

20.0 PROJECT SPECIAL PROVISIONS

The following Project Special Provisions supplement or modify the CDOT *Standard Specifications for Road and Bridge Construction* and take precedence over the CDOT Standard Specifications.

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**REVISION OF SECTION 202
RECLAIMED ASPHALT PAVEMENT MILLINGS**

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

Subsection 202.09 shall include the following:

CDOT will retain 0% of the Reclaimed Asphalt Pavement (RAP) millings removed from the existing mat on this project. All remaining RAP millings, if any, shall be used in the project as allowed in the Contract or as approved by the Engineer. Otherwise, they shall become the property of the Contractor and shall be disposed at his expense outside the project limits.

If the Contractor desires to retain a quantity of RAP millings that exceeds that allowed by this Contract, the Contractor may request this by submitting a Value Engineering Change Proposal (VECP) in accordance with subsection 104.07.

**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT**

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

Subsection 202.01 shall include the following:

This work includes removal and disposal of existing asphalt mat.

In subsection 202.02 delete the seventh paragraph and replace with the following:

The existing asphalt mat shall be removed in a manner that minimizes contamination of the removed mat with underlying material. The removed mat shall become the property of the Contractor and shall be either disposed of outside the project site, or used in one or more of the following ways:

1. Used in embankment construction in accordance with section 203.
2. Placed in bottom of fills as approved by the Engineer.
3. Recycled into the hot mix asphalt.

**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

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

Delete subsection 202.09, and replace it with the following:

202.09 Removal of Asphalt Mat (Planing). Prior to 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 3/8 inch from a 10 foot straightedge. A 10 foot straightedge shall be supplied by the Contractor.

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.

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REMOVAL OF ASPHALT MAT (PLANING)

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 in accordance with CP 77. Milled surfaces that do not meet these criteria shall require corrective action in accordance with the PCP. The Contractor shall be responsible for testing the macrotexture of the milled surface at the location directed by the Engineer in accordance with 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.

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 prior to 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 prior to commencement of resurfacing.

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 5 working days. Any milled areas left uncovered that are damaged after 5 days shall be removed and rebuilt by the Contractor in accordance with Book 2, Section 10 – Geotechnical and Pavements, subsection 10.4.1 HMA Pavement Construction.

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

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**REVISION OF SECTION 202
REMOVAL OF ASPHALT MAT (PLANING)**

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:

Macrotecture testing, macrotecture corrective actions, planers, brooms and all other work necessary to complete the item will not be measured and paid for separately, but shall be included in the work.

REVISION OF SECTION 202
REMOVAL OF BRIDGE

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

Subsection 202.01 shall include the following:

This work consists of the removal of existing bridges.

Bridge removal shall consist of the complete removal of all superstructure and substructure elements unless otherwise shown on the plans.

Subsection 202.02 shall include the following:

The removal of each existing bridge shall be performed in a safe manner. The Construction Plan requirements (1) through (15) shown in Revision Section 107-Performance of Safety Critical Work shall be included in the Bridge Removal Plan.

When removal operations are located over or in proximity to a railroad or any live water way, additional coordination including potential incident emergency/risk management notifications with the railroad or other agency (United States Army Corps of Engineers (USACE), US Fish and Wildlife Service, US Forest Service, etc.) shall be required.

The Contractor shall submit a Bridge Removal Plan for each structure to the Engineer for review and acceptance at least 14 days prior to the proposed start of removal operations. This Plan shall detail procedures, sequences, and all features required to perform the removal in a safe and controlled manner. The Bridge Removal Plans shall be prepared by the Contractor's Engineer and contain the seal and signature of a Professional Engineer registered in the State of Colorado. The Bridge Removal Plan shall be stamped "Approved for Construction" and signed by the Contractor. The Bridge Removal Plan will be submitted to CDOT for review concurrent with the Engineer's review for general specification compliance, but will not be approved by the Engineer. Comments from the Engineer's review of the Bridge Removal Plan shall be submitted in writing to the Contractor within seven calendar days from receipt of the plan and prior to the Pre-removal Conference. Acceptance of the Bridge Removal Plans will be contingent upon the Contractor adequately addressing all written comments provided by the Engineer.

The Bridge Removal Plans shall provide complete details of the bridge removal process, including:

- (1) The removal sequence corresponding to the construction phasing shown on the plans, including calculations and analysis of the Contractor's removal equipment as related to loading capacity and any crane bearing during the removal operations. Sequence of operation shall include a detailed schedule that complies with the working hour limitations.
- (2) Equipment descriptions including size, number, type, capacity, backup/standby need, and location of equipment during removal operations.

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REMOVAL OF BRIDGE

- (3) Roles, responsibilities, and positioning of all CDOT project management, construction supervision, and critical workers during removal activities. This section shall include instructions for communicating and managing a 'safe-all-stop' scenario if unexpected hazards are discovered during the activity.
- (4) Shoring that exceeds 5 feet in height, all falsework and bracing. Shoring design shall follow the AASHTO Guide Design Specifications for Bridge Temporary Works, or other design standard as approved by the Engineer. Shoring construction, including verification and proof testing shall be in accordance with Section 206. Shoring will not be measured and paid for separately.
- (5) Details, locations, and types of protective coverings to be used. The protective covering shall prevent materials, equipment, and debris from falling onto the property below. When removal operations are located over or in proximity to a live waterway, railroad, or pedestrian/bicycle path, additional width of protective covering sufficient to protect these facilities shall be required. Detailed methods for protection of the existing roadway facilities, including measures to assure that people, property, utilities, and improvements will not be endangered. Catastrophic unplanned failure of the structure in demolition is to be considered as worst-case scenario.
- (6) Detailed methods for protection of live waterways including minimization of turbidity and sedimentation, and protection of existing wetlands.
- (7) Detailed methods for mitigation of fugitive dust resulting from the demolition.
- (8) Details for dismantling, removing, loading, and hauling steel elements.
- (9) Locations of railroad tracks, roadways, utilities (overhead and underground), structures or facilities located within the area of the bridge removal operations.
- (10) Detailed methods of fire suppression.
- (11) Methods of Handling Traffic, including bicycles and pedestrians, in a safe and controlled manner.
- (12) Details for managing project communications, media, and public on-lookers during demolition as needed.
- (13) Contingency planning for unexpected weather.
- (14) Details for emergency and post-incident management in a catastrophic failure or other serious incident or worker injury.

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The Contractor's Engineer shall be responsible for the stability of the existing "in service" structure for any deviation from the bridge removal limits shown on the construction phasing plans. The Contractor is also responsible for the protection of any portion of the structure to remain in place for later phases, including protection from the Contractor's construction activities.

When a temporary works or demolition guideline is provided by a railroad or local agency, the more stringent criteria of the design guidelines shall be used.

A Pre-removal Conference shall be held at least ten days prior to the beginning of removal of the bridge. CDOT, the Contractor, the removal subcontractor, the Contractor's Engineer, the Traffic Control Supervisor (TCS), and CDOT/Project Communications Staff shall attend the Pre-removal Conference. The Bridge Removal Plan shall be finalized at this Conference. Meeting minutes and attendance list will be recorded.

The Contractor's Engineer shall sign and seal items (1) and (3) listed above in the final Bridge Removal Plan. Calculations shall be adequate to demonstrate that the loads and impact of the Contractor's demolition equipment do not impose detrimental effects on the stability of the structure remaining after the end of each phase of removal, before traffic is allowed to resume in its normal configuration.

The final Bridge Removal Plan shall be stamped "Approved for Construction" and signed and sealed by the Contractor's Engineer. The Contractor shall address all written comments from the Engineer and submit a final Bridge Removal Plan to the Engineer. The Contractor shall not begin the removal operations without the Engineer's written acceptance of the final Bridge Removal Plan.

Submittal of the final Bridge Removal Plans to the Engineer, and field inspection performed by the Engineer, will in no way relieve the Contractor and the Contractor's Engineer of full responsibility for the removal plan and procedures.

Work within Railroad right-of-way shall be in accordance with Section 107. For bridge removal over railroads, including overhead wires, tunnels and underground facilities, approval of the bridge removal plans will be contingent upon the drawings being satisfactory to the railroad company involved.

The Contractor's Engineer shall be onsite during safety critical removal operations considered to have a high degree of safety risk. Bridge removal operations determined to be of high safety risk shall be agreed upon and documented between the Contractor and Engineer at or before the Pre-removal Conference. The Contractor's Engineer shall inspect and provide written approval of each phase of the removal operations corresponding to the construction phasing shown on the plans prior to allowing vehicles or pedestrians on, below, or adjacent to the structure. The Contractor's Engineer shall certify in writing that the falsework, bracing, and shoring conform to the details of the final Bridge Removal Plan. A copy of the certification shall be submitted to the Engineer. Should any part of the adjacent structure designated to remain in place be damaged during removal operations, the Contractor's Engineer shall perform a full and complete engineering evaluation of the structure and submit a written report to the Engineer. This evaluation, as well as any additional costs to stabilize the structure due to or resulting

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REMOVAL OF BRIDGE**

from the Contractor's actions or inactions, shall be borne solely by the Contractor. Further work involving the bridge shall not be permitted until the report and any subsequent remedial stability measures are complete and satisfactory to the Engineer and Staff Bridge.

The Contractor shall have all necessary workers, materials, and equipment at the site prior to closing any lanes to traffic to accommodate bridge removal operations. While the lanes are closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to traffic.

Removal of hazardous material shall be in accordance with Section 250.

The Contractor shall take all necessary steps to avoid contaminating state waters, in accordance with subsection 107.25.

Should an unplanned event occur or the bridge removal operation deviate from the submitted Bridge Removal Plan, the bridge removal operations shall immediately cease after performing any work necessary to ensure worksite safety. The Contractor shall submit to the Engineer the procedure or operation proposed by the Contractor's Engineer to correct or remedy the occurrence of this unplanned event or to revise the final Bridge Removal Plan. The Contractor's Engineer shall submit a written report to the Engineer within 24 hours of the event summarizing the details of the event and the procedure for correction. The Engineer shall review the information submitted regarding the unplanned event and provide written acceptance of the corrective action or remedy procedure prior to resuming operations.

Before removal of the protective covering, the Contractor shall clean the protective covering of all debris and fine material.

Bridge removal may be suspended by the Engineer for the following reasons:

- (1) Final Bridge Removal Plan has not been submitted, or written acceptance has not been provided by the Engineer to begin the removal.
- (2) The Contractor is not proceeding in accordance with the final Bridge Removal Plan, procedures, or sequence.
- (3) The Contractor's Engineer is not onsite to conduct inspection for the written approval of the work.
- (4) Safety precautions are deemed to be inadequate.
- (5) Existing neighboring facilities are damaged as a result of bridge removal.

Suspension of bridge removal operations shall in no way relieve the Contractor of their responsibility under the terms of the Contract. Bridge removal operations shall not resume until modifications have

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been made to correct the conditions that resulted in the suspension, as approved in writing by the Engineer.

The Contractor shall notify all emergency response agencies of the proposed removal work and any detours a minimum of three days in advance of the work. This shall include the Colorado State Patrol, local Police Department, local Fire Department, all local ambulance services, and the Sheriff's Department, as appropriate.

All required traffic control devices, night time flagging stations, barricades and VMS signs shall be in place, with detours in operation, prior to the beginning of removal operations each day. Night work shall conform to the requirements of the MUTCD, Parts 1, 5, and 6.

Prior to reopening the roadway to public traffic, all debris, protective pads, materials, and devices shall be removed and the roadways swept clean.

Explosives shall not be used for removal work without the written approval of the Engineer.

Removal shall include the superstructure, the substructure, which includes the piers, abutments and wingwalls, the bridge rail, and any approach slabs and sleeper slabs.

Removal of the substructure shall be removed per Book 2, Section 15 - Structures. Holes resulting from substructure removal shall be backfilled with Structure Backfill (Class 2) to the adjacent existing grades.

All other materials removed from the existing structure shall become the property of the Contractor and shall be properly disposed of offsite at the Contractor's expense, unless otherwise stated.

Existing structures, facilities, and surrounding roadways shall not be damaged by the removal operations. Damage that occurs shall be repaired immediately at the Contractor's expense.

**REVISION OF SECTION 202
REMOVAL OF MARKING (ASPHALT
OR CONCRETE GROOVING)**

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

Subsection 202.05 shall include the following:

- (c) *Removal of Pavement Marking (Asphalt or Concrete Grooving)*. Pavement marking shall be removed by asphalt grooving or concrete grooving to provide a recessed channel in the pavement surface for the placement of permanent pavement markings at locations as shown on the plans. The channel shall have a transverse and longitudinally uniform depth of 60 mils. The dimensions of the channel shall match the length and width of the specified pavement marking, within a tolerance of +0.25, -0.00 inches. Where broken line patterns are required, the grooved channel length shall not be continuous, but shall consist of individual grooved segments matching the required pavement marking pattern.

Asphalt, concrete, and pavement marking debris generated by the grooving process shall be collected and removed from the roadway and disposed of lawfully. Displacement of grooving debris to the roadway shoulder shall not be permitted.

**REVISION OF SECTION 203
EMBANKMENT MATERIAL**

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

Subsection 203.02 (c) shall include the following:

Embankment material containing significantly more than optimum moisture that would become stable if dried shall not be unsuitable material.

In subsection 203.03, first paragraph, after the second sentence add the following:
Imported embankment material utilized for construction shall consist of materials meeting AASHTO classification A-1-a, A-1-b, or A-2-4 when classified in accordance with AASHTO M 145, and shall not contain Reclaimed Asphalt Pavement (RAP) materials in any percentage.

Materials generated on-site that do not meet AASHTO classification A-1-a, A-1-b, or A-2-4 when classified in accordance with AASHTO M 145 may be used on fill slopes and embankment areas outside of the roadway prism (See Section 101.65 of the Standard Specifications) as designated in the plans or as approved by the Engineer.

In subsection 203.03, seventh paragraph, delete the first sentence and replace with the following:
Inclusion of recycled asphalt will not be allowed in the embankment fill. If recycled concrete is to be incorporated into embankment fill, the maximum dimension permitted for concrete is 6 inches.

Delete subsection 203.07(c) and replace with the following:

Use of Recycled Concrete: Recycled concrete may be incorporated into embankment material, and shall be processed, placed, and compacted in accordance with subsection 203.07(a) or (b), depending on the overall classification of the embankment material once the recycled material is incorporated. Recycled concrete shall not contain any rebar or reinforcing steel. Recycled concrete shall not be placed in the upper 2 feet of the final subgrade elevation or within 2 feet of the final finished side slopes unless otherwise noted in the Contract. Recycled or Reclaimed Asphalt Pavement will not be allowed in the new embankment materials.

Subsection 203.11 (b) shall include the following:

The disposal of unsuitable material and replacement of embankment will not be measured and paid for separately, but shall be included in the work.

Subsection 203.12 shall include the following:

The Contractor's Process Control efforts will not be measured and paid for separately but shall be included in the work.

**REVISION OF SECTION 208
CONSTRUCTION MAT**

Section 208 of the standard specifications is hereby revised for this project to include the following:

DESCRIPTION

208.13 This work consists of furnishing and installing construction mats to support equipment working in wetlands, streams, and other locations designated on the plans while protecting the soils and vegetation beneath from damage.

MATERIALS

208.14 Construction mats shall be capable of supporting the anticipated loads on the types of soil that will be encountered. Larger mats shall be used on soils with low bearing strength (e.g., muck or peat) to spread the weight over a larger area. Construction mats shall be free of leachable preservatives or other constituents harmful to aquatic environments. All treated wood shall contain a quality mark or letter of certification from a third party inspection agency assuring the product meets the minimum American Wood Protection Association (AWPA) Use Category 4A standard. The Contractor may fabricate the mats or use prefabricated mats designed for these purposes.

(a) *Construction Mats Fabricated by the Contractor.* The construction mats shall be fabricated of wooden cants, sawn dense hardwoods, or round logs fastened together. The mats shall be fabricated of cants or logs of length, width, and thickness to meet anticipated loads, soil strength, and construction equipment sizes. Alternative materials may be used if approved by the Engineer.

The mats shall be capable of being connected using quick links or other heavy-duty connectors if needed for stability or to reduce movement.

The Contractor's mat design shall be submitted to the Engineer for review and approval at least three weeks before the mats are to be used on the project. The design shall include a list of equipment and materials to be placed on the mats and anticipated loading.

Mats that are determined to be inadequate to support the required loads or protect the soil and vegetation beneath shall be removed from the project and replaced with adequate mats at the Contractor's expense.

(a) *Prefabricated Construction Mats.* Pre-fabricated mats shall be made of natural timber or other material approved by CDOT's Project Engineer. Mats shall be capable of assembly to form appropriate size mats to be placed directly onto ground surfaces for the purposes of holding or transferring heavy equipment, preventing excessive rutting, and minimizing vegetation disturbance.

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CONSTRUCTION MAT

(b) *Hardware.* Construction mats shall be supplied with all necessary hardware, including all bolts with nuts and washers, timber connectors, drift pins, dowels, nails, screws, spikes, metal pile protectors, steel anchor plates and all other metal fastenings.

CONSTRUCTION REQUIREMENTS

208.15 General. Prior to placement of mats, woody vegetation (willows, shrubs, trees, etc.) shall be cut or trimmed at or slightly above ground level. Vegetation shall not be uprooted, and the root mat of any vegetation shall not be disturbed.

Crossing sites shall be located where stream channel is narrow for the shortest possible clear span and where stream banks are stable and well defined. When feasible on large wetland complexes, structures shall be accessed from opposite sides to avoid crossing the entire wetland.

208.16 Installation. Mats shall be in good condition to ensure proper installation, use, and removal. Mats shall be inspected by the Engineer to ensure they are clean of soil and any invasive plant species seed stock or plant material from previous use. The spread of aquatic nuisance species, including the New Zealand mud snail, shall be prevented. Specifically, if heavy equipment (including mats) is used that was previously working in another stream, river, lake, pond, or wetland, it shall be cleaned using one of the following procedures:

- (1) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray/soak equipment with a solution of commercial grade quaternary ammonium disinfectant compound containing at least 8.0% active ingredient diluted in solution to achieve at least 0.8% concentration (roughly 12 ounces of product per gallon of water). Treated equipment shall be kept moist for at least 10 minutes, managing rinsate as a solid waste in accordance with local, county, state, or federal regulations, OR
- (2) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray or soak equipment with water hotter than 140 °F for at least 10 minutes.

Hand tools, boots, and any other equipment that will be used in the water shall be cleaned using option

(1) or (2) as well. The equipment shall be dried before use. Equipment shall not be moved from one water body to another without cleaning.

Equipment and associated materials (including mats) shall not be stored, maintained, fueled or repaired in waters of the U.S. or wetlands.

Operating heavy equipment on mats in wetlands shall be minimized.

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CONSTRUCTION MAT

Impacts to waters of the U.S. or wetlands areas shall be minimized during installation, use, and removal of construction mats. Mats shall be placed in a location that would minimize the amount needed for crossing the waters of the U.S. or wetlands.

Construction mats shall not be dragged into position. More than one layer of mats may be necessary in areas which are inundated or have deep organic wetland soils.

At crossings where no flow is present or anticipated during project construction, the mats may be placed directly onto the ground in order to prevent excessive rutting, provided stream banks and bottoms are not adversely altered.

For further protection, mats may be installed on top of nonwoven geotextile that covers the crossing area.

Construction mats may be used as a temporary bridge over a stream to allow vehicles access to the work site. Mats shall not be placed so that they restrict the natural flow of the stream. When used for flowing water crossings, small sections of mat shall be placed within and along the stream parallel to the flow of water. Mats shall then be placed perpendicular to the stream, resting on top of the initial construction mat supports. It may be necessary to place additional reinforcement for extra stability and to minimize the amount of sediment that could fall between the spaces of each timber.

In most cases, construction mats shall be placed along the travel area so that the individual cants or logs are resting perpendicular to the direction of traffic. Mats shall be placed far enough on either side of the stream or wetland to rest on firm ground.

Adequate erosion and sediment controls shall be installed at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, construction mats.

Matted crossings of waters of the U.S. or wetlands shall be monitored to assure correct functioning of the mats. Mats shall be inspected during use for any defects or structural problems. Mats which become covered with soils or construction debris shall be cleaned and the materials removed and disposed of in an upland location. The material shall not be scraped and shoveled into the resource area. Mats which become imbedded shall be reset or layered to prevent mud from covering them or water passing over them.

208.17 Removal Mats shall be removed by “backing” out of the site, removing mats one at a time. Construction mats shall not be dragged out of position. All other material placed for protection, such as geotextile fabric, straw, etc. shall then be removed. Any rutting or significant indentations identified during mat removal shall be regraded immediately, taking care not to compact soils.

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CONSTRUCTION MAT

Crossings shall be inspected following mat removal to determine the level of restoration required.

Mats shall be cleaned in an upland area which doesn't drain directly to waters of the U.S. or wetlands before transport to another wetland or stream location. Cleaning methods may include but are not limited to shaking or dropping mats in a controlled manner with a piece of machinery to knock off attached soil and debris, spraying with water or air, and sweeping.

208.18 Restoration. Upon removal of the construction mats, the Contractor and the Engineer shall examine the matted area together to determine what restoration, if any, is required. Restoration shall include, but is not limited to, the following:

Areas of disturbed soil located near waters of the U.S. or wetlands shall be promptly stabilized. Matted areas within wetlands shall be restored to their original condition and elevation. This may involve natural revegetation from existing root and seed stock of native plant species. Conditions may warrant planting and the broadcast of a wetland seed mix over the matted area to supplement the existing seed and rootstock. Seed mixes and vegetation shall contain only native plant species of the appropriate moisture tolerance regime. The use of mulch in wetlands shall consist of weed free mulch to mitigate the risk of the spread of invasive plant species.

**REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS BIOLOGICAL
WORK PERFORMED BY THE 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.

MATERIALS AND CONSTRUCTION REQUIREMENTS

240.02 The Contractor shall schedule 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 protected by the Migratory Bird Treaty Act (MBTA). The Contractor shall retain a qualified wildlife biologist for this project. 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 biologist's 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.

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) *Vegetation Removal.* When possible, vegetation shall be cleared prior to 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. 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 prior to 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

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

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 prior to 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 CDOT biologist. This buffer dimension may be changed if determined appropriate by the CDOT 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.

The 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. If construction activities are located within the Colorado Division of Wildlife (CDOW) recommended buffer zone for specific raptors, "NO WORK" zones shall be established around active sites during construction according to the CDOW standards or as recommended by the wildlife biologist in consultation with the CDOW. 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) *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:

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**REVISION OF SECTION 240
PROTECTION OF MIGRATORY BIRDS BIOLOGICAL
WORK PERFORMED BY THE CONTRACTOR’S BIOLOGIST**

1. The Contractor shall remove existing nests prior to April 1. If the Contract is not awarded prior to April 1 and CDOT has removed existing nests, then the monitoring of nest building shall become the Contractor’s responsibility upon Notice to Proceed.
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.

If an active nest become established, i.e., there are eggs or young in the nest, all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied as determined by the wildlife biologist and approved by the Engineer. The Contractor shall prevent construction activity from displacing birds after they have laid their eggs and before the young have fledged.

If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, the Contractor shall remove and properly dispose of netting used on the structure.

- (c) *Taking of a Migratory Bird.* The taking of a migratory bird shall be reported to the Engineer. The Contractor shall be responsible for all penalties levied by the U. S. Fish and Wildlife Service (USFWS) for the taking of a migratory bird.

**REVISION OF SECTION 304 AND 703
AGGREGATE BASE COURSE (SHOULDERING MATERIAL)**

Section 304 of the Standard Specifications is hereby revised for the project as follows.

Subsection 304.01 shall include the following:

This work consists of furnishing and placing recycled asphalt pavement (RAP), crushed concrete or virgin aggregate base course for shouldering material in accordance with these specifications and in conformity with the lines and details shown on the plans or established.

Subsection 304.02 shall include the following:

Aggregate Base Course (Shouldering Material) shall be 100 percent reclaimed asphalt pavement material, 100 percent recycled concrete aggregate or 100 percent crushed mineral aggregate conforming to the requirements of Table 703-3A.

Delete Subsection 304.04 and replace with the following:

304.04 Placing. Aggregate Base Course (Shouldering Material) shall be placed with a shouldering machine capable of shaping the material next to the roadway as shown in the plans. It shall be well compacted with a wheel roller after placement as directed by the Engineer. Aggregate Base Course (Shouldering Material) shall not be placed directly on new asphalt. Unless otherwise shown in the plans, stockpiling will not be permitted within the Right-of-Way for the project. The Contractor shall address these issues in the method statement for this work.

The contractor will be responsible for all labor, materials, equipment, and other items necessary and incidental to the completion of the work. Processing, hauling, placing and compacting of the Aggregate Base Course (Shouldering Material) will not be measured and paid for separately, but shall be included in the work.

Subsection 703.03 shall include the following:

The material Aggregate Base Course (Shouldering Material) shall conform to Table 703-3A and the following.

The plasticity index shall be less than 5 when tested in accordance with AASHTO T89 and AASHTO T90 respectively. The material shall not contain clay balls, vegetable matter, or other deleterious substances.

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REVISION OF SECTIONS 304 AND 703
AGGREGATE BASE COURSE (SHOULDERING MATERIAL)

Table 703-3A
GRADATION REQUIREMENTS - SHOULDER MATERIAL

Sieve Size	Mass Percent Passing Square Mesh Sieve
50 mm (2")	100
25 mm (1")	85 - 100
19 mm (3/4")	75 - 100
12.5 mm (1/2")	55 - 90
9.5 mm (3/8")	45 - 80
4.75 mm (No. 4)	30-65* 25 – 55**
1.18 mm (No. 16)	5 - 25
75 µm (No. 200)	0 – 15* 0 – 5**

*Mineral Aggregate
**RAP

**REVISION OF SECTION 304 AND 403
TICKET COLLECTION FOR AGGREGATE BASE
COURSE AND HOT MIX ASPHALT**

Section 304 and 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 304.08 and 403.05 shall include the following:

The Contractor shall collect the scale ticket on each load when it is delivered to the project site, and ensure that the information required in subsection 109.01 is shown on each ticket:

The scale tickets shall be available on site for CDOT personnel to inspect.

Each day the Contractor shall provide to the Engineer envelopes, which contain the previous day's signed tickets and the following:

1. On each envelope: Project number, date of paving, type of material, beginning and ending station, daily total and cumulative total.
2. One of the following:
 - A. Two adding machine tape tabulations of the weight tickets with corresponding totals run and signed by different persons,
 - B. One signed adding machine tape tabulation of the weight tickets that has been checked and signed by a second person,
 - C. Signed check tape of computer scale tickets that have a cumulative total. These scale tickets must be consecutive and without voids adjustments.
3. A listing of any overweight loads on the envelope, including ticket numbers and amount over legal limit.
4. A comparison of the actual yield for each day's placement to the theoretical yield. Theoretical yield shall be based on the actual area paved, the planned thickness, and the actual density of the mixture being placed. Any variance greater than +/- 2.5% shall be indicated on the envelope and a written explanation included.

The Contractor shall provide a vehicle identification sheet that contains the following information for each vehicle:

- (1) Vehicle number
- (2) Length
- (3) Tare weight
- (3) Number of axles
- (4) Distance between extreme axles
- (5) All other information required to determine legal weight.
- (6) Legal weight limit.

If the Contractor fails to provide the Engineer with the required information on a daily basis, paving will not be allowed to resume unless approved by the Engineer.

**REVISION OF SECTION 403
HOT MIX ASPHALT**

Section 403 of the Standard Specifications is hereby revised 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(75)			Patching
Air Voids, percent at: N (design)	CPL 5115			3.5 – 4.5			3.5 – 4.5
Lab Compaction (Revolutions): N (design)	CPL 5115			75			75
Stability, minimum	CPL 5106			28			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			70			70
Accelerated Moisture Susceptibility Tensile Strength Ratio (Lottman), minimum	CPL 5109 Method B			80			80
Minimum Dry Split Tensile Strength, kPa (psi)	CPL 5109 Method B			205 (30)			205 (30)
Grade of Asphalt Cement, Top Layer				PG 58-28			PG 58-28
Grade of Asphalt Cement, Layers below Top				PG 58-28			PG 58-28
Voids in the Mineral Aggregate (VMA) % minimum	CP 48			See Table 403-2			See Table 403-2
Voids Filled with Asphalt (VFA), %	AI MS-2			65-75			65-75
Dust to Asphalt Ratio Fine Gradation Coarse Gradation	CP 50			0.6 – 1.2 0.8 – 1.6			0.6 – 1.2 0.8 – 1.6

Table 403-1						
Property	Test Method	Value For Grading				
				SX(75)		Patching
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.

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.			

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REVISION OF SECTIONS 403
HOT MIX ASPHALT

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 prior to 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 in accordance with CP 59. Unique requirements for WMA design, production and acceptance testing as documented during CDOT WMA approval shall be submitted and approved prior to 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.

Hot mix asphalt for patching shall conform to the gradation requirements for Hot Mix Asphalt (Grading SX).

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

Acceptance samples shall be taken at the location specified in either Method B or C of CP 41.

Subsection 403.03 shall include the following:

If liquid anti-stripping additive is added at the plant, an approved in-line blender must be used. The blender shall be in the line from the storage tank to the drier drum or pugmill. The blender shall apply sufficient mixing action to thoroughly mix the asphalt cement and anti-stripping additive.

The Contractor shall construct the work such that all roadway pavement placed prior to the time paving operations end for the year, shall be completed to the full thickness required by the plans. The Contractor's Progress Schedule shall show the methods to be used to comply with this requirement.

Aggregate, asphalt recycling agent, additives, hydrated lime, and all other work necessary to complete each hot mix asphalt item will not be paid for separately, but shall be included in the Lump Sum bid. When the pay item includes the PG binder grade, the asphalt cement will not be measured and paid for separately, but shall be included in the work. Asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately, but shall be included in the work.

**REVISION OF SECTION 603
CULVERTS AND SEWERS**

Subsection 603.07(a) shall include the following:

Joints for all circular reinforced pipe shall be made with confined rubber gaskets. Concrete collars shall be required at all nonstandard joints (not tongue and groove or bell and spigot), and at all connections to existing pipe.

**REVISION OF SECTION 613
ELECTRICAL CONDUIT**

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

Subsection 613.02(c) shall include the following:

PVC or Polyethylene pipe shall be used in all 90 degree sweeps in trenching and direction boring applications. The conduit is to be buried at the nominal depth of 3 feet and in applications where conduit is attached to bridges or structures. Conduit specified in the plans shall be trenching and the unit price shall include the work described herein. Existing concrete or asphalt surfaces; especially roadways shall be bored, no open cutting is allowed unless approved by the engineer. All materials furnished assembled, fabricated, or installed under this item shall be new, corrosion resistant and in accordance with this contract. Conduit sizes shall be a minimum of 2-inch diameter.

The conduit shall be schedule 80 PVC or other UV rated electrical conduit if it will be above ground or otherwise sun exposed. For bored conduit, polyethylene pipe shall be used. Pipe connections shall be made with UL approved fittings.

The Contractor shall submit documentation from the supplier that the polyethylene pipe meets or exceeds all requirements of ASTM D3350.

Transitions from polyethylene pipe to PVC pipe, if applicable, shall be made with UL approved couplers.

CONSTRUCTION

Electrical Conduit (Bored) shall be HDPE and installed using a trenchless technology of either jacked conduit or directional boring.

Electrical Conduit (Plastic) shall be PVC or HDPE and installed by direct burial methods such as plowing, open trenching, or other excavation methods. When PVC is used, expansion fittings shall be installed at 100' intervals.

One conduit per bundle shall have a copper tracer wire of at least 12-gauge in a single conduit. In trenches containing multiple conduits, the tracer wire shall not be installed in the same conduit as the fiber.

Each individual conduit shall be equipped with a pull tape of 1250 pounds tensile strength and be of a design to prevent cutting or burning of conduit walls during cable installation.

CONSTRUCTION REQUIREMENTS

The installation of conduit shall be performed in such a manner as to avoid unnecessary damage to streets, sidewalks, utilities, landscaping, and sprinkler systems. Excavations and conduit installation shall be performed in a continuous operation. All trenches shall be backfilled by the end work day. The 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.

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REVISION OF SECTION 613
ELECTRICAL CONDUIT

The Contractor shall take all necessary precautions to avoid heaving any existing asphalt/concrete mat or over-excavating a trench, whether caused by equipment directly or by dislodging rocks and boulders. Any such heaving or over-excavation shall be repaired or replaced at the Contractor's expense. The Contractor shall bear the cost of backfilling all over-excavated areas with the appropriate backfill material as approved by CDOT.

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

If the Contractor is unable to bore the conduit at the lengths shown on the plans from access point to access point, all splice couplings and associated work to splice conduit shall be included in the cost of this item. The coupling technology shall allow the conduit to be connected without the need for special tools, and shall form a watertight, airtight seal. Breaking force between segments shall exceed 250 pounds of force. No metal fittings shall be allowed. No elevation difference between the conduit run and the splice location will be allowed. Conduit splices shall be kept to a minimum and all locations shall be approved by the project engineer. Additional pull boxes shall not be substituted for splices.

Conduit plugs shall be supplied and installed in all conduit ends as soon as the conduit is installed. Conduit shall be plugged at all termination points such as pull boxes, manholes, controller cabinets, and node buildings. Conduits containing cable shall be plugged with durable and reusable split type plugs, fabricated without metallic parts, and allow easy removal and reinstallation around in-place cables. Split type plugs shall provide a water and air-tight seal of at least 50 psi and shall be installable by hand without using special tools and without damaging the cable. All plugs shall be correctly sized to fit the conduit being plugged. Empty conduits shall be sealed with removable type duct plugs that provide a watertight barrier.

All conduits shall use sweeps to elevate the buried conduits to within 4 inches of the bottom of the pull box or manhole, as shown in project details. The sweeps shall be terminated within the pull boxes and manholes to allow for easy installation and removal of the conduit plugs. The sweeps shall be set above the ground surface within the pull box at a height that does not interfere with the coiling of the fiber optic cable.

If new conduits are installed in existing pull boxes, manholes or cabinet bases the Contractor shall carefully excavate around the pull box or manhole and install the new conduit as shown in the plans. The Contractor shall not damage the existing pull box, manhole or their contents. If the existing pull box, lid, or the concrete collars are cracked or damaged during conduit installation, the Contractor shall restore the damaged section to preconstruction condition at no additional cost.

Conduit shall also include anchors, bands, skids, sweeps, pull tape, copper tracer wire, warning tape, adapters, fittings, conduit plugs, installation equipment, splice coupling, mounting brackets and hardware, structural anchors, adhesives, labor and all other items necessary to complete the work

**REVISION OF SECTION 613
PULL BOXES**

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

DESCRIPTION

Contractor shall furnish and install fiberglass reinforced, polymer concrete pull boxes.

MATERIALS

The pull boxes shall be made of fiberglass reinforced polymer concrete. A certificate from the manufacturer shall be supplied for the structural capabilities and materials used in manufacturing.

The nominal dimensions shall be as shown in the plans. The pull box shall have a detachable cover that has a skidresistant surface and have the words “CDOT ELECTRICAL” physically impressed, (not painted) upon it. The cover shall be attached to the pull box body by screw-in bolts. Non-standard bolts shall not be used. Pull boxes shall have pre-formed knockouts located in the short ends of the box as shown on the details to allow entry of the conduit. A concrete collar shall be poured around each pull box, with a 12” width and a 6” depth, which shall be incidental to the cost of the pull box pay item.

The Contractor shall submit test results documenting the minimum lateral pressure capacity of 2000 pounds per square foot distributed can be accommodated over the sidewall of the box. The Contractor shall submit test results documenting the minimum vertical load capacity of 18000 lbs over 10 inches x 10 inches square.

CONSTRUCTION

The pull box shall be constructed in accordance with the Plans and CDOT Standard Specifications with regard to pull boxes. All pull boxes shall be outfitted with traffic bearing lids rated for AASHTO HS 20-44 loads. Pull boxes that are installed in traveled ways shall have a special concrete footing extending 6 inches around the outside and 3 inches around inside of the pull box bottom and pull boxes that are installed in dirt areas shall have a 12 inch by 6 inch Portland concrete collar around the top. Pull boxes shall be grounded with a 5-foot x 5/8 inch copper ground rod. Bedding under the pull box shall be 18-inch depth of 3/8-inch gravel or 1/2-inch crushed rock. Excavations for placement of pull boxes or conduit splices shall be back filled with aggregate base course class 6 material. Compaction for class 6 material shall be in accordance with AASHTO T-99. All excess and demolition materials shall become the property of the contractor and shall be disposed of in compliance with all state and federal laws.

METHOD OF MEASUREMENT

Pull Boxes shall include base, lid, excavation, backfill, concrete apron, wire mesh and 3/4” 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.

REVISION OF SECTION 620
FIELD FACILITIES

Electrical Grounding:

The site shall have three field trailers, where the first trailer will serve as the Field Office, the second trailer will serve as the Field Laboratory, and the third trailer will be a Field Laboratory (State Furnished). The three trailers shall be set together and share a common electrical grounding so computer cabling can be installed without spanning driveways.

Running exposed copper cabling along the ground between buildings is unacceptable.

Telephones & Cabling:

Telephone lines shall be of type full business (1FB).

The number of line to be determined by the CDOT project Manager.

Of these lines:

If a fax and DSL will be ordered, piggy back them together on one circuit to save the expense of two separate lines.

One line will serve the office phone and will be located in the office trailer.

If a Lab trailer exists, one line will serve the Lab phone and shall be located in the lab.

Order phone lines through the Telco provider's (CenturyTel, etc.) business office to optimize cost efficiencies with regard to basic, local and long distance plans and charges.

All phones will be speakerphones supplied by the contractor.

At the discretion of the CDOT project Manager and dependent on the number of phone circuits installed, the type of phones may be of the multi-line type to fully utilize all the phone circuits.

Cabling of phones must be industry standard.

Labeling must completed on all wall jacks, ports, and phones with the actual phone numbers. This cabling is to be performed by the Telco or other certified technicians, past the demarc to the wall jacks.

The phone wall jacks will be located by the Project Manager.

The Contractor shall be responsible for providing and maintaining all phones, cables and circuits in good operating condition at all times during this project.

High Speed Internet:

Note: The contractor shall contact the CDOT Regional IT Analyst (Get contact information from CDOT PM) for most recent specifications of required network equipment (see Network Equipment section below) and of high-speed provider restrictions and limitations.

The contractor shall provide the field location with high-speed internet connection and equipment.

Important note: High Speed Internet access can be difficult to achieve in rural areas. It is strongly recommended that site selection for the trailer be made with consideration of the availability of High Speed Internet access. If none is available, the CDOT project manager will be notified immediately in case site relocation is necessary.

The type of High Speed Connection shall preferably be of DSL type. The throughput shall be a minimum of 3 Mbps. 10 Mbps or better is preferable. IP addressing shall be DHCP.

If DSL is not available, Cable or wDSL (Wireless DSL) or a 4G "Cellular" from VerizonWireless or AT&T device that provides internet service to multiple computers may suffice if above specified throughput speeds are achieved.

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REVISION OF SECTION 620
FIELD FACILITIES

As a last resort Aircards for each computer perhaps augmented with a cellular signal booster equipment may suffice.

If the Internet service is to serve more than 6 computers, it is recommended that additional circuits be provided.

A UPS (battery Backup) of a minimum rating of 500va (volt amp) needs to be provided to protect the Internet equipment.

Note that satellite type broadband will NOT work for CDOT purposes.

Cabling: Cat 5e cabling must be installed connection the DSL (cable, wDSL, etc.) modem to all computers.

WIFI option: The use of Wifi may be acceptable provided the service remains as fast and stable as Cat 5e cable and not obstructed by electronic interference (microwaves, generators, etc.) or by distance or walls which will impair the signal. Also, if any of the CDOT computers do not have wifi capability such as the desktop models, then the Cat5e cabling must be installed.

If CDOT computers will reside in more than one trailer, as with a MAT lab, then fiber, conduit and transceivers (preferable) or cat 5e cooper cabling with surge suppressors (more subject to failure and needing regular replacement) will need to purchased and installed as per CDOT IT. The cost here may range up to \$500. Another and possibly more cost efficient option may be to provide separate high speed Internet service to each building.

Network Equipment:

Long term projects with several or more CDOT employees MAY require specialized Cisco network equipment possibly with higher speed circuits from a Telco (such as CenturyLink managed networks). Note that this equipment is in addition to the modem provided by the internet provider.

Contact the CDOT Regional IT Analyst (get contact information from CDOT PM) for current specifications for this network equipment. Procuring this equipment may take time, so haste in contacting the CDOT Regional Network Analyst is recommended. It is typical for this equipment to take over a month to procure due to back orders.

Note: If Cisco network equipment is deemed required by CDOT IT then the current cost of this specialized equipment is approximately \$800.00 to \$1300.00 depending on site requirements.

Important Cyber Security issue: At project conclusion, all network equipment (if provided) will be returned to CDOT Regional Network Analyst for removal of CDOT confidential data and network configuration.

Facsimile Machine (if needed): The Project Engineer must approve this machine. It must be able to perform sequential broadcast, polling and delayed transmissions with a minimum ten-page memory. The Contractor shall install and maintain the fax machine in the Engineer's field office. Should the fax machine require repair and be out of service for more than twenty-four hours, a replacement is to be provided and installed by contractor within twenty-four hours. The Contractor shall provide a roll around stand for the fax machine paper and supplies.

Contractor will provide and maintain stock of printer paper and toner.

Note: An All-In-One type printer/scanner/fax may be used if acceptable to the CDOT Project Manager.

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REVISION OF SECTION 620
FIELD FACILITIES

Computer Accessories: CDOT has restrictions and limitations with regard to the type of equipment permitted to be connected and supported on its computers and network. Due to the constantly changing nature of the computer field, contact the CDOT Regional IT Analyst for latest recommendations and cautions before purchasing any requested equipment such as printers, scanners, cameras, etc.

It is imperative that any accessories be compatible with the CDOT standard computer operation system:

Windows 7 64 bit.

Warning: Many devices will not work on the required 64 bit version, but only on the more common consumer Windows 32 bit version. Make sure the product states Windows 7, **64bit** compatible.

Printers / Multi-Function Copiers:

The Contractor shall provide a self-feeding plain paper photo copying/printer machine, which is capable of making at least fifteen copies per minute and have color copying capability. Maximum size of original shall be 11" x 17" and copy paper size shall be 5-1/2" x 8-1/2" to 11" x 17" with standard intermediate sizes. The copier/printer machine shall have an automated document feeder capable of feeding a stack of up to 25 originals ranging in size from 5-1/2" x 8-1/2" to 11" x 17". The copy/printer machine shall have two standard paper cassettes accommodating paper sizes of 5-1/2" x 8-1/2" to 11" x 17". Each cassette shall accept 250 sheets for a total of 500 sheets of paper capacity and have a single sheet bypass for manual copying onto special stock not in paper cassettes and shall be capable of using paper sizes of 5-1/2" x 8-1/2" to 11" x 17". The copier/printer machine shall be capable of zoom magnification / reduction from 70% to 150% in 1% increments. The copier/printer machine shall have sorting capabilities. The Contractor shall supply all necessary supplies and a roll around stand. The Contractor shall maintain all furnished equipment in good working condition and shall provide replacement equipment due to breakage, damage, or theft within five working days. This copier/printer shall have capabilities to connect to the internet to serve as a network printer.

Printers/ MFPs, may **NOT** be networked or shared across different networks for example between the CDOT network and non-CDOT computer network (consultant and/or contractor).

The printer/ MFP must be directly connected by USB cable only to a CDOT computer and can then be shared for use by other CDOT computers.

Note: Wifi on the printers may not work because the ip address will conflict with the CDOT ip network.

All equipment is to be **new with warranties.**

Contractor will provide and maintain stock of printer paper and toner for any provided printers, scanners, fax machines.

The Field Facilities compound consisting of the Field Office(s) (Class 2) and Field Laboratory (Class 2) shall be provided with all-weather surfacing and all-weather access, and a security fenced and lighted yard with adequate area to accommodate state vehicles and state employee parking.

The Contractor shall provide insurance for full replacement of all the contents of the Field Office, Field Laboratory due to theft, fire, or any other cause. Insurance shall be provided at all times that the office or laboratory is on the project.

**REVISION OF SECTIONS 627 AND 713
MODIFIED EPOXY PAVEMENT MARKING ACCEPTANCE**

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

Subsection 627.05 shall include the following:

The Contractor shall take retroreflectivity readings on all modified epoxy pavement marking lines for each mile of roadway striping on the project. A test section is defined as each continuous line type (lane lines, centerlines, edge lines, channelizing lines, and others), which has been completed in a single day.

The Contractor shall use a Contractor-furnished retroreflectometer conforming to ASTM E 1710 or AASHTO TP111. The retroreflectometer shall be calibrated, tested and operated in accordance with manufacturer recommendations. The Contractor shall take one retroreflectivity reading within every lane mile striped in a single day. The calibration for the retroreflectometer shall be verified each day, prior to the readings being taken. The retroreflectivity readings shall be taken in the presence of the Engineer no earlier than 3 days and no later than 14 days after the marking is tack free. Traffic control required for retroreflectivity readings shall be included in the cost of the work.

The initial minimum retroreflectivity reading (mcd/m²/lux) in a one-mile line section of pavement marking paint shall be 350 for white and 200 for yellow. Any retroreflectivity readings below 350 for white and 200 for yellow shall be subject for removal and replace. In the case of a failing retroreflectivity reading three additional readings can be taken at random within the same line mile, if the average of the three additional readings is equal to or greater than 350 for white and 200 for yellow. That new average may be substituted for a passing retroreflectivity reading.

Prior to taking retro-reflectivity readings, at the retro-reflectivity reading locations, the Contractor shall remove any excess beads placed during marking application.

**REVISION OF SECTIONS 627 AND 713
MODIFIED EPOXY PAVEMENT MARKING (INLAID)**

Sections 627 and 713 of the Standard Specifications are 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 for inlaid pavement marking shall be a max width of 4 ¼ inch and a min width of 4 inch. The depth of the inlaid grooves shall be 90 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. The applied epoxy in the inlaid grooved shall have a width of min/max of 4 inch.

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 6F.79 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 4 inch 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. Any marking that does not meet specification shall be assessed a reduction in pay factor per Standard Special Provisions 106.03.

Subsection 627.05 shall include the following:

Modified Epoxy Pavement Marking shall conform to subsection 713.17.

Section 713.17 shall include the following:

- (n) *Performance.* Marking, when applied in accordance with manufactures recommendations shall demonstrate a uniform level of sufficient night time retro-reflection when tested in accordance to ASTM E1710-97. The applied material must have an initial minimum intensity reading of 400 $\text{mcd}\cdot\text{m}^{-2}\cdot 1\text{x}^{-1}$ for white and 250 $\text{mcd}\cdot\text{m}^{-2}\cdot 1\text{x}^{-1}$ for yellow as measured with a retro-reflectometer. If not met pay factors will be assessed per Revision of Section 106 Modified Epoxy Pavement Markings Acceptance and Pay Factors.

**REVISION OF SECTIONS 627 AND 713
PERFORMED THERMOPLASTIC PAVEMENT MARKING**

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

Subsection 627.09 (a) shall include the following:

- (a) *Application.* An epoxy resin primer shall be applied to any existing surface (concrete, asphalt, existing markings, etc.) prior to the application of any new preformed thermoplastic, plastic pavement marking. The epoxy resin primer shall conform to CDOT Standard Specifications subsection 708.07. Primer shall be required for all markings used including markings that manufacture does not require a primer. Primer and application 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/or significant oily substances. Application procedures for Portland concrete pavement shall be as described above except a compatible primer sealer shall be applied before application of marking to assure proper adhesion.

Subsection 627.09 shall include the following:

- (c) *Inlaid Preformed Thermoplastic Pavement Marking.* Shall be done for Xwalk and Stop Lines and FHWA Exit Ramp Arrows. The grooved width shall be the pavement marking width plus 1 inch, with a tolerance of $\pm \frac{1}{4}$ inch. The dimensions of the Xwalk marking shall 2ft x 8ft typical. The dimension of the stop bar shall be 2ft x length of need. The FHWA Exit Ramp Arrow is composed of two 10ft x 8 in and one 16.5ft x 8 in lines. The depth of the grooves shall be 130 mils \pm 5 mils. Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint. Grinding of existing preformed thermoplastic pavement marking and the inlaying of proposed preformed thermoplastic pavement marking shall not be measured and paid for separately, but shall be included in the work. Word Symbols (Arrows), shall be Preformed Thermoplastic Pavement Marking.

Grooving shall not be performed on bridge decks.

The preformed thermoplastic pavement marking shall be inlaid on new and existing pavements as shown in the Contract. The material shall be capable of use for patching worn areas of the same type according to the manufacturer's recommendations.

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

Subsection 713.14 (a) shall include the following:

- (a) *General.* Material such as lines, legends, or symbols shall be capable of being affixed to HMA or PCC pavements. Marking shall be capable of conforming to pavement contours, breaks, and faults etc. by the use of the normal heat of a propane torch. Marking shall be capable of withstanding the actions of traffic at normal pavement temperatures. Marking shall have resealing characteristics such that it is capable of fusing with itself and previously applied thermoplastic pavement markings when heated with the torch.

Subsection 713.14 shall include the following:

- (c) *Performance.* Marking, when applied in accordance with manufactures recommendations shall demonstrate a uniform level of sufficient night time retro-reflection when tested in accordance to ASTM E1710-97. The applied material must have an initial minimum intensity reading of 500 $\text{mcd}\cdot\text{m}^{-2}\cdot 1\text{x}^{-1}$ for white and 300 $\text{mcd}\cdot\text{m}^{-2}\cdot 1\text{x}^{-1}$ for yellow as measured with a retro-reflectometer.

The top surface of the stencils (the same side as the factory applied surface beads) shall have an indicator system for the contractor to properly gauge the correct amount of heat to apply during installation. The indicator system shall have a positive visual indication, such as beads changing color or indents closing together, when the material has reached the correct installation temperature. The indicator system must also provide a positive, visual indication if the material has not reached the correct installation temperature.

**REVISION OF SECTION 624
DRAINAGE PIPE**

Subsection 624.03 shall include the following:

Joint systems irrigation systems, cross drains, and storm drains shall be watertight. Testing of joints shall be performed by the Contractor in accordance with approved methods. Should any section of irrigation system, cross drains, and/or storm drains fail to meet the test requirements, it shall be corrected at the Contractor's expense.

**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 of the objects detailed and located on the plans. A sand barrel array will not be permitted.

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. For posted speed limits in the construction zone greater than 45 miles per hour, the attenuator shall meet the requirements of TL-3.

CONSTRUCTION REQUIREMENTS

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.

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.

**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.

Subsection 630.13 shall include the following:

The portable message sign panel shall be on the project site at least 2 weeks 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.

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REVISION OF SECTION 630
PORTABLE MESSAGE SIGN PANEL

Subsection 630.15 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.

REVISION OF SECTION 630
TRAFFIC SIGNAL (TEMPORARY)

Section 630 of the Standard Specifications is hereby revised for projects as follows:

In subsection 630.01 shall include the following:

This work consists of furnishing and installing, temporary, portable traffic signals to control one lane alternating traffic as shown on the Contractor's approved plans or MHTs. The work includes, all equipment, labor, signage and materials to install and maintain a complete and operational system that accommodates the variations in traffic flow and removal of the installation.

The Contractor shall develop a maximum of six traffic signal timing plans for each structure segment based on current traffic count data, for review and approval by CDOT and shall be responsible for implementing the timing and maintaining the traffic signals. Timing plans shall include provisions for weekend and weekday traffic variations and provide sufficient clearance time for vehicles through the work zone.

Subsection 630.04 shall include the following:

Portable temporary traffic signal units shall be portable trailers, licensed for normal highway travel and capable of travel at speeds up to 65 MPH. Portable units shall include stabilizing jacks and shall be stable in winds of 100 MPH. The Traffic Signal (Temporary) shall consist of a pair of portable traffic signals capable of radio communication, microwave or video vehicle detection for actuation, hardwire or CDOT approved interconnect method, multiple timing plans, manual operation and a paging or cell phone system capable of verifying and resetting the system operation. The interconnection system shall provide communication between the units within a one mile range. The power system can utilize either a direct power source to a local power line or solar power source. The signals shall operate by connection to a local power line with a transfer switch connecting the load to the power line when energized and disconnecting from the power line when power fails and connecting to the solar or generator power operation with battery back-up that will provide a minimum of five days of continuous operation. The Contractor may elect to go with a generator or solar powered system with a backup battery life of 10 days. The backup battery life shall be checked daily. All electrical wiring, including connectors and switch controls necessary to allow all signal functions required by the specification shall be provided with each system. Each system shall include an operating and parts manual, wiring diagrams, and trouble-shooting guide. Lenses and reflectors for the signal shall be of a type as described in ITE Technical Bulletin No. 1. The cantilevered signal faces shall be 12" and include louvered backing plates. Each unit shall have a locking device to ensure the cantilevered signal faces remain in position.

The portable traffic signal system shall be capable of maintaining all required operations under Colorado mountain-winter weather conditions. The portable temporary traffic signal shall be capable of operating for extended periods of time in severe weather conditions including temperatures ranging from -40 to 120 degrees Fahrenheit. The Contractor shall provide a half day of training on usage, maintenance and repair of the portable temporary traffic signal for up to six persons designated by CDOT.

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REVISION OF SECTION 630
TRAFFIC SIGNAL (TEMPORARY)

The Traffic Signal (Temporary) shall be in satisfactory operating condition prior to installation. The Contractor shall demonstrate the satisfactory operating condition by operating the system prior to closing the road to one lane of traffic. The Traffic Signal (Temporary) shall be replaced at the Contractor's expense if the unit fails to operate satisfactorily to the Engineer and shall be retested until a satisfactorily operating Traffic Signal (Temporary) is obtained and installed. The unit shall be kept in satisfactory operating condition for the duration of its use. The unit shall remain in place or remain available until all the work is completed at each location that requires one-lane operation or as deemed necessary by the Engineer. The Traffic Signal (Temporary) shall include adequate spare parts and a source of replacement components such that the system is in operation continuously. Subsection 630.10 shall include the following:

(4) MHT's detailing the portable traffic signals for one-lane alternating traffic, shall follow the MUTCD Typical Application -12 in Chapter 6 and shall include provisions for the CDOT prequalified traffic signal contractor to be onsite during initial operation until traffic is serviced to the satisfaction of CDOT. The signal systems shall also be checked a minimum of daily for proper operation. Vehicle queue lengths shall not exceed 1000 feet and queued vehicles should clear the signal within two (2) cycles. The Contractor shall be on-site wherever Traffic Signal (Temporary) are used during both Friday and Sunday afternoons from 12 pm to 8 pm, or as directed by CDOT, during the first month of one-lane alternating traffic for observation, maintenance and troubleshooting, including timing plan adjustments and queue dissipation by manual override. If issues continue beyond the first month, the contractor shall be onsite as listed above, until the issues are resolved to the satisfaction of CDOT. The Contractor shall also provide two signs (24 inches x 36 inches) that shall be placed near each signal that provides a 7-day, 24 hour number that can be called if the signal malfunctions.

If the signal loses power, switches to flashing mode, or fails for any reason, the Contractor shall respond within two hours and establish traffic control with the use of flaggers. Flagger control of the site shall remain in place until the Traffic Signal (Temporary) system has been restored and demonstrates satisfactory operations.

Flaggers shall control traffic during the initial turn on of the signal. The flaggers shall remain on standby for 2 hours after the signal is turned on and operating properly.

Signal timing information shall be included with the MHT, and shall include phasing, green, yellow and red interval time at a minimum.

**REVISION OF SECTION 630
NIGHT WORK LIGHTING**

Section 632 is hereby added to the Standard Specifications for this project as follows:

DESCRIPTION

632.01 This work consists of furnishing, installing, operating, maintaining, moving, adjusting, and removing lighting to illuminate construction work spaces for night work. Night work will be defined as work performed between 30 minutes before sunset and 30 minutes after sunrise.

MATERIALS AND EQUIPMENT

632.02 The Contractor shall provide lighting for night work in the activity area work space where construction equipment, workers on foot, or both are present. The workspace is that portion of the roadway closed to road users, or outside of the roadway, set aside for workers, equipment and materials performing contract work. The work space may be stationary or may move as the work progresses.

Illumination may be accomplished by using a combination of portable lights, floodlights, equipment mounted lights, or other lighting methods that will provide the required minimum lighting intensity. Light fixtures that are mounted on the construction equipment shall have a secure connection to minimize vibration and ensure that the view of the equipment operator is not obstructed. Portable lights shall be aimed either generally parallel or perpendicular to the roadway, aimed downward towards the work to avoid glare to oncoming drivers.

In the event of any failure of the lighting system, the construction operation shall be discontinued until the required level of illumination is restored. Delays due to insufficient lighting levels are the responsibility of the Contractor. Existing street and highway lighting shall not eliminate the need for the Contractor to provide work area lighting. Vehicle headlights shall not be permitted as the sole means of illumination while working.

632.03 Portable Generator and Inverter Generator. The Contractor shall provide a portable generator, inverter generator, or both as needed to power the added equipment mounted lights on motorized equipment if the existing power supply on the equipment is insufficient to power the added lights. Fuel tank capacity and availability of fuel on site shall be sufficient to permit uninterrupted operation throughout the planned shift. All power sources shall be equipped with a ground-fault circuit interrupter. The generator shall be placed or temporarily mounted on the equipment without obstructing access onto the equipment or the view of the operator.

632.04 Light Meter. The Contractor shall furnish a light meter for use by the Engineer. The meter shall have a digital display calibrated to NIST standards, shall be cosine and color corrected with an accuracy of +/- 5 percent. The light meter shall remain the property of the Contractor after final acceptance.

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REVISION OF SECTION 630
NIGHT WORK LIGHTING

CONSTRUCTION REQUIREMENTS

632.05 Lighting for night work shall include:

- (1) Minimum lighting intensity of 5 foot candles for work space illumination.
- (2) Illuminate the stationary work space as stated in (1) above where construction equipment, workers on foot or both are present.
- (3) Light sources shall be positioned not to interfere with or impede traffic in any direction and not cause glare for motorists or onto adjacent properties whenever possible. The Contractor shall make adjustments, use visors or shields, or both to minimize glare.
- (4) Illumination for mobile operations within a closed travel lane with traffic control devices will be defined as 25 feet in front of and behind and 5 feet to each side of each piece of moving equipment.
- (5) Workers performing materials testing for either mobile or stationary operations shall have their work space illuminated as stated in (1) above. For concrete operations at night, the Contractor shall illuminate the designated concrete truck washout location including the access and the wash out site.
- (6) Workers on foot, performing work within a moving work space (i.e. striping layout/installation, surveying, etc.) shall wear ANSI approved high visibility apparel and headwear for Class 3 risk exposure including vest, Class E pants or leg gaiters, and reflective tape on hard hats.
- (7) Portable light towers and lights mounted on stands shall be sturdy and free-standing without the aid of guy wires or bracing. Minimum illumination levels as stated in (1) above shall be maintained at a distance of 5 feet on all sides of stationary equipment with either equipment mounted or free standing lights.
- (8) The Contractor shall ensure that all pieces of equipment have operating lights to illuminate operator's controls, backhoe and loader buckets, and illuminate the equipment reach limits around rotating equipment. (i.e. the paving machine shall have illumination for the hopper, auger, and screed areas.)
- (9) The TCS vehicle shall have the rear of the truck illuminated while installing, maintaining, and removing traffic control devices unless sufficient lighting levels exist with stationary lights.

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**REVISION OF SECTION 630
NIGHT WORK LIGHTING**

- (10) The Contractor shall maintain a uniformity ratio no greater than 5:1 over the work space. Uniformity ratio is the ratio of average to minimum horizontal illuminance within the work space. The uniformity ratio shall be determined by dividing the average of all light meter measurements by the light meter measurement at the darkest spot within the illuminated area. The limits for checking the uniformity ratio for moving operations within the closed travel lanes will be limited to the 25 feet in front of and behind and 5 feet to each side of each piece of moving equipment.

632.06 Night Work Lighting Plan. The Contractor shall submit a lighting plan to the Engineer for review signed by the Contractor's designated person three days in advance of the Preconstruction Conference. The lighting plan shall appropriately describe the work and include the following:

- (1) Layout drawing and supplemental narrative showing light locations, equipment mounted lights, and configuration including both typical spacing and lateral placement for each work activity.
- (2) Tabulation of lights for those lights that are included within the Night Work Lighting pay item. Lights included in the tabulation such as tower lights, lights mounted on stands and lighting mounted to mobile equipment (not original equipment lights) but those additional equipment mounted lights or portable lights that provide the 25 feet in front and behind illumination zone shall have catalog cuts giving the specific brand names, model numbers, lamp type and wattage.
- (3) Narrative description of those operations where workers will be on foot in a moving work space.
- (4) Details of hoods, visors, louvers, shields or other means to be used to minimize glare.

The plan shall be revised and updated by the Contractor as requested by the Engineer during the progress of the work to accommodate changes to the work.

632.07 Inspection of Lighting. Lighting inspection by the Engineer will be performed jointly with the Contractor's designated person on a drive through the project to include (1) observation of the lighting setup to evaluate glare potential for drivers and workers and (2) light meter measurements to determine minimum illumination levels. The Contractor shall make adjustments to the lighting as needed based on the Engineer's inspection. Any corrections and deficiencies needed to provide the minimum illumination levels must be made within one hour of being notified or the Engineer is required to shut down construction.

The Engineer will take light meter measurements to verify the minimum lighting levels using a light meter provided by the Contractor during the night work shift. Light meter readings will be

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**REVISION OF SECTION 630
NIGHT WORK LIGHTING**

taken within the work space where work is being performed, in a horizontal plane, light sensor part of the meter held parallel to the ground with the sensor aimed upward, 3 feet above the pavement or ground surface. Meter readings will be taken at the source at 5 foot intervals out to the illuminated work space perimeter. These measurements will be documented and filed in the project records.

632.08 Lighting for Flagger Stations. For nighttime flagging, flagger stations shall be illuminated by an overhead light source providing a minimum lighting intensity level of 5 foot candles measured 1 foot out from the flagger's chest. The flagger station light shall illuminate the station area with a radius of at least the width of the lane plus 5 feet, and be centered on the flagger in the initial flagging position. The size of the illuminated area shall be increased to account for flagger movements required to control traffic. The flagger station light shall be a minimum of 10 feet above the pavement and be capable of being shielded through the use of visors, hoods, louvers, or screens as needed to minimize glare to approaching traffic and spilling over onto adjacent properties.