be recorded during the test procedure:

- (1) Names of personnel conducting the test
- (2) Type of test equipment used (manufacturer, model, serial number, calibration date and a valid certification of calibration)
- (3) Date test is being performed
- (4) Optical source wavelength and spectral width
- (5) Fiber identification
- (6) Start and end point locations
- (7) Test direction
- (8) Reference power measurement (when not using a power meter with a Relative Power Measurement Mode)
- (9) Measured attenuation of the link segment
- (10) Acceptable link attenuation

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REVISION OF SECTION 614

TEST FIBER OPTIC CABLE

(c) Acceptable Attenuation Values

The Contractor shall calculate acceptable attenuation values for each fiber tested. These values represent the maximum acceptable test values.

The general attenuation equation for all single mode link segments is as follows:

Acceptable Link Attenuation = Cable Attenuation + Connector Attenuation + Splice Attenuation.

8.3 □m (nominal) Single-mode Attenuation Coefficients:

- (1) Cable Attenuation=Cable Length (km) x (0.35 dB/km at1310 nm and 0.22 dB/km at1550 nm)
- (2) (No. of Mated Connections x 0.50 dB)
- (3) Splice Attenuation = Splices x 0.30 dB

(d) Test Procedures

The single mode Optical Power Meter fiber test shall be conducted in accordance with TIA-526-7.

The single mode OTDR test shall be conducted in accordance with TIA-526-7.

Once all splicing of the individual sub-ring is complete the Contractor shall conduct the OTDR and spectrum analyzer testing and submit the results to the Project Engineer. At the acceptance of these tests, the Contractor shall determine the proper optical attenuator to install in the Receive (RX) ports at both the communications termination panel and the node building termination panel. After installation, one final test of optical power shall be conducted to determine if the proper signal strength is being achieved by the Ethernet switch.

At that point the Colorado Department of Transportation, Colorado Transportation Management Center personnel along with Ciena network engineers will configure the sub-ring into the overall CDOT ITS network. If network communications cannot be achieved, a review of the testing materials will begin.

(e) Test Acceptance

The Contractor shall demonstrate that the tests result in acceptable attenuation values.

The Contractor, solely at the Contractor's expense, shall re-splice all fusion splices and re-terminate all terminations that have test results exceeding acceptable attenuation values. The Contractor, solely at the Contractor's expense, shall retest all fiber links that have been re-spliced and shall retest all fiber links that have been re-terminated.

The Contractor, solely at the Contractor's expense, shall bring all links not meeting the requirements of this specification into compliance.

(f) Submittals

The Contractor shall submit test result documentation as both a hard copy and electronic copy.

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REVISION OF SECTION 614

TEST FIBER OPTIC CABLE

After each reel test, the Contractor shall submit one hard copy of the OTDR trace for every fiber on the reel.

After installation, the Contractor shall submit two hard copies and one electronic copy of the following tests:

- (1) Continuity OTDR trace for every spliced fiber which the optical network will utilize.
- (2) OTDR trace for every fiber the high speed DWDM optical network will utilize.
- (3) OTDR trace for every fiber which the CWDM optical network will utilize.
- (4) OTDR traces and power meter results for all “dark” unused fiber strands in the backbone fiber optic cable from node buildings.

Hard copy traces shall be organized and bound in logical order in an 8 ½ inch x 11-inch hard cover binder.

The Contractor shall submit, after approval of the hard copy traces, electronic copies of all traces (PDF and native file format) and appropriate software, if needed, to allow reading the traces.

The Contractor shall submit one copy of the complete contract Plans, including additional drawings issued as part of all change orders, with all deviations clearly marked in color. Deviations to be noted shall include at a minimum, but not be limited to, the following:

- (1) Fiber Splice location
- (2) Fiber Splice configuration
- (3) Termination layout

After all splicing and fiber optic testing is completed the Contractor shall test the optical power of the incoming, (Receive) signal at each field Ethernet switch and existing node building location. To obtain the most accurate values of optical power, the testing equipment shall be attached to the SFP optic end of the pre-connectorized patch cable.

Once the optical power has been tested, the Contractor shall install the appropriate attenuator in the receive port to meet the receive values of the SFP optic module, including a design margin of 6 dB (to allow for degradation over the life of the system).

METHOD OF MEASUREMENT

Testing of fiber optic cable will be measured by all fiber optic testing, retesting, including all labor, materials, and document submittals necessary to complete the work.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Test Fiber Optic Cable	Lump Sum

Payment will be full compensation for all labor, materials and equipment required to complete the work.

REVISION OF SECTION 614 SPlice FIBER OPTIC CABLE

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This item includes performing splicing of both fiber optic backbone and fiber optic lateral cables at locations shown on the plans.

MATERIALS

The Contractor shall provide all required equipment to perform the splicing of the fiber optic cable. This equipment is expected to include, but not be limited to, common hand tools, a standard torque wrench, a fusion splicer, and a digital camera to document completed work.

CONSTRUCTION REQUIREMENTS

The Contractor shall notify the Project Engineer of proposed daily splicing locations two business days prior to splicing and also the morning of proposed splicing. The Contractor shall contact the Project Engineer at least four hours prior to sealing the closure to allow inspection.

If the Project Engineer cannot be on site to inspect the open splice closure, a minimum of eight digital pictures shall be taken at varying angles of the interior of the splice closure showing all completed work as stated in this specification and shown on the Project Detail Sheet. The pictures shall include exposed fiber strands (both spliced and uncut) in all splice trays, fiber tray labeling and remaining buffer tubes showing appropriate coiling. One picture shall also include the complete re-assembly of all interior parts prior to final sealing. Once the closure and fiber coils are installed in the pull box or manhole, two pictures shall be taken showing the final installation of both the closure and the coiled fiber cable attached to the fiber management hardware. All pictures shall be organized per location and shall be submitted to the Project Engineer along with all final testing result documentation.

All splices shall be performed using the fusion splicing method. The fusion splicer shall be calibrated and certified at least once within the previous year from this project. The Contractor shall present all certification documentation to the Project Engineer prior to start of fiber splicing.

The optical fibers shall be fusion spliced and shall meet the requirements in the Revision of Section 614 – Test Fiber Optic Cable.

The Contractor shall label each individual splice and buffer tube in all splice trays per the Project Detail Sheet included on the plans.

The Contractor shall cut and splice only those fiber strands shown to be spliced on the fiber splicing plan sheets. All unused buffer tubes and fiber strands shall remain uncut. After the fiber cable and proposed buffer tube is prepped for splicing, all fiber strands in the buffer tube shall be cleaned of all homogeneous gel, unless gel-free buffer tubes are used. All uncut fiber strands shall be coiled in the tray. Remaining buffer tubes shall be neatly coiled, secured and stored in the storage area within the closure under the splice trays per the manufacturer's recommendations. Buffer tubes proposed for splicing shall be wrapped and secured to the splice tray with ties per the manufacturer's recommendations.

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REVISION OF SECTION 614
SPLICE FIBER OPTIC CABLE

Bare fiber strands shall not be taped to the splice tray.

All fiber optic cables shall be secured and sealed at the closure entrances. All unused cable entries shall be plugged.

If the splice closure requires re-entry, it shall be conducted per the manufacturer's recommendation for re-entry and resealing. The Contractor shall use caution to prevent damage to the existing fiber strands, splices, and buffer tubes inside the splice closure. When sealing the closure for a second time, the Contractor shall follow all re-entry requirements of the manufacturer.

The Contractor shall ensure that the fiber optic splice closures and associated fiber cable coils fit adequately within the manhole or pull box splice locations shown on the plans and shall securely mount the splice enclosure to the side of the manhole.

METHOD OF MEASUREMENT

Splice Fiber Optic Cable will be measured and paid for by the actual number of splices performed and accepted and shall include all associated labor, materials and equipment required to complete the work.

BASIS OF PAYMENT

Payment will be made under:

Pay Item

Pay Unit

Splice Fiber Optic Cable (1 Strand)

Each

REVISION OF SECTION 614
ETHERNET SWITCH (INSTALL ONLY)

Section 614 of the Standard Specifications is hereby revised for this project as follows:

MATERIALS

The Contractor shall install the Ethernet switch Ubiquiti EdgeSwitch 8 POE and Proline SM1310 Compatible 1000BASE-LX-SFP SMF fiber transceivers, provided by the City of Littleton.

METHOD OF MEASUREMENT

Ethernet Switch will be measured by the actual number installed and accepted for a complete installation. Also included shall be all required modules, optical attenuators, power supplies, power cables, Ethernet cables, single mode fiber optic pre-connectorized patch cables, material for the Ethernet switch attachment to the interior of the traffic signal controller cabinet equipment rack rails licenses, switch software, wiring, and documentation.

BASIS OF PAYMENT

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Ethernet Switch (Install Only)	Each

Payment will be full compensation for all labor, materials, and equipment required to complete the work.

REVISION OF SECTION 614 FIBER OPTIC PRE-SPLICE TESTING

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Fiber Optic Pre-Splice Testing shall include individual bare fiber testing utilizing an Optical Time Domain Reflectometer (OTDR) on existing single mode fiber optic backbone cable strands to test for continuity of allocated fibers as shown on the project plans. The testing will be conducted at fiber optic cable end points identified in the project plans, and at existing cable end splice locations as directed by the Project Engineer. The Contractor shall complete and submit the test to the Project Engineer for review and approval before completing the project splicing.

MATERIALS

Fiber optic pre-splice testing shall be conducted on bare fiber strands. The Contractor shall use industry standard equipment and materials while conducting the pre-splice testing. Recommended materials include but not limited to the following:

- Optical Time Domain Reflectometer (OTDR)
- Fiber Optic Tool Kit (Shears, Fiber Stripper, Fiber Cleaver)
- Safety Gear (Eye Protection and Gloves)
- Fusion Splicer
- Isopropyl Alcohol Preparation Wipes
- Slice Heat Shrinks

CONSTRUCTION REQUIREMENTS

The Contractor shall open existing fiber optic splice closures and conduct bare fiber testing on fiber optic strands identified in the project plans to be spliced for both traffic signal intersection controller connections and Ciena 5142 backbone connections. The Contractor shall submit a Method Statement of the proposed work including the manufacture's recommended procedures to access the existing fiber splice closures.

Two (2) crews shall be utilized to conduct the fiber testing, one on each end of the fiber cable span being tested. The OTDR test of the fiber optic strand shall be conducted using the 1550nm wavelength only. The completed OTDR test shall be reviewed and approved on site to ensure continuity by the Project Engineer. If the specified strands are not continuous in the cable span, the Project Engineer will designate alternate strands to be tested and used on the project for final splicing. All fiber strands shown on the plans which do not show continuity in the fiber cable span shall not be used.

When testing is conducted at a cable end location, the Contractor shall prep the fiber cable to expose the entire buffer tube. All exposed fibers in the buffer tube shall be cleaned to remove all water proofing gel. After testing and splicing, fiber strands shall be neatly coiled in the fiber splice tray.

When testing at an existing cable to cable end splice location, the Contractor shall first test for data communications on the fiber strand. If no data is detected on the fiber strand the Contractor may proceed to break the existing splice and test the fiber. All strands tested that are not utilized shall be re-spliced to current conditions. If a cable end splice is at a proposed splice location, the tested strands shall be used. After testing and splicing, fiber strands shall be neatly coiled in the fiber splice tray. Locations of cable to cable end splice locations shall be provided to the Contractor at the Pre-Construction Conference.

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REVISION OF SECTION 614
FIBER OPTIC PRE-SPLICE TESTING

All temporary exposed fiber optic backbone cable buffer tubes and fiber strands shall be properly protected and shall not be damaged during testing. All damage to the exposed fiber or existing fiber splices shall be repaired by the Contractor at no additional cost to the project.

If testing of the project plan fibers show full continuity in the tested cable span, those strands shall be spliced as shown on the plans.

All project and re-spliced strands shall be completed in a splice closure splice tray.

All OTDR traces shall be saved and submitted to the project Engineer with the final project documentation.

METHOD OF MEASUREMENT

Fiber Optic Pre-Splice Testing and all associated materials will not be measured separately but will be considered subsidiary to the Test Fiber Optic Cable pay item.

BASIS OF PAYMENT

Fiber Optic Pre-Splice Testing and all associated materials will not be paid for separately but will be considered subsidiary to the Test Fiber Optic Cable pay item.

REVISION OF SECTION 614 FIBER OPTIC SPLICE CLOSURE AUDIT

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

Fiber Optic Splice Closure Audit shall include accessing existing fiber optic splice closures as shown on the plans, to document current and proposed project fiber usage including fiber optic cables entering the closure and fiber splices. Also included shall be the organization of existing bare fiber strands and splices in the closure trays and labeling of both the closure trays and fiber cables entering the closure. All fiber usage information shall be documented in a spreadsheet format showing existing conditions for each splice tray in the splice closure.

MATERIALS

The Contractor shall use industry standard equipment and materials while conducting the fiber optic splice closure audit. Recommended materials include but are not limited to the following.

- Digital Camera
- Common Hand Tools
- Standard Torque Wrench
- Isopropyl Alcohol Preparation Wipes
- Nylon Cable Zip Ties
- Laminated Tie on Tag (Water-Resistant)
- Portable Label Printer with Adhesive Backed Vinyl Labels

CONSTRUCTION REQUIREMENTS

The Contractor shall remove the splice closure from the pull box or manhole identified in the project plans. Fiber optic cables entering the splice closure shall be documented. The Contractor shall then access the fiber optic splice closure per the manufacture's recommendations. Fiber optic splice trays shall be carefully separated from the closure.

The following information shall be documented for each fiber splice closure.

- Fiber Optic Cable Manufacturer
- Fiber Optic Cable Size
- Fiber Optic Cable Use (Backbone or Lateral)
- Fiber Optic Cable Direction
- Fiber Buffer Tube Color
- Fiber Strand Color
- Fiber Strand Number
- Fiber Splices

The Contractor shall create a Microsoft Excel spreadsheet with the collected information listed above.

If no labeling exists, the Contractor shall label all splices and spice trays per the Project Detail. The Contractor shall also label the work conducted as part of this project.

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REVISION OF SECTION 614
FIBER OPTIC SPLICE CLOSURE AUDIT

The Contractor shall take before and after pictures of fiber optic cables entering the splice closure, fiber optic splice trays showing all bare fiber coiling, splices, and buffer tube coiling. A minimum of eight (8) pictures shall be taken.

The Contractor shall neatly coil fiber optic strands in splice trays and fiber optic buffer tubes in the splice closure when documentation is completed. The Contractor shall reassemble and seal the splice closure per the manufacturer's recommendations.

All temporary exposed fiber optic backbone cable buffer tubes and fiber strands shall be properly protected and shall not be damaged during the audit. Any damage to the exposed fiber or existing fiber splices shall be repaired by the Contractor at no additional cost to the project.

If fiber optic cable tags are missing or are not legible on cables entering the pull box or manhole the Contractor shall install new laminated tie-on label tags.

All audit information and digital pictures shall be submitted to the project Engineer with the final project documentation.

METHOD OF MEASUREMENT

Fiber Optic Splice Closure Audit and all associated materials will not be measured separately but will be considered subsidiary to the Test Fiber Optic Cable pay item.

BASIS OF PAYMENT

Fiber Optic Splice Closure Audit and all associated materials will not be paid for separately but will be considered subsidiary to the Test Fiber Optic Cable pay item.

REVISION OF SECTION 614 FIBER OPTIC SPLICE CLOSURE LOCK

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This item includes securing existing and proposed fiber optic splice closures with a lock. The locks will be provided by CDOT ITS.

MATERIALS

Fiber Optic Splice Closure Locks will be furnished by the Colorado Traffic Management Center, Roadway Technical Services Department. The Contractor shall submit a ticket to cdot_its_support@state.co.us prior to removing an existing splice closure lock and to be issued a new splice closure lock. The Contractor shall pick up the Fiber Optic Splice Closure Locks from the CTMC at 425C Corporate Circle, Golden, CO 80401.

CONSTRUCTION REQUIREMENTS

The Contractor shall notify the Project Engineer of proposed daily splicing locations as noted in the Revision of Section 614 - Fiber Optic Splice Closure Special Provision. The following processes shall be followed for existing and proposed fiber optic splice closures.

(a) Existing Splice Closures

If the existing Fiber Optic Splice Closure has a Serialized Fiber Optic Splice Closure lock, prior to cutting lock, Contractor shall notify the Colorado Traffic Management Center, Roadway Technical Services Department with the location and serial number of the lock to be cut. The number to call is provided on the lock cable.

The existing cable is not to be cut until a new Fiber Optic Splice Closure lock and new check out form has been issued. The Contractor shall provide plan sheets showing work to be completed in the Fiber Optic Splice Closures to receive a Fiber Optic Splice Closure lock.

The new Fiber Optic Splice Closure lock form shall be returned to CDOT Project Manager and Roadway Technical Services Department accompanied with:

- (1) The lock that was removed
- (2) An as-built of the splice performed
- (3) Signature and date from the person who completed the splice and who secured the lock on the fiber optic splice closure.

All documentation shall be returned to CDOT Project Manager and Roadway Technical Services Department within 48 hours of completion of the splice. The documentation may be faxed or e-mailed during the 48-hour time period. All completed forms with supporting documentation shall be returned prior to project acceptance.

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REVISION OF SECTION 614
FIBER OPTIC SPLICE CLOSURE LOCK

(a) Proposed Splice Closures

Fiber Optic Splice Closures shall be secured with a Fiber Optic Splice Closure lock, issued from Colorado Traffic Management Center, Roadway Technical Services Department. The Contractor shall contact cdot_its_support@state.co.us to be issued a lock. The Contractor shall provide plan sheets showing work to be completed in the Fiber Optic Splice Closures to receive a Fiber Optic Splice Closure lock.

The issued lock and issued check out form, with the specific splice case lock serial number on the form, is not to be altered with the exception of filling in the missing information.

The Fiber Optic Splice Closure lock form shall be completed and returned, accompanied with:

- (1) An as-built of the splice performed (splicing diagrams)
- (2) Signature and date from the person who completed the splice and who secured the lock on the fiber optic splice closure.

All documentation shall be returned to ITS Roadway Technical Services Department via the Project Engineer within 48 hours of completion of the splice. All completed forms with supporting documentation shall be returned prior to project acceptance.

METHOD OF MEASUREMENT

Fiber Optic Splice Closure Locks will be provided by CDOT and installed by the Contractor.

BASIS OF PAYMENT

The work to secure the Fiber splice canister locks will not be measured separately but will be considered subsidiary to the Fiber Optic Cable (Single Mode) pay item.

REVISION OF SECTION 614
FIBER OPTIC PRE-CONNECTORIZED CABLE

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of the installation of fiber optic pre-connectorized patch cables in communication cabinets from the termination patch panel to the optical communication device optics.

MATERIALS

The Contractor shall furnish and install the Fiber Optic Pre-connectorized cable Proline 3m LC (M) to LC (M) fiber patch cable.

CONSTRUCTION REQUIREMENTS

Pre-connectorized cables shall be installed from the termination panel bulkheads to the optical modules of the communication devices.

At communication cabinets, the Contractor shall provide pre-connectorized cables of sufficient length to span from the fiber termination patch panel bulkheads to the equipment device or network device optical port. This length shall include a maximum of two (2) feet of slack cable. Appropriate cable management shall be used.

Prior to installation, all pre-connectorized cable bulkhead connectors shall be cleaned with lint-free fiber wipes moistened with Isopropyl Alcohol 99% U.S.P. After cleaning with alcohol, the bulkhead shall be cleaned with an optical connector cleaner to ensure that all residue is removed.

Manufacturer testing reports for pre-connectorized cables shall be submitted as part of the as-built documentation. The installation location shall be noted on the test report for future reference.

At all field device locations, each cable shall have individual labels indicating the termination panel port and the data transmitting description, (example: Tx or Rx).

Patch cable labeling shall be as shown on the Project Detail Sheet.

The pre-connectorized cables shall be provided in the following lengths.

Field Device Cabinets.....4 Feet – 0 Inch maximum

METHOD OF MEASUREMENT

Fiber optic pre-connectorized cables and labeling will not be measured or paid for separately but will be considered subsidiary to the individual communications device or Ethernet switch item and shall include all labor, materials and equipment required to complete the work. Also included shall be all information labeling in the communication node building and in field device communications cabinets.

REVISION OF SECTION 614 ITS TESTING AND ACCEPTANCE

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

-ITS TESTING-

The Contractor shall be responsible for testing all new and reset ITS devices and communications infrastructure in accordance to the Testing and Acceptance Requirements. This shall include Fiber Optic Cable, Dynamic Messages Signs, Variable Speed Limit Signs, Lane Use Signs, Variable Toll Message Signs, Cameras, Microwave Vehicle Radar Detectors, Automatic Traffic Recorders, Roadway Weather Information Systems and all associated cabinets and Ethernet Gear. All components, subsystems, and the overall system must be successfully tested and integrated prior to project acceptance, including a 30-day burn in period. The Testing and Acceptance Requirements outlines: Contractor's roles and responsibilities, testing procedures for local field devices, subsystem functionality and communications testing, system-wide integration requirements, documentation requirements and the acceptance process.

The Contractor shall follow the CDOT ITS Construction Testing and Acceptance Requirements found at: <https://www.codot.gov/programs/intelligent-transportation-systems>.

The Contractor shall utilize the CDOT 1411 ITS Device Acceptance submittal process found at: <https://www.codot.gov/programs/intelligent-transportation-systems/1411-form>.

The Contractor shall include pictures of the device. The following pictures shall be included in the 1411: Upstream view of the device and structure, downstream view of the device and structure, and inside of all associated cabinets. Label each picture file with the major street name, mile marker to the nearest hundredth, device type, and brief description of the picture (e.g. cabinet).

-DOCUMENTATION-

The Contractor shall complete and submit the following items:

- a. Red-Line As-Builts of the Project Plans
- b. Fiber Optic Cable As-Built Documentation
- c. Splice Lock Documentation
- d. Survey-quality data of the conduit running lines and vaults

a. Red-Line As-Builts of the Project Plans

The Contractor shall document the as-built device, communications, and power infrastructure placement and material information. The Contractor shall clearly mark the plan sheets with red ink describing the as-built condition of all elements installed, including all changes made to fiber optic splicing. The as-built markups shall include:

- Pull boxes and Manholes with actual conduit distances between all
- ITS cabinets
- ITS structures
- Electrical service meter cabinets (labeled meter numbers)
- Locations of all of the splice points

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REVISION OF SECTION 614 ITS TESTING AND ACCEPTANCE

The Contractor shall provide electronic interim updates to the as-builts. The interim as-builts shall be submitted to CDOT ITS or to the designated CDOT ITS Representative on a monthly basis.

At the end of the project, the Contractor shall create a legible PDF scan of the marked up as-built drawings, and submit the hard copy and PDF to the Project Engineer. If the as-builts were created digitally, then the Contractor may only submit a PDF.

b. Fiber Optic Cable As-Built Documentation

The Contractor shall record the required information on the Fiber Optic Cable As-Built Form for every fiber optic cable installed on the project. The Contractor shall record the following information at each fiber access point (pull box, manhole, or cabinet) that the cable passes through:

- Mile Marker and/or Station Number of access point
- Highway where access point is installed
- Cable measurement markings at entrance and exit of the access point
- Cable ID Number
- If there is a splice case present in the access point
- If a cable end splice is present in the splice case
- Number of laterals entering into splice case

CDOT will accept a spreadsheet that includes all of the above-mentioned information in lieu of using the provided form.

c. Splice Lock Documentation

The Contractor shall include the documentation per the Fiber Optic Splice Closure Lock specification in the as-built documentation package.

d. Survey-quality data of the conduit running lines and vaults

The Contractor shall provide the survey data per the 625 Construction Survey Specification.

REVISION OF SECTION 614 GROUNDING AND BONDING

Section 614 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

Subsection 614.01 shall include the following:

This work consists of grounding and bonding requirements at project locations for all Traffic or Intelligent Transportation System (ITS)-related structures, poles, service pedestals, and cabinets. The work covered in this section consists of labor, materials, and services required for a functional and unobtrusive grounding system.

- (a) *General.* The Contractor shall provide comprehensive grounding and bonding for Traffic or ITS-related equipment. The Colorado Department of Transportation's (CDOT's) target resistance to ground value is equal to or less than 10 ohms (Ω).
- (b) *Applicable Documents.* Work performed in this section shall comply with the most current edition of the following codes and/or standards:
 - (1) Institute of Electrical and Electronics Engineers (IEEE) 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System
 - (2) IEEE C2 – National Electrical Safety Code
 - (3) National Electrical Manufacturers Association (NEMA) Grounding Rod (GR) 1 – Grounding Rod Electrodes and Grounding Rod Electrode Couplings
 - (4) National Fire Protection Association (NFPA) 70 – National Electrical Code
 - (5) NFPA 70E – Standard for Electrical Safety in the Workplace
 - (6) NFPA 780 – Standard for the Installation of Lightning Protection Systems
 - (7) TIA-607 – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
 - (8) Underwriters Laboratories (UL) 96 – Lightning Protection Components
 - (9) UL 96A – Installation Requirements for Lightning Protection Systems
 - (10) UL 467 – Grounding and Bonding Equipment
- (c) The Designer shall identify to the Engineer any conflicts between the requirements of codes/standards development organizations and the plans and specifications for this project.
- (d) *Submittals.*
 - 1. The Designer shall provide cut-sheets of each type of product proposed for approval by the Engineer prior to commencement of work.
 - 2. The Designer shall provide a system plan, conductor routing, supports, connectors and ground rods along with connection, mounting and splicing details.

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REVISION OF SECTION 614
GROUNDING AND BONDING

MATERIALS

Subsection 614.08 shall include the following:

(a) Components.

1. Grounding electrodes (driven rods). Ground rods shall be provided that meet or exceed the following requirements:
 - A. Preferred. Copper-clad steel ground rods (pointed) shall not be less than 5/8-inch diameter and a minimum of eight feet in length. It shall be UL certified and have a minimum plating thickness of 10 mil copper cladding.
 - B. Other Alternatives. Other ground rod types, such as chemical ground electrodes, may be considered based on site soil chemistry, adjacent electrically bonded structures, or if the installation must occur in a corrosive area, but must be approved by the Engineer in writing.
2. Grounding Electrode Conductor. The grounding electrode conductor shall be solid or stranded copper with a minimum size of #6 American Wire Gauge (AWG), unless otherwise specified. The Contractor shall size the grounding electrode conductor in accordance with Article 250.66 of the National Electrical Code (NEC). Bare and insulated grounding electrode conductors shall be permitted, as approved by the Engineer. Insulated grounding electrode conductors shall be Type thermoplastic heat- and water-resistant nylon-coated (THWN) and conform to the requirements of Article 310 of the NEC. Insulated grounding electrode conductors shall utilize a green jacket color. The grounding electrode conductor run shall be installed in one continuous run without a splice or joint, except as permitted in accordance with Article 250.64(C) of the NEC.
 - A. For bonding between a cabinet frame and busbar, a braided ground strap shall be utilized. The braided ground strap shall consist of non-insulated tinned copper flat braid wire with a minimum width of 0.5 inches and a thickness of 0.07 inches (based on estimated #6 AWG equivalence).
3. Grounding Connectors. Grounding connectors shall be provided for attachment to grounding electrodes, ground bus and ground lugs. Grounding and bonding connections shall be made by means of a compression connector, a mechanical connector, or an exothermic weld. Mechanical and compression connectors shall have only one conductor installed unless designed or UL-listed for more conductors. Mechanical connections shall only be permitted when a compression or exothermic connection cannot be made.

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REVISION OF SECTION 614

GROUNDING AND BONDING

4. Ground Bus. Provide copper bar stock grounding busbar as shown on plans. If the dimensions of the busbar are not shown on the plans, the minimum size shall be 0.25-inch-thick by 2 inches high by 6 inches wide and positions for five lugs, unless otherwise specified by the Engineer. Hole patterns on the busbar shall accommodate two-hole lugs in accordance with Telecommunications Industry Association (TIA)-607 and hole spacing should not be less than 0.75 inch. Busbar must be wall mountable and UL certified. Stand-off brackets shall also be included and brackets shall be manufactured from 300 series stainless steel with stainless steel bolts and lock washers.

CONSTRUCTION REQUIREMENTS

Subsection 614.09 shall include the following:

- (a) General. The Contractor shall install equipment, materials, and devices in accordance with equipment manufacturer's written instructions and in compliance with applicable installation standards.
 1. Connections.
 - A. The Contractor shall provide exothermically welded connections below grade and in areas exposed to visible moisture.
 - B. The Contractor shall provide heavy duty bolted clamped connections, UL listed, above grade and in areas where safety to personnel and structures dictate.
 2. Installation.
 - A. The Contractor shall install one grounding electrode. Each grounding electrode shall be installed such that at least the entire length is in contact with the soil. Where a rock bottom is encountered, the grounding electrode installation shall conform to the requirements of Article 250.53(G) of the NEC. The grounding electrode system shall be installed within CDOT right-of-way.
 - B. The Contractor shall leave top of grounding electrode exposed for testing and for verifying quantities.
 - C. The Contractor shall measure the resistance of the installed grounding electrode with respect to the surrounding soil using an earth ground resistance tester.
 - D. If the results exceed 10 Ω , the Contractor shall install a second grounding electrode a minimum of one electrode length away from the first grounding electrode. The bonding jumper used to connect grounding electrodes shall be installed and sized in accordance with Article 250.53(C) of the NEC.
 - E. The Contractor shall measure the resistance of the installed grounding electrode system with respect to the surrounding soil using an earth ground resistance tester.

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REVISION OF SECTION 614

GROUNDING AND BONDING

- F. The Contractor shall record and report results to Engineer in writing. CDOT's target resistance to ground is equal to or less than 10 Ω , however after installing two grounding electrodes, a resistance to ground value equal to or less than 25 Ω will be accepted by CDOT. The Contractor shall be responsible for confirming the resistance to ground requirements with the various manufacturers of the equipment it procures for this project. Where manufacturers have more stringent resistance to ground requirements for operational performance and warranties, the Contractor shall be required to adhere to the manufacturer's requirements for acceptance by CDOT.
- G. In the absence of low resistance soil conditions, the Engineer, at their sole discretion, may allow the use of the following: bentonite to fill the ground rod hole; chemical electrodes; or ground enhancement material. The Contractor shall obtain written permission from the Engineer prior to using the previously mentioned materials.

3. Surface Preparation

- A. Ground Bus. An abrasive pad shall be used to remove any dirt, grease, oil, and oxidation from the ground bus. A thin coating of antioxidant compound shall be applied to the connection point on the ground bus. Using stainless steel hardware, the Contractor shall tighten and torque to the value specified for the hardware grade, material, and size. Only one lug shall be installed per a two-hole mounting on a bonding surface. Lugs shall not overlap or use the same mounting holes on a bonding surface. Due to thermal cycling anticipated in the field environment, the lock washer shall be substituted with flat washers and a cupped spring washer (i.e., Belleville washer), with the cup against the head of the bolt.
- B. Other Surfaces. Clean the surface thoroughly where the grounding lug is to be connected. The grounding surface shall be clean of any paint, dirt, grease, oil, rust, and other oxidation. A thin coating of antioxidant compound shall be applied to the connection point on the surface. Using stainless steel or silicon bronze hardware, the Contractor shall tighten and torque to the value specified for the hardware material and size. Lugs shall not overlap or use the same mounting holes on a bonding surface. The lock washer shall be substituted with flat washers and a cupped spring washer, with the cup against the head of the bolt.
- C. Ground Attachment to Structures and Poles. The grounding electrode conductor shall be connected to the ground stud on a structure or within a pole using stainless steel nuts and cupped spring washers. The connector type for the grounding electrode conductor shall be a full circle connector sized appropriately for the diameter of the ground stud and the wire gauge of the conductor. Where a ground stud does not exist on a structure or within a pole, the Contractor shall install a tapped and threaded hole to accommodate the grounding electrode conductor and screw. The connector type for the grounding electrode conductor shall be a full circle connector sized appropriately for the diameter of the screw and the wire gauge of the conductor. Stainless steel screws and cupped spring washers shall be included.

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REVISION OF SECTION 614

GROUNDING AND BONDING

D. Grounding Connectors. The lug size, configuration and material for compression connectors shall be selected based on the grounding electrode conductor size and fastening conditions. The insulation shall be trimmed back so that the bared grounding electrode conductor is slightly longer than the barrel. After applying an antioxidant compound on the exposed grounding electrode conductor, the conductor shall be inserted so that it touches the end of the barrel as viewed through the inspection port. The Contractor shall ensure the grounding electrode conductor remains at the end of the barrel before making the first crimp nearest the tongue end and working toward the conductor with the remaining crimps. The lug manufacturer's instructions shall be followed for the number of crimps and their location on the barrel. For exothermic welds to the grounding electrode conductor, the Contractor shall select the mold and weld metal applicable to the conductor size and lug configuration. The Contractor shall clean and dry (using a torch) the grounding electrode conductor and the mold. The Contractor shall insert the conductor and lug into the mold. The Contractor shall close the handle clamp, lock the mold, and then insert the disk into the mold. The Contractor shall pour the weld metal into the mold and apply the starting material over the weld metal and on the lip of the mold. The Contractor shall close the cover and ignite using a flint igniter. After the reaction is complete, The Contractor shall wait a minimum of 15 seconds and then open the mold and remove the finished lug connection. The Contractor shall clean any slag from the finished lug connection.

4. Testing.

- A. Testing shall be performed prior to connecting to utility ground in an effort to eliminate ground loops.
- B. When the grounding electrodes are installed, they shall be measured for their effectiveness using the three-point, fall of potential method per IEEE 81 to measure the resistance of the installed grounding electrode configuration with respect to the surrounding soil using an earth ground resistance tester. The final measurement must be performed in the presence of the Engineer or CDOT's designated representative. The Contractor shall provide documentation to the Engineer of ground grid measurement results for each site location tied to a single grounding system.
- C. The Contractor shall furnish its own earth ground resistance tester including stakes, clamps, cabling, transformers, and other required accessories needed to perform the testing. A copy of the earth ground resistance tester's National Institute of Standards and Technology (NIST) certification shall be provided to the Engineer as verification that the unit has been calibrated using standards and instruments traceable to international standards.

METHOD OF MEASUREMENT

Subsection 614.13 shall include the following:

Grounding and bonding will not be measured or paid for separately but will be considered subsidiary to the field device, structure, pole, service pedestal and cabinet items, and shall include all labor, materials, equipment, testing and documentation required to complete the work.

**REVISION OF SECTION 614
TRAFFIC LOOPS AT AUTOMATED
TRAFFIC RECORDER (ATR) SITES**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of the removal and replacement of loop detector wires for the Automatic Traffic Recorder (ATR), where the loops been removed within a project site. Work shall be in accordance with this specification and as shown on the plans.

MATERIALS

Loop detector wire shall consist of specified loop wire encased in ¼ inch OD, 3/16 inch ID vinyl or polyethylene tubing. (14-1/C Loop detector cable 19 STR. PVC/Nylon/PVC Tube 600v IMSA 51-5)

Loops shall be sealed with a two-part self-curing, self-bonding weatherproof epoxy approved for sealing loops. Loops shall be 6 feet by 6 feet.

Grout or epoxy for the installation of the loops shall conform to manufacturer's recommendations.

Pull boxes shall be in accordance with Section 613.

CONSTRUCTION

A. *General.* A minimum of five days prior to installation, the contractor shall submit a schedule of installation activities including alternative scheduling to the CDOT Project Manager and the Traffic Data Collection (TDC) Manager (Mark Groetken (303) 886 2918 mark.groetken@state.co.us). The installation instructions from the manufacturer shall also be submitted for approval. Installation of loops shall not begin until approval has been received from the Engineer.

The Contractor shall install the loops as close to the locations shown on the plans as possible. Exact locations, dimensions, and configurations may vary based on site conditions, and shall be as approved by the Engineer.

If loops are installed during asphalt paving, the loops shall be installed before the final lift is placed.

All work will be inspected by the Traffic Data Collection Unit (TDC) during installation. Acceptance will be based on the testing and operation of the loops under actual traffic conditions, in which one week of actual data will be collected. The volume and vehicle class shall be within ±10 percent for the site compared to historical data for the same time period. There shall be no more than 1 percent sensor misses in any one lane for the same time period.

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REVISION OF SECTION 614
TRAFFIC LOOPS AT AUTOMATED
TRAFFIC RECORDER (ATR) SITES

- B. *Installation of loops.* Loops shall be centered in the travel lane with two sides parallel to lane striping. The saw cut for the loops shall be made 3/8 inch wide and 3-½ inches deep. The saw slot shall be as straight as possible and shall not vary more than ½ inch when checked with a straightedge. No more than one set of loop lead wires shall be placed in one saw slot. Saw cuts shall be hydro-blasted with a mixture of water and air and then blown free of water and debris with compressed air, using a large capacity air compressor of at least 150 CFM. The cuts shall be dry prior to placement of loop wire.
- C. The contractor shall locate all buried utilities, which may interfere with the planned location of the ATR site. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at 811 or 1-800-922-1987 for location of member utilities at least three working days prior to any excavation, not including the day of actual notice.

The Contractor shall also locate non-member utilities, such as storm sewer and ditch. Any utility conflicts encountered with the proposed installation shall be brought to the attention of the Engineer

After the saw slot is cleaned of debris and dried, the wire shall be placed for the loop by pushing it into the slot with a blunt non-metallic object. A screwdriver or other sharp tool will not be permitted. Care shall be used to avoid abrading or damaging the insulation.

All loop corners shall be rounded using a 1-½ inch hole drilled to a minimum depth of 3-½ inches. Loop leads shall be drilled when leaving the roadway surface at a 45 degree angle 8 inches from pavement edge out through the side or bottom of roadway, the drilled hole shall be no larger than ¾ of an inch. All holes shall be spaced a minimum of three inches from one another. No more than one set of loop lead wires shall be placed in one drill hole.

One continuous length of loop wire shall be used for each loop from pull box or cabinet around the loop with 4 turns and back to the pull box or cabinet with no splices. The wires shall be seated in the bottom of the saw slot. A ½-inch backer-rod shall be installed to insure wires do not float to the surface during grouting. Backer-rod shall be installed in 4 to 6 inch pieces with 1 to 2 foot gaps in-between, to insure the sealant will come in contact with the loop wire. One continuous piece of backer-rod will not be allowed.

Prior to sealing the loop, loop lead and feeder slots, a loop continuity test will be performed. The test will be performed by the TDC representative. Loop continuity shall be no higher than 1 ohm. Loop continuity higher than 1 ohm shall be cause for replacement of the loop. Replacement shall be at the Contractor's expense.

After the loops are properly seated and tested, the slots shall be filled with a two-part self-curing, self-bonding epoxy or grout, as recommended by the manufacturer. Excess epoxy shall be removed to avoid unnecessary high spots, and level with the roadway surface.

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REVISION OF SECTION 614
TRAFFIC LOOPS AT AUTOMATED
TRAFFIC RECORDER (ATR) SITES

Loop leads shall be pulled into cabinet without splices to match original installation when applicable.

All detector loops shall measure six feet by six feet.

Installation at an ATR count or classification site shall consist of one loop set (two loops) within a single lane. The loop sets shall be separated by 10 feet, plus or minus 1 inch, resulting in a distance of sixteen feet from the leading edge of the first loop in the direction of travel to the leading edge of the second loop.

Loop and loop leads shall be installed directly into the pavement, to pavement edge, pull box or cabinet. If loops are installed during asphalt paving, the loops shall be installed before the final lift is placed.

Loop lead wires from pavement edge to pull box shall be enclosed in $\frac{3}{4}$ inch PVC conduit or $\frac{3}{4}$ inch rubber hose to protect wire from abrasion. Loop lead-in pairs from pavement edge, to pull box, shall be symmetrically twisted 5 turns per 1 foot. Pull boxes or cabinet shall contain a minimum of 3 feet of loop lead wire for splicing. All loop and loop leads shall be clearly labeled in all pull boxes and or cabinet. The Contractor shall be responsible for all trenching and digging from pavement edge to pull box.

All splices shall be made with approved waterproof pressure connector. All splices shall be capable of satisfactory operation under continuous submersion in water.

- D. *Pull Boxes* All pull boxes on the shoulder of the roadway surface shall be raised to finished grade or level with the surrounding ground. If the shoulder has been raised to the point that the conduit is below the bottom of the pull box, then the conduit shall be raised. All wiring splices for existing wiring shall be a minimum of 12 inches in length above the conduit.

All existing pull boxes that are found to be damaged shall be replaced.

- E. *Water Valves.* A minimum of two feet of slack shall be provided on the loop wires that are contained in water valves.

No splices shall be allowed in water valves.

- F. *Pull Rope.* A $\frac{1}{8}$ inch nylon pull rope shall be installed in all new conduits and all existing conduits where a wire or cable is added or an existing wire or cable is replaced.

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REVISION OF SECTION 614
TRAFFIC LOOPS AT AUTOMATED
TRAFFIC RECORDER (ATR) SITES

- G. *Conduit.* The contractor shall seal all conduits with a sealing compound where a wire or cable is added or an existing wire or cable is replaced. The sealing compound shall be UL tested and approved for use. Sealing compound shall be a permanently soft, fibrous, non-staining sealer that can be easily applied and removed by hand at all working temperatures. Sealing compound shall be designed to seal out weather, moisture, dust rodents and atmospheric conditions both indoors and outdoors. No foam sealant will be allowed.

METHOD OF MEASUREMENT

Loop Detector Wire will be measured as the actual number of linear feet of wire that is installed and accepted, including splices and lead wire.

BASIS OF PAYMENT

Payment will be made under:

Pay Item

Pay Unit

Loop Detector Wire

Linear Foot

Payment will be full compensation for all work, materials, and equipment required to install the loop detector wire.

REVISION OF SECTION 614
TRAFFIC SIGNAL POLE

Subsection 614.08(h) shall include the following:

Traffic Signal Poles shall be Valmont Traffic Signal Poles 2015 AASHTO per the City of Littleton Standard. The traffic signal poles shall be galvanized and not painted. Coordinate with the City of Littleton and the Project Engineer fourteen (14) days prior to ordering the traffic signal poles.

The Traffic Signal Poles shall be in accordance with BABA requirements and the Contractor shall provide the BABA required documentation.

REVISION OF SECTION 619

CONTACT GROUTING

Subsection 619.03 shall include the following:

(c) *Contact Grouting*

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Section includes requirements for conducting Contact Grouting of overcut and voids outside the Initial Support.
- B. Requirements in this Section apply to all tunnels on the project. Submittals must be provided for each tunnel separately.

1.2 RELATED WORK:

- A. Related Documents and Specification Sections include but are not necessarily limited to:
 - 1. Casing Pipe for Waterlines
 - 2. Tunnel Instrumentation and Monitoring
 - 3. Casing Pipe Installation and Backfill

1.3 DEFINITIONS

- A. CONTACT GROUT: An approved mixture of Portland cement and water used to fill the annular overcut space created during tunneling.
- B. CONTACT GROUTING: The filling of the overcut and voids in the ground or between the ground and Initial Support.
- C. GROUT PORTS: Location along the tunnel Initial Support where grout is injected in the overcut and void space.

1.4 REFERENCE STANDARDS:

- A. ASTM C150 – Standard Specification for Portland Cement.
- B. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
- C. ASTM C942 – Test Method for Compressive Strength of Grout for Pre-placed Aggregate Concrete in the Laboratory.

1.5 GENERAL REQUIREMENTS

- A. Be responsible for construction and performance of the Contact Grouting on this project. Be responsible for developing and implementing Contact Grouting to fulfill the specified requirements necessary for completion of the work.
- B. The Contractor shall provide testing of materials and verification of material properties.
- C. Provide the Engineer with a schedule of Contact Grouting activities at least two (2) weeks before beginning grouting and update weekly. Notify the Engineer at least one working day in advance of schedule changes.

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REVISION OF SECTION 619

CONTACT GROUTING

D. Contact Grouting is required for all Initial Support systems except for Guided Pipe Ramming.

1.6 QUALIFICATIONS:

- A. Be experienced in grouting tunnels and underground projects using methods, materials, and equipment comparable to this project. Demonstrate successful completion of at least three (3) grouting jobs in the last three (3) years with similar scope to the proposed Contact Grouting plan.

1.7 SUBMITTALS

- A. Preconstruction: Submit to the Engineer the following a minimum of two (2) weeks before the scheduled start of the applicable activity.
 - 1. Contractor Contact Grouting qualifications.
 - 2. Descriptions and shop drawings describing and illustrating methods and equipment proposed for grouting. Include at a minimum the method(s) of transporting/delivery, sequence and stages of Contact Grouting, injection locations, and verification of grouting.
 - 3. Provide the maximum anticipated Contact Grout pressure. This pressure shall be verified in the field and shall not be exceeded without prior approval from the Engineer.
 - 4. Mix design for the grout including proportions of all constituents, properties of the wet mix, test results of the wet mix, and test results of the cured backfill.
 - a. Submittal shall fulfill all the QA/QC requirements specified herein.
 - b. Submit test results from samples made using the same materials, including water and cement that will be used on the Project.
 - 5. Description of equipment and methods proposed to mix Contact Grout including mixing equipment, quantity controls and instrumentation.
 - a. Description of trial batches, trial batch testing and proof of acceptable delivery and placement of grout.
 - 6. Injection methods for grout including pumping equipment, mixer, agitator, hoses, boosters, pumping distances, return flow lines, flow rates, and pressures.
 - a. Include methods and description of instrumentation to monitor and control placement of the grout, and procedures to be used to verify complete placement and check for voids.
 - 7. Drawings and description of grout ports, plugs, and valves for the ports, and materials used to plug and permanently seal the grout ports following Contact Grouting.
- B. Construction: Submit the following to the Engineer during construction within the specified time restrictions:
 - 1. Test results. Include results of all Contact Grout tests specified herein for the grout including but not limited to field tests and laboratory tests.
 - 2. Instrumentation and monitoring collected data during contact grouting as specified in Section 31 09 13 – Tunnel Instrumentation and Monitoring.
 - 3. Daily Logs as specified herein. Submit logs daily for the previous day's work within 1 day.

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REVISION OF SECTION 619

CONTACT GROUTING

PART 2 - EQUIPMENT, PRODUCTS, AND MATERIALS

2.1 GROUTING EQUIPMENT

- A. The Contractor's grouting equipment shall consist, at a minimum, of:
 - 1. Water meter in gallons;
 - 2. High speed shear mixer;
 - 3. Paddle type agitator;
 - 4. Grout pump; and
 - 5. Grouting header assembly.
- B. Provide grouting equipment with the ability to grout to a pressure of at least 0.5 psi, controllable to within 0.5 pounds per square inch (psi), and controllable to within 0.5 gallons per minute (gpm).
- C. Provide controls on the proportioning and mixing of the grout sufficient to assure the designed mix is achieved.
- D. Provide a pressure gauge at the injection point with a range suitable for the expected pressures and reading to an accuracy of 0.1 psi or better.
- E. Provide a flow meter with a range suitable for the expected grout flows and measuring the rate of flow to an accuracy of 0.2 gpm or better.
- F. Provide a total flow indicator capable of measuring the grout injected at each port to an accuracy of 1 gallon or better.
- G. Provide a backup pressure gauge and flow meter onsite should primary components be unable to provide accurate readings.
- H. Provide piping with a spigot and valve at the injection point for collecting grout samples.

2.2 COMMUNICATIONS EQUIPMENT

- A. Provide equipment to communicate between workers in the tunnel at the grout injection points with workers outside the tunnel.

2.3 MATERIALS

- A. Cement: per Division 03 00 00, Concrete.
- B. Contact Grout.
 - 1. A mixture of Portland cement and water.
 - a. Maximum water/cement ratio of 1:1 by volume.
 - b. 28-day strength of at least 500 psi.
 - c. No shrinkage when tested per ASTM C827.
- 2. Sand may be added only with approval of the Engineer.
- 3. Tested for compressive strength per ASTM C942.
- C. Ports and Port Patches in Initial Support.
 - 1. Ports and Port Patches in the Initial Support as shown on the Contract Drawings. The holes or ports shall be compatible with a minimum 1-inch diameter pipe nipple.
 - 2. Ports shall be prefabricated in Casing Pipe.

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REVISION OF SECTION 619

CONTACT GROUTING

PART 3 - EXECUTION

3.1 CONTACT GROUTING

- A. Contact Grout using methods and procedures that track the movement of grout and verify presence of grout throughout the tunnel by injecting grout at one port and using nearby ports to detect the presence of grout. Sequentially close off and move injection points to ensure full grout coverage of voids outside of the casing pipe.
- B. Ribs and Lagging Initial Support
 - 1. If ribs and lagging is used and stable ground exists as determined by the Engineer, Contact Grouting may be performed concurrently with Backfill Grouting through grout transmission holes cut in the Initial Support. The maximum size of a single grout transmission hole shall be one rib board spanning between two members of steel ribs.
 - 2. If unstable ground exists as determined by the Engineer, perform Contact Grouting through ports drilled or cut in the lagging. Follow all other requirements specified herein.
 - 3. Regardless of ground type, space ports as shown on the Contract Drawings similar to other
 - 4. Initial Support types.
- C. The grout pressure shall be sufficient for the grout to fill voids and displace fluids surrounding the pipe. Maximum allowable grouting pressure shall be maintained from the start of grout injection of each hole to refusal of the hole.
- D. The maximum grout pressure at all locations shall be less than the pressure that would cause ground surface heave and/or cause hydraulic fracturing and/or cause damage to the Initial Support.
- E. Maximum Contact Grout injection port spacing as shown on the Contract Drawings. Contact Grout through any injection port shall be considered complete when the grout take is $\frac{1}{4}$ of a cubic foot of grout or less for a minimum of 5 minutes at maximum grout injection pressure, or when grout delivery causes rapid increases in the grout injection pressure beyond the maximum grout injection pressure.
- F. After completion of Contact Grout, replace plug, and fill or patch in accordance with Initial Support manufacturers' specifications and recommendations.

3.2 LINER PLATE INITIAL SUPPORT

- A. When Liner Plate is used as the tunnel Initial Support, Contact Grout through preinstalled ports in the Initial Support each day that Initial Support is installed.
- B. Place Contact Grout as close as possible to the excavation face of the tunnel without damaging or jamming tunneling equipment in place. As a minimum, bring Contact Grout to within four (4) feet of the end of the tail shield of the tunnel excavation equipment before stopping work each day.

3.3 QUALITY CONTROL

- A. Monitor and record as a minimum all data necessary to complete the required Submittals.
- B. Pressure gauges of appropriate diameters and ranges for monitoring the Contact Grout injection pressures shall be located as close as possible to the point of injection in the line transporting the Contact Grout. Contact Grouting is not permitted without pressure gauges in good working condition.
- C. The volume of grout injected shall be measured, recorded, and compared with the anticipated volume per foot of grout expected. The advance of the grout shall be monitored using grout injection ports.
- D. Perform all monitoring and testing as specified and as necessary to complete all submittals.

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REVISION OF SECTION 619

CONTACT GROUTING

E. Ground Movement

1. The Contractor is solely responsible for damage caused by grouting operations. The Contractor shall determine the amount of movement allowed and control movements within those limits. The Contractor shall, at his expense repair any damage caused by grouting.
2. Surface survey points as designated in Section 31 09 13 – Tunnel Instrumentation and Monitoring shall be monitored and measured during Contact Grout pumping. If surface heave is measured during Contact Grouting, grouting at that specific Port shall immediately cease and the Contractor shall move on to the next port in series.

3.4 TESTING

- A. Test the Contact Grout. Obtain samples of Contact Grout at the point of discharge or alternatively at a simulated point of discharge through the same or greater pumping distance.
- B. Compression and Shrinkage Testing of Grout: A minimum of one set of five 3-inch diameter by 6-inch high cylinders shall be made for each 400 LF of contiguous tunnel. At least one set of test samples shall be made from each 75 cubic feet, or major fraction thereof, of Contact Grout placed in any one day. Test grout compressive strength at 7 days and 28 days.
- C. Testing results shall be provided to the Engineer as they become available from the Contractor employed testing agency.

3.5 DAILY LOGS

- A. Maintain Daily Logs of the work. As a minimum, the Daily Logs shall contain the following:
 1. Work hours, equipment, and crews in use with persons and craft designations;
 2. Stations of grouting;
 3. Volume and pressures injected at each location and grout sequence with take at each port and observations of return from nearby holes;
 4. Record of holes grouted with locations, quantities, pressures, injection times, and verifications used; and
 5. Problems or unusual conditions encountered, and actions taken to address these situations.

**REVISION OF SECTION 625
ASSET GEOSPATIAL DATA COLLECTION**

Section 625 of the Standard Specifications is hereby revised for this project as follows:

DESCRIPTION

Subsection 625.04 shall include the following:

The Contractor's surveyor shall conduct an as-constructed survey as defined below of all assets installed or relocated on this project within the project limits.

CONSTRUCTION REQUIREMENTS

The Contractor's surveyor shall conduct an as-constructed survey of the following items:

- (1) Installed or relocated utility lines as shown on the utility plans, including those installed or relocated by the Contractor or by others.
- (2) Installed or relocated culverts, conduit, inlets or other drainage features.
- (3) Traffic signal heads, poles, pushbutton assemblies and controller cabinets.
- (4) ITS/Communications manholes, pull boxes, conduit, fiber splice points, poles, towers, cabinets, nodes, devices and other ITS assets.
- (5) Lighting including pull boxes, meters and light standards.

The as-constructed survey shall be completed in accordance with the *CDOT Survey Manual*, Chapter 6, Section 6.14. Item 4 is hereby deleted and replaced with:

4. Three-dimensional (containing northings, eastings and elevations) data is to be submitted to CDOT's utility database. The Contractor's surveyor shall collect observations in accordance with Sections 2.1 - 2.4 below. Accuracy requirements, projections, coordinate systems, and equipment requirements are outlined in Table 1 and Sections 1.1 - 1.4 below. Points and polylines shall be collected with the appropriately named survey codes identified in Table 2 below. Each file of observed points shall contain a description of what each point represents.

All utility and hydraulic installations within CDOT right of way shall be collected using CDOT's mobile application, PointMan. Download the PointMan mobile application from the Apple Store (iOS) or Google Play (Android). If required, please contact CDOT at cdotpointman@gmail.com in order to obtain new login and password information.

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REVISION OF SECTION 625 ASSET GEOSPATIAL DATA COLLECTION

High-accuracy equipment requirement:

The Contractor shall use a device designed specifically for capturing GPS coordinates that is listed as compatible with CDOT’s mobile application. Deviation from CDOT’s list of accepted GNSS receivers must be requested and approved by the department in writing prior to submission of as-built data:

Trimble DA1	Emlid Reach RS2
Trimble R2	Bad Elf – Flex RTK
Trimble R8	Android only – Leica RTK
Trimble R10	
Trimble 12 and 12i	

1.1 Projections and Coordinate System

Horizontal Datum: The North American Datum of 1983, 2011 Adjustment (NAD 83) and the Geodetic Reference System of 1980, (GRS80).

Vertical Datum: The North American Vertical Datum of 1988, (NAVD 88) RTK GPS is an acceptable method to derive NAVD 88 elevations and is the vertical datum to be used for all CDOT projects. Use the latest Geoid model from NGS to compute orthometric heights.

1.2 Positional Accuracy Specification

CDOT requires positional accuracy Level(s) 1, 2, or 3 for all Horizontal and Vertical positions collected for utilities and ITS assets installed within CDOT right of way. Accuracy level designations are shown in Table 1 below. Other assets may be collected at accuracies not to exceed 5. Utilizing CDOT’s mobile application pedigree (survey record) will assist in determining the accuracy levels that must be assigned to the specific permitted installation by the utility company representative responsible for collection of as-built data.

Table 1. Positional Accuracy Requirements

Positional Accuracy Level	Positional Accuracy (English Units)	Positional Accuracy (SI Units)
1	0.1 ft	25 mm
2	0.2 ft	50 mm
3	0.3 ft	100 mm
4	1 ft	300 mm
5	3 ft	1000 mm
0	indeterminate	indeterminate

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REVISION OF SECTION 625
ASSET GEOSPATIAL DATA COLLECTION

At the 95% confidence level, use the root-mean-square error in accordance with FGDC-STD-007.3-1998. Positional accuracy is in direct reference to the actual geodetic positional coordinates referenced to the National Spatial Reference System maintained by the National Oceanic and Atmospheric Administration National Geodetic Survey. Geodetic positional coordinates (latitude, longitude, and orthometric heights) reference the official United States datum, currently the North American Datum of 1983 and the North American Vertical Datum of 1988. GPS coordinates shall be delivered in World Geodetic System 84, latitudes, and longitudes, and be in decimal degree format.

Rigid above-ground features are subject to the same positional accuracy requirements as underground features. The positional accuracy of suspended aerial cables and wires is variable due to environmental factors, and therefore shall be classified as Level 0, except at the points where they are anchored to support structures such as poles.

For linear features, the depicted position must meet the tolerances as specified in Table 1 at every position along the length of the feature in order to be designated that accuracy level. Since survey-collected data and resulting 3D models are usually chorded, the point spacing must be close enough so that the true location and depicted location meet the tolerance along its entire length.

Documentation verifying the type of GPS unit being proposed for use, and the specifications of the unit, shall be provided to the Project Engineer for review prior to data gathering. The Contractor shall supply complete information for each device. For data collection, the Contractor shall use a fixed RTK solution only. Data shall be submitted to the Project Engineer in an electronic format per Section 1.1. If deviating from using the department's approved mobile technology, including a GPS-collecting device with Windows and ArcPad, capable of ArcView/ArcGIS Export/Import Formats *.e00 files, or ArcView/ArcGIS shape files must be approved in writing prior to using such alternative.

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REVISION OF SECTION 625
ASSET GEOSPATIAL DATA COLLECTION

2.0 Utilities Collected

Table 2. Utilities Collected

Utility Type	Feature Code	Description of Utilities
Test hole	5950	Point - test hole physically locating X,Y,Z underground facility location.
Proposed running line/Bore log data	6001 or 6075	Line segment code 6001 - surface elevation of proposed HDD bore. Point - 6075 location bore log depth required for each observed point.
Communication	4210, 4410, 4211	Line segment - all communication facilities, including fiber optic (4211), copper (4210), coaxial (4410), including appurtenances within defined size parameter.
Gas	4510, 4511	Line segment - low pressure (4510), high pressure (4511), natural gas transmission, distribution, service lines, and appurtenances within defined size parameter.
Electric	4310	Line segment - secondary electric or higher voltage.
Pipe (Oil)	4610 or 4611	Line segment - pipeline facilities including crude oil, refined oil, and all other types of oil pipeline transmission, distribution, service lines, and appurtenances within defined size parameter.
Propane	4512	Line segment - propane transmission, distribution and service lines, and appurtenances within defined size parameter.
Sanitary Sewer	4811	Line segment - sanitary sewer facilities including all mains, collection system, force mains, services and leads, including appurtenances within defined size parameter. Combined sewer is classified as sanitary sewer.
Surface Elevation	6075	Point - X,Y,Z single observation for surface elevation.
Storm Sewer	2712	Line segment - storm sewer facilities including all mains and collection system, and appurtenances within defined size parameter. (Excludes underdrain).
Water	4710	Line segment - water transmission, distribution, service lines, and appurtenances within defined size parameter. (Excludes irrigation systems).
Unknown	6075 or 6001	Point and Line segment - this designation can be used for those facilities not covered by the feature codes above, including but not limited to industrial facilities of all types, and discovered utilities where the type of utility is unknown.

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REVISION OF SECTION 625

ASSET GEOSPATIAL DATA COLLECTION

2.1 General Observations Standards

- A. All transmission, distribution and collector system main lines
 - a. Start and end points
 - b. Minimum of every 25 feet with the following additional points
 - i. Deviations in installation alignment (horizontal and vertical) including, but not limited to, the following:
 - a. Intentional changes in geometry such as changing direction to avoid obstacles
 - b. Fittings such as elbows (horizontal and vertical)
 - ii. Changes in facility characteristics (change in size, material, number or pair, encasement size, material, etc.)
 - iii. Start and end point for vaults
- B. Appurtenances installed concurrently with new main installations, whereas appurtenances are defined as service leads and stubs.
 - a. Tap-in at the main and at (near) the right of way line
- C. New appurtenances from existing mains
 - a. All size and material types shall be recorded for each utility type
 - b. Tap-in at main and at (near) the right of way line
- D. Transverse utility crossings installed via trenchless methods
 - a. All qualified utilities crossing roads as described in Section 2.4
 - b. 25-foot intervals across pavement sections when safely achievable

All other transverse utility crossings that are installed using methods conducive to a direct survey observation require survey observations to be collected at a minimum of 25-foot intervals when crossing a pavement section. Additionally, all utilities shall be directly observed when installed using a method that support direct observation.

All utilities installed by trenchless technologies shall be observed directly above the installed utility with the elevation computed from the best available depth readings (typically, depths read from bore head during installation). The accuracy of the depth readings to the installed utility will vary depending on the type of equipment used during installation; use code 6075 to record bore depth information.

Direct survey observations are required where utilities are exposed, including tie-in locations, bore pits, hand holes and manholes. Alignment and depth shall be documented during boring operations at the required interval. Some form of field witnessing shall be used to mark the horizontal location and depth of the utility based on readings from the equipment being used. The utility company then can survey each marked location and compute the elevation of the installed facility based on the recorded depth readings at each surveyed location.

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REVISION OF SECTION 625
ASSET GEOSPATIAL DATA COLLECTION
METHOD OF MEASUREMENT

At a minimum, alignment and depths must be physically documented at an interval of not more than 50 feet, and at all changes in horizontal and vertical alignment. The more survey observations collected along a utility line, the better the true three-dimensional alignment of the utility will be represented. For example, long and deep bores could create a parabolic curve shaped utility that will not be accurately represented with point spacing at 50 feet. Use professional judgement and collect additional points at a closer interval to generate a more representative geometry of the utility.

Subsection 625.12 shall include the following:

Asset Geospatial Data shall include all labor, materials and equipment required to complete the work.

-
BASIS OF PAYMENT

Subsection 625.13 shall include the following:

Payment will be made under:

Pay Item

Pay Unit

Construction Surveying

Lump Sum

REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

Section 626 of the Standard Specifications for this project to include the following:

DESCRIPTION

This work consists of providing Public Information Management for the duration of the project. The Contractor shall submit all documentation associated with the Public Information Management item to the Project Engineer. Before approval, the Engineer will coordinate review and approval with the Region Communications Manager (RCM) and the City of Littleton Project Engineer or the Engineer's Representative.

Anticipated communications issues on this project include:

1. Communication with business regarding full-time access during construction
2. Coordination with Douglas County
3. Coordination with Regional Transportation District (RTD)
4. Coordination with South Metro Fire District
5. Coordination with Water and Sanitation Districts
 - a. Centennial Water and Sanitation District
 - b. Northern Douglas County Water and Sanitation District
 - c. Southwest Metropolitan Water and Sanitation District
 - d. Denver Water

CONSTRUCTION REQUIREMENTS

- (a) *Public Information Manager (PIM)*. The PIM shall perform all activities associated with Public Information Management for this project. In the event the PIM is not available, the Backup PIM shall perform the required activities. The PIM shall not be the Project Superintendent.

Within ten days of the Notice to Proceed date or five days before the Pre-construction Conference, whichever is later, and at least 14 days before the start of PIM work the Contractor shall submit the name, contact information, and resume of the PIM and the Backup PIM to the Engineer. The PIM and Backup PIM shall have a minimum of five years of professional experience in public or media relations, marketing, or other related field and appropriate verbal and written communication skills. Experience in administrative or business office duties is not a related field.

- (b) *Activities of the PIM*. The PIM duties are:

- (1) *Project Onboarding/Offboarding Request Form*. The PIM shall complete and update the Project Onboarding/Offboarding Request Form (<https://form.jotform.com/71167524405150>) every month or as requested by the Engineer. The form will assist the PIM and CDOT with tracking required activities and deliverables.
- (2) *On-Call*. The PIM shall be available or on-call each day there is work on the project and shall be available upon the Engineer's request outside of normal working hours. The PIM and the Contractor shall participate with the City of Littleton on all meetings requested by the Engineer.

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REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

- (3) *Public Information Office.* The Contractor shall establish a public information office equipped with a telephone, a local telephone number with voicemail, which becomes the Project Hotline, a computer, and an email address. Acceptable locations for the project's public information office include the project office or off-site within the Contractor's office or the PIM's office. The Project Information signs shall include the Project Hotline telephone number. The PIM shall update the Project Hotline telephone message greeting weekly at a minimum and include the project's anticipated completion date and forthcoming activities for the update period. The PIM shall answer calls, listen to voicemail, and check email throughout each day that construction operations are in effect. The PIM, and when necessary, the Engineer, shall respond to all inquiries with a phone call, a voicemail message, or an email within one day. The PIM shall document the contact's name, contact phone number or email address, and the action taken. Within two days of receiving the message, the PIM shall enter message details and follow-up action into the electronic reporting system.
- (4) *Project Meetings.* The PIM shall participate in the weekly project meetings, discuss communication issues, and provide a status on the items in this specification.
- (5) *Lane Closure Reporting.*
- (i) *Electronic Reporting System.* Before the Pre-construction Conference and at least 14 days before the project start, the PIM shall submit a request for access to the electronic reporting system through the Project Onboarding/Offboarding Request Form (b.1). At least once per week, the PIM shall enter project information into the electronic reporting system.
 - (ii) *Weekly Lane Closures.* The Superintendent or PIM shall notify the Engineer one week in advance of all planned "no work" periods and planned lane closures. The PIM shall enter the planned weekly lane closures and updates into the electronic reporting system for the upcoming work period, Sunday through Saturday, by Thursday at 12:00 P.M. The Engineer will approve the Lane Closure and Updates by Friday at 3:00 P.M. Each Monday by 12:00 P.M., the PIM shall review www.cotrip.org and verify that the lane closure and update information is accurate. If corrections are necessary, the PIM shall coordinate with the Engineer to make necessary corrections to www.cotrip.org.
 - (iii) *Real-Time Lane Closure Changes.* The Superintendent shall notify the PIM and the Engineer at least 24 hours in advance on approved Lane Closure changes. The Engineer will notify the PIM when the electronic reporting system is available for changes. After completing the changes, the PIM shall notify the Engineer that the changes are ready for review and approval.
- (6) *Public Information Collateral.* The PIM shall develop a variety of Public Information Collateral to share project information for project milestones such as long-term closures or impactful construction activities. Collateral includes the following:

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REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

- (i) *Photographs and Video Recordings.* The PIM shall take digital photographs and video recordings at regular intervals and submit them to the Engineer. The PIM may use a cell phone camera. Photographs and video recordings shall capture various work activities and other areas of work as identified by the Contractor or the Engineer. Public Information Collateral shall include these photographs and video recordings. The PIM shall submit a minimum of two digital photographs or video recordings of the project activities and progress each month. Each photograph and video recording shall include the project number, project code, date, time, location and station or milepost, and name of the person taking the photograph or video recording.
- (ii) *Maps and Graphics.* The PIM shall develop maps, detour maps, and graphics for use in Public Information Collateral.
- (iii) *Web Page Updates.* The PIM shall work with the City of Littleton to develop the latest project information for the internet web page content. The PIM shall supply information for the web page using the CDOT web page template in the Project Onboarding/Offboarding Request Form PIM resources. When applicable, the updates shall contain all appropriate web page links to and from other sites. The PIM shall provide updated information at least weekly. In addition, the City of Littleton will update the web page.
- (iv) *Stakeholder List.* The PIM shall submit a Stakeholder List as a component of the Public Information Plan with each stakeholder's name, telephone number, email address, and notes on communication needs for the project.
- (v) *Public Information Management Contact Sheet.* The PIM shall prepare and update a Public Information Management Contact Sheet with the names and contact information of the individuals pertinent to the project's public information. The Public Information Plan shall include the Public Information Management Contact Sheet.
- (vi) *Traffic Advisories and Project Updates.* The PIM shall develop weekly traffic advisories and project updates developed from the weekly Lane Closure Report, including lane closures and project update information.. The Engineer will approve traffic advisories and project updates before distribution. The PIM shall email the traffic advisory and project updates to the stakeholder list by Friday of each week to announce the following week's upcoming project activity. The emailed advisory may come from the project email box or an automated distribution platform.
- (vii) *Media Relations.* At least 14 days before the start of work or a milestone, the PIM shall prepare media releases. The PIM shall allow the Engineer at least three days to review and approve the media release before distribution. City of Littleton will distribute media releases.

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REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

City of Littleton will address all media inquiries and media requests. The PIM shall immediately notify the Engineer of any project and on-site situations involving the media. When the media contacts the PIM or Contractor staff, the PIM shall provide the media the RCM's contact information.

The PIM shall prepare a media release announcing the project, summarizing the project scope, construction phasing, construction activities that affect traffic, the project end date, and a summary of project benefits. The PIM shall develop additional media releases for major construction milestones, traffic control or lane shifts, closures, project completion, and as directed by CDOT. The releases shall also include maps or other graphics.

- (viii) *Project Fliers.* The PIM shall develop project fliers using the CDOT project flier template available in the Project Onboarding/Offboarding Request Form PIM resources. The PIM shall submit the draft project flier to the Engineer for review 10 days before the planned distribution and shall distribute the project flier at least 10 days before the Project's start or milestone. The review and approval of the project flier will not exceed five days.

This project requires project fliers at the following milestones:

1. Initial project flier
2. Bi-monthly flier and supplemented with additional fliers sent out prior to major traffic changes.

The initial project flier shall provide the project start and end dates, project location, description of work, traffic impacts, scheduled work hours and workdays, the Project Hotline telephone number, email address, web address, project map, photo of the project area, and a construction safety message as defined by CDOT. The PIM shall distribute the initial project flier before construction starts.

Develop the list of recipients via <http://uspseverydoordirectmail.com>, from county GIS mapping, or other approved method. The PIM shall deliver one approved flier per property owner and each tenant within 1 miles of the project limits. The estimated number of printed fliers is 1000. The PIM shall distribute an email containing a digital form of the flier to stakeholders identified in the Stakeholder List.

- (ix) *Advertisements.* At least 14 days before the start of work, the Contractor or PIM shall submit a draft of the quarter-page advertisement and available media outlets to the Engineer. The PIM shall allow the Engineer at least four days to review the advertisement and media outlets. The PIM shall publish the advertisement at least four days before the start of the work. The advertisement shall detail the dates and scope of construction with visual aids, maps, or photographs of the project area. If applicable, the advertisement shall note any business access changes and temporary closures. The advertisement shall encourage readers to sign up for project updates via CDOT's website. CDOT will post advertisements on social media.

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REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

(7) *Public Information Plan*. The PIM shall submit a Public Information Plan (PIP) within five days of the Pre-construction Conference. The PIP shall be specific to the project. The PIP shall include public information strategies for affected road users using the Public Information Collateral, the expected work zone impacts and closure details, commuter alternatives, community, government and business relations, media relations, identification of public information issues, proposed outreach strategies, approach to crisis communications, the Stakeholder List, and the Public Information Management Contact Sheet. The PIM shall update the plan when necessary and as directed by the Engineer. The PIP is a component of subsection 630.10 Transportation Management Plan.

(8) *Project Public Information Manager (PPIM)*.

(c) *Response Protocol to City of Littleton and the Public*. The PIM shall follow Table 626-1 in responding to correspondence from stakeholders and the public:

Table 626-1 - Response Timing

Type	Timing
Project Hotline calls and voice messages	Answer calls and check messages throughout each day. Respond within one day. Enter details into the electronic reporting system within two days.
Email messages	Respond within one day. For high-volume situations, respond within two days. Enter details into the electronic reporting system within two days.
Calls from City of Littleton and CDOT Staff	Respond as soon as possible, and within 24 hours.
Web page inquiries	Respond within one day. For high-volume situations, respond within two days.
Public Meeting inquiries	Respond within one week of the meeting.

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REVISION OF SECTION 626
PUBLIC INFORMATION MANAGEMENT
(TIER II)

METHOD OF MEASUREMENT

Public Information Management will be measured as the number of days elapsed from 14 days before the construction start date and no earlier than the project Notice to Proceed through Final Acceptance. Failure to provide acceptable Public Information Management will result in withholding of payment for the days affected as determined by the Engineer.

BASIS OF PAYMENT

Pay under:

<u>Pay Item</u>	<u>Pay Unit</u>
Public Information Management (Tier II)	Day

Payment for Public Information Management will be full compensation for each measured day where the work, materials, and equipment to provide public information is in accordance with this specification.

If the Contractor fails to complete construction within the approved contract time, City of Littleton will not pay for Public Information Management for the period after expiration of the approved contract time. The Contractor shall continue to provide Public Information Management through Final Acceptance at its expense.

**REVISION OF SECTION 627
MODIFIED EPOXY PAVEMENT MARKING (INLAID)**

Section 627 of the Standard Specifications is hereby revised for this project as follows:

Section 627.05 shall include the following:

The surface area receiving marking shall be ground prior to placement of the Modified Epoxy Pavement Marking (Inlaid). This applies to new or existing concrete or asphalt pavements. Grinding of the pavement is required so that Modified Epoxy Pavement Marking (Inlaid) is inlaid into the surface being applied to. The grooved width shall be the pavement marking width plus 1 inch, with a tolerance of plus or minus ¼ inch. The depth of the inlaid grooves shall be 35 mils below the surface of the existing pavement. The Contractor shall set the spacer width between blades such that there is less than a 5 mil rise in the pavement between the blade grooves. Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint.

The ground surface shall be cleaned with a high-pressure air blast to remove loose material prior to placement of the Modified Epoxy Pavement Marking (Inlaid). Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves, and shall re-clean grooves, as necessary, prior to application of the preformed plastic pavement markings.

The Contractor shall not perform more inlaid grinds than can be applied by the pavement marking truck during the same working day or working period. Unless approved by the Engineer.

If a rain event occurs during grinding and marking application, temporary raised flexible pavement markers shall be installed on all channelizing, center, and lane lines. Temporary markers shall also be placed on edge lines where lighted curb or other delineation is not provided as directed by the engineer. The frequency of temporary markers shall be according to Section 6J.03 of MUTCD. Marking application may proceed only when pavement is dry and has had no moisture for a minimum of 24 hours.

Modified Epoxy Pavement Marking shall have uniform mil thickness and bead distribution across the entire width of the line. Unless otherwise shown on the plans, typical pavement markings shall conform to the shapes and sizes as shown on Standard Plan S-627-1.

Subsection 627.05 shall include the following:

Modified Epoxy Pavement Marking (Inlaid) shall conform to subsection 713.17.

BASIS OF PAYMENT

Subsection 627.13 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Modified Epoxy Pavement Marking (Inlaid)	Gallon

**REVISION OF SECTION 627 AND 713
PREFORMED THERMOPLASTIC PAVEMENT MARKING**

Section 627 of the Standard Specifications is hereby revised for this project as follows:

CONSTRUCTION REQUIREMENTS

In subsection 627.09, first paragraph, delete the first sentence and replace with the following:

The markings shall consist of a resilient white, yellow, or other color thermoplastic product with glass beads and anti-skid elements uniformly distributed throughout the entire cross-sectional area to ensure that skid resistance and retroreflectivity are maximized.

Section 627 of the Standard Specifications is hereby revised for this project to include the following:

Subsection 627.09 (c) is hereby added to the Standard Specifications for this project as follows:

(c) Inlaid (Word-Symbol) (X-walk/Stop-bar) (Shield)

All Preformed Thermoplastic Pavement Marking surfaces shall be ground before placement of proposed marking. Depth of grinding shall be such as to completely remove any existing pavement markings and to have a nominal depth of 125 milliinches (mils) +/- 10 mils. The inlaid area for the new Preformed Thermoplastic Pavement Marking shall be in the same shape or pattern as the Preformed Thermoplastic Pavement Marking that is being installed. Grinding of existing preformed thermoplastic pavement marking and existing asphalt shall not be measured and paid for separately, but shall be included in the work.

Colorado epoxy glass beads and anti-skid elements applied to the surface of the material to ensure the required skid resistance and retroreflectivity will not be measured and paid for separately, but shall be included in the work.

Surface shall be dry and free of dirt, dust, chemicals, and significant oily substances. Existing pavement markings shall be removed prior to installation of Preformed Thermoplastic Pavement Marking in areas where markings overlap. Application procedures for Portland concrete pavement shall be as described above except a compatible primer sealer shall be applied before application of marking to ensure proper adhesion.

The Contractor shall require the stencil manufacturer to provide on-site training prior to installation of the first stencil. All crew members on the work site shall be certified by the stencil manufacturer. The training shall include surface preparation and stencil installation for both hot bituminous pavement and concrete pavement. The training shall be coordinated with and attended by Colorado Department of Transportation (CDOT) project engineers and inspectors. Training shall be incidental to the work.

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REVISION OF SECTION 627 AND 713
PREFORMED THERMOPLASTIC PAVEMENT MARKING

1. The Contractor shall use a durable, high skid resistant, retroreflective pavement marking material suitable for use as interstate shields; route shields; and bike path, roadway, intersection, airport, commercial, or private pavement delineation and markings.
 - A. The markings shall be a resilient white, yellow, or other color thermoplastic product, the surface of which shall contain glass beads and abrasives in an alternating pattern. The markings shall be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, etc. Lines, legends, and symbols shall be capable of being affixed to bituminous or Portland cement concrete pavements by the use of the normal heat of a propane torch.
 - B. The markings shall be capable of conforming to pavement contours, breaks, and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the torch.
 - C. The markings shall not have minimum ambient and road temperature requirements for application, without any preheating of the pavement or special storage, handling, preheating, or treatment of the material before application.
2. Manufacturing Location, Control and International Standards Organization (ISO) Certification: The marking material must be produced in the United States, and the manufacturer must be ISO 9001:2015 certified for design, development, and manufacturing of preformed thermoplastic pavement markings, and provide proof of current certification.
3. Material: The marking material shall be composed of an ester modified rosin resistant to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, abrasives, and glass beads which have been factory produced as a finished product. The marking material shall meet the requirements of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways. The thermoplastic material shall conform to American Association of State Highway and Transportation Officials (AASHTO) designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state.
 - A. Graded Glass Beads
 - (1) The material shall contain a minimum of 30 percent intermixed graded glass beads by weight. The intermixed beads shall conform to AASHTO designation M247, with minimum 80 percent true spheres and minimum refractive index of 1.50.

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REVISION OF SECTION 627 and 713

PREFORMED THERMOPLASTIC PAVEMENT MARKING

- (2) The material shall have factory applied coated surface beads and abrasives at a rate of 1/2 pound (0.23 kilogram) [$\pm$ 20 percent] per 11 square feet (1 square meter) each in addition to the intermixed beads. The surface beads and abrasives shall be applied evenly across the surface of the material so that the surface is covered completely with glass beads and abrasive materials. The abrasive material shall have a minimum hardness of 9 (Mohs scale). The factory applied coated surface beads shall have a minimum of 80 percent true spheres, have a minimum refractive index of 1.50, and meet the following gradation:

Size Gradation		Retained, %	Passing, %
US Mesh	Um		
12	1700	0 - 2%	98 – 100%
14	1400	0 - 6%	94 – 100%
16	1180	1 – 21%	79 – 99%
18	1000	28 - 62%	38 – 72%
20	850	62 - 71%	29 – 38%
30	600	67 - 77%	23 – 33%
50	300	86 - 95%	5 – 14%
80	200	97-100%	0 – 3%

B. Pigments

- (1) White: The material shall be manufactured with sufficient titanium dioxide pigment to meet Federal Highway Administration (FHWA) Docket_No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.
- (2) Red, Blue, and Yellow: The material shall be manufactured with sufficient pigment to meet FHWA Docket_No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments shall be organic and shall be heavy-metal-free.
- (3) Other Colors: The pigments shall be heavy-metal-free.

- C. Heating indicators: The top surface of the material (same side as the factory applied surface beads/abrasives) shall have regularly spaced indents. The closing of these indents during application shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.

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REVISION OF SECTION 627 and 713

PREFORMED THERMOPLASTIC PAVEMENT MARKING

- D. Skid Resistance: The surface of the preformed thermoplastic (anti-skid material) items shall contain factory applied anti-skid material with a minimum hardness of 9 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 British Pendulum Number (BPN) when tested according to American Society for Testing and Materials (ASTM) E303. The surface beads and abrasives shall be applied evenly across the surface of the material so that the surface is covered completely with glass beads and abrasive materials.
- E. Thickness: The material shall be supplied at a minimum thickness of 125 mils (3.15 millimeters (mm)).
- F. Retroreflectivity: The material, when applied in accordance with manufacturer's guidelines, shall demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance to ASTM E1710. The applied material shall have an initial minimum intensity reading of 275 millicandelas per square meter per lux ($\text{mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$) for white, as measured with a pavement marking retroreflectometer.
- G. Environmental Resistance: The material shall be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to oil and gasoline.

Only Preformed Thermoplastic Pavement Marking material listed on the Department's approved products list may be used.

BASIS OF PAYMENT

Subsection 627.13 shall include the following:

<u>Pay item</u>	<u>Pay Unit</u>
Preformed Plastic Pavement Marking (Type I) (Inlaid)	SF
Preformed Thermoplastic Pavement Marking (Word-Symbol) (Inlaid)	SF
Preformed Thermoplastic Pavement Marking (Xwalk-Stop Line) (Inlaid)	SF

Pavement Marking Shields as shown in the plans is paid under Preformed Thermoplastic Pavement Marking (Word-Symbol)

REVISION OF SECTION 630
IMPACT ATTENUATOR (TEMPORARY)

Section 630 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing, installing, certifying, moving, repairing, maintaining, and removing temporary impact attenuators in accordance with these specifications and in conformity with the lines and details shown on the plans or established.

MATERIALS

Each impact attenuator shall be selected from the Crash Cushion and End Treatment Application Chart as listed in the *Safety Selection Guide* on the CDOT Design and Construction Project Support web site. Impact attenuators shall conform to the requirements of the manufacturer and be capable of bi-directional shielding. Filler materials shall be treated according to the manufacturer's recommendations to prevent freezing to a temperature of -50 °F.

If the posted speed limits of the construction zone are 45 miles per hour or less, the impact attenuator shall comply with the crash test requirements contained in NCHRP Report 350 (only applicable for impact attenuators developed prior to 2011) or MASH (acceptable for all impact attenuators), TL-2.

CONSTRUCTION REQUIREMENTS

If sand barrel arrays are used, the Contractor shall paint, with white epoxy paint, an outline and the weight of each barrel on the pavement prior to final placement. All numbers shall be a minimum of 6 inches high. Barrel type shall be one of those listed in the *Safety Selection Guide*.

The site shall be prepared to receive the impact attenuator by filling, excavating, smoothing, constructing the paved foundation pad, installing approved transition and anchoring, and all other work necessary for the proper installation of the attenuator.

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REVISION OF SECTION 630
IMPACT ATTENUATOR (TEMPORARY)

The impact attenuator shall be fabricated and installed in accordance with the manufacturer's recommendations. The Contractor shall provide a copy of the manufacturer's installation instructions and parts list to the Engineer prior to installation of the device.

Each installation shall be supervised and certified as correct upon completion by a representative of the device manufacturer or by an employee of the Contractor who is a certified installer. The certified installer shall have completed device training and shall be registered with the manufacturer as a certified installer. The Contractor shall submit all appropriate documentation to validate that the certified installer has completed device training and has been registered with the manufacturer as a certified installer.

METHOD OF MEASUREMENT

Impact Attenuator (Temporary) will be measured by the number of attenuators shown on the plans, installed, certified, and accepted; or the actual number of authorized 24-hour periods that the attenuator is used.

BASIS OF PAYMENT

If the pay unit is "day" there will be no incremental payment for the device. If the pay unit is "each" the item will be paid incrementally in accordance with subsection 630.17.

The accepted quantities will be paid for at the contract unit price for the pay item listed below:

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Impact Attenuator (Temporary)	Each

Payment will be full compensation for all work and materials required to furnish, install, certify, move, repair, maintain, and remove the impact attenuator. Site preparation, foundation pad, epoxy painting, and all necessary hardware including anchors and transitions will not be paid for separately, but shall be included in the work.

REVISION OF SECTION 630
PORTABLE MESSAGE SIGN PANEL

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work includes furnishing, operating, and maintaining a portable message sign panel.

Add subsection 630.031 immediately following subsection 630.03 as follows:

630.031 Portable Message Sign Panel. Portable message sign panel shall be furnished as a device fully self-contained on a portable trailer, capable of being licensed for normal highway travel, and shall include leveling and stabilization jacks. The panel shall display a minimum of three - eight character lines. The panel shall be a dot-matrix type with an LED legend on a flat black background. LED signs shall have a pre-default message that activates before a power failure. The sign shall be solar powered with independent back-up battery power. The sign shall be capable of 360 degrees rotation and shall be able to be elevated to a height of at least five feet above the ground measured at the bottom of the sign. The sign shall be visible from one-half mile under both day and night conditions. The message shall be legible from a minimum of 750 feet. The sign shall automatically adjust its light source to meet the legibility requirements during the hours of darkness. The sign enclosure shall be weather tight and provide a clear polycarbonate front cover.

Solar powered message signs shall be capable of operating continuously for 10 days without any sun. All instrumentation and controls shall be contained in a lockable enclosure. The sign shall be capable of changing and displaying sign messages and other sign features such as flash rates, moving arrows, etc.

Each sign shall also conform to the following:

- (1) In addition to the onboard solar power operation with battery back-up, each sign shall be capable of operating on a hard wire, 100-110 VAC, external power source.
- (2) All electrical wiring, including connectors and switch controls necessary to enable all required sign functions shall be provided with each sign.
- (3) Each sign shall be furnished with an operating and parts manual, wiring diagrams, and trouble-shooting guide.
- (4) The portable message sign shall be capable of maintaining all required operations under Colorado mountain-winter weather conditions.
- (5) Each sign shall be furnished with an attached license plate and mounting bracket.
- (6) Each sign shall be wired with a 7-prong male electric plug for the brake light wiring system.

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**REVISION OF SECTION 630
PORTABLE MESSAGE SIGN PANEL**

Subsection 630.13 shall include the following:

The portable message sign panel shall be on the project site at least 14 calendar days prior to the start of active roadway construction. Maintenance, storage, operation, relocation to different sites during the project, and all repairs of portable message sign panels shall be the responsibility of the Contractor.

Subsection 630.18 shall include the following:

Portable message sign panels will be measured one of the two following ways:

- 1) By the actual number of days each portable message sign is used on the project as approved by the Engineer.
- 2) By the maximum number of approved units in use on the project at any one time.

Subsection 630.18 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Portable Message Sign Panel	Each

REVISION OF SECTION 630
UNIFORMED TRAFFIC CONTROL (LOCAL AGENCY)

Section 630 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing a uniformed police agency officer from the following local agency to perform uniformed traffic control:

City of Littleton

When called for in the Contract, this work includes furnishing a vehicle for the officer to use in performing uniformed traffic control.

MATERIALS

- (a) *Qualifications.* The local agency officer shall have completed “The Safe and Effective Use of Law Enforcement Personnel in Work Zones” Training Course. The Contractor shall provide copies of documentation certifying the officer’s successful completion of this course.
- (b) *Traffic Control Vehicles.* When called for in the Contract, the Contractor shall furnish white sedans to be used by uniformed police agency officers in the performance of Uniformed Traffic Control duties. The Contractor shall be responsible for licensing, insuring, servicing, and fueling the vehicle.

For each Traffic Control Vehicle furnished by the Contractor, the Contractor shall furnish Class 1 SAE certified light bar and control panel for exclusive use by uniformed police agency officers while performing Uniformed Traffic Control. The light bar shall have the following configuration:

- (1) minimum of 44 inches in length, and shall be either permanently or temporarily attached to the top of the vehicle.
- (2) flash red on the driver side and blue on the passenger side
- (3) equipped with an amber-colored directional device in the rear of the bar.
- (4) have alley and takedown lights.
- (5) The control panel shall be capable of controlling the front of the bar and the rear of the bar separately.
- (6) The traffic advisor shall be controlled separately.

The light bars shall be mounted on traffic control vehicles, and shall be maintained in good operating condition at all times. The Contractor shall obtain a permit from the police or sheriff department, as appropriate, for the use of the light bars. The Contractor shall keep the light bars covered at all times when the traffic control vehicle is being used by someone other than the authorized uniform police agency officer.

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REVISION OF SECTION 630
UNIFORMED TRAFFIC CONTROL (LOCAL AGENCY)

METHOD OF MEASUREMENT

Uniformed Traffic Control will be measured by the total number of hours that are required for uniformed traffic control including minimum shift hours required by the agency.

BASIS OF PAYMENT

The accepted number of hours of Uniformed Traffic Control will be paid for at the contract unit price per hour.

Subsection 630.18 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Uniformed Traffic Control	Hour

Hours of Uniformed Traffic Control that are not authorized or approved will not be paid for. Scheduling of traffic control will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 630
MOBILE ATTENUATOR

Section 630 of the Standard Specifications is hereby revised for this project as follows:

Subsection 630.01 shall include the following:

This work shall consist of furnishing, operating, and maintaining a truck with an attached impact attenuator.

Subsection 630.09 shall include the following:

Mobile Attenuator Options:

Truck Mounted Attenuator. The Contractor shall supply a vehicle with a truck mounted attenuator approved by the FHWA to meet NCHRP 350 criteria for level TL-3 collisions. The attenuator shall be mounted to a suitable truck in a manner meeting the Manufacturer's specifications. The truck shall be furnished with a roof mounted Advance Warning Flashing or Sequencing Arrow Panel (B Type). The truck shall be used when setting up or taking down the work zone and shall be parked in the activity area protecting the construction work while work is being performed, unless otherwise directed.

Trailer Attenuator. The Contractor shall supply a vehicle with an attached trailer attenuator approved by the FHWA to meet NCHRP 350 criteria for level TL-3 collisions. The trailer attenuator shall be attached to a suitable host truck in a manner meeting the Manufacturer's specifications, to include factory-installed 20-ton (minimum) rated pintle hook and ½-inch (minimum) steel frame plate, or as specified by Manufacturer. The trailer shall be furnished with a mounted Advance Warning Flashing or Sequencing Arrow Panel (B Type).

The weight of the host truck shall be between 10,000 and 20,000 lbs., or as specified by the trailer attenuator manufacturer. The Contractor shall provide a certified scale ticket confirming the weight of the truck without trailer attached.

The Trailer Attenuator attached to its host truck shall be used when setting up or taking down the work zone and shall be parked in the activity area protecting the construction work while work is being performed, unless otherwise directed. A buffer zone shall be provided in front of the host truck, for worker safety. This buffer zone shall be in accordance with the manufacturer's recommendations but shall be no less than 100 feet in length, unless otherwise directed.

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REVISION OF SECTION 630
MOBILE ATTENUATOR

Subsection 630.13 shall include the following:

Maintenance, storage, operation, and all repairs of Mobile Attenuator and associated vehicle shall be the responsibility of the Contractor.

Subsection 630.17 shall include the following:

Mobile Attenuators will be measured as the actual number of attenuators that are used during construction; or the actual number of authorized 24-hour periods that the attenuator is used.

Subsection 630.18 shall include the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Mobile Attenuator	Day

Payment will be full compensation for all labor, materials and equipment required to operate and maintain the truck and attenuator for the duration of the project, including the attenuator and flashing panel.

REVISION OF SECTION 715

LIGHTING AND ELECTRICAL MATERIALS

Section 715 is hereby added to the Standard Specifications for this project as follows:

715.07 Conduit. Shall include the following:

Unless otherwise specified, conduit shall be rigid metallic or semirigid plastic electrical conduit. Metallic conduit shall be clean, free of burrs, and galvanized.

Plastic conduit shall be a semirigid type currently recommended and UL listed for the proposed use. Underground power conduit shall be RNC: NEMA TC 2, Type EPC-80-PVC, UL 651 with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Underground plastic conduit for ITS devices shall conform to ASTM-F441 schedule 80. Fittings shall be the type used outside the conduit with solvent cement welded. Fittings shall connect the conduit in a manner that makes the joints watertight.

Bored conduit shall be HDPE duct: type EPEC-80 HDPE, complying with NEMA TC 7 and UL 651A Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified as follows:

- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
- b. Printing on tape shall be permanent and shall not be damaged by burial operations.
- c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

Color and Printing:

- a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
- b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
- c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

Type Two Pull Box – Shall include but not limited to the following:

1. Basis of design – Flush in-grade and cast in concrete Pull Boxes shall be polymer concrete, bottomless, stackable and tier 22 rated, bolted covers. 13 inches by 24 inches and 12 inches deep manufactured by Quazite; Cat. # PG1324BA12, (or NewBasis Cat. #PCA132412-20018 or Oldcastle Precast Group Cat. #1324-12), Covers shall be Cat. # PG1324HH00 (or NewBasis Cat. #PCA132412-20018 or Oldcastle Precast Group Cat. #1324-T22) stainless steel bolts and the word "ELECTRIC" molded into the top.
2. Heavy-Duty, 13 inches wide by 24 inches long by 12 inches deep, Polymer concrete bottomless, TIER 22 rated pull/splice box with straight sides and stackable.
3. Heavy-Duty, non-deliberate traffic rated, TIER 22 rated, 2-bolt cover with engraved legend "CDOT ELEC".
4. Pea Gravel Base – Provide a minimum of 12-inch-deep pea gravel base under box for drainage.

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REVISION OF SECTION 715 LIGHTING AND ELECTRICAL MATERIALS

5. Pull boxes shall be verified by a 3rd Party Nationally Recognized Independent Testing Laboratory as meeting all test provisions of American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77, 2013 Specification for Underground Enclosure Integrity, Tier 22 rating. Pull boxes shall be Underwriters Laboratories (UL) listed. Certification documents shall be submitted with material submittals.
6. Each pull box shall have an Electrical Marker System (EMS) locator disk manufactured into the lid for communication line locating. The locator disk shall be compatible with a CDOT cable locator utilize the APWA uniform color code standard for visual reference if disk is observable on the exterior of the lid. The locator disk shall utilize the proper location frequency for the pull box type.
7. Pull box removable lids shall be provided with a skid-resistant surface and have the words “CDOT COMM”, “EMS MARKER EMBEDDED IN COVER” and the tier level rating cast into the surface. Pull boxes containing electrical conductors shall have the words “CDOT ELEC”, “EMS MARKER EMBEDDED IN COVER” and the tier level rating cast into the surface. Painting of words shall not be accepted. The cover shall be attached to the pull box body by means of 3/8-inch x 7 inch lag thread hex head stainless steel bolts.
8. One-piece lids shall have a minimum of two lift slots per lid, while split lids shall have a minimum of one lift slot per lid. Test point locations shall be integrated into the pull box lids to provide for attachment of test leads of various connector types for underground conduit tracing. The minimum number of test point locations shall equal the number of conduit banks entering the pull box, up to a maximum of five test points. Pull boxes with split lids shall have the test points on one split lid section only. Pull box lids shall be furnished with 3/8-inch x 1/16 inch deep recesses at locations adjoining each test point for the application of direction arrow symbols indicating the direction of underground conduit exiting the pull box. Recesses shall be thoroughly cleaned with alcohol prior to applying arrow symbols.
9. Wire mesh shall be installed in a manner to completely surround the box as shown on the Plans. The wire mesh shall meet the material standard ANSI/American Society of Testing and Materials (ANSI/ASTM) A555-79 and made of T-304 stainless steel, 0.025-inch wire diameter minimum and shall have a spacing of 4 mesh per inch.
10. A 3/4 inch by 10-foot-long copper coated steel ground rod is required at each new Pull Box location shown on plans.
11. Boxes shall have a concrete ring/collar around all pull/splice boxes installed in open landscape, 4-inch-deep x 12-inch-wide on all sides as indicated in the S-613-1.

715.09 Secondary Service Pedestals, Lighting Control Centers, and Meter Power Pedestal. Shall include the following:

New Meter Power Pedestal ‘MPPX’ – Shall include but not limited to the following:

1. 120/240V-1ph-3w, Metered, 200 Amps Main Breaker
2. Stainless Steel, NEMA 3R enclosure painted forest service brown.
3. Meter Sockets (200 amp minimum) with lever bypass to Xcel Energy specifications
4. Meter Pull-Out, Fusible Disconnect with Fuses ahead of meter (cold sequence).
5. Meter cover hold open lever.
6. Meter tab lockable dead-front cover.

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REVISION OF SECTION 715
LIGHTING AND ELECTRICAL MATERIALS

7. Copper bus, service entrance rated, load center panel for always on loads, with main circuit breaker and all branch breakers as indicated on the panel schedule on the plans.
8. Built-in GFCI maintenance receptacle flush in dead front.
9. Provide a 4000 PSI Concrete pad foundation. This shall be bid as pay item 613-40000 Concrete Foundation Pad.
10. 3/4" x 10'-0" copper-clad driven ground rods, exothermic weld or underground rated lug connect ground conductor to ground rods. (2) ground rods required.
11. Provide all service lateral and secondary feeder connections as shown on the plans and details.
12. Provide white phenolic label with black letter stainless steel screw attached to enclosure. Label to include "panel designation, voltage, amperage, and fed from" information in a minimum of 1/8" high lettering.

"Arc-Flash Hazard Warning" labels shall be furnished and installed by the electrical contractor per the National Electric Code NEC 110.16 and the NFPA 70E, and all other labels required by NFPA 70 shall be installed on all new panels.

FORCE ACCOUNT ITEMS

DESCRIPTION

This special provision contains the Department's estimate for force account items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at \$5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

<u>Force Account Item</u>	<u>Unit</u>	<u>Amount</u>
F/A Minor Contract Revisions	F.A.	\$ 1,000,000*
F/A Asphalt Pavement Incentive	F.A.	\$130,000
F/A Concrete Pavement Incentive	F.A.	\$4,000
F/A Fuel Cost Adjustment	F.A.	\$ 15,000
F/A Roadway Smoothness Incentive	F.A.	\$80,000
F/A Asphalt Cement Cost Adjustment	F.A.	\$137,920
F/A On-The-Job Trainee	F.A.	\$18,000
F/A Interim Surface Repair	F.A.	\$3,540
F/A Furnish & Install Electrical Service	F.A.	\$100,000
F/A Install Conduit	F.A.	\$100,000
Project First Program	F.A.	\$ 5,000
F/A Erosion Control	F.A.	\$ 10,000

F/A Minor Contract Revisions: Consists of minor work authorized and approved by the Engineer, which is not included in the contract plans or specifications, and is necessary to accomplish the scope of work of this contract.

F/A Asphalt Pavement Incentive: Asphalt Pavement Incentive will be made in accordance with subsection 105.05.

F/A Concrete Pavement Incentive: Concrete Pavement Incentive will be made in accordance with Subsection 105.06 as modified by Revision of Section 105 – Pay Factor for Incentive/Disincentive. PCCP incentive shall utilize compressive strength criteria.

F/A Fuel Cost Adjustment: This Force Account is to provide funds should the Contractor choose to accept the Fuel Cost Adjustment. Adjustment will be made in accordance with subsection 109.06(i).

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FORCE ACCOUNT ITEMS

F/A Roadway Smoothness Incentive: Roadway Smoothness Incentive will be made in accordance with Subsection 105.07 – Conformity to Roadway Smoothness Criteria.

F/A Asphalt Cement Cost Adjustment: Asphalt Cement Cost Adjustment will be made in accordance with Revision of Section 109 – Asphalt Cement Cost Adjustment (Asphalt Cement Included in the Work)

F/A On-The-Job Trainee – Cost of maintaining on-the job-training program in accordance with the Standard Special Provision.

F/A Interim Surface Repair: This work consists of placing and compacting a machine scratch course in locations as directed by the Engineer for HMA pavement. The machine scratch course may be used once the Contractor meets all the specification requirements for the Revision of Section 202, Removal of Asphalt Mat (Planing) and irregularities such as, but not limited to, delamination and raveling exceeding 10 percent within any ½ mile segment that are encountered prior to the specified time of the overlay.

F/A Furnish & Install Electrical Service: This work shall consist of all cost charges from the power service provider, and all necessary materials, labor, and coordination required to maintain existing or establish new power sources required for permanent operation of equipment.

F/A Install Conduit: This work shall consist of all cost charges, materials, labor, and coordination required for the Contractor to install additional Zayo-supplied conduits as shown on the ITS Plan within the trench opened for the CDOT ITS backbone. Compliance with BABA Requirements shall be per CDOT's Standard Specifications for Road and Bridge Construction. All Zayo-supplied conduit shall meet current BABA Requirements and shall be verified by the Contractor prior to installation. Conduit not compliant with current BABA Requirements shall not be incorporated into the project. Payment under this Force Account will be made in accordance with CDOT Standard Specification Sub-Section 109.04. The Contractor shall clearly document incurred costs for labor, materials, and equipment related to the installation of the additional Zayo-supplied conduits. The City of Littleton shall not seek reimbursement through Federal Funds for this work and Zayo shall reimburse the City of Littleton for the work under this Force Account. The Contractor shall be responsible for insuring the construction of the additional Zayo-supplied conduits is free from defects in materials, construction, and workmanship. If any defects in the work in violation in the forgoing arises prior to final acceptance of the project, the contractor shall, upon receipt of written notice of such defect, promptly furnish at no additional cost to the project, all labor, equipment, and materials at the job site necessary to correct such defect and cause the work to comply fully with the forgoing. Installation of the additional Zayo-supplied conduits, shall be performed in accordance with the Revision of 613 – Electrical Conduit.

Project First Program: Cost of participating in a Project First Program between the Contractor and the Department in accordance with the Standard Special Provision.

F/A Erosion Control: – Supplemental erosion control measures suggested by the Erosion Control Supervisor, but not provided for in the contract plans or specifications. All items shall be approved by the Engineer prior to installation or they will be at no cost to the project.

TRAFFIC CONTROL PLAN - GENERAL

The key elements of the Contractor's method of handling traffic (MHT) are outlined in subsection 630.10(a).

The components of the TCP for this project are included in the following:

- (1) Subsection 104.04 and Section 630 of the specifications.
- (2) Standard Plan S-630-1, Traffic Controls for Highway Construction and Standard Plan S-630-2.
- (3) Schedule of Construction Traffic Control Devices.
- (4) Signing Plans.
- (5) Construction phasing details.
- (6) Detour Details.

Unless otherwise approved by the Engineer, the Contractor's equipment shall follow normal and legal traffic movements. The Contractor's ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the work zone. When located behind barrier or at other locations shown on approved traffic control plans, equipment may operate in a direction opposite to adjacent traffic.

CDOT may have entered into operating agreements with one or more law enforcement organizations for cooperative activities. Under such agreements, at the sole discretion of CDOT, law enforcement personnel may enter the work zone for enforcement purposes and may participate in the Contractor's traffic control activities. The responsibility under the Contract for all traffic control resides with the Contractor and any such participation by law enforcement personnel in Contractor traffic control activities will be referenced in either the Special Provisions or General Notes of the plans depending on whether the Contractor is to hire local law enforcement or if CDOT is contracting with Colorado State Patrol for uniformed traffic control. Nothing in this Contract is intended to create an entitlement, on the part of the Contractor, to the services or participation of the law enforcement organization.

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TRAFFIC CONTROL PLAN - GENERAL

Special Traffic Control Plan requirements for this project are as follows:

During the construction of this project, traffic shall use the present traveled roadway unless identified on the plans or approved by the Engineer.

The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time, unless approved by the Engineer.

At least one week prior to starting construction, the Contractor shall notify the City of Littleton Project Engineer of the date the Contractor intends to start construction.

All costs incidental to the foregoing requirements shall be included in the original contract prices for the project.

SPECIAL CONSTRUCTION REQUIREMENTS

Regional Transportation (RTD) Property

The Contractor shall apply for and obtain a Contractor's Right of Entry with RTD in order to enter onto RTD property for the work associated with the construction of curb ramps and sidewalk along Mineral Avenue. See Attachment A to the Project Special Provisions.

DePietro Limited Partnership Property

A Temporary Construction Easement is provided in order to enter onto De Pietro Limited Partnership property for the work associated with the construction of curb ramps and sidewalk along Mineral Avenue.

The City of Littleton's Agreement with the landowner, De Pietro Limited Partnership includes the following provisions:

1. The Contractor shall indemnify, protect, defend, and hold De Pietro Limited Partnership free and harmless from and against any and all claims, actions, causes of action, suits, proceedings, costs, expenses (including, without limitation, attorneys' fees and costs), liabilities, damages, and liens of any type (collectively "Losses") to the extent arising out of the use of the Temporary Construction Easement to the extent caused by the Contractor and their agents. To the extent permitted by law, the foregoing indemnification shall not extend to claims or liability that are the result of the negligence or willful misconduct of De Pietro Limited Partnership, its tenants, agents, or contractors. Any obligations of the Contractor under this Section shall not be limited or otherwise affected by the amount or the availability of the insurance required herein, or by the amount or the availability of any other insurance. This indemnity shall not be limited by any defense or limitation of damages relating to worker's compensation claims that the Contractor could assert against the claimant.
2. The Contractor shall keep De Pietro Limited Partnership's real property free and clear of mechanics' liens or any other liens resulting from work performed by or on behalf of the Contractor within or from the area of the Temporary Construction Easement.
3. For access during construction, the Contractor shall follow the CDOT Standard Specifications Section 104.04 for Maintaining Traffic. If De Pietro Limited Partnership has any concerns about such the Contractor's compliance with the 104.04 specification, De Pietro Limited Partnership or their representative can contact the City of Littleton Construction Manager:

Matthew Matuszewski P.E.
Capital Improvement Program Manager
303-795-3871 (office)
303-601-4783 (mobile)
mmatuszewski@littletongov.org

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SPECIAL CONSTRUCTION REQUIREMENTS

The Contractor is required to provide the information required and be in compliance with the Contractor requirements within these provisions for work on De Pietro Limited Partnership.

Zayo Group, LLC

Zayo has requested to add two additional conduits within the trench open for the CDOT ITS backbone. Installation of the additional Zayo-supplied conduits will be performed by the Contractor. The Contractor shall meet the following provision:

1. The Contractor shall indemnify, protect, defend, and hold Zayo Group, LLC free and harmless from and against any and all claims, actions, causes of action, suits, proceedings, costs, expenses (including, without limitation, attorneys' fees and costs), liabilities, damages, and liens of any type (collectively "Losses") to the extent arising out of the incorporation of Zayo-supplied materials and to the extent caused by the Contractor and their agents. To the extent permitted by law, the foregoing indemnification shall not extend to claims or liability that are the result of the negligence or willful misconduct of Zayo Group, LLC, its agents, or contractors. Any obligations of the Contractor under this Section shall not be limited or otherwise affected by the amount or the availability of the insurance required herein, or by the amount or the availability of any other insurance. This indemnity shall not be limited by any defense or limitation of damages relating to worker's compensation claims that the Contractor could assert against the claimant.

UTILITIES

The known utilities within the limits of this project are:

UTILITY	CONTACT/EMAIL	PHONE
City of Englewood Utilities Department (City Ditch) 1000 Englewood Parkway Englewood, CO 80110	Stephanie Ellis sellis@englewoodco.gov	303-783-6811 (Office) 720-668-1770 (Mobile)
Colorado Department of Transportation CDOT ITS Fiber Optic Backbone 425 C Corporate Circle Golden, CO 80401	Jill Scott Jill.Scott@state.co.us	303-512-5805 (Office)
Comcast Cable Communications 6850 Tucson Way Englewood, CO 80112	Jason Mollo Jason_Mollo@comcast.com	303-241-1964 (Mobile)
Denver Water 1600 West 12 th Ave. Denver, CO 80204-3412	Paul R. Peloquin Paul.Peloquin@denverwater.org	303-628-6620 (Office) 720-808-3618 (Mobile)
Lumen Technologies – Local (Formerly Lumen) 7759 S. Wheeling Ct. Englewood, CO 80121	Wesley Bugal (Consultant) wbugal@congruex.com Bobby Hight bobby.hight@lumen.com	720-331-6099 (Mobile) 303-309-8794 (Office)
Lumen Technologies - National (Formerly Level3) 1025 Eldorado Blvd. Broomfield, CO 80021	Wesley Bugal (Consultant) wbugal@congruex.com Tom Longan thomas.longan@lumen.com	720-331-6099 (Mobile) 303-482-9822 (Office) 720-878-6311 (Mobile)
Regional Transportation District (RTD) 1600 Blake Street Denver, CO 80202	Mace Pemberton Mace.pemberton@RTD-denver.com	303-299-2272 (Office)
Southwest Metropolitan Water and Sanitation District (SWMWSD) 8739 W. Coal Mine Ave. Littleton, CO 80123	Justin Roquemore jwroquemore@platteccanyon.org Chris Cochran clchran@platteccanyon.org	303-979-2333 (Office) 303-591-5207 (Mobile) 303-591-5206 (Mobile)
Verizon/MCI MCI Metro Access 9706 East Easter Avenue Centennial, CO 80112	Lane Grady lane.grady@verizon.com	303-390-2466 (Office) 303-827-9756 (Mobile)
Xcel Energy Application for Electrical Services	Builders Call Line BCLCO@Xcelenergy.com	800-628-2121 (Office)
Xcel Energy - Electric, Gas, Lighting 10001 W. Hampden Ave. Lakewood, CO 80227	Owi Effiongudo owoidohoabasi.m.effiongudo@xcelenergy.com	720-305-8135 (Mobile)
Xcel Energy - Gas High Pressure 9777 Pyramid Court, Ste. 300 Englewood, CO 80112	Austin Shorr Austin.E.Shorr@xcelenergy.com	720-501-5657 (Office)
Zayo - Mountain Plains Region 1805 29th Street Unit 2050 Boulder, CO 80301	James Black jamesr.black@zayo.com	719-216-8508 (Mobile)

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UTILITIES

The work described in these plans and specifications requires full cooperation between the Contractor and the utility owners in accordance with Subsection 105.11 in conducting their respective operations, so the utility work can be completed with minimum delay to all parties concerned. Also, in accordance with the plans and specifications, and as directed by the Engineer, the Contractor shall keep each utility owner advised of any work being done to its facility, so that each utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

The Contractor shall coordinate the work with the owners of the utilities impacted by the work. Coordination with utility owners includes, but is not limited to, staking construction features, providing and periodically updating an accurate construction schedule which includes all utility work elements, providing written notification of upcoming required utility work elements as the construction schedule indicates, allowing the expected number of working days for utilities to complete necessary relocation work, conducting necessary utility coordination meetings, and all other necessary accommodations as directed by the Project Engineer. Surveying and/or staking of utility relocations to be performed by the owner shall be the responsibility of the utility owner.

Prior to excavating or performing any earthwork operations, the Contractor shall positively locate all potential conflicts with existing underground utilities and proposed construction, as determined by the Contractor according to proposed methods and schedule of construction. The Contractor shall modify construction plans to avoid existing underground facilities as needed, and as approved by the Engineer.

The Contractor shall provide traffic control for any utility work expected to be coordinated with construction, as directed by the Engineer. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

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UTILITIES

PART 1 - CONTRACTOR SHALL PERFORM THE WORK LISTED BELOW:

General Requirements:

Coordinate Pre-Construction meetings with each utility owner or utility owner's representative at least fourteen (14) days prior to beginning construction. Utility owners/representatives shall be notified at least seven (7) days prior the meeting.

The Contractor shall contact, in writing, the utility owner or utility owner's representative upon receipt of NTP.

Coordinate project construction with the performance by the utility owner of each utility work element listed in Part 2 below. Perform preparatory work specified in Part 2 for each utility work element. Provide an accurate construction schedule that includes all utility work elements to the owner of each impacted utility.

The Contractor shall note that the project limits are highly congested with existing utilities and expected durations for utility elements listed below are approximate. The Contractor shall work with utility owners to identify required work elements, traffic control, and to verify schedules. No added time will be granted to the construction schedule unless approved by the Project Engineer. Changes to phasing or schedule by the Contractor shall be clearly communicated with the utility owners immediately.

Provide each utility owner with weekly updates to the schedule. Conduct detailed utility coordination meetings weekly, with utility representatives of utilities affected by that week's planned construction activities, to coordinate all requirements and schedules, and provide other necessary accommodations as directed by the Engineer. Notify each utility owner in writing, with a copy to the Engineer, prior to the time each utility work element is to be performed by the utility owner. Provide the notice with the number of days specified in Part 2 immediately prior to the time the utility work must be begun to meet the project schedule.

Provide traffic control, as directed by the Engineer, for any utility work by the utility owner expected to be coordinated with construction. However, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. Utility owner shall provide MHT's to the Contractor and Project Engineer and shall not proceed with utility work until the Contractor and Project Engineer has approved utility owner's MHT's.

Provide erosion control for any utility work by the utility owner expected to be coordinated with construction. Traffic control for utility work outside of typical project work hours or current phase of construction shall be the responsibility of the utility owner. Utility owner, in coordination with the Contractor, shall provide erosion control plans/specifications to the Project Engineer and shall not proceed with utility work until the Contractor and the Project Engineer have approved utility owner's erosion control plan/measures.

Perform each utility work element for every utility owner listed here in Part 1. Notify each utility owner in advance of any work being done by the Contractor to its facility, so that the utility owner can coordinate its inspections for final acceptance of the work with the Engineer.

The Contractor shall identify all existing utilities (by potholing if necessary) and protect in place when constructing the project, including sub-excavation work. If existing utilities are within close proximity horizontal or vertically, the Contractor shall alter the sub-excavation work limits, construction methods, or equipment to avoid impacting existing utilities.

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UTILITIES

Water & Sanitary Utilities:

City of Littleton (Sanitary Sewer):

The Contractor shall protect, in place, all existing City of Littleton Sanitary Sewer lines as noted on the plans and utility matrix.

No conflicts are anticipated with City of Littleton Sanitary Sewer facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer City of Littleton immediately.

Southwest Metropolitan Water and Sanitation District (SWMWSD):

The Contractor shall protect, in place, all existing and SWMWSD infrastructure and all associated appurtenances during all phases of construction as noted on the plans and utility matrix. Any damages to the existing SWMWSD infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Portions of existing SWMWSD water infrastructure are anticipated to be abandoned in place prior to construction NTP to accommodate proposed construction as noted in the plans and utility matrix. In the event that anticipated abandonment is not completed prior to construction NTP, the Contractor shall be responsible for coordinating the abandonment with SWMWSD and shall incorporate that work by others into the overall project construction schedule.

To accommodate proposed construction, the Contractor shall remove portions of abandoned water pipe and other abandoned water appurtenances as deemed necessary by the Project Engineer and as detailed in the utility plans and matrix. The Contractor shall verify with SWMWSD that water infrastructure is abandoned prior to removal. Removal of abandoned water pipe will be paid for in accordance with 202-00035 Removal of Pipe - LF. Removal of abandoned water appurtenances shall not be paid for separately and shall be included in the work.

The Contractor shall schedule a pre-construction meeting with the Project Engineer, SWMWSD, and Denver Water representatives fourteen (14) days prior to any work beginning in areas that will affect SWMWSD infrastructure.

Adjustments and modification to the existing water manholes and valve boxes will be paid for in accordance with Revision of Section 210 Valve Box and Manhole Adjustments.

The Contractor shall coordinate all required inspections with SWMWSD. The Contractor shall provide the utility owner written notice as directed by SWMWSD at the Pre-Construction meeting for this work element.

The Contractor shall coordinate with SWMWSD forces to schedule any required waterline shutdowns. Unless otherwise directed, SWMWSD will exercise/operate all water valves required to facilitate construction activities. Contact SWMWSD to schedule these activities at least fourteen (14) days prior to required shutdown.

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UTILITIES

Southwest Metropolitan Water and Sanitation District (SWMWSD) - continued:

Through out the various phases of construction of the project, the Contractor shall coordinate with SWMWSD representatives to identify/confirm the locations of existing water service lines. The Contractor shall protect, in place, all water service lines as noted on the plans.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Denver Water:

The Contractor shall protect, in place, all existing Denver Water owned waterlines and all associated appurtenances as noted on the plans and utility matrix. Any damages to existing Denver Water infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Adjustments and modifications to the existing water manholes and valve boxes will be paid for in accordance with Revision of Section 210 Valve Box and Manhole Adjustments.

No conflicts are anticipated with Denver Water owned facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer and Denver Water immediately. The Contractor will not be due any additional compensation for such a conflict until a reasonable attempt has been made by the Contractor to coordinate with the Project Engineer and Denver Water to find an equitable solution to the conflict.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

City of Englewood (City Ditch)

The Contractor shall protect, in place, all existing City of Englewood City Ditch infrastructure as noted on the plans and utility matrix.

No conflicts are anticipated with Englewood City Ditch facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer and the City of Englewood immediately. The Contractor will not be due any additional compensation for such a conflict until a reasonable attempt has been made by the Contractor to coordinate with the Project Engineer and City of Englewood to find an equitable solution to the conflict.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Tele-Communications Utilities

The Contractor shall construct all roadway elements, (i.e.: excavation, and embankment), necessary to complete the construction of the proposed CDOT ITS and privately owned fiber optic relocations as the priority of each of the individual phases of construction. **This work shall be coordinated with each telecommunication company during construction, in accordance with the ITS Plans, Utility Modification Plans, and these specifications.**

If the Contractor deviates from the plan, the Contractor shall coordinate with each telecommunication utility owner and the Project Engineer/Engineer's representative. Any deviation shall be approved in writing by all applicable utility owners and the Project Engineer/Engineer's representative. Approvals of deviations related to fiber optic relocation construction phasing will not be justification for extensions to the overall construction schedule.

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UTILITIES

Lumen Technologies – Local Network (formerly CenturyLink):

The Contractor shall protect, in place, existing Lumen infrastructure. Any damage to existing Lumen infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Portions of existing Lumen fiber optic and telephone infrastructure will be relocated by Lumen to accommodate proposed construction as noted in the plans and utility matrix. Any damages to relocated Lumen infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

The Contractor shall schedule a pre-construction meeting with the Project Engineer and Lumen representatives fourteen (14) days prior to any work beginning in areas that will affect Lumen infrastructure.

As specified in Part 2, Lumen forces shall adjust Lumen owned manholes, vaults, pull boxes, pedestals, etc. to finished grade. The Contractor shall establish finished grade and provide marking / staking necessary for Lumen forces to complete the work.

The Contractor shall coordinate all required inspections with Lumen forces. The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each required work element or inspection to be completed by Lumen.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Lumen Technologies – National Network (formerly Level 3):

The Contractor shall protect in place existing Lumen National conduits/cables noted in the plans. Any damages to existing Lumen National infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

No conflicts are anticipated with Lumen National facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer and Lumen National (Lumen Technologies) immediately. Lumen will make representatives available to find an equitable solution to the conflict.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Comcast Cable:

The Contractor shall protect, in place, existing Comcast infrastructure. Any damage to existing Comcast infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

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UTILITIES

Comcast Cable - continued:

Portions of existing Comcast fiber optic and/or CATV infrastructure will be relocated by Comcast to accommodate proposed construction as noted in the plans and utility matrix. Any damages to relocated Comcast infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

The Contractor shall schedule a pre-construction meeting with the Project Engineer and Comcast representatives fourteen (14) days prior to any work beginning in areas that will affect Comcast infrastructure.

As specified in Part 2 Comcast forces shall adjust Comcast owned pull boxes, pedestals, etc. to finished grade. The Contractor shall establish finished grade and provide marking/staking necessary for Comcast forces to complete the work.

The Contractor shall coordinate all required inspections with Comcast forces. The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each required work element or inspection to be completed by Comcast.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

CDOT Region 1 ITS:

The Contractor shall protect, in place, existing CDOT ITS infrastructure. Any damage to existing CDOT IT infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Portions of the existing CDOT ITS infrastructure will be relocated by the Contractor to accommodate proposed construction as noted in the plans and utility matrix. Any damages to relocated CDOT ITS infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

The Contractor shall construct CDOT ITS conduits, pull boxes/vaults, wiring, and splicing as shown and identified on the ITS Plans. Construction of the CDOT ITS conduit and fiber cable and one (1) Zayo Conduit shall be performed by the Contractor as detailed and noted in the plans.

The Contractor shall schedule a pre-construction meeting with the Project Engineer and CDOT ITS representatives fourteen (14) days prior to any work beginning in areas that will affect CDOT ITS infrastructure.

The Contractor shall provide a 12-day advance notice to CDOT ITS to coordinate any downtime for ITS devices in accordance with **Revision of Section 108 Disincentive for ITS Offline Devices**.

The Contractor shall coordinate all required inspections with CDOT ITS forces. The Contractor shall provide the utility owner written notice forty-five (45) days immediately prior to each required inspection to be completed by CDOT ITS.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

City of Littleton (Traffic Signals):

The Contractor shall construct City of Littleton Traffic Signals, conduits, pull boxes/vaults, wiring, and splicing as shown and identified on the Construction Plans.

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UTILITIES**

City of Littleton (Traffic Signals) – continued:

The Contractor shall schedule a pre-construction meeting with the Project Engineer and City of Littleton Traffic representatives fourteen (14) days prior to any work beginning in areas that will affect City of Littleton traffic signal infrastructure.

The Contractor shall coordinate all required inspections with City of Littleton forces. The Contractor shall provide the utility owner written notice forty-five (45) days immediately prior to each required inspection to be completed by City of Littleton.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Regional Transportation District (RTD):

No conflicts are anticipated with RTD owned facilities.

If during construction a conflict is found, the Contractor shall notify the Project Engineer and RTD immediately. RTD will make representatives available to find an equitable solution to the conflict.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Sprint:

No conflicts are anticipated with Sprint owned facilities.

If during construction a conflict is found, the Contractor shall notify the Project Engineer and Sprint immediately. Sprint will make representatives available to find an equitable solution to the conflict.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Verizon Business (MCI):

The Contractor shall protect, in place, existing Verizon Business (MCI) infrastructure. Any damage to existing Verizon Business (MCI) infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Portions of the existing Verizon Business (MCI) fiber optic infrastructure will be relocated by Verizon Business (MCI) to accommodate proposed construction as noted in the plans and utility matrix. Any damages to relocated Verizon Business (MCI) infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

The Contractor shall schedule a pre-construction meeting with the Project Engineer and Verizon Business (MCI) representatives fourteen (14) days prior to any work beginning in areas that will affect Verizon (MCI) infrastructure.

As specified in Part 2 Verizon Business (MCI) forces shall adjust Verizon Business (MCI) owned manholes and pull boxes to finished grade. The Contractor shall establish finished grade and provide marking/staking necessary for Verizon Business (MCI) forces to complete the work.

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UTILITIES

Verizon Business (MCI) - continued:

The Contractor shall coordinate all required inspections with Verizon Business (MCI) forces. The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each required work element or inspection to be completed by Verizon Business (MCI).

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Zayo

The Contractor shall protect, in place, existing and relocated Zayo infrastructure. Any damage to existing and relocated Zayo infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

The Contractor shall procure and install one (1) two-inch blue conduit for Zayo use as detailed on the ITS Plan and within the trench opened for the CDOT ITS backbone.

Zayo Project Work:

Two (2) additional Zayo conduits installed in the trench opened for the CDOT ITS backbone shall be supplied by Zayo, installed by the Contractor, and paid for in accordance with 700-70110 F/A Install Conduit. Zayo-specific pull boxes detailed on the ITS Plan shall be supplied by Zayo, installed by the Contractor, and paid for as 613-07199 Pull Box (Install Only). Compliance with BABA Requirements for all Zayo-supplied material shall be verified by the Contractor prior to installation. Any Zayo-supplied material not compliant with current BABA Requirements shall not be incorporated into the project.

The Contractor shall schedule a pre-construction meeting with the Project Engineer and Zayo representatives fourteen (14) days prior to any work beginning in areas that will affect Zayo infrastructure and before beginning installation of the Zayo conduit as defined in the Utility Modification Plans and this specification.

The Contractor shall notify Zayo thirty (30) days prior to the anticipated completion of all Zayo-supplied pull boxes and Contractor-supplied two-inch blue conduit within the CDOT ITS backbone trench. Upon completion of the conduit and pull boxes for Zayo use, the Contractor shall allow forty-five (45) days for Zayo to install new Zayo fiber optic cable within the two-inch blue conduit and to complete splicing of that cable. Existing CDOT ITS backbone conduit containing existing Zayo fiber optic cable shall not be disturbed or removed prior to completion of the Zayo work.

The Contractor shall coordinate all required inspections with Zayo forces. The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each required work element or inspection to be completed by Zayo.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

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UTILITIES**

Electric and Gas Utilities

Xcel Energy- Electrical:

The Contractor shall protect, in place, all existing Xcel Energy infrastructure and all associated appurtenances during all phases of construction as noted in the plans and utility matrix. Any damages to existing Xcel Energy infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost. Portions of existing Xcel Energy infrastructure will be relocated by Xcel Energy to accommodate proposed construction as noted in the plans and utility matrix. Any damages to relocated Xcel Energy infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

Xcel Energy- Electrical Transmission:

The Contractor shall schedule a pre-construction meeting with the Project Engineer and Xcel Energy representatives fourteen (14) days prior to any work beginning in areas that will affect Excel Energy infrastructure.

As specified in Part 2, Xcel forces shall adjust Xcel owned electrical infrastructure to finished grade. The Contractor shall establish finished grade and provide marking / staking necessary for Xcel forces to complete the work.

The Contractor shall provide the utility owner written notice forty-five (45) days immediately prior to each utility work element expected to be coordinated with construction.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

Roadway Lighting and Power Source Connections:

After the Contractor has completed the installation of the roadway lighting and traffic signals for each construction phase including conduit and wiring to the power sources as shown on the plans, Xcel forces shall connect the metered power source. The Contractor shall coordinate with the Xcel Energy for connection to pad mount transformer power source. This work is expected to be coordinated with construction and take three (3) working days/per site for each construction phase to complete. All cost charges from the power service provider, and all necessary materials, labor and coordination required to maintain existing or establish new power sources required for permanent operation of equipment as shown in the plans shall be reimbursed from the Force Account Furnish and Install Electrical Service.

Xcel Energy- Gas Operations:

The Contractor shall protect in place, all existing Xcel Energy Gas infrastructure and all associated appurtenances during all phases of constructed as noted in the plans and utility matrix. Any damages to existing Xcel Energy Gas infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost. When the Contractor is working in the vicinity of Xcel Energy Gas pipelines, to the extent possible, the Contractor shall adhere to the most current version of Xcel's minimum requirements for grading and excavation near Public Service Company of Colorado (PSCo) transmission pipelines. If the contractor requires a copy of this document, it can be furnished by the Project Engineer. The Contractor will be required to provide information regarding, and obtain Xcel acceptance for, track and wheel-based equipment that will be operated over the Xcel HP transmission pipeline before operations over the pipeline begin. and to obtain Xcel watch and protect forces during caisson installation.

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UTILITIES**

Xcel Energy- Gas Operations - continued:

The Contractor shall also note the requirement to vacuum excavate the signal caisson at the Nichols and Santa Fe intersection adjacent to the Xcel HP transmission pipeline. The Contractor shall schedule a pre-construction meeting with the Project Engineer and Xcel Energy Gas representatives fourteen (14) days prior to any work beginning in areas that will affect Excel Energy Gas infrastructure.

As specified in Part 2 Xcel Energy Gas forces shall adjust Xcel owned gas valves and other appurtenances to finished grade. The Contractor shall establish finished grade and provide marking/staking necessary for Xcel Energy Gas forces to complete the work.

Throughout the various phases of construction of the project, the Contractor shall notify Xcel Energy Gas to identify the locations of existing gas service lines. Xcel Energy shall relocate all service lines in conflict with proposed roadway improvements within five (5) days.

Once the Contractor has received notice to proceed, they shall contact in writing the utility owner immediately. The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each utility work element expected to be coordinated with construction.

The Contractor shall contact, in writing, the utility owner immediately upon receipt of NTP.

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UTILITIES

PART 2 - UTILITY OWNERS SHALL PERFORM THE WORK LISTED BELOW:

Although the Contractor shall provide Method of Handling Traffic (MHT) and traffic control for utility work expected to be coordinated with construction, traffic control for utility work outside of typical project work hours shall be the responsibility of the utility owner. The utility owner shall prepare and submit to the CDOT a Method of Handling Traffic Plan for utility work to be performed outside typical project work hours. The utility owner shall obtain acceptance of the Method of Handling Traffic Plan from the CDOT prior to beginning the utility work to be performed outside typical project work hours.

Water & Sanitary Utilities

City of Littleton (Sanitary Sewer):

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

No work elements identified.

No conflicts are anticipated with City of Littleton Sanitary Sewer facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer and City of Littleton immediately. The City of Littleton will make representatives available to find an equitable solution to the conflict.

Southwest Metropolitan Water and Sanitation District (SWMWSD):

SWMWSD representatives shall respond to Contractor contact and attend Project Pre- Construction meetings and Utility Coordination Meetings as applicable.

Portions of existing SWMWSD water infrastructure are anticipated to be abandoned in place by adjacent development contractors prior to the subject project's construction NTP to accommodate proposed construction as noted in the plans and utility matrix. In the event that anticipated abandonment is not completed by adjacent development contractors prior to construction NTP, SWMWSD shall coordinate with the adjacent development contractor while the adjacent development contractor completes the anticipated abandonment on the adjacent development contractor's schedule.

To accommodate proposed construction, the Contractor may remove portions of abandoned water pipe and other abandoned water appurtenances as deemed necessary by the project engineer and as detailed in the utility plans and matrix. SWMWSD shall coordinate with the Contractor to verify that water infrastructure is abandoned prior to removal.

SWMWSD forces shall perform applicable inspections of utility work coordinated with the Contractor at the Pre-Construction Meeting for the work element in a timely manner.

SWMWSD forces shall operate water valves as coordinated with the Contractor and required to facilitate construction activities. The Contractor shall coordinate with SWMWSD forces to schedule waterline shutdown. Timeline for this activity shall be coordinated with the Contractor at the Pre-Construction meeting for the work element.

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UTILITIES**

Southwest Metropolitan Water and Sanitation District (SWMWSD) - continued:

SWMWSD forces shall work with the Contractor to protect and support existing SWMWSD facilities as necessary to facilitate construction of the project elements. Any damages to Denver Water infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction unanticipated conflicts are found, SWMWSD shall make representatives available to find an equitable solution to the conflict.

Denver Water:

Denver Water representatives shall respond to Contractor contact and attend Project Pre- Construction meetings and Utility Coordination Meetings as applicable.

Denver Water forces shall perform applicable inspections of adjustment work coordinated with the Contractor in a timely manner.

Denver Water forces shall work with the Contractor to protect and support existing Denver Water facilities as necessary to facilitate construction of the project elements. Any damages to Denver Water infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction unanticipated conflicts are found, Denver Water shall make representatives available to find an equitable solution to the conflict.

City of Englewood (City Ditch)

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

No work elements identified.

City of Englewood forces shall work with the Contractor to protect in place existing Englewood City Ditch facilities as defined in Part 1.

No conflicts are anticipated with City of Englewood City Ditch facilities. If during construction a conflict is found, the Contractor shall notify the Project Engineer and City of Englewood immediately. The City of Englewood will make representatives available to find an equitable solution to the conflict.

Tele Communications Utilities

Lumen Technologies – Local Network (formerly CenturyLink):

Lumen representatives shall respond to Contractor contact and attend Project Pre- Construction meetings and Utility Coordination Meetings as applicable.

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UTILITIES

Lumen Technologies – Local Network (formerly CenturyLink) - continued:

Lumen forces shall relocate existing telephone and fiber optic infrastructure to accommodate proposed construction as shown on the project plans. Lumen forces shall be responsible for any required adjustments or modifications to existing conduits and cables necessary to reconnect to the relocated telecom infrastructure. Lumen forces shall install their new conduits, cables, pull boxes, and vaults in accordance with the Utility Modification Plan. This work by Lumen is anticipated to be completed prior to project construction NTP but shall be coordinated with the Contractor during construction if required. Installation of cable and splicing is anticipated to take approximately sixty (60) days to be completed.

Lumen forces shall remove pedestals, pull boxes, vaults, lines, and other appurtenances associated with their system to accommodate proposed construction as shown on the project plans. Lumen forces shall coordinate this work with all other utility owners within the corridor. As needed to complete the work, the Contractor is free to remove abandoned underground conduits and remaining conductors that may impact construction. The Contractor shall verify status of abandonment with Lumen forces prior to beginning any removals of Lumen facilities.

Lumen forces shall adjust to finished grade all Lumen owned pull boxes/vaults as required to accommodate construction phasing as construction progresses. Manholes shall be adjusted to ¼" to ½" below finished roadway elevation. Pull boxes/vaults shall be adjusted to finished grade prior to final stabilization/restoration. This work is anticipated to take one (1) working day at each location. The Contractor shall establish roadway elevation or finished grade and provide marking/staking necessary for Lumen forces to complete the work.

Lumen forces shall perform applicable inspections of utility work coordinated with the Contractor in a timely manner.

Lumen forces shall work with the Contractor to protect and support existing or relocated conduits and cables as necessary to facilitate construction of the project elements. Any damages to existing or relocated Lumen infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction additional conflicts are found, Lumen forces shall relocate their facilities within thirty (30) working days from notice of the conflict.

Lumen shall be responsible for traffic control for utility work performed outside typical project work hours or prior to project construction NTP. Lumen shall prepare and submit to the City a Method of Handling Traffic (MHT) and obtain City acceptance of the MHT prior to performing utility work outside typical project work hours.

Lumen Technologies – National Network (formerly Level 3):

Lumen National representatives shall respond to Contractor contact and attend Project Pre-Construction meetings and Utility Coordination Meetings as applicable.

Lumen National forces shall work with the Contractor to protect and support existing Lumen National facilities as necessary to facilitate construction of the project elements. Any damages to Lumen National infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

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UTILITIES

Lumen Technologies – National Network (formerly Level 3) - continued:

If during construction unanticipated conflicts are found, Lumen National shall make representatives available to find an equitable solution to the conflict. If a relocation is required to accommodate an unanticipated conflict, Lumen National forces shall relocate their facilities within thirty (30) working days from notice of the conflict.

Lumen National shall be responsible for traffic control for utility work performed outside typical project work hours. Lumen National shall prepare and submit to the City a Method of Handling Traffic (MHT) and obtain City acceptance of the MHT prior to performing utility work outside typical work hours.

City of Littleton (Traffic Signals):

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

Attend Project Pre-Construction meeting(s) and Weekly Utility Coordination meeting(s) as applicable with a minimum fourteen (14) day notice of meeting location and time.

Inspect utility work performed by the Contractor listed in Part 1 above given a minimum of forty-five (45) day notice by the Contractor.

Comcast Cable:

Comcast representatives shall respond to Contractor contact and attend Project Pre- Construction meetings and Utility Coordination Meetings as applicable.

Comcast forces shall relocate existing television and fiber optic infrastructure to accommodate proposed construction as shown on the project plans. Comcast forces shall be responsible for any required adjustments or modifications to existing conduits and cables necessary to reconnect to the relocated telecom infrastructure. Comcast forces shall install their new conduits, cables, pull boxes, and vaults in accordance with the Utility Modification Plan. This work by Comcast is anticipated to be completed prior to project construction NTP but shall be coordinated with the Contractor during construction if required. Installation of cable and splicing is anticipated to take approximately sixty (60) days to be completed.

Comcast forces shall remove pedestals, pull boxes, vaults, lines, and other appurtenances associated with their system to accommodate proposed construction as shown on the project plans. Comcast forces shall coordinate this work with all other utility owners within the corridor. As needed to complete the work, the Contractor is free to remove abandoned underground conduits and remaining conductors that may impact construction. The Contractor shall verify status of abandonment with Comcast forces prior to beginning any removals of Comcast facilities.

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UTILITIES**

Comcast Cable - continued:

Comcast forces shall adjust to finished grade all Comcast owned pull boxes/vaults as required to accommodate construction phasing as construction progresses. Manholes shall be adjusted to ¼" to ½" below finished roadway elevation. Pull boxes/vaults shall be adjusted to finished grade prior to final stabilization/restoration. This work is anticipated to take one (1) working day at each location. The Contractor shall establish roadway elevation or finished grade and provide marking/staking necessary for Comcast forces to complete the work.

Comcast forces shall perform applicable inspections of utility work coordinated with the Contractor in a timely manner.

Comcast forces shall work with the Contractor to protect and support existing or relocated conduits and cables as necessary to facilitate construction of the project elements. Any damages to existing or relocated Comcast infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction additional conflicts are found, Comcast forces shall relocate their facilities within fourteen (14) working days from notice of the conflict. Comcast shall be responsible for traffic control for utility work performed outside typical project work hours or prior to project construction NTP. Comcast shall prepare and submit to the City a Method of Handling Traffic (MHT) and obtain City acceptance of the MHT prior to performing utility work outside typical project work hours.

CDOT Region 1 ITS:

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

Attend Project Pre-Construction meeting(s) and Weekly Utility Coordination meeting(s) as applicable with a minimum fourteen (14) day notice of meeting location and time.

Inspect utility work performed by the Contractor listed in Part 1 above given a minimum of forty-five (45) day notice by the Contractor.

City of Littleton (Traffic Signals):

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

Attend Project Pre-Construction meeting(s) and Weekly Utility Coordination meeting(s) as applicable with a minimum fourteen (14) day notice of meeting location and time.

Inspect utility work performed by the Contractor listed in Part 1 above given a minimum of forty-five (45) day notice by the Contractor.

Regional Transportation District (RTD):

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

No conflicts are anticipated with RTD owned facilities.

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UTILITIES

Regional Transportation District (RTD) - continued:

If during construction a conflict is found, the Contractor shall notify the Project Engineer and RTD immediately. RTD will make representatives available to find an equitable solution to the conflict.

Verizon Business/ formally MCI (Verizon):

Verizon representatives shall respond to Contractor contact and attend Project Pre- Construction meetings and Utility Coordination Meetings as applicable.

Verizon forces shall relocate existing fiber optic infrastructure to accommodate the project construction as shown and identified in the plans and utility matrix. Verizon forces shall be responsible for any required adjustments or modifications to existing conduits and cables necessary to reconnect to the relocated telecom infrastructure. Verizon forces shall install their new conduits, cables, pull boxes, and vaults in accordance with the Utility Modification Plan. This work by Verizon is anticipated to be completed after project construction NTP, but prior to project construction along Mineral Avenue, as coordinated with the Contractor. Installation of cable and splicing is anticipated to take approximately thirty (30) days to be completed.

Verizon forces shall remove pedestals, pull boxes, vaults, lines, and other appurtenances associated with their system to accommodate proposed construction as shown on the project plans. Verizon forces shall coordinate this work with all other utility owners within the corridor. As needed to complete the work, the Contractor is free to remove abandoned underground conduits and remaining conductors that may impact construction. The Contractor shall verify status of abandonment with Verizon forces prior to beginning any removal of Verizon facilities.

Verizon forces shall adjust to finished grade all Verizon owned pull boxes/vaults as required to accommodate construction phasing as construction progresses. Manholes shall be adjusted to ¼" to ½" below finished roadway elevation. Pull boxes/vaults shall be adjusted to finished grade prior to final stabilization/restoration. This work is anticipated to take one (1) working day at each location. The Contractor shall establish roadway elevation or finished grade and provide marking/staking necessary for Verizon forces to complete the work.

Verizon forces shall perform applicable inspections of utility work coordinated with the Contractor in a timely manner.

Verizon forces shall work with the Contractor to protect and support existing or relocated conduits and cables as necessary to facilitate construction of the project elements. Any damages to existing or relocated Verizon infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction additional conflicts are found, Verizon forces shall relocate their facility within fourteen (14) working days from notice of the conflict.

Verizon shall be responsible for traffic control for utility work performed outside typical project work hours or prior to project construction NTP. Verizon shall prepare and submit to the City a Method of Handling Traffic (MHT) and obtain City acceptance of the MHT prior to performing utility work outside typical project work hours.

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UTILITIES**

Zayo:

Zayo representatives shall respond to Contractor contact and attend Project Pre-Construction meetings and Utility Coordination Meetings as applicable.

Zayo forces shall be responsible for any required adjustments or modifications to existing conduits and cables necessary to reconnect to the relocated telecom infrastructure. Zayo forces shall install their new cables in accordance with the Utility Modification Plan. This work by Zayo is anticipated to be coordinated with the Contractor during project construction.

Installation of fiber cable and splicing is anticipated to take approximately forty-five (45) days, per location, to be completed.

The Contractor shall procure and install one (1) two-inch blue conduit for Zayo use as detailed on the ITS Plan within the trench opened for the CDOT ITS backbone. Two (2) additional Zayo conduits installed in the trench opened for the CDOT ITS backbone shall be supplied by Zayo and installed by the Contractor. Zayo-specific pull boxes detailed on the ITS Plan shall be supplied by Zayo and installed by the Contractor. All materials supplied by Zayo shall meet current BABA Requirements. Any Zayo-supplied material not compliant with current BABA Requirements shall not be incorporated into the project. The project will proceed without installation of Zayo-supplied materials if compliance with BABA requirements cannot be met or if Zayo is unable to supply materials in a manner that does not incur project delay as determined by the Project Engineer.

The Contractor shall notify Zayo thirty (30) days prior to the anticipated completion of all Zayo- supplied pull boxes and Contractor-supplied two-inch blue conduit within the CDOT backbone trench. Upon completion of the conduit and pull boxes for Zayo use, Zayo shall be allowed up to forty-five (45) days to install new Zayo fiber optic cable within the two-inch blue conduit and to complete splicing of that cable. Existing CDOT ITS backbone conduit containing existing Zayo fiber optic cable shall not be disturbed or removed prior to completion of the Zayo work. Zayo forces shall be responsible for any required adjustments or modifications to existing conduits/cables necessary to reconnect to the relocated telephone and fiber optic infrastructure unless otherwise noted on the plans and specifications and approved in writing by the City of Littleton.

Zayo forces shall remove pedestals, pull boxes, vaults, lines, and other appurtenances associated with their system to accommodate proposed construction as shown on the project plans. Zayo forces shall coordinate this work with all other utility owners within the corridor. As needed to complete the work, the Contractor is free to remove abandoned underground conduits and remaining conductors that may impact construction. The Contractor shall verify status of abandonment with Zayo forces prior to beginning any removals of Zayo facilities.

Zayo forces shall adjust to finished grade all Zayo owned pull boxes/vaults as required to accommodate construction phasing as construction progresses. Manholes shall be adjusted to ¼" to ½" below finished roadway elevation. Pull boxes/vaults shall be adjusted to finished grade prior to final stabilization/restoration. This work is anticipated to take one (1) working day at each location. The Contractor shall establish roadway elevation or finished grade and provide marking/staking necessary for Zayo forces to complete the work.

Zayo forces shall perform applicable inspections of utility work coordinated with the Contractor in a timely manner.

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UTILITIES**

Zayo (in progress) - continued:

Zayo forces shall work with the Contractor to protect and support existing or relocated conduits and cables as necessary to facilitate construction of the project elements. Any damages to existing or relocated Zayo infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction additional conflicts are found, Zayo forces shall relocate their facilities within thirty (30) working days from notice of the conflict.

Zayo shall be responsible for traffic control for utility work performed outside typical project work hours.

Electric and Gas Utilities

Xcel Energy:

Xcel Electric representatives shall respond to Contractor contact and attend Project Pre-Construction meetings and Utility Coordination Meetings as applicable.

Xcel Electric forces shall relocate existing electric infrastructure to accommodate proposed construction as shown on the project plans. Xcel Electric forces shall be responsible for any required adjustments or modifications to existing conduits and cables necessary to reconnect to the relocated electric infrastructure. Xcel Electric forces shall install their new conduits, cables, switches, transformers, and vaults in accordance with the Utility Modification Plan.

This work by Xcel Electric is anticipated to be completed prior to project construction NTP but shall be coordinated with the Contractor during construction if required. Installation of cable and splicing is anticipated to take approximately sixty (60) days to be completed.

Xcel Electric forces shall remove pedestals, switches, transformers, vaults, lines, and other appurtenances associated with their system to accommodate proposed construction as shown on the project plans. Xcel Electric forces shall coordinate this work with all other utility owners within the corridor. As needed to complete the work, the Contractor is free to remove abandoned underground conduits and remaining conductors that may impact construction.

The Contractor shall verify status of abandonment with Xcel Electric forces prior to beginning any removals of Xcel Electric facilities.

Xcel Electric forces shall adjust to finished grade all Xcel Electric owned pull boxes/vaults as required to accommodate construction phasing as construction progresses. Manholes shall be adjusted to ¼" to ½" below finished roadway elevation. Pull boxes/vaults shall be adjusted to finished grade prior to final stabilization/restoration. This work is anticipated to take one (1) working day at each location. The Contractor shall establish roadway elevation or finished grade and provide marking/staking necessary for Xcel Electric forces to complete the work.

Xcel Electric forces shall perform applicable inspections of utility work coordinated with the Contractor in a timely manner.

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UTILITIES

Xcel Energy - continued:

Xcel Electric forces shall work with the Contractor to protect and support existing or relocated conduits and cables as necessary to facilitate construction of the project elements. Any damages to existing or relocated Xcel Electric infrastructure due to the Contractor's construction activities will be repaired at the Contractor's cost.

If during construction additional conflicts are found, Xcel Electric forces shall relocate their facilities within thirty (30) working days from notice of the conflict.

Xcel Electric shall be responsible for traffic control for utility work performed outside typical project work hours or prior to project construction NTP. Xcel Electric shall prepare and submit to the City a Method of Handling Traffic (MHT) and obtain City acceptance of the MHT prior to performing utility work outside typical project work hours.

Roadway Lighting and Power Source Connections:

Xcel forces shall provide/install power sources for the roadway lighting and traffic signals and luminaires as shown on the plans and coordinated with the Contractor.

Xcel forces shall connect the metered power source after the Contractor has completed the installation of project electrical equipment for each construction phase including conduit and wiring to the power sources as shown on the plans. This work is expected to be coordinated with construction and take three (3) working days at each location to complete.

Gas Operations:

Once the Contractor has received NTP, they shall contact in writing the utility owner immediately.

Attend Project Pre-Construction meeting(s), Xcel Energy Work Element pre-construction meeting(s), Weekly Utility Coordination meeting(s) as applicable with a minimum fourteen (14) day notice of meeting location and time.

Xcel Energy forces shall work with the Contractor to protect in place existing Xcel Energy Gas infrastructure as defined in Part 1. Xcel forces shall review and accept as appropriate track and wheel-based equipment information provided by the Contractor. Xcel shall provide watch and protect forces during the excavation for the Santa Fe and Nichol signal caisson.

The Contractor shall provide the utility owner written notice thirty (30) days immediately prior to each utility work element expected to be coordinated with construction.

No additional conflicts are anticipated. If during construction a conflict is found, Xcel forces shall relocate their facility within thirty (30) working days from notice of the conflict.

**-21-
UTILITIES**

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavating or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days, not including the actual day of notice, prior to commencing such operations. The Contractor shall contact the Utility Notification Center of Colorado (UNCC) at phone no. **811**, to have locations of UNCC registered lines marked by member companies. All other underground facilities shall be located by contacting the respective owner. Utility service laterals shall also be located prior to beginning excavation or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work, except as noted within this specification.

**RIGHT OF ENTRY AGREEMENT
FOR SIDEWALK IMPROVEMENTS AT SANTA FE & MINERAL**

THIS RIGHT OF ENTRY AGREEMENT ("**Agreement**") is made by and between the REGIONAL TRANSPORTATION DISTRICT, a political subdivision of the State of Colorado, whose address is 1660 Blake St., Denver, Colorado 80202 ("**RTD**"), and CONTRACTOR, whose address is 123 Main St. Littleton, CO ("**Contractor**").

RECITALS

- A. RTD owns and operates the land and improvements known as the Littleton/Mineral Station located at 3203 West Mineral Avenue in Littleton, Colorado (the "**RTD Property**") for mass transit purposes.
- B. The City of Littleton ("**City**") is designing the Santa Fe Drive & Mineral Avenue Improvements Project ("**Project**") to construct a quadrant roadway in the southwest corner of the Santa Fe Drive and Mineral Avenue intersection adjacent to the RTD Property. The Project requires reconstruction of sidewalks and curb ramps within the RTD Property.
- C. The City is reconstructing sidewalks and curb ramps within a portion of the RTD Property as authorized by Permanent Roadway Purposes Easement recorded in Arapahoe County on July 16, 1991, at Reception No. 9100057921 (the "**Permanent Easement**").
- D. The City has contracted with Contractor to perform the reconstruction of sidewalks and curb ramps required by the Project. To complete this work, Contractor requires access to portions of RTD Property which are not included in the Permanent Easement.

In consideration of the permission of RTD for Contractor to enter upon the RTD Property, the receipt and sufficiency of which are acknowledged, the parties agree as follows:

ARTICLE 1. RIGHT OF ENTRY

- A. Subject to all the terms and conditions of this Agreement, RTD grants to Contractor the non-exclusive, revocable right to enter upon and have ingress to and egress from the RTD Property solely for the purpose of ingress and egress across the RTD Property within the area shown on the attached **Exhibit A** ("**Licensed Area**") to complete work related to the Project in accordance with the plans attached as **Exhibit B** ("**Plans**").
- B. RTD shall retain all rights in and usage of the Licensed Area. This Agreement is subject to existing interests, easements, leases, licenses, and permits (if any) previously granted, reserved, or held by RTD, its predecessors in interest, or any other person or entity affecting any of the Licensed Area or RTD Property, whether of record or not. Contractor's use of the Licensed Area shall not interfere with RTD's use and/or maintenance of RTD facilities and the RTD Property, nor with the needs and requirements of RTD's tenants,

easement beneficiaries, licensees, or lien holders, nor with the use of their improvements on the RTD Property.

- C. Contractor shall require its agents, employees, and subcontractors (collectively, "**Contractor's Agents**") performing work pursuant to this Agreement to comply with each of the terms and conditions of this Agreement and to acknowledge all rights reserved to RTD pursuant to this Agreement.
- D. In the event of Contractor's violation of any of the terms of this Agreement, RTD may terminate this Agreement in part or in full, effective immediately upon Contractor's receipt of RTD's written termination notice.
- E. All recitals and attached exhibits are deemed incorporated into this Agreement. Exhibits may not be modified without prior approval by RTD; any approved modifications to exhibits shall be incorporated in this Agreement by an amendment to the Agreement signed by both parties.

ARTICLE 2. TERM

This Agreement shall become effective upon the last date of execution by both parties ("**Effective Date**") and shall remain in effect for 90 days, until completion of the work, or until earlier termination of this Agreement, whichever occurs first.

ARTICLE 3. WORK AND COORDINATION WITH RTD

- A. Contractor shall perform the work with due care, at Contractor's expense, and in full compliance with federal, state, and local laws and applicable industry and RTD standards.
- B. Contractor shall coordinate all work with Luke Johnson, RTD's Manager, Mapping and Engineering Data ("**RTD Representative**") at office number 303.299.2060 or by email at luke.r.johnson@rtd-denver.com. Contractor's Agent shall notify the RTD Representative 2 weeks prior to beginning work.

ARTICLE 4. ACCESS

- A. During any work under this Agreement, Contractor agrees to maintain the Licensed Area in a clean, neat, and sanitary condition, and to properly and promptly dispose of all litter and debris. Following completion of the work, Contractor shall promptly remove all tools, equipment, and materials and restore the Licensed Area, including re-vegetation, to substantially the same state and condition as when entered upon. If Contractor does not complete the restoration work within a reasonable time, RTD may complete the restoration work at Contractor's sole expense; Contractor shall reimburse RTD within 30 days of Contractor's receipt of a written invoice and supporting documentation. Contractor's obligation to restore the Licensed Area or to reimburse RTD for such restoration shall survive any termination of this Agreement.
- B. Contractor shall obtain a Buildings and Grounds Access Permit ("**BGAP**") from RTD Facilities Maintenance by submitting the permit form, which can be found at <https://www.rtd-denver.com/business-center/construction-engineering/right-of-way-agreements-and->

[permits](#), to bgapermits@rtd-denver.com whenever Contractor, Contractor's Agents, or their equipment will be present on the Licensed Area. Contractor must initiate its request for a BGAP five business days before the work is scheduled to begin. Any conditions set forth in a BGAP shall be deemed to be incorporated in this Agreement by this reference.

- C. **In case of emergency** caused by failure of the Facilities or in connection with Contractor's work within the Licensed Area, Contractor shall immediately notify RTD of the emergency at 303.299.2911 or such other number provided by RTD and advise of Contractor's proposed actions to immediately address the emergency. Contractor shall be responsible for any costs incurred by RTD in connection with any failure of the Facilities or Contractor's actions in relation to such failure or emergency, in accordance with the reimbursement requirements of this Agreement.
- D. RTD reserves the right to have its personnel present during any work under this Agreement.
- E. Contractor shall be responsible for safety related to all aspects of its work under this Agreement. Contractor shall obtain all health, fire, and other relevant safety regulations, work practices, and procedures prescribed by law and by RTD and shall ensure that Contractor's Agents are notified of, understand, and abide by them at all times. Contractor shall provide all required personal protective equipment and other equipment required for the safe performance of the work.
- F. Contractor shall promptly report all accidents, safety incidents, injuries, and environmental incidents concerning the RTD Property or RTD facilities to government authorities as required by law and to RTD.
- G. At any reasonable time, RTD may inspect a work site and appropriate records regarding Contractor's safety procedures and statistics to ascertain compliance with the safety requirements of this Agreement. Neither the existence nor exercise of such right by RTD shall relieve Contractor of its responsibility for compliance with, and for monitoring compliance by Contractor and its subcontractors with, the safety requirements of this Agreement.
- H. Contractor shall stop work when an imminent hazard to persons, the RTD Property, or RTD facilities is identified and shall immediately notify RTD that work has stopped, providing the reasons for stopping the work and an estimate of when the work will resume. Contractor shall take all appropriate measures to abate the imminent hazard.
- I. Contractor shall ensure that Contractor's Agents understand their right to stop work at any time they feel there is an unsafe condition or unsafe behavior in place that could harm them, others, property, or the environment. The work shall not resume until all appropriate measures to abate the hazards have been implemented.
- J. Notwithstanding any other provision of this Agreement, RTD has the right to immediately suspend the performance of the work under this Agreement if RTD, in its sole judgment, determines that any of Contractor's Agents is failing to comply with RTD safety requirements or applicable safety laws and regulations while performing the work, or if the safety of RTD employees or patrons is at risk or RTD operations are at risk. The suspension

will continue until RTD notifies Contractor that the suspension is lifted. Contractor acknowledges that RTD has no obligation to lift the suspension until RTD is satisfied that Contractor will comply with applicable requirements. RTD shall not be liable for any delays in the completion of the work that result from an RTD suspension under this paragraph.

ARTICLE 5. NOTICES

Unless otherwise prescribed in this Agreement, any notices required to be given shall be provided in writing and mailed by U.S. mail, first class postage prepaid, or by electronic mail and addressed as follows:

If to RTD:	Regional Transportation District Attn: Susan K. Altes, Senior Manager, Real Property 1560 Broadway, Suite 650 Denver, Colorado 80202 303.299.2440 susan.altes@rtd-denver.com
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If to Contractor:	CONTRACTOR contact information
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Any such notice shall be deemed to have been provided three days after such notice or communication is mailed. Each party will provide notice of any changes to its address, email address, or contact person.

ARTICLE 6. LIABILITY

- A. Contractor shall be responsible for any damage to any property, including the Licensed Area, the RTD Property or other RTD property, Contractor's property, adjacent property, utilities, adjacent structures, and other third party real and personal property on or under the RTD Property that is caused by Contractor or Contractor's Agents. Contractor shall either promptly repair such damage or pay damages to the reasonable satisfaction of the owner of the damaged property, in either case at no cost to RTD. RTD and Contractor shall notify one another of any such damage and any potential claims arising out of such damage.
- B. Contractor shall, and shall require Contractor's agents and subcontractors to, indemnify, defend, and hold harmless RTD and its officers, directors, employees, agents, and contractors against and from all claims (including without limitation actions, demands, expenses, costs, attorneys' fees, court costs, and judgments) arising out of or caused by the use of the Licensed Area and RTD Property under this Agreement. In the event of any claims made or suits filed, each party shall give the other prompt written notice, and RTD shall have the option to defend or reasonably settle the same as to claims or suits made against it, without effect as to Contractor's obligations under this Agreement.
- C. Nothing in this Agreement shall be deemed to waive any of RTD's privileges or immunities pursuant to the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq.*
- D. The provisions of this Article shall survive the termination, in whole or in part, of this Agreement.

ARTICLE 7. NO WARRANTY

- A. RTD does not grant nor purport to grant any right not specifically set forth in this Agreement. Permission for Contractor or Contractor's Agents to traverse the property of any other property owners or interest-holders other than RTD is the sole responsibility of Contractor, as is the procurement of any applicable regulatory permission or consent.
- B. The right to use the Licensed Area and RTD Property is granted subject to their "AS IS" physical condition without any warranty, express or implied.
- C. Contractor specifically assumes all risk of loss, damage, or destruction to any tools, equipment, or materials, if any, that Contractor or Contractor's Agents store on the Licensed Area or the RTD Property, whether the loss, damage, or destruction results from accident, act of God, the elements, severe weather, theft, or vandalism.

ARTICLE 8. INSURANCE

- A. Contractor shall, throughout the Term of this Agreement, procure and maintain, and shall require that Contractor's Agents, with the exception of individual Contractor employees, procure and maintain, the following types of insurance, at a minimum, with an insurer or insurers and in a form satisfactory to RTD. All insurance policies shall name RTD as an additional insured, with the exception of Workers' Compensation and Employers' Liability Insurance.
 - 1. Commercial General Liability Insurance with contractual liability endorsement, which shall provide coverage for limits of not less than \$5,000,000 each occurrence and an aggregate limit of at least \$10,000,000, and shall also include, but not be limited to, coverage for bodily injury, property damage, and products and completed operations. Following the completion of construction, this insurance will be maintained (renewed annually) for a time period no less than through the period of the applicable Colorado statute(s) of limitation and, if applicable, the Colorado statute of repose.
 - 2. Umbrella/Excess Liability Insurance. An umbrella/excess liability policy may be procured to meet the requirements of the Commercial General Liability Insurance limits.
 - 3. Automobile Liability Insurance with a combined single limit of at least \$1,000,000 per occurrence, and including coverage for, but not limited to, bodily injury liability and property damage liability for any vehicles owned, used, or hired.
 - 4. Workers' Compensation and Employers' Liability Insurance covering all employees of Contractor, wherever they may be in the United States of America so long as they are engaged in the work covered by this Agreement. The policy or policies shall cover the entire liability of Contractor as determined by the workers' compensation laws of the state or states under which such liability arises, and shall contain, so far as it is lawful to obtain, a waiver of insurer's right of subrogation against RTD for payments made to or on behalf of employees of Contractor. Employers' Liability Insurance shall provide coverage for limits of not less than \$500,000. This insurance, when procured by Contractor's Agents, shall also cover Contractor's Agents' employees.

- B. Prior to entry upon, above, or adjacent to the RTD Property and the Licensed Area, Contractor agrees to furnish RTD with a certificate of the required insurance for each of Contractor's and Contractor's Agents' policy(ies). Contractor shall provide 30 days' advance notice of cancellation of such policy(ies) by registered or certified mail. Certificates of insurance shall be provided to the RTD Senior Manager of Real Property as provided in this Agreement.
- C. Each insurance certificate required above shall have the following endorsements attached:
1. An endorsement naming RTD an additional insured, except on Workers' Compensation and Employers' Liability Insurance;
 2. An endorsement evidencing coverage for a liability assumed under an insured contract for liability assumed by Contractor and Contractor's Agents;
 3. A Broad Form Property Damage endorsement if the policy does not provide for the equivalent coverage; and
 4. Waiver of subrogation in favor of and acceptable to RTD.
- D. In the event of reduction or exhaustion of the applicable aggregate limit or limits of liability under the primary policy or policies referred to in the certificate of insurance solely by reason of losses paid under this Agreement on account of occurrences during the policy period, the excess policy, if any, referred to in the certificate shall (1) in the event of reduction, apply as excess of the reduced limit of liability thereunder; and (2) in the event of exhaustion, continue in force as though it were primary insurance. For claims covered by the insurance specified in this Agreement, the insurance coverage shall be primary and non-contributory insurance with respect to the insured, additional insured parties, and their respective members, directors, officers, employees, and agents, and it shall specify that coverage continues notwithstanding the fact that Contractor and Contractor's Agents have left the RTD Property.
- E. The insurance shall apply separately to each insured and additional insured party against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.
- F. Liability of Contractor under this Agreement shall not be limited to coverage provided under the required insurance policies.
- G. Only those Contractor's Agents whose operations are covered by the required insurance will be authorized to work upon or about the Licensed Area or the RTD Property.
- H. In the event that any Contractor's Agent does not have its own insurance coverage as set forth in this Article, Contractor shall cause such Contractor Agent to be a named insured under Contractor's policies.

ARTICLE 9. HAZARDOUS MATERIALS

Contractor and Contractor's Agents shall not use, produce, treat, generate, release, discharge, store, transport, or cause to be transported, or dispose of any Hazardous Materials

at, on, under, in, or about the Licensed Area or RTD Property in violation of applicable law. **"Hazardous Materials"** shall mean any and all substances, chemicals, wastes, or other materials now or from time to time defined or characterized as hazardous substances or hazardous wastes pursuant to laws or regulations of any government authority having jurisdiction over the RTD Property, the State of Colorado, or the United States, or otherwise posing a present or potential risk to human health, welfare, or the environment.

ARTICLE 10. GENERAL

- A. Assignment. Contractor may not assign this Agreement, or any part or interest in this Agreement, without the prior written consent of RTD. No RTD-approved assignment shall release Contractor from any liability under this Agreement. Any assignment in violation of this Agreement shall be null and void.
- B. Agreement Binding. This Agreement and all of the covenants, terms, and conditions in this Agreement shall be binding upon and inure to the benefit of the parties and their respective permitted successors and assigns.
- C. Execution in Counterparts. This Agreement (and each amendment, modification, and waiver in respect of this Agreement) may be executed and delivered in counterparts, each of which will be deemed an original, but all of which when taken together shall constitute a single contract. Delivery of an executed counterpart of a signature page to this Agreement shall be effective as delivery of a manually executed counterpart of this Agreement.
- D. Governing Laws; Jurisdiction and Venue. The laws of the State of Colorado and applicable federal, state, and local laws, rules, regulations, and guidelines govern this Agreement. Jurisdiction and venue for all disputes shall be in the county in which the Licensed Area is located, and Contractor expressly submits itself to such jurisdiction.
- E. No Recordation. Neither party (nor any of their respective agents or representatives) shall record this Agreement (or any memorandum or short form of this Agreement) without the prior written consent of the other party.
- F. Amendment. This Agreement may not be amended except in writing by mutual agreement of the parties, nor may rights be waived except by an instrument in writing signed by the party charged with such waiver.
- G. No Agency. It is expressly understood and agreed that RTD and Contractor do not intend to be and shall not in any respect be deemed agents of each other.
- H. Headings. The headings in this Agreement are inserted for reference purposes only and are not restrictive as to content.
- I. Liens. Contractor shall not permit any lien, claim, or other charge to be placed on the RTD Property, and Contractor shall promptly cause any such lien, claim, or charge to be removed. If any mechanic's lien, claim, or other charge is filed against the RTD Property, Contractor shall discharge the same of record by a release or bond within 30 days after the filing of any notice of such lien, claim, or other charge. This provision shall survive termination, in whole or in part, of this Agreement.

- J. Waiver; Severability. The failure of either party to exercise any right under this Agreement, or to insist upon strict compliance by the other party, shall not constitute a waiver of either party's right to demand strict compliance with the terms and conditions of this Agreement. If any provision of this Agreement is held to be unenforceable for any reason, its unenforceability shall not affect the remainder of this Agreement, which shall remain in full force and effect and enforceable in accordance with its terms.
- K. Legal Authority. Contractor warrants that it possesses the legal authority to enter into this Agreement and that it has taken all actions required by its procedures, bylaws, and/or applicable law to exercise that authority, and to lawfully authorize its undersigned signatory to execute this Agreement and to bind Contractor to its terms. The person(s) executing this Agreement on behalf of Contractor warrant(s) that such person(s) have full authorization to execute this Agreement.
- L. No Dedication; Third Parties. Nothing in this Agreement shall be deemed to be a gift or dedication of any portion of the Licensed Area or the RTD Property to the general public or for any public use or purpose whatsoever. Except as specifically provided in this Agreement, no rights, privileges, or immunities of either party shall inure to the benefit of any third party, nor shall any third party be deemed to be a beneficiary of any of the provisions contained in this Agreement.
- M. Breach. Any failure of Contractor to fulfill any of Contractor's obligations under this Agreement shall constitute a breach of this Agreement and subject Contractor to immediate termination of the Agreement, as well as damages and costs, including attorneys' fees.
- N. Applicable Laws; Violation. Contractor shall use the Licensed Area in a safe and careful manner and shall comply with all applicable ordinances and regulations of the jurisdiction in which the Licensed Area is located; federal, state, and local laws; and all other rules of governmental authorities as may be in force and effect during the term of this Agreement. If at any time the use of the Licensed Area by Contractor violates applicable ordinances or laws, Contractor shall cease and desist from continuing such use upon demand by RTD.
- O. Additional Uses. Contractor understands and agrees that the RTD Property may be used by the public or otherwise, and Contractor shall conduct its work so as not to unreasonably interfere with such other uses.
- P. RTD Equipment. Contractor shall not use RTD equipment, tools, or furnishings located in or about the Licensed Area or RTD Property without prior written approval by RTD.
- Q. Entire Agreement. This Agreement represents the entire agreement between the parties regarding the Licensed Area and the RTD Property.
- R. Electronic Signatures. This Agreement may be executed by electronic signature, which shall be considered as an original signature for all purposes and shall have the same force and effect as an original signature. Without limitation, "electronic signature" shall include faxed versions of an original signature, electronically scanned and transmitted versions of an original signature, and digital signatures.

Signature Page(s) to Follow

SAMPLE

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the Effective Date.

REGIONAL TRANSPORTATION DISTRICT

By: _____
Jyotsna Vishwakarma
Acting AGM, Capital Programs

APPROVED AS TO LEGAL FORM FOR THE
REGIONAL TRANSPORTATION DISTRICT

By: _____
Attorney Name:
Attorney Title:

Date: _____

CONTRACTOR
CONTRACTOR

By: _____

Name: _____

Title: _____

Date: _____

EXHIBIT A
Licensed Area

SAMPLE

EXHIBIT "A"

CDOT PROJECT CODE: AQC M810-017

CDOT PROJECT NUMBER: 23574

CDOT PROJECT DESCRIPTION: US 85 AND MINERAL ROADWAY IMPROVEMENTS

TEMPORARY EASEMENT NUMBERS: TE-1 AND TE-1A

PAGE 1 OF 3

A Temporary Easement No. TE-1 of the City of Littleton, County of Arapahoe, State of Colorado, containing 774 sq. ft. (0.018 acres), more or less, in the Northwest One-Quarter of Section 32, Township 5 South, Range 68 West, of the 6th Principal Meridian, in Arapahoe County, Colorado, also lying within a portion of Lot 1, Block, 1, Mineral Park-N-Ride Subdivision recorded at Reception Number B0040815, Arapahoe County Records. Temporary Easement being more particularly described as follows:

Beginning at a point on the northeasterly line of a parcel of land recorded in Book 6207, Page 285, Arapahoe County Records, whence the North One-Quarter Corner of said Section 32 bears N. 53° 40' 05" E., a distance of 484.75 feet, said point also being the POINT OF BEGINNING.

1. Thence N. 20° 26' 31" E., a distance of 15.28 feet;
2. Thence S. 69° 35' 13" E., a distance of 49.21 feet;
3. Thence S. 20° 27' 45" W., a distance of 11.50 feet;
4. Thence S. 53° 43' 07" E., a distance of 13.51 feet to said northeasterly line of a parcel of land;
5. Thence along said northeasterly line N. 69° 40' 01" W., a distance of 62.20 feet, more or less, to the POINT OF BEGINNING;

The above-described Temporary Easement contains 774 sq. ft. (0.018 acres), more or less.

TOGETHER WITH

A Temporary Easement No. TE-1A of the City of Littleton, County of Arapahoe, State of Colorado, containing 416 sq. ft. (0.010 acres), more or less, in the Northwest One-Quarter of Section 32, Township 5 South, Range 68 West, of the 6th Principal Meridian, in Arapahoe County, Colorado, also lying within a portion of Lot 1, Block, 1, Mineral Park-N-Ride Subdivision recorded at Reception Number B0040815, Arapahoe County Records. Temporary Easement being more particularly described as follows:

Beginning at a point on the northeasterly line of a parcel of land recorded in Book 6207, Page 285, Arapahoe County Records, whence the North One-Quarter Corner of said Section 32 bears N. 66° 43' 38" E., a distance of 587.22 feet, said point also being the POINT OF BEGINNING.

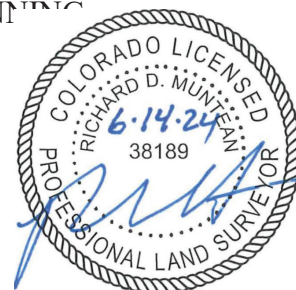


EXHIBIT "A"

CDOT PROJECT CODE: AQC M810-017

CDOT PROJECT NUMBER: 23574

CDOT PROJECT DESCRIPTION: US 85 AND MINERAL ROADWAY IMPROVEMENTS

TEMPORARY EASEMENT NUMBERS: TE-1 AND TE-1A

PAGE 2 OF 3

1. Thence along said northeasterly line N. 69° 40' 01" W., a distance of 10.68 feet;
2. Thence continuing along said northeasterly line and the arc of a tangent curve to the right, a radius of 15.00 feet, a central angle of 90° 31' 08", a distance of 23.70 feet to the southeasterly line of said parcel of land;
3. Thence along said southeasterly line N. 20° 51' 06" E., a distance of 20.89 feet;
4. Thence departing said southeasterly line S. 14° 56' 47" E., a distance of 44.13 feet, more or less, to the POINT OF BEGINNING.

The above-described Temporary Easement contains 416 sq. ft. (0.010 acres), more or less.

All lineal distances are represented in U.S. Survey Feet.

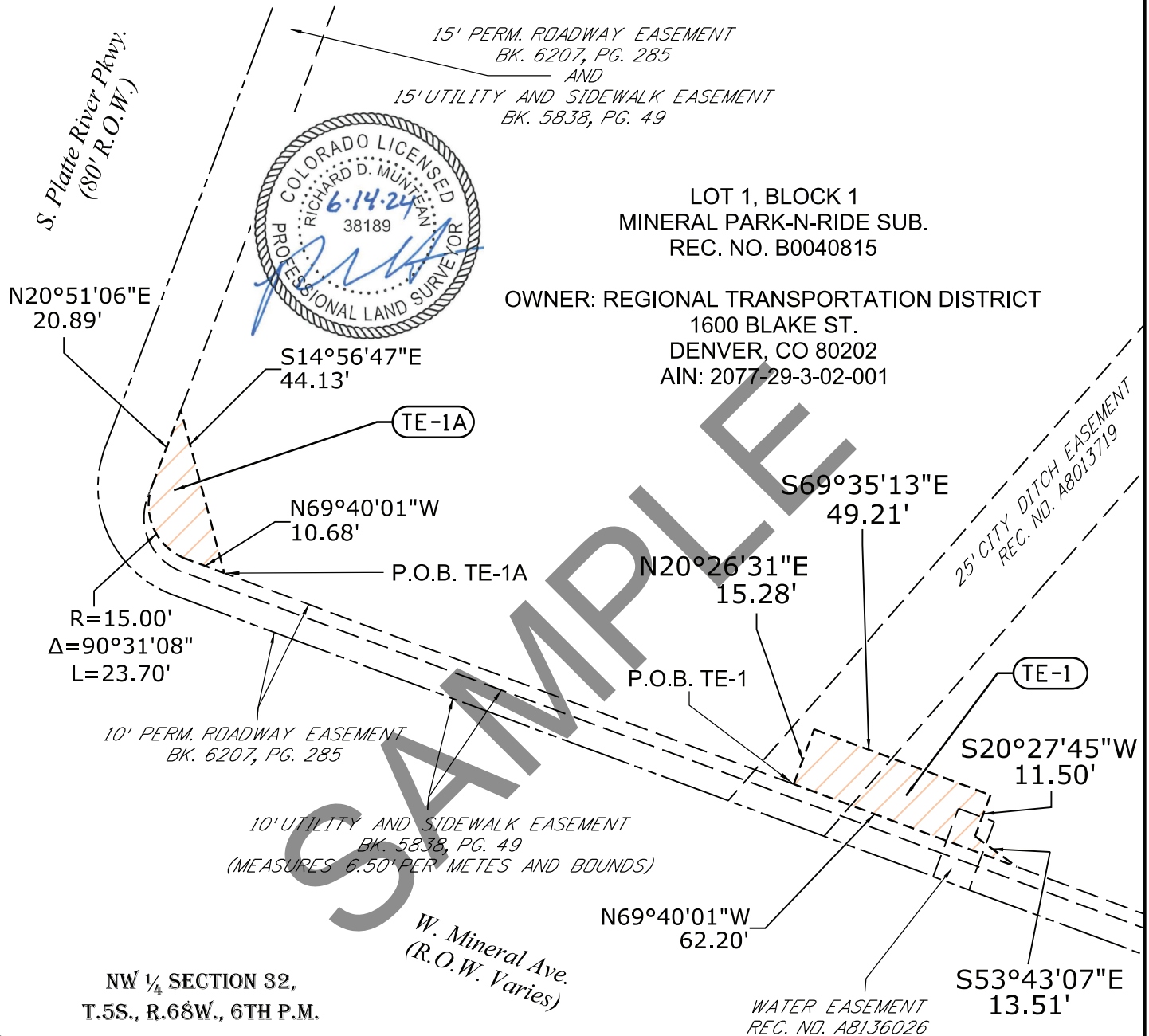
Basis of Bearings: All bearings are based on a line between the North One-Quarter Corner of said Section 32, Township 5 South, Range 68 West, of the 6th P.M. (Found 3-1/4" Aluminum Cap in Monument Box stamped "2000") and the Northwest Corner of said Section 32, Township 5 South, Range 68 West, of the 6th P.M. (Found 3-1/4" Aluminum Cap in Monument Box stamped "COLO DEPT OF TRANSPORTATION, PLS 25384"), having a grid bearing of S. 89° 29' 28" W.

For and on behalf of:
105 West, Incorporated
Richard D. Muntean, PLS 38189
4201 E. Yale Ave., Ste. 230
Denver, Co 80222



EXHIBIT A

THIS EXHIBIT IS A GRAPHIC DEPICTION OF THE PARCEL DESCRIBED ON THE ATTACHED LEGAL DESCRIPTION AND IS NOT INTENDED TO INCLUDE SURVEY PLAT REQUIREMENTS AS DEFINED IN CRS 38-51-106.



PAGE 3 OF 3

COLORADO DEPARTMENT OF TRANSPORTATION
FEDERAL-AID HIGHWAY PROJECT

ROW PLANS AUTHORIZED:

DATE

CDOT CHIEF ENGINEER

PARCEL NO'S. TE-1 & TE-1A EXHIBIT TO ACCOMPANY
LEGAL DESCRIPTIONBASIS OF BEARINGS: BEARINGS ARE BASED ON THE NORTH
LINE OF THE NORTHWEST ONE-QUARTER OF SECTION 32,
TOWNSHIP 5 SOUTH, RANGE 68 WEST, 6TH P.M.,
BEARING S89°29'28"W.0' 20' 40' 80'
1" = 40'

TE-1 CONTAINS 774 SQ. FT. (0.018 ACRES) & TE-1A CONTAINS 416 SQ. FT. (0.010 ACRES), MORE OR LESS.

CITY OF LITTLETON, COLORADO

TEMPORARY CONSTRUCTION EASEMENTS (TE-1 & TE-1A) SITUATED IN THE
NW 1/4 OF SECTION 32, T.5S., R.68W., 6TH P.M., CITY OF LITTLETON,
COUNTY OF ARAPAHOE, STATE OF COLORADO, BEING A PART OF
LOT 1, BLOCK 1, MINERAL PARK-N-RIDE SUBDIVISION, RECORDED AT
RECEPTION NO. B0040815, ARAPAHOE COUNTY RECORDS.DRAWN BY:
SDBSCALE:
1" = 40'

R.O.W. FILE NUMBER

CHECKED BY:
JJKDATE:
4/4/2024JOB NUMBER:
159-0004CDOT PROJECT NUMBER:
AQC M810-017CDOT PROJECT CODE:
23574CDOT PROJECT DESCRIPTION:
US 85 AND MINERAL ROADWAY IMPROVEMENTS

EXHIBIT B
Plans

SAMPLE

PLATTE RIVER PKWY

MATCH EXISTING SIDEWALK

RTD PARK AND RIDE

PERMANENT ROADWAY EASEMENT (BK 6207) &
UTILITY AND SIDEWALK EASEMENT (BK 5838)

EXISTING RTD SIGN TO REMAIN
AND PROTECT IN PLACE

PROPOSED TEMPORARY
EASEMENT

MATCH EXISTING SIDEWALK

10' PERMANENT ROADWAY
EASEMENT (BK 6207)

10' UTILITY AND SIDEWALK EASEMENT
(BK 5838) (6.5' MEASURED)

MATCH EXISTING SIDEWALK

EXISTING ROW

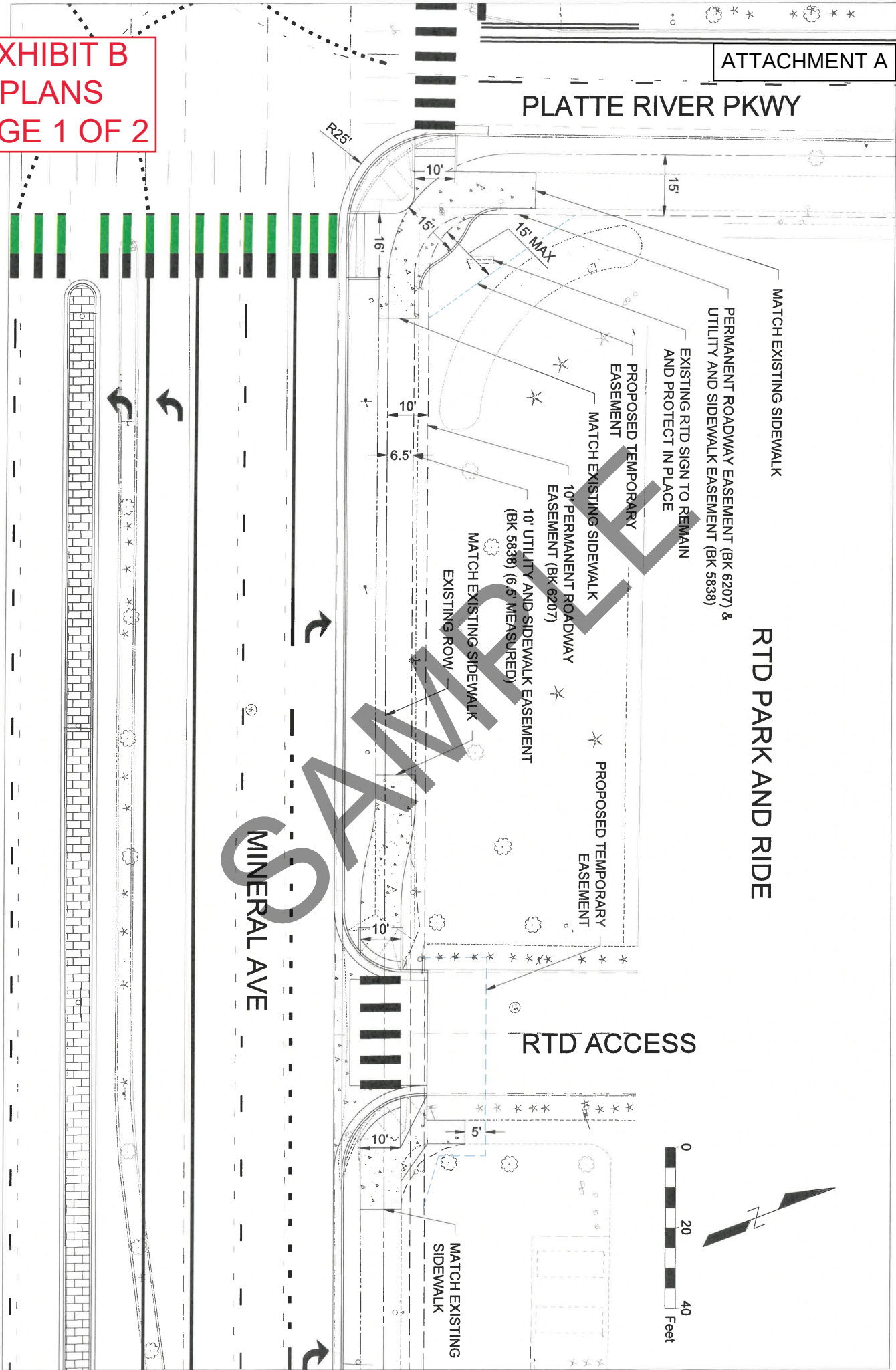
PROPOSED TEMPORARY
EASEMENT

RTD ACCESS

MATCH EXISTING
SIDEWALK



MINERAL AVE





RTD PARK AND RIDE

MINERAL AVE

10' PERMANENT ROADWAY
EASEMENT (BK 6207)

10' UTILITY AND SIDEWALK
EASEMENT (BK 5838) (6.5' MEASURED)

MATCH EXISTING SIDEWALK

EXISTING ROW

SANTA FE DR.

