

## **SECTION 201 CLEARING AND GRUBBING**

### **201-1.01 DESCRIPTION.**

Clear, grub, remove, and dispose of all vegetation and debris within designated areas of the project, except such objects as are designated to remain or are to be removed under other sections of these Specifications. Preserve from injury or defacement all vegetation and objects designated to remain.

### **201-2.01 MATERIALS.**

None.

## **CONSTRUCTION REQUIREMENTS**

### **201-3.01 GENERAL.**

The Engineer will designate the limits of work and all trees, shrubs, plants and other things to remain. Preserve all things designated to remain.

Keep erosion potential to a minimum.

Preserve survey stakes, boundary markers, bench marks, and tie points until such time as their usefulness has ceased and the Engineer gives permission for their destruction. An undisturbed area five feet in diameter may be left around existing monuments and property corners. A list of known land monuments and property corners is shown on the Plans.

The Contractor shall use appropriate erosion control methods, as approved by the Owner's Representative, to prevent impact to existing streams, natural drainage ways, and wetlands.

Damage to vegetation outside the construction limits is prohibited. In the unlikely event this occurs, the vegetation damaged by the Contractor shall be fenced around, protected and allowed to recover. Seed shall be applied immediately in accordance with [Section 618](#).

Wetlands are not to be disturbed outside of the grading limits during the clearing and grubbing activities. No mechanical land clearing activities resulting in soil disturbance, or fills, in wetlands or waters of the United States are permissible. If soils are disturbed, the Contractor shall assume responsibility and restore the site as required by the governing agency. The Owner does not assume responsibility for mechanical land clearing resulting in soil disturbance or fills that result from the Contractor's clearing and/or grubbing activities.

Any vegetation, trees, down timber, stubs, brush, bushes, stumps, tree roots, debris and other objectionable material left in the construction zone from earlier clearing operations shall become the property of the Contractor and shall be removed from the site, in accordance with this Section.

All temporary stockpiles created by the Contractor shall be removed from the site and disposed of, or placed in their designated final disposal areas and the sites re-graded and stabilized prior to completion of the work.

### **201-3.02 CLEARING WINDOW.**

Utilizing the U.S. Fish & Wildlife Service's (USFWS) Construction Advisory for Protecting Migratory Birds/Land Clearing Guidance for Alaska document, the clearing window for forest, woodland, shrub, and open habitats located in the Interior and Southcentral Regions is from July 16 to April 31. The aforementioned publication can be found here:

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[https://dot.alaska.gov/sereg/projects/sitka\\_katlianbayroad/assets/1-vegetation\\_clearing.pdf](https://dot.alaska.gov/sereg/projects/sitka_katlianbayroad/assets/1-vegetation_clearing.pdf)

Any clearing for projects will take place between those dates, and shall be in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, to avoid impact to nesting migratory birds. For purposes of complying with the MBTA, tree and brush clearing on frozen ground is permitted prior to obtaining an NOI so long as the clearing operations do not disturb the vegetative mat; however, no grubbing activities are permitted until an NOI is obtained. Additionally, if clearing activities take place subsequent to the anticipated spring thaw date, an active NOI is required.

### **201-3.03 CLEARING.**

Cut and dispose of all trees, down timber, stubs, brush, bushes and debris from all areas designated.

Fell trees toward the center of the area to be cleared, in order to minimize damage to the trees that are to be left standing. Remove and dispose of trees unavoidably falling outside the specified limits. Cut trees and brush to a height of not more than 6 inches above the surrounding ground.

### **201-3.04 GRUBBING.**

Remove and dispose of all stumps, roots, moss, grass, turf, debris or other objectionable material within excavation limits, and within fill limits where the embankments are to be made to a depth less than 4 feet below subgrade. Grub any other areas designated on the Plans or in the Special Provisions. In fill limits where the planned grade is more than 8 feet above native ground, stumps may be left but must not be more than 6" above the surrounding native ground.

Grub all side hill fill areas where benching will be required per **Subsection 203-3.03**. Grub any other areas designated on the plans or in the Supplemental Conditions. The grubbing shall progress in such a manner that erosion will be kept to a minimum.

Except in areas to be excavated, backfill stump holes and other holes with suitable materials and compact according to the Specifications.

### **201-3.05 HAND CLEARING.**

Cut and dispose of all trees, down timber, stubs, brush, bushes and debris from all areas designated, with minimal disturbance to grass and/or moss cover. Do not use equipment on wheels or tracks in areas designated as hand clearing, except as stated below.

Where shown on the Plans, you may use a mechanical brush cutter, provided such work is performed within the time frame specified in the Special Provisions.

Cut stumps flush with the ground. In areas to be covered by least 4 feet of subgrade material, stumps may extend up to 12 inches above natural ground, except where geotextile is specified.

### **201-3.06 SELECTIVE TREE REMOVAL.**

Remove and dispose of selected trees, as designated by the Engineer, and which are located outside the normal clearing and grubbing limits. The Engineer may designate the trees to be removed under this item at any time during the Contract life, subject to conditions in **Subsection 201-3.04**, Hand Clearing. Cut off designated trees no more than 12 inches above the ground surface.

### **201-3.07 TIMBER FOR PUBLIC REMOVAL.**

Cut timber, with a 5 inch diameter or larger at breast height, into 8 foot lengths, de-limbed, and stacked to a height no greater than 6 feet. Place the stacks at locations shown in the Plans,

included in Specifications or at other locations approved by the Engineer. Make locations adjacent to the nearest turnout, side street, or other approved site that does not create a traffic hazard due to lack of adequate parking for the public. Access to the site(s) shall be maintained and controlled by flaggers, in accordance with **Subsection 643-3.04**. The Contractor shall provide and maintain a separate firewood telephone hotline that details when and where the wood is available to the public. Special Construction signs, in accordance with **Subsection 643-2.01**, shall be used to advertise the firewood telephone hotline. Provide two weeks for the public to access each area of the project where timber is made available. Dispose of the timber left by the public after the two week time period.

Mechanical loading by the public is not permitted.

**201-3.08 DISPOSAL.**

Dispose of all vegetation and debris removed by clearing or grubbing by burning, burying, or other approved methods and at approved locations.

Obtain the property owner's written permission to dispose of vegetation and debris at locations outside the right-of-way limits and a waiver of all claims against the Owner for any damage to such land which may result. Obtain all permits required by law for such disposal. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work.

Do not burn when prevailing winds would produce a smoke hazard to traffic or disturb local communities. Place piles for burning in open spaces within the project, or in other spaces designated by the Engineer where no damage to trees, other vegetation or embankment stability will occur.

Conduct all burning operations under the constant care of competent watchmen so that the surrounding forest cover or other adjacent property will not be jeopardized. Comply with applicable laws and ordinances regarding burning.

Where shown on the Plans, you may dispose of clearing debris under 4 inches in diameter within the construction limits. Do this by spreading in an even layer, so the material does not intrude into the upper 3 feet of subgrade.

~~All merchantable timber in the clearing area at the beginning of construction becomes your property.~~

**201-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

1. Acre. The area acceptably cleared and/or grubbed, measured on the ground surface. Only areas shown on the Plans or staked for clearing and/or grubbing will be measured.

Existing roadways, lakes, ponds, stream beds, and other areas not covered by trees or brush will not be included for measurement. Other areas which do not require clearing and/or grubbing will be so staked.

2. Each. The number of designated trees acceptably removed, regardless of size.

**201-5.01 BASIS OF PAYMENT.**

Backfill and compaction of holes left from removal of stumps or other objects are subsidiary.

Payment will be made under:

PAY ITEM	
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<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
201.0001.____	Clearing	ACRE
201.0002.____	Grubbing	ACRE
201.0003.____	Clearing and Grubbing	ACRE
201.0004.____	Hand Clearing	ACRE
201.0005.____	Clearing and Grubbing State-Furnished Material Sources	ACRE
201.0006.____	Selective Tree Removal	EACH
201.0007.____	Clearing	LS
201.0008.____	Grubbing	LS
201.0009.____	Clearing and Grubbing	LS
201.0010.____	Hand Clearing	LS
201.0011.____	Clearing and Grubbing State-Furnished Material Sources	LS

## **SECTION 202 REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

### **202-1.01 DESCRIPTION.**

Remove and dispose or salvage all buildings, fences, guardrail, structures, old pavements, abandoned utilities and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the Contract. Backfill the resulting trenches, holes and pits. When the bid does not include pay items for removal of structures and obstructions as set out in this Section, perform such work under Section 203 or as specified. Remove and reset mailboxes and newspaper delivery tubes and the preserve from injury and defacement all vegetation and objects not scheduled to be removed. Remove existing bridges as indicated on the Plans.

### **202-2.01 MATERIALS.**

Use materials that conform to the following:

Concrete	Section 501, Class A
Controlled Low-Strength Material	Subsection 712-2.22
Timber	AASHTO M 168 (Hemlock, Douglas fir, Western Pine, or Sitka Spruce). Pressure treated per AASHTO M 133.
Steel Pipe	Standard Weight Steel Pipe, 2-inch (max.) diameter. Galvanized per AASHTO M 111.
Steel Fasteners	ASTM A307, Grade A. Galvanized per AASHTO M 232.
Reflectors	Yellow acrylic prismatic type meeting AASHTO M 290 or retroreflective sheeting meeting ASTM D4956, Type III, IV, or V.

### **CONSTRUCTION REQUIREMENTS**

#### **202-3.01 GENERAL.**

Raze, remove, and dispose of, or salvage all buildings and foundations, structures, fences, and other obstructions, any portions of which are within the right-of-way, except utilities and those for which other provisions have been made for removal.

Fill basements, or cavities left by structure removal, to the level of the surrounding ground and, if within the prism of construction, compact backfill as specified under Section 203.

Stockpile all materials which are designated for use on the project at approved locations.

Burn or otherwise dispose of combustible debris as approved.

Non-combustible debris or materials may be:

1. placed in embankments under the provisions of Subsection 203-3.03 for placing rock in embankments (No metal pipes, wires, or cables may be placed in any embankment),
2. buried on the project, outside the embankment at approved locations, under a minimum covering of 2 feet of earth, or
3. disposed of outside the right-of-way limits, provided that before disposing of such materials or debris on private or public lands, obtain from the owner of such land written permission for such disposal and a waiver of all claims against the State for any damage to such land which may result, together with all permits required by law for such disposal. Furnish a copy of such

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permission, waiver of claims, and permits to the Engineer before commencing work. Grade disposal areas to drain.

### **202-3.02 MAIL BOXES.**

Remove existing mail boxes and newspaper delivery tubes within the project limits and temporarily reset them at approved locations. Install the boxes and tubes in such a position that their usefulness will not be impaired.

After construction has been completed, install mail boxes and tubes to meet Alaska Standard Plans M-20 and M-23. Repair or replace any posts, boxes, tubes or other material broken or damaged by the Contractor.

### **202-3.03 REMOVAL OF BRIDGES, CULVERTS, AND OTHER DRAINAGE STRUCTURES.**

Do not remove bridges, culverts and other drainage structures in use by traffic until satisfactory arrangements have been made to accommodate traffic.

1. Abandoned In-place Structures. Submit an abandonment plan at least 15 days prior to abandoning structures in-place. The plan shall, at a minimum, provide the mix design and quantity for the controlled low strength material (CLSM), quality control measures in-place, and installation details to include blocking.
2. Culverts and Minor Structures. Do not remove manholes, inlets, valves or any other portion or portions of the sewer or water systems until the new systems are in operation or suitable arrangements have been made for the diversion, interruption, or a temporary system has been installed.
3. Bridges.
  - a. Submittals. Submit a Bridge Demolition Plan at least 60 days before beginning bridge removal. Include the following items in the Bridge Demolition Plan:
    - (1) Proposed bridge removal date
    - (2) Contact names and phone numbers for individuals responsible for the demolition
    - (3) Schematic and detailed drawings identifying the method and sequence of removal
    - (4) Schematic and detailed drawings identifying and detailing means of access to the bridge during demolition
    - (5) Methods to prevent debris from entering the waterway
    - (6) A list of the type, number and size of all proposed equipment to be used
    - (7) Details of temporary support shoring and bracing, if required
    - (8) Schematic drawings specifying crane locations and lifting locations
    - (9) A listing of the size and weight of bridge subassemblies to be transported from the site
    - (10) A schematic drawing identifying the proposed waste site location
    - (11) Details of lead paint containment and disposal

- b. Demolition. Remove and dispose of all bridge steel, concrete and timber bridge elements. Do not damage new construction during demolition operations. Maintain the integrity of undemolished portions of the bridge structure during demolition operations.

Do not allow debris from bridge removal operations to enter a waterway.

Unless noted otherwise in the Contract Documents, all existing bridge steel is coated with lead-based paint. Follow all applicable laws, permits, and Section 513 requirements for containing, handling and disposing of lead-based paint waste and debris when dismantling, removing and handling steel from the existing bridge.

- c. Disposal. Deliver all steel bridge components generated during demolition to a steel mill or ferrous foundry where the steel will be melted down to a raw material and recycled. Follow all applicable OSHA, EPA, DEC, Federal, State, Local and Section 513 requirements for containing, handling and disposing of lead-based paint waste and debris when handling, transporting, delivering and recycling structural steel from the existing bridge. Submit certification from the mill or foundry attesting that all of the existing structural steel has been recycled and that the lead byproduct has been recycled or disposed of in accordance with applicable regulatory requirements. In the certification, provide the weight of steel recycled and the mill or foundry's EPA regulated waste activity identification number.

Dispose of all non-salvageable and non-recyclable materials in a Contractor-furnished waste disposal site or in a manner approved by the Engineer.

- d. Cleanup. The Contractor shall remove all rubbish, temporary structures, excess materials, and equipment from the project site, from state owned materials sources, and from all work areas before project completion in addition, dress all bridge slopes or embankments according to the Plans. Dress slopes not designated in the Plans to conform to the natural ground surface or blend as directed. Fill all excavations and depressions.

**202-3.04 REMOVAL OF PIPE.**

When the bid schedule contains an item for the "Removal of Culvert Pipe", the removed pipe becomes your property.

**202-3.05 REMOVAL OF PAVEMENT, SIDEWALKS, AND CURBS.**

Dispose of all pavement, base course, sidewalks, curbs, gutters, etc., designated for removal, in an acceptable manner.

In removing pavements, curbs, walks, driveways and similar structures, make all cuts clean, vertical, and true to designated lines where an abutting structure or a part of a structure is to be left in place.

**202-3.06 GROUND WATER WELL DECOMMISSIONING.**

Decommission the water wells according to DEC requirements conforming to 18AAC 80.015(e) Well Protection Source Water Protection and Well Decommissioning, American National Standards Institute/American Water Works Association Standard A100-97, Water Wells, Appendix H, or a DEC approved alternate method. Develop and submit a detailed Ground Water Well Decommissioning Plan to the Engineer.

**202-3.07 REMOVAL OF RIVETS.**

Remove rivets per 2023 AREMA 15-7.4.1.4 and the following:

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- a. Existing rivets that are removed to effect a repair or strengthening shall be replaced on a one for one basis with high-strength bolts of equal or greater diameter.
- b. Where remaining safe fatigue life is a controlling limit state, existing rivet holes shall be reamed after removal of the rivets, and the replacement high-strength bolt shall be one size larger in nominal diameter than the replaced rivet or if of the same diameter shall satisfy the requirements for an oversize hole unless the hole is examined and found to contain no significant flaws or stress raisers.
- c. Rivet heads may be removed by either mechanical means or careful use of oxygen-fuel gas cutting methods. If the oxygen-fuel gas method is used, use of a rivet cutting tip is recommended. Where existing material is to be preserved for reuse, rivet shanks shall be removed by mechanical means only, with coring permitted to assist the mechanical removal; the coring process shall not penetrate the surface of the rivet shank. Where existing material is to be discarded, rivets may be removed by any appropriate means acceptable to the Engineer.
- d. If a rivet hole has been scored or otherwise damaged, the hole shall be reamed and the replacement high-strength bolt shall be one size larger in nominal diameter than the replaced rivet, or if of the same diameter shall satisfy the requirements for an oversize hole.
- e. Existing high-strength bolts removed to effect a repair or strengthening may be reused only under conditions approved by the Engineer. If unacceptable to the Engineer, they shall be replaced with new high-strength bolts of equivalent diameter.
- f. The extent of contamination of the faying surfaces by damage, mill scale, paint, grease, etc. shall be considered by the Engineer in assigning the allowable shear values for high-strength bolts used in repair, strengthening or retrofitting applications.
- g. Type 3 high-strength bolts shall be used with weathering steel. Galvanized bolts shall not be used with uncoated steel.

### **202-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

1. Square Yard. Length times average width before removal.
2. Linear Foot. Length before removal.
3. Each. Each complete unit removed or installed. Newspaper tubes will not be measured.

### **202-5.01 BASIS OF PAYMENT.**

Items 202.0001.\_\_\_\_ and 22.0013.\_\_\_\_. Payment includes removing and disposing or relocating of all structures and obstructions encountered within the right-of-way under the provisions of this Section.

Items 202.0002.\_\_\_\_ through 202.0009.\_\_\_\_. Payment includes salvage of materials removed, their custody, preservation, storage on the right-of-way and disposal as provided.

Items 202.0010.\_\_\_\_ through 202.0012.\_\_\_\_. Payment includes final installation of mail boxes and newspaper tubes.



Items 202.0014.\_\_\_\_ through 202.0019.\_\_\_\_. Payment includes removing and disposing of all pavement, sidewalk, curb and gutter and culvert pipe designated for removal.

Items 202.0020.\_\_\_\_ through 202.0022.\_\_\_\_ Payment includes removal and temporary relocation, of mail boxes and newspaper tubes.

Item 202.0023.\_\_\_\_. Payment includes removal, handling, transportation, and disposal of the existing bridge in its entirety. Removal of bridge rail, pavement, utilities, and other objects mounted to the bridge is subsidiary.

Item 202.0024.\_\_\_\_. Payment includes all materials, equipment, labor, and supervision necessary to place CLSM as described herein.

Item 202.0025.\_\_\_\_. Payment includes all materials, equipment, labor, and supervision to decommission a well in accordance with the governing body's stipulations or as indicated within the Contract Documents.

Item 202.0026.\_\_\_\_. Payment includes all materials, equipment, labor, and supervision to remove rivets in accordance with the governing body's stipulations or as indicated within the Contract Documents. Reaming, replacement with high-strength bolts (of same or larger diameter), faying surface repair, or any other repairs needed due to the Contractors methods are subsidiary. Rivets, bolts, and members that require removal due to Contractors means and methods shall be replaced meeting these specifications at no additional cost to the Owner.

Excavation, backfill, and compaction is subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
202.0001.____	Removal of Structures and Obstructions	LS
202.0002.____	Removal of Pavement	SY
202.0003.____	Removal of Sidewalk	SY
202.0004.____	Removal of Culvert Pipe	LF
202.0005.____	Removal of Sanitary Sewer Pipe	LF
202.0006.____	Removal of Manhole	EACH
202.0007.____	Removal of Junction Box	EACH
202.0008.____	Removal of Inlet	EACH
202.0009.____	Removal of Curb and Gutter	LF
202.0010.____	Single Mail Box Installation	EACH
202.0011.____	Multiple Mail Box Installation	EACH
202.0012.____	Double Mail Box Installation	EACH
202.0013.____	Removal of Structures and Obstructions	CS
202.0014.____	Removal of Pavement	LS
202.0015.____	Removal of Sidewalk	LS
202.0016.____	Removal of Pavement	STA
202.0017.____	Removal of Culvert Pipe	EACH
202.0018.____	Removal of Culvert Pipe	LS
202.0019.____	Removal of Curb and Gutter	LS
202.0020.____	Removal of Single Mail Box	EACH
202.0021.____	Removal of Multiple Mail Box	EACH
202.0022.____	Removal of Double Mail Box	EACH
202.0023.____	Removal of Bridge	LS

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<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
202.0024.	Abandonment of Structure In-Place	EACH
202.0025.	Decommission Well	EACH
202.0026.	Removal of Rivets	EACH

**SECTION 203  
EXCAVATION AND EMBANKMENT**

**203-1.01 DESCRIPTION.**

Excavate, haul, place, and compact or dispose of specified materials necessary to construct the project. Conform to the lines, grades, depths and typical cross sections shown on the Plans or as established. The Contract will designate material to be removed within the excavation limits as classified or unclassified excavation.

**203-2.01 MATERIALS.**

1. Unclassified Excavation. All materials of whatever character encountered in the work. May include rock, common, or muck.
2. Classified Excavation.
  - a. Common Excavation. Silt, sand, gravel, and granular material other than rock or muck.
  - b. Rock Excavation. Rock that cannot be excavated without blasting or ripping.
  - c. Muck Excavation. Soils, organic matter, and other material not suitable for foundation material regardless of moisture content.
3. Borrow. Approved material required for embankments or for other portions of the work, and obtained from sources outside the right-of-way limits for the project.
4. Rock Stabilization Materials. As specified on the Plans or Special Provisions.
5. Rockfall Mitigation Materials. As specified on the Plans or Special Provisions.
6. Crushed Glass. May be combined with soil-aggregate material to be used in embankment construction. Meet Subsection 703-2.15 requirements.
7. Contaminated Soils. Any soil which has been exposed to an organic or inorganic contaminant in excess of the standards, prescribed or adopted by Local, State, Federal, or Tribal Regulations.

**CONSTRUCTION REQUIREMENTS**

**203-3.01 GENERAL.**

Perform all necessary clearing and grubbing prior to beginning excavation, grading, and embankment operations in any area.

Keep excavation and embankment areas free draining at all times as the work progresses. Finish the excavation and embankments to reasonably smooth and uniform surfaces.

Excavate and embank material only within the limits on the Plans or as directed. Prevent disturbing material and vegetation outside of the slope limits.

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The Engineer may designate excavated soils, that cannot be properly compacted in embankments, as unsuitable.

When unsuitable material is encountered at the required depth of excavation, remove the unsuitable material to the depth specified or directed. Allow for measurements to be taken before backfill is placed.

Dispose of unsuitable material or excess usable material at approved locations.

Obtain the property owner's written permission to dispose of unsuitable material or excess usable material at locations outside the right-of-way limits and a waiver of all claims against the State for any damage to such land which may result. Obtain all permits required by law for such disposal. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work.

Ensure that all disposal areas are properly graded and drained. Blend the outer limits of unsuitable material into surrounding grounds with no noticeable break or variation readily discernible. When existing roadway embankment slopes are used as disposal sites for unsuitable or excess useable material, finish the slopes with a motor grader or other approved method.

When the volume of suitable excavation is not sufficient for constructing the fill to the grades indicated, furnish the necessary borrow from approved sources. Borrow may be necessary even though not shown on the Plans. The source and acceptability of the borrow is subject to approval.

Do not place borrow material until after the usable roadway excavation has been placed in the fill. If you place more borrow than is required, resulting in or as a result of the unnecessary disposal of usable excavation, the amount of such disposed material will be deducted from the borrow quantity.

Obliteration of Roadways includes all grading operations necessary to incorporate the existing roadway into the new roadway and surroundings in order to provide a pleasing appearance from the new roadway. Fill ditches not required for drainage and grade to the approximate original ground contour.

Do not place soil-aggregate containing glass cullet:

1. Within four feet from the face of any embankment slope,
2. Within 150 feet from any surface water body,
3. In embankment areas where culvert placement is required,
4. In contact with any geosynthetic material.

### **203-3.02 ROCK EXCAVATION.**

Excavate rock by blasting, ripping, or both.

Unless Subgrade Blasting is specified, excavate material which would classify as rock within the limits of the roadbed to a minimum depth of 6 inches below subgrade.

1. Blasting.

- a. Blasting Plan. Prior to commencement of drilling, submit a Blasting Plan prepared by a qualified Blaster. Include the details of test blasting, controlled blasting and production blasting. Include station limits, date and time of each blast, layout details of each blast, trade names, types and sizes of explosives and accessories, delay sequences of the blast holes, and powder factors. Submit a revised Blasting Plan any time there is a change in the drilling or blasting methods.
- b. Blaster. Use a qualified blaster licensed or otherwise authorized under all applicable federal, state and local laws or regulations to possess, transport, store and use explosives of the type used on the Project. Provide the Blaster's resume and copies of all applicable licenses to the Engineer with the Blasting Plan. Have the Blaster on site during all loading and blasting operations. Require the Blaster to take responsible charge for safety procedures as set forth below and to maintain a detailed record for each day of blasting work.
- c. Pre-Blast Conference. Hold a pre-blasting meeting at the jobsite prior to commencement of any drilling and blasting operations with the Contractor, the Blaster and representatives of the Engineer. Discuss the Blasting Plan and visit such specific sites as are necessary to familiarize the participants with the details of the blasting operations.
- d. Safety. Submit a Safety Plan that includes descriptions of road closures, warning signals, and plans for notification of affected local, state, and federal agencies. Discuss in the Safety Plan methods for protection of life and health, public and private property, new work or existing work on the project, nearby structures, wetlands, waters and wildlife. Hold a safety meeting prior to commencement of blasting operations to address safety issues.
- e. Controlled Blasting. Controlled blasting holes are closely spaced, lightly loaded holes drilled along the plane of the final design slope. Controlled blasting is either preshear blasting with holes detonated before the production blasting or cushion (trim) blasting with holes detonated after the production blasting. Drill holes parallel to each other and within 12 inches of the staked slope plane. Use controlled blasting techniques for all rock slopes higher than 10 feet to produce a stable cut face sheared along the designed neat excavation line. If at any time during the progress of the work, the approved methods of blasting and drilling fail to produce the desired result of a smooth, stable backslope, modify the blasting method to achieve the desired result. Do not construct benches in finished rock back slopes unless approved by the Engineer. The Engineer may permit an offset for drilling equipment clearances. Do not use ANFO in controlled blasting holes.
- f. Production Blasting. Use materials and methods as necessary to fragment and loosen the rock inside the design excavation limits, while leaving a smooth, stable back slope using the controlled blasting methods set forth above. Use appropriately designed delay sequences and charge weights per delay to minimize ground vibrations and prevent damage to buildings, structures, utilities, sensitive fish or wildlife habitat and other facilities. Prior to blasting, remove all loose objects, and render safe all dangerous conditions, in or near the cut slope area. Detonate production hole charges in a delay sequence toward the free face. Remove and dispose of loose material from rock slope failures or slides at

- the contract price for unclassified excavation if the Engineer determines the failure did not occur as a result of the Contractor's methods. The Engineer will determine the amount of loose material at the time of removal.
- g. Scaling. Remove all loose, hanging, or potentially dangerous rock from newly excavated slopes and from surrounding existing slopes as the excavation progresses to ensure the rock slopes are stable. Do not commence work on subsequent lifts or shots until scaling is complete. Accomplish scaling with hand tools, hydraulic splitters, machine scaling with excavators or other equipment, high pressure water spray, light explosive charges, or other approved methods.
  - h. Ditch Line/Subgrade Blasting. Construct a free-draining fractured rock zone below the ditch line and the bottom of the structural section as shown on the Plans and Specifications or as directed. Blast or rip rock below the bottom profile of the ditch line and below the bottom of the structural section to depths as indicated or directed.
- 2. Stabilization. Stabilize excavated or existing rock surfaces with rock bolts, rock dowels, shotcrete, or other techniques, as indicated in the Plans and Specifications or as directed. The Engineer may increase or decrease the extent and type of stabilization methods depending on the geologic conditions encountered during the work. Obtain approval from the Engineer for rock bolts, dowels, shotcrete, resin grout, cement grout, mortar, and other stabilization accessories prior to ordering the items. Conduct performance testing as required by the Engineer to confirm the stabilization methods and equipment produce the required capacities and functions.
  - 3. Rockfall Mitigation. Use rockfall mitigation methods such as rock catchment fences, wire mesh draping, flexible or rigid barriers, ditch width modification, and other techniques to intercept rockfall and control it before it reaches the roadway or other facilities. Construct according to the Plans and Specifications or as required by the Engineer. The Engineer may increase or decrease the extent and type of mitigation methods depending on the geologic conditions encountered during the work. Obtain approval from the Engineer for fence material, wire mesh, barrier design and accessories prior to ordering the items. Conduct performance testing as required by the Engineer to confirm the methods and equipment produce the required capacities and functions.
  - 4. Drain Holes. Drill drain holes in rock slopes to relieve excess water pressure as specified or directed. The Engineer will determine the location and construction details of the drain holes, depending on the conditions encountered in each slope.

**203-3.03 EMBANKMENT CONSTRUCTION.**

Prepare the areas upon which embankments are to be placed, construct dikes within or outside the right-of-way when required, place and compact approved material within the roadway areas where unsuitable material has been removed, and place and compact embankment material in holes, pits, and other depressions within the roadway area. Use only approved materials in the construction of embankments and backfills. Embankment material will be approved for gradation following placement but prior to compaction.

Construct the embankment with selected material meeting the requirements of [Subsection 703-2.07](#). Selected material may be obtained from unclassified excavation, rock excavation, common excavation or borrow.

Do not place rocks, broken concrete or other solid materials in embankment areas where piling is to be placed or driven, or where culvert placement is required.

Bench slopes that are steeper than 4:1, when measured at right angles to the roadway, when embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built half-width at a time. Continuously bench over those areas as the work is brought up in layers. Make benches wide enough to permit placing and compacting operations. Begin each horizontal cut at the intersection of the original ground and the vertical side of the previous bench. Incorporate material cut out, and deemed suitable, into the new embankment and recompact along with the new material.

Scarify existing roadways, lying within 3 feet of subgrade, to a depth of 6 inches and recompact to meet [Subsection 203-3.04](#) or [203-3.05](#).

When permanently frozen soils are encountered, place backfill or embankment materials in a timely manner, as directed, to minimize degradation of the foundation material. Do not place embankment over seasonally frozen ground unless authorized in writing.

Thaw and drain frozen material deemed acceptable for fill before placing in the embankment. Frozen cuts may require stage excavation: remove thawed material and allow the cut to thaw while work continues on some other portions of the project. After the material in the cut has thawed to a sufficient depth, remove the thawed material. Repeat this operation until all frozen material is removed or the cut is excavated to grade.

When excavation is performed when freezing weather is imminent, place the specified backfill promptly, following the excavation work, at least up to a level which will allow the surface to adequately drain. Make arrangements for the timely availability of such embankment or backfill materials prior to commencement of the stripping or excavation operations, when required.

If embankment can be deposited on one side only of abutments, wing walls, piers or culvert headwalls, prevent the overturning of or excessive pressure against the structure. Do not place the fill adjacent to the abutment of a bridge higher than the bottom of the backwall of the abutment until the superstructure is in place. When embankment is to be placed on both sides of a concrete wall or box type structure, keep the embankment at approximately the same elevation on both sides of the structure.

Place roadway embankment of earth materials in horizontal layers not to exceed 8 inches (uncompacted) for the full width of the embankment, except as required for traffic, and compact as specified before the next layer is placed. Use spreading equipment on each lift to obtain uniform thickness prior to compacting. Maintain uniform density, during compaction. Add or remove water, as necessary, to obtain the required density. Route compaction equipment uniformly over the entire surface of each layer.

Place rock embankment in lifts not thinner than the thickness of the largest rocks. Restrict maximum rock dimension to 3 feet. Distribute spalls and finer rock fragments to level and smooth each lift. Place succeeding lifts without damaging previously completed

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lifts. Dump rock on the lift being constructed and distribute by blading or dozing to fill voids and to form a dense, well-compacted embankment. Do not place rocks over 6 inches within 2 feet of finished subgrade.

Rock is considered usable material, regardless of size. Rocks too large to be embanked, as specified above, may either be reduced to a suitable size for incorporation into the embankment or disposed of in approved areas, at your option. Replace all wasted rock from excavation with borrow at no additional cost to the Owner, unless such rock is excess to project embankment requirements.

Finish the subgrade surface so it will not vary more than 0.10 foot when tested using a 10-foot straightedge nor vary more than 0.10 ft from the established grade.

When embankment is to be placed over swampy or saturated ground, which will not support the weight of heavy hauling and spreading equipment, the Contractor shall choose methods of embankment construction and utilize hauling and spreading equipment that will minimally disturb the swampy or saturated ground. When encountered, and when approved by the Owner's Representative, the lower part of the fill may be constructed by dumping and spreading successive vehicle loads of material in a uniformly distributed layer of a thickness not greater than necessary to support the vehicle while placing subsequent layers. The remainder of the embankment above the aforementioned layer will be constructed as specified herein. There shall not be an increase in the planned depth of embankment material over swampy or saturated ground for the sole purpose of providing support for heavy hauling and spreading equipment, unless the Contractor proves, to the satisfaction of the Owner's Representative, that there are no other means and methods to perform the work. If the use of smaller hauling vehicles or different methods of embankment construction than originally planned are necessary to construct embankment over swampy or saturated ground, this shall not be the basis for a claim for extra compensation. The contract unit price for the various pay items involved shall be full compensation for all labor, materials, and equipment necessary to perform the work outlined herein.

The Contractor may construct embankment over frozen swampy and saturated ground only with express written approval from the Owner or its designated Representative. If the Contractor chooses to construct embankments over frozen ground, the Contractor shall submit an Embankment Plan that outlines the type of equipment to be used, the approximate schedule of activities, and methods to be used to adhere to the requirements in this Section.

Repair damage to embankment caused by hauling equipment.

Where the Plans call for placement of classified material and excavation is required, the existing material may be utilized if the material is classified and meets the material requirements specified in the Contract Documents.

Construct all embankments with moisture and density control unless the Engineer determines that such controls are not feasible. In-situ material below all roadway embankments shall be proof rolled in order to provide a firm and unyielding surface for the new roadway section.

Temporary surcharging consists of two methods:



1. Static Surcharge. Leave surcharge in place until the foundation material has reached stability or the required settlement has taken place.
2. Rolling Surcharge. Construct a surcharge on top of the embankment to the specified elevation and continually advance the surcharge as the embankment is constructed ahead.

Use material removed from the temporary surcharge in areas indicated on the Plans. Do not dispose of temporary surcharge material without written approval. Compaction is not required for material placed in a temporary surcharge.

**203-3.04 COMPACTION WITH MOISTURE AND DENSITY CONTROL.**

The maximum density and optimum moisture will be determined by ATM 207 or ATM 212.

Adjust the moisture content of the embankment material to within 2 percent of the optimum moisture content and compact each layer to not less than 95 percent of the maximum density. Acceptance densities will be determined by ATM 213 and ATM 214.

All embankments within 20 feet of a bridge abutment shall be compacted to not less than 100 percent of the maximum density for the full width of the embankment. Acceptance densities will be determined by ATM 213 and ATM 214.

**203-3.05 COMPACTION WITHOUT MOISTURE AND DENSITY CONTROL.**

Except for rock fills and the first layer of fills over swampy ground, deposit embankment materials in layers not exceeding 8 inches in thickness before compaction.

Compact by routing construction equipment and/or rollers uniformly over the entire surface of each layer before the next layer is placed. Compact until embankment does not rut under the loaded hauling equipment.

Keep dumping and rolling areas separate. Do not cover any lift by another until the required compaction has been completed.

**203-3.06 CONTAMINATED SOIL.**

The Contractor shall segregate contaminated soil if encountered during excavation, as determined by the Owner's Representative. The Contractor shall transport all designated contaminated soil to specially designed Potentially Contaminated Materials Storage Area (PCMSA)'s. Locations of PCMSA's will be identified by the Owner's Representative in the directive authorizing the work. These stockpile areas will be located within the Project limits. Soil segregation and transport will be conducted under the supervision of the Owner's Representative. The Owner's Representative shall have stop work authority.

The Contractor will be responsible for construction of the (PCMSA). The segregation, transportation, stockpiling, and disposal of contaminated soil material from the property will be included in this work. The PCMSA shall be constructed in accordance with the Local, State, Federal, and Tribal Regulations.

**203-4.01 METHOD OF MEASUREMENT.**

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See SC-01.02 and the following:

1. Items 203.0001.\_\_\_\_ through 203.0004.\_\_\_\_, 23.0008.\_\_\_\_, and 203.0022.\_\_\_\_. The volume measured in original position.
2. Item 203.0005.\_\_\_\_. The volume measured in final position.
3. Item 203.0006.\_\_\_\_. By weighing.
4. Item 203.0007.\_\_\_\_. By vehicle measure.
5. Item 203.0009.\_\_\_\_ and 203.0011.\_\_\_\_. By the area measured before obliteration or blasting.
6. Item 203.0010.\_\_\_\_. By adding the sum of the depths of line holes drilled and loaded.
7. Item 203.0012.\_\_\_\_. By adding the sum of the depths of drain holes drilled.
8. Item 203.0016.\_\_\_\_. By the length measured along the base of the fence.
9. Items 203.0015.\_\_\_\_, 203.0017.\_\_\_\_, and 203.0018.\_\_\_\_. By the area covered, measured along the slope.

### **203-5.01 BASIS OF PAYMENT.**

When no pay item is shown in the bid schedule for "Stripping Material Sources", removal of overburden and other unsuitable material from such Material Sources is subsidiary.

No payment will be made under Items 203.0001.\_\_\_\_ or 203.0003.\_\_\_\_ for material excavated and placed as a classified material within the limits of the Project .

The following work is subsidiary:

1. scarifying material in place
2. hauling of material
3. excavating overbreak material
4. slope rounding excavation and benching of slopes
5. water for compaction
6. placing and removing of temporary surcharge material
7. work required to continually advance the heading on a rolling surcharge
8. test pits and explorations required to evaluate the acceptability of borrow
9. stage construction of cuts and stage excavation of material sources
10. construction of PCMSA's for the storage of contaminated soils within the Project limits

Removal of slides and associated work will be paid for at the contract unit price for excavation at the location of the slide or as extra work under General Condition Article 10.

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Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
203.0001.	Common Excavation	CY
203.0002.	Rock Excavation	CY
203.0003.	Unclassified Excavation	CY
203.0004.	Muck Excavation	CY
203.0005.	Borrow	CY
203.0006.	Borrow	TON
203.0007.	Borrow	CYVM
203.0008.	Stripping State-Furnished Material Sources	CY
203.0009.	Obliteration of Roadway	SY
203.0010.	Controlled Blasting	LF
203.0011.	Ditchline/Subgrade Blasting	SY
203.0012.	Drain Holes	LF
203.0013.	Stabilization - Rock Bolt	EACH
203.0014.	Stabilization - Rock Dowel	EACH
203.0015.	Stabilization - Shotcrete	SY
203.0016.	Rockfall Mitigation - Rock Fence	LF
203.0017.	Rockfall Mitigation - Wire Mesh	SY
203.0018.	Rockfall Mitigation - Cable Mesh	SY
203.0019.	Unclassified Excavation	LS
203.0020.	Borrow	LS
203.0021.	Obliteration of Roadway	LS
203.0022.	Contaminated Soils Excavation	CY



## SECTION 501 CONCRETE FOR STRUCTURES

### 501-1.01 DESCRIPTION.

Furnish, place, finish, and cure Portland cement concrete for structure construction. Use the class of concrete noted on the Plans unless otherwise specified.

### CLASSES OF CONCRETE

<u>Class A:</u>	General use concrete
<u>Class A-A:</u>	Concrete where improved strength and durability is required
<u>Class P:</u>	Concrete where strength in excess of 5000 psi is required
<u>Class DS:</u>	Concrete for drilled shaft foundations

### 501-1.02 DEFINITIONS

**ADMIXTURE.** A material other than water, aggregate, hydraulic cement, pozzolan, and fiber reinforcement, added to the batch before or during mixing, used as an ingredient of a cementitious mixture to modify its freshly mixed, setting, or hardened properties.

Air-Entraining Admixture. An admixture causing the development of a system of microscopic air bubbles in concrete, mortar, or cementitious material paste during mixing, usually to improve its workability and resistance to damage by freezing and thawing.

Set-Accelerating Admixture. An admixture causing an increase in the rate of hydration of the hydraulic cement and shortens the time of setting, increases the rate of strength development, or both.

Set-Retarding Admixture. An admixture causing a decrease in the rate of hydration of the hydraulic cement and lengthens the time of setting, decreases the rate of strength development, or both.

Water-Reducing Admixture. An admixture either increasing slump of freshly mixed mortar or concrete without increasing water content or maintaining slump with a reduced amount of water, due to factors other than air entrainment.

**AGITATION.** The process of providing motion in mixed concrete just sufficient to prevent segregation or loss of plasticity.

**BLEED WATER.** The autogenous flow of water emerging from newly placed concrete, and caused by the settlement of the solid materials within the mass. The relative quantity of mix water that will bleed can be estimated by AASHTO T 158.

**CAMBER.** For prestressed concrete members, camber is the net upward deflection of an eccentrically prestressed concrete member due to the combined loads, shrinkage, creep, and eccentricity of the prestress force. For non-prestressed members, camber is a deflection intentionally built into a structural element or form to improve appearance or to nullify the deflection of the element under the effects of loads, shrinkage, and creep.

**CEMENT.** A binding material that sets and hardens by hydration and is capable of doing so underwater, sometimes called hydraulic cements.

**CEMENTITIOUS MATERIAL.** Hydraulic cements and pozzolans with cementing properties.

**CHAMFER.** A beveled edge or corner formed into finished concrete.

**COMPRESSIVE STRENGTH TEST.** The average strength test of concrete, from at least two 6.0 x 12.0 inch or at least three 4.0 x 8.0 inch compressive strength test cylinders sampled according to AASHTO T 141 or ATM 501, cured according to AASHTO R 39 or ATM 506, and tested according to AASHTO T 22 or sampled, cured, and tested to equivalent ASTM test methods. Or the average strength test of grout, from at least three specimens sampled and tested according to ATM 507, AASHTO T 106, or ASTM C 109. Unless otherwise noted, tested at an age of 28 days.

**COMPRESSIVE STRENGTH, ( $f'_c$ ).** The measured maximum resistance of a concrete, grout, or mortar specimen to axial compressive loading; expressed as force per unit cross-sectional area; or the specified resistance used in design calculations.

**CONCRETE ANCHOR.** Cast-in-place or post-installed fastening device installed in the concrete for the purpose of transferring loads to the concrete. See ASTM E2265 for standard terminology.

**CONSOLIDATION.** The process of inducing a closer arrangement of the solid particles in freshly mixed concrete during placement by the reduction of voids, usually by vibration, rodding, tamping, or some combination of these actions.

**CONSTRUCTION JOINT.** The surface where two successive placements of concrete meet.

**CURING COMPOUND.** A liquid applied as a coating to the surface of newly placed concrete to retard the loss of water and, in the case of pigmented compounds, reflects heat to provide an opportunity for the concrete to develop its properties in a favorable temperature and moisture environment.

**CURING PERIOD.** The length of time in which continuous curing operations are maintained thereby allowing the concrete to properly hydrate and develop its required strength and durability.

**CURING.** Action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration and (if applicable) pozzolanic reactions to occur so the desired properties of the mixture develop.

**DURABILITY.** The ability of concrete to resist weathering action, chemical attack, abrasion, and other conditions of service.

**EVAPORATION RATE REDUCER.** A material generating a continuous thin film when spread over water on the surface of fresh concrete to retard the evaporation of bleed water.

**FIELD TEST RECORD.** A record of compressive strength test results from concrete used on prior projects and produced by the concrete production facility.

**FINAL CURING PERIOD.** The time period after the concrete achieves final set in which deliberate action is taken, without damaging or marring the concrete surface, to maintain satisfactory moisture content and temperature in concrete.

**FINAL SET.** Attainment of significant rigidity in which rainfall, foot traffic, and curing materials contacting the concrete surface do not damage or mar the concrete surface and do not alter the properties of the finished surface.

**INFORMATIONAL FIELD TEST.** A compressive strength test, determined by the Engineer, from field test cylinders cured on the site under temperature and moisture conditions similar to the concrete in the structure; except, the compressive strength test may consist of one 6.0 x 12.0 inch or one 4.0 x 8.0 inch compressive strength test cylinder.

**INITIAL CURING PERIOD.** The time period between placement and implementation of final curing methods in which deliberate action is taken to reduce the loss of moisture from the surface of the concrete.

**INITIAL SET.** The first stiffening of concrete.

**KEYWAY.** A recess or groove in one lift or placement of concrete and filled with concrete of the next lift or grout, giving shear strength to the joint.

**LAITANCE.** A layer of weak material derived from cementitious material and aggregate fines either: 1) carried by bleeding to the surface or to internal cavities of freshly placed concrete; or 2) separated from the concrete and deposited on the concrete surface or internal cavities during placement of concrete underwater.

**MORTAR.** A mixture of cementitious material paste and fine aggregate occupying the space between particles of coarse aggregate.

**REQUIRED AVERAGE COMPRESSIVE STRENGTH, ( $F'_{cr}$ ).** The 28-day compressive strength, used as the basis for selection of concrete proportions in the mix design process, sufficiently greater than the Specified Compressive Strength to ensure the acceptance criteria are met.

**RETEMPER.** To add water and remix concrete or mortar to restore workability to a condition in which the mixture is placeable or usable.

**ROCK POCKET.** A porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids.

**SCREED.** To strike off concrete lying beyond the desired plane or shape. A tool for striking off the concrete surface, sometimes referred to as a strikeoff.

**SET.** The condition reached by a cementitious material paste, mortar, or concrete that has lost plasticity to a degree of stiffening generally stated as the time in hours and minutes required for cementitious material paste to stiffen sufficiently to resist the penetration of a weighted test needle as prescribed by AASHTO T 197,

**SPECIFIED COMPRESSIVE STRENGTH, ( $F'_c$ ).** The 28-day compressive strength used in structural design and specified in the Contract documents.



**TREMIE.** A pipe or tube with a hopper for filling at its upper end through which concrete is deposited.

### **501-2.01 MATERIALS.**

Use materials conforming to the following:

#### 1. Cementitious Materials

Portland Cement	Subsection <a href="#">701-2.01</a>
Blended Hydraulic Cement	Subsection <a href="#">701-2.02</a>
Fly Ash	Subsection <a href="#">701-2.04</a>
Ground Granulated Blast-Furnace Slag	Subsection <a href="#">701-2.05</a>
Silica Fume	Subsection <a href="#">701-2.06</a>

#### 2. Aggregate Materials

Fine Aggregate	Subsection <a href="#">703-2.01</a>
Coarse Aggregate	Subsection <a href="#">703-2.02</a>
Aggregate for Abrasive Finish	Subsection <a href="#">703-2.14</a>

#### 3. Water, Admixtures and Curing Materials

Curing Materials	Subsection <a href="#">703-2.01</a>
Chemical Admixtures	Subsection <a href="#">711-2.02</a>
Water and Ice	Subsection <a href="#">712-2.01</a>

#### 4. Anchors and Inserts

Concrete Anchor Inserts and Bolts	Subsection <a href="#">712-2.20</a>
Utiliduct, HDPE	Subsection <a href="#">706-2.08</a>
Utiliduct, Steel	Section <a href="#">716</a>
Structural Steel	Section <a href="#">716</a>
Asphalt Felt	ASTM D226, Type I (No. 15 Asphalt Felt)
Expanded Polyethylene	Subsection <a href="#">705-2.06</a>

#### 5. Grout and Epoxy

Grout	Subsection <a href="#">701-2.03</a>
Epoxy Adhesive for Crack Sealing	AASHTO M 235, Type IV, Grade 3
Epoxy Adhesive for Crack Injection	AASHTO M 235, Type IV, Grade 1
Low-Viscosity Resin	Subsection <a href="#">712-2.19</a>
Epoxy Bonding Agents	AASHTO M235, Type V

### **501-2.02 COMPOSITION OF MIXTURE - JOB MIX DESIGN.**

Provide a Job Mix Design, for each required class of concrete and Specified Compressive Strength ( $f'_c$ ), which meets the requirements of this Subsection and provides workability and consistency so the concrete can be worked readily into the forms and around reinforcement without segregation or bleeding. Determine proportions using the absolute volume method according to ACI 211.1.

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1. Water-Cement Ratio and Cementitious Materials. Provide a Job Mix Design meeting the water-cement ratio requirements in **Table 501-1**.

Calculate the water-cement ratio based on the total weights of water and cementitious material. The weight of water includes all water as defined in **Subsection 501-3.01.2c**. The following are considered cementitious materials: Portland cement, blended hydraulic cement, fly ash, ground granulated blast-furnace slag, and silica fume.

Fly ash, ground granulated blast-furnace slag, silica fume, and combinations of these materials may be used as a substitute for Portland cement provided the quantity meets the limits of **Table 501-2** and the total quantity of combined fly ash, ground granulated blast-furnace slag, and silica fume does not exceed 40 percent of the total cementitious material by weight. Do not use Type III Portland cement for cast in place concrete decks and approach slabs.

**TABLE 501-1  
WATER-CEMENT RATIO REQUIREMENTS**

Class of Concrete	Water-Cement Ratio, maximum
	lbs/lbs
A	0.45
A-A	0.40
P	0.35
DS	0.45

**TABLE 501-2  
SUPPLEMENTARY CEMENTITIOUS MATERIAL LIMITS**

Cementitious Material	Percent of Total Cementitious Material by Weight <sup>1</sup>
	Maximum
Fly Ash	35%
Ground Granulated Blast-Furnace Slag	40%
Silica Fume	10%

<sup>1</sup> The maximum percent includes initial quantities in blended hydraulic cement plus additional supplementary cementations materials.

2. Aggregate Gradations. Provide a Job Mix Design meeting the fine aggregate gradation requirements in **Subsection 703-2.01** and the coarse aggregate gradation requirements in **Table 501-3**. Alternative sizes of coarse aggregate, as shown in Table 1 of AASHTO M 43, may be used only when approved in writing. Combined aggregate gradations, shown in Table 1 of ATM 530, may be used for packing density mix designs (e.g. Shilstone) on the condition that the nominal maximum

aggregate size specified remains unchanged and the concrete is proportioned according to ATM 530.

**TABLE 501-3  
COARSE AGGREGATE GRADATION REQUIREMENTS**

Class of Concrete	Coarse Aggregate Size Number
	AASHTO M 43
A	No. 57 or 67
A-A	No. 57 or 67
P	No. 67
DS	No. 7 or 8

3. Air Content. Provide a job mix design meeting the requirements of **Table 501-4**

**TABLE 501-4  
AIR CONTENT REQUIREMENTS**

Class of Concrete	Air Content
A	6.0% $\pm$ 0.5%
A-A	6.0% $\pm$ 0.5%
P	4.0% $\pm$ 0.5% <sup>1</sup> and Super Air Meter (SAM) number $\leq$ 0.20 <sup>1</sup>
DS	Not required

<sup>1</sup>Not required for web and bottom flange of precast, prestressed decked bulb-tee girders.

4. Slump. Provide a Job Mix Design meeting the slump requirements in **Table 501-5**.
5. Chloride Ion Content. Provide Job Mix Designs with water-soluble chloride ion contents determined by percent weight of cementitious material according to ASTM C1218 for the concrete mixture aged between 28 and 42 days. For Class P and Class A-A Concrete the limit is 0.06 percent. For Class A and DS concrete the limit is 0.08 percent.
6. Required Averaged Compressive Strength. Provide a Job Mix Design meeting a Required Average Compressive Strength ( $f'_{cr}$ ) established from either the Empirical Method or the Statistical Method.

If the Specified Compressive Strength ( $f'_c$ ) is not designated on the Plans, use a Specified Compressive Strength listed in **Table 501-6**.

**TABLE 501-5  
SLUMP REQUIREMENTS**

Condition	Slump
Concrete without a water-reducing admixture	4" max.
Concrete with a Type A, D, or E water-reducing admixture	6" max.
Concrete with a Type F or G high-range water-reducing admixture	9" max.
Class DS concrete, wet-shaft process	7" min. 9" max.
Class DS concrete, dry-shaft process	6" min. 9" max.

**TABLE 501-6  
COMPRESSIVE STRENGTH REQUIREMENTS**

Class of Concrete	Specified Compressive Strength ( $f'_c$ ) (psi)
A	4000
A-A	5000
P	8000
DS	4000

- a. Empirical Method. Establish the Required Average Compressive Strength from the following equations:

$$f'_{cr} = f'_c + 1200 \quad \text{for } f'_c \leq 5000 \text{ psi}$$

$$f'_{cr} = 1.1f'_c + 700 \quad \text{for } f'_c > 5000 \text{ psi}$$

Where:  $f'_{cr}$  = Required Average Compressive Strength, psi  
 $f'_c$  = Specified Compressive Strength, psi

- b. Statistical Method. If the production facility has field test records of compressive strength tests, establish the Required Average Compressive Strength based on the calculated standard deviation of the field test records and using the largest result of the following equations:

$$f'_{cr} = f'_c + 1.34ks \quad \text{for all } f'_c$$

or,

$$f'_{cr} = f'_c + 2.33ks - 500 \quad \text{for } f'_c \leq 5000 \text{ psi,}$$

$$f'_{cr} = 0.90f'_c + 2.33ks \quad \text{for } f'_c > 5000 \text{ psi,}$$

Where:  $f'_{cr}$  = Required Average Compressive Strength, psi

$f'_c$  = Specified Compressive Strength, psi  
 $k$  = 1.16 if 15 total tests are considered  
 1.08 if 20 total tests are considered

- 1.03 if 25 total tests are considered  
 1.00 if 30 or more total tests are considered  
 $s$  = standard deviation, psi

Use linear interpolation to determine  $k$  for intermediate number of tests.

Use field test records performed within the past 12 months and spanning a period of more than 60 days for a class of concrete within 1000 psi of the Specified Compressive Strength. Use field test records from concrete produced at the production facility, which represent materials, quality-control procedures, and climatic conditions similar to those expected in the work. Do not use field test records from concrete in which acceptance requirements for materials or concrete proportions were more closely restricted than those in the proposed work. Use field test records meeting one of the following:

- (1) One Group of Field Test Records. Use field test records representing a group of at least 15 consecutive compressive strength tests in which all concrete was produced using the same mixture proportions. Calculate the standard deviation using the following equation:

$$s = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{(n-1)}}$$

Where:  $s$  = standard deviation, psi

- $n$  = number of compressive strength test results considered  
 $X_i$  = individual compressive strength test result, psi  
 $\bar{X}$  = average of  $n$  compressive strength test results, psi

- (2) Two Groups of Field Test Records. Use field test records representing two groups of consecutive compressive strength tests totaling at least 30 tests. Ensure each group is comprised of at least 10 consecutive compressive strength tests, and all concrete in each group was produced using the same mixture proportions. Calculate the standard deviation using the following equation:

$$s = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2 - 2)}}$$

Where:  $s$  = standard deviation for the two groups combined, psi

- $s_1, s_2$  = standard deviation for groups 1 and 2, respectively, calculated according to [Subsection 501-2.02.6.b.\(1\)](#), psi  
 $n_1, n_2$  = number of test results in groups 1 and 2, respectively

## 7. Job Mix Design Verification.

- a. Required Average Compressive Strength. Verify the Job Mix Design satisfies the Required Average Compressive Strength by meeting at least one of the following requirements:

- (1) Field Test Records. Use field test records that:
- (a) use materials of the same brand and type and from the same manufacturer as the materials used in the work;
  - (b) were from concrete produced at the production facility;
  - (c) use quality-control procedures, and had climatic conditions similar to those expected in the work; and
  - (d) encompass a period of not less than 60 days.

Do not use field test records from concrete in which acceptance requirements for materials or concrete proportions were more closely restricted than those in the proposed work.

For a single group of at least 10 consecutive compressive strength tests for one mixture, verify the average of the compressive strength tests equals or exceeds the Required Average Compressive Strength.

For two groups, each having at least 10 consecutive compressive strength tests, for two mixtures representing classes of concrete within 1000 psi of the Specified Compressive Strength, plot the average strength of each group versus the water-cementitious material ratio of the corresponding mixture proportions and interpolate between them to determine the compressive strength corresponding to the water-cementitious material ratio of the Job Mix Design. Verify the interpolated compressive strength equals or exceeds the Required Average Compressive Strength.

- (2) Laboratory Trial Mixtures. Use materials and material combinations for trial mixtures of the same brand and type and from the same manufacturer as the materials used in the work.

Record the temperature of the freshly mixed concrete according to ASTM C1064 and ensure the temperature is within 10°F of the intended maximum temperature of the concrete as mixed and delivered.

For each trial mixture, make and cure at least two 6.0 x 12.0 inch or at least three 4.0 x 8.0 inch compressive strength test cylinders for each test age according to AASHTO R 39. Test for compressive strength according to AASHTO T 22 at test ages of 3, 7 and 28 days.

For a single trial mixture, verify the compressive strength test equals or exceeds the Required Average Compressive Strength.

For a group of trial mixtures, make at least three trial mixtures with each mixture having a different cementitious material content. Select water-cement ratios producing a range of compressive strengths encompassing the Required Average Compressive Strength. From the results of the 28-day compressive strength tests, plot a curve showing the relationship between water-cement ratio and compressive strength. From the curve of water-cement ratio versus compressive strength, determine the compressive strength corresponding to the water-cementitious material ratio of the Job Mix

Design. Verify the compressive strength equals or exceeds the Required Average Compressive Strength.

- b. Flowability Requirements for Class DS Concrete (Wet-Shaft Process). Verify the Job Mix Design satisfies the concrete flowability requirements of [Subsection 501-3.05.6.a\(1\)](#). Develop a slump loss table showing the slump at 1 hour intervals since batching until the concrete takes initial set.
  - c. Plasticity Requirements for Class DS Concrete (Dry-Shaft Process). Verify the Job Mix Design satisfies the concrete plasticity requirements of [Subsection 501-3.05.6.b\(1\)](#). Ensure initial set occurs after placement operations are complete.
8. Job Mix Design Submittal. Submit a written mix design, signed and sealed by a Professional Engineer registered in the State of Alaska, for each specified class of concrete and for each Specified Compressive Strength, to the Engineer at least 45 days prior to scheduled production. Submit the mix design to include the following:
- a. Job Mix Design Proportions and Test Results. Submit concrete mixture proportions per cubic yard and test results for the proposed Job Mix Design. Include the following information:
    - (1) Weights of cementitious materials
    - (2) Weights of aggregates in saturated surface dry condition
    - (3) Volume or weight dosage range of each admixture.
    - (4) Weight of water
    - (5) Water-cement ratio
    - (6) Percentage of air by volume
    - (7) Total water soluble chloride ion content
    - (8) Wet unit weight
    - (9) Expected slump
    - (10) Expected 3, 7 and 28-day compressive strength (Include 1-day compressive strength for Class P concrete.)
    - (11) Slump loss table for Class DS concrete (if applicable)
    - (12) Time of initial set for Class DS concrete (if applicable) and for other classes where extending Time for Placement ([Subsection 501-3.02.2](#)) will be requested
    - (13) Compressive strength test results showing the Required Average Compressive Strength is met or exceeded.
  - b. Materials Documentation. Submit the following:
    - (1) For each cementitious material, include:

- (a) Type/Class
  - (b) Brand
  - (c) Producer
  - (d) Plant location
  - (e) Certified test reports confirming the cementitious material meets these Specifications.
- (2) For aggregates, include:
- (a) Pit or quarry location(s)
  - (b) Bulk dry specific gravity, bulk saturated surface dry specific gravity, and apparent specific gravity
  - (c) Absorption values
  - (d) AASHTO size number for coarse aggregates
  - (e) Gradations for aggregates
- (3) For each admixture, include:
- (a) Type
  - (b) Manufacturer
  - (c) Manufacturer's product data sheet giving the procedure for admixture use and confirming the admixture meets these Specifications.
  - (d) The batching process step and mixing instructions when each admixture is added.
  - (e) Manufacturer's certificates demonstrating admixture compatibility and manufacturer's recommended dosage range.
- (4) Include the source of supply for water and ice.
- c. Materials Samples. The Engineer may require samples of aggregate, cementitious materials, and admixtures to verify the mix design. If requested, furnish representative samples (330 pounds each) of both coarse and fine aggregates, 94 pounds of each cementitious material, and one-quarter of each admixture to allow for Job Mix Design verification testing. Ensure the Department receives these samples at least 45 days before the mixture's scheduled production for the project.
- d. Basis of Required Average Compressive Strength. If the Statistical Method is used, submit the following for each field test record:
- (1) Compressive strength test results of the tested concrete.
  - (2) Standard test method used for determining compressive strength.



- (3) Date the compressive strength tests were performed
  - (4) Aggregate source used for the tested concrete.
  - (5) Specified strength of the tested concrete.
  - (6) Batched weights of constituent materials or the producer's mix design identification number for the concrete used for each compressive strength test.
- e. Documentation of Required Average Compressive Strength. Submit documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the Required Average Compressive Strength meeting one of the following requirements:
- (1) Field Test Records. If field test records were used to verify the Required Average Compressive Strength, submit the following for each field test record:
    - (a) Compressive strength test results of the tested concrete.
    - (b) Standard test method used for determining compressive strength.
    - (c) Date the compressive strength tests were performed
    - (d) Aggregate source used for the tested concrete.
    - (e) Specified strength of the tested concrete.
    - (f) Batched weights of constituent materials or the producer's mix design identification number for the concrete used for each compressive strength test.
  - (2) Trial Mixtures. If a single or group of trial mixtures were used to verify the Required Average Compressive Strength, submit concrete mixture proportions per cubic yard and test results for each trial mixture. Include the following information:
    - (a) Weights of cementitious materials
    - (b) Weight of aggregates in saturated surface dry condition
    - (c) Volume or weight of each admixture
    - (d) Weight of water
    - (e) Water-cement ratio
    - (f) 3-day, 7-day, and 28-day compressive strength test results (Include 1-day compressive strength test results for Class P concrete)
    - (g) Percentage of air by volume
    - (h) Wet unit weight

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(i) Slump

9. Approval. Obtain the Engineer's approval of each mix design prior to use. Approval of the Job Mix Design does not constitute acceptance of produced concrete and will not obligate the Department to accept or pay for concrete that does not meet the mix acceptance requirements of Subsection 501-3.03.
10. Changes. Provide a new Job Mix Design and obtain the Engineer's approval according to Subsection 501-2.02 for a change in approved Job Mix Design proportions, materials, aggregate gradation, aggregate quality, or admixtures.

### CONSTRUCTION REQUIREMENTS

#### 501-3.01 BATCHING.

Batch concrete, in proportioned amounts, according to the approved Job Mix Design.

1. Certification and Calibration. Batch concrete using a certified batch plant.

Use concrete batch plants certified according to the requirements of a. or b. of this Subsection for cast-in-place concrete, and for precast or prestressed concrete where the concrete is supplied from a batch plant that is not located at the casting facility.

Use concrete batch plants certified according to the requirements of a., b., or c. of this Subsection for precast and prestressed concrete where the concrete is supplied from a batch plant located at the casting facility.

Use concrete batch plants certified according to the requirements of a., b., or d. of this Subsection for non-prestressed precast concrete where the concrete is supplied from a batch plant located at the casting facility.

Use and maintain calibrated weighing and measuring devices for concrete batching and for adding material on-site, meeting the requirements of this Subsection..

a. Plant Certification by the National Ready Mix Concrete Association. Certification may be obtained from the National Ready Mix Concrete Association (NRMCA). Information concerning NRMCA certification may be obtained from the NRMCA, 900 Spring Street, Silver Springs, MD 20910, or online at [www.nrmca.org](http://www.nrmca.org). The NRMCA certification is valid for 2 years from the date of inspection.

b. Plant Certification by a Professional Engineer. Certification may be obtained by independent inspection and evaluation by a Professional Engineer:

(1) registered in the State of Alaska,

(2) qualified by NRMCA for concrete plant certification, and

(3) who uses and completes the NRMCA Plant Certification Check List.

Correct deficiencies to the satisfaction of the Professional Engineer. The Professional Engineer must sign and seal the completed NRMCA Plant Certification Check List certifying all applicable items have been met. The certification by a Professional Engineer is valid for 2 years from the date of inspection.

- c. Plant Certification by Precast/Prestressed Concrete Institute. Certification may be obtained from the Precast/Prestressed Concrete Institute (PCI) for fabrication of precast and prestressed concrete if the batching plant is located at the concrete casting facility. Information concerning PCI certification may be obtained from the Precast/Prestressed Concrete Institute, 200 W. Adams St. #2100, Chicago, IL 60606, or online at [www.pci.org](http://www.pci.org).
- d. Plant Certification by National Precast Association. Certification may be obtained from the National Precast Association (NPCA) for fabrication of non-prestressed precast concrete if the batching plant is located at the concrete casting facility. Information concerning NPCA certification may be obtained from the National Precast Concrete Association, 1320 City Center Drive, Suite 200, Carmel, IN 46032, or on-line at <http://precast.org>.
- e. Calibration of Weighing and Measuring Devices. Use weighing and measuring devices meeting the requirements of the NRMCA *Plant Inspector's Guide*, calibrated by a commercial scale service, using equipment traceable to the Alaska State Standards of Weight and Measure as adopted by AS 45.75.020.

Verify calibration of all weighing and measuring devices used in concrete production:

- (1) no more than 6 months before commencing concrete work,
  - (2) after each relocation,
  - (3) at least once every 6 months until the work is completed, and
  - (4) when, in the opinion of the Engineer, the accuracy or adequacy of the device is in question.
- f. Certification and Calibration Submittals. Submit documentation required for plant certification and weighing and measuring device calibration meeting the requirements of this Subsection before commencing concrete work.

If the Plant Certification is by NRMCA, PCI or NPCA submit a copy of the Certificate of Conformance. Include the most recent date of inspection and the calibrated accuracy for each weighing and measuring device.

If the Plant Certification is by a Professional Engineer, submit a copy of the signed and sealed completed NRMCA Plant Certification Check List and calibration and/or verification worksheets for each weighing and measuring device. Include the most recent date of inspection and the calibrated accuracy for each weighing and measuring device.

## 2. Measuring Materials.

- c. Cementitious Materials. Use cementitious materials of the same brand, type, and from the same plant of manufacture as the cementitious materials used to verify the approved Job Mix Design according to [Subsection 501-2.02.7](#). Ensure the quantity of the Portland cement and the cumulative quantity of Portland cement plus other cementitious materials is proportioned in amounts required by the Job Mix Design and meets the mix acceptance requirements.

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Measure cementitious materials by weight. When other cementitious materials, including fly ash, ground granulated blast-furnace slag, or silica fume, are specified in the concrete proportions, the material may be cumulatively weighed with the Portland cement. Weigh cementitious materials on a weighing device that is separate and distinct from those used for other materials. Weigh the Portland cement before other cementitious materials.

Portland cement is permitted to be measured in bags of standard weight (94 pounds). Do not use a fraction of a bag of cementitious materials unless its weight has been determined by calibrated weighting devices.

- d. Aggregates. Use aggregates from the same sources and gradations as the aggregates used in the trial mixtures or field test records used to verify the required average compressive strength. Ensure the quantity of the aggregates is proportioned in amounts required by the Job Mix Design.

Measure aggregates by weight. Establish batch weight measurements on dry materials and adjust the actual scaled weight for the required dry materials weight plus the total weight of moisture, both absorbed and surface, contained in the aggregate.

- e. Water. The total quantity of mixing water includes water added to the batch, ice added to the batch, and water occurring as surface moisture on the aggregates. Measure the added water by weight or volume. Measure added ice by weight. Discharge the flush water (wash water) prior to loading the next batch of concrete. Do not use flush water (wash water) as a portion of the mixing water.
- f. Admixtures. Use concrete admixtures according to the manufacturer's instructions and as approved in the Job Mix Design. Measure powdered admixtures by weight. Measure paste or liquid admixtures by weight or volume.

### 3. Materials Storage and Handling.

- a. Cementitious Materials. Keep cementitious materials dry and free from contaminants. Do not use cementitious materials which have become partially hydrated or which contain lumps of caked cementitious material.
- b. Aggregates. Do not allow segregation of the aggregates or contamination with foreign materials. Separate aggregate to prevent intermixing of specified gradations.

Drain aggregate so the moisture content is uniform and is accounted for during the batching process.

Do not use aggregates that contain ice, are frozen, or have been heated directly by combustible materials. Use direct steam, steam-coil, or water-coil heating when heating aggregates. When direct steam is used to thaw aggregate piles, drain aggregates to uniform moisture content before batching.

- c. Admixtures. Protect admixtures from contamination, evaporation, or damage. Store admixtures according to the manufacturer's instructions. Protect liquid admixtures from freezing and from temperature changes affecting the admixture's performance.

**501-3.02 MIXING AND DELIVERY.**

Mix concrete, in proportioned amounts, according to the approved Job Mix Design. Mix ingredients into a thoroughly combined and uniform mixture. Do not retemper concrete mixtures. Do not use concrete that has developed initial set prior to placement

1. Addition of Water. Additional water may be added on-site provided the following are met:
  - a. The volume of concrete in the mixer after the additional water is added does not exceed the maximum mixing capacity.
  - b. The water measuring device is calibrated according to **Subsection 501-3.01.1.e.**
  - c. The total quantity of mixing water, including water added according to **Subsection 501-3.02.1** is within the proportion requirements in **Subsection 501-3.03.4.** Account for the actual volume of concrete remaining in the mixer.
  - d. Water additions are completed within 30 minutes after the introduction of the mixing water to the cementitious materials.

The addition of water is not prohibited from being several distinct additions of water. Inject additional water into the mixer under pressure and direction of flow to allow for proper distribution within the mixer. Provide additional mixing to ensure a thoroughly combined and uniform mixture is attained.

2. Time for Placement. Discharge the concrete within 1.5 hours of the following:
  - a. after adding the mixing water to the cementitious materials, and
  - b. after adding the cementitious materials to the aggregates.

The time to complete discharging the concrete may be extended 2 minutes for every degree the concrete temperature is below 70°F, measured at the point of discharge, to a maximum total time of 2 hours. The Engineer may extend the Time for Placement if Time of Initial Set information is provided in the approved Job Mix Design submittal.

**501-3.03 EVALUATION OF MATERIAL FOR ACCEPTANCE.**

All concrete in the work will be evaluated for acceptance.

The Engineer may reject a batch or load of concrete failing to meet the requirements for proportions, slump, total air content, or temperature. Prior to sampling, the Engineer may reject a batch or load of concrete that appears defective in composition.

1. Sampling. The Department will take all samples from the delivery truck discharge.

Provide adequate and representative fresh concrete for sampling and testing as directed by the Engineer. The Engineer will sample the concrete after a minimum of 1/2 cubic yard of concrete has discharged from the delivery truck. Do not add water or admixtures to the mix after the concrete has been sampled for acceptance testing.

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The Engineer will determine aggregate gradation for acceptance based on random samples taken at the plant.

2. Sampling and Test Methods. The Department will sample and test according to the following:

ATM 301	Sampling of Aggregates
ATM 304	Sieve Analysis of Fine and Coarse Aggregates, and Materials Finer Than No. 200 Sieve in Mineral Aggregate by Washing
ATM 501	Sampling Freshly Mixed Concrete
ATM 502	Temperature of Freshly Mixed Portland Cement Concrete
ATM 503	Slump of Hydraulic Cement Concrete
ATM 504	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ATM 505	Air Content of Freshly Mixed Concrete by the Pressure Method
ATM 506	Method of Making and Curing Concrete Test Specimens in the Field
AASHTO T 231	Capping Cylindrical Concrete Specimens
AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
ATM 507	Field Sampling and Fabrication of 50-mm (2-in) Cube Specimens using Grout (Non-Shrink) and or Mortar

3. Batch Tickets. Provide a printed ticket with each batch of concrete delivered to the project. Include the following information:

- a. Manufacturer plant (batching facility)
- b. Department contract number
- c. Date
- d. Batch number
- e. Time batched
- f. Time batch plant discharge is completed
- g. Truck number

- h. Quantity (quantity batched this load)
  - i. Type of concrete by class and producer's mix design identification number
  - j. Weights of every type of cementitious material
  - k. Weights of each aggregate type
  - l. Weight or volume of each admixture
  - m. Weight or volume of water added at the plant
  - n. Total moisture and absorption percentage for each aggregate
  - o. Volume or weight of any water added after batching
  - p. Signature of Contractor's representative, affirming the accuracy of the information provided
4. Proportion Requirements. Meet the proportion requirements of the approved Job Mix Design within the proportion tolerances:
- a. Total Cementitious Material, weight           ±1%
  - b. Aggregates, weight                                 ±2%
  - c. Total Water, weight or volume                 ±3%
  - d. Admixtures, weight or volume, according to the dosage range in the approved Job Mix Design.

If the total cementitious material weight is made up of different components, keep the component weights within the following tolerances:

- (1) Portland Cement                                 ±1%
- (2) Fly Ash   ±5%
- (3) Ground Granulated Blast-Furnace Slag     ±5%
- (4) Silica Fume                                       ±10%

Proportion tolerance will be calculated using consistent units for  $M_{JMD}$  and  $M_A$  as follows:

$$P = \frac{(M_A - M_{JMD})}{M_{JMD}} \cdot 100$$

Where: P = Proportion tolerance, percentage

$M_{JMD}$  = Weight or Volume of component according the approved Job Mix Design

$M_A$  = Weight or Volume of actual batched component

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5. Slump Requirements. Provide concrete with slump within 1 inch of target mix design slump.
6. Total Air Content Requirements. Provide concrete with total air content within +/-1.5 percent of the approved Job Mix Design at delivery time.
7. Temperature Requirements. Unless otherwise noted, ensure the concrete temperature is between 50°F and 90°F when placed in the forms.
8. Compressive Strength Requirements. Meet the strength requirements for the Specified Compressive Strength. Concrete of the approved Job Mix Design will be considered to meet the Specified Compressive Strength requirements when both of the following conditions are met:
  - a. The lowest individual compressive strength test result is not less than the Specified Compressive Strength minus 500 psi, or 90.0 percent of the Specified Compressive Strength, whichever is lower.
  - b. The lowest averaged result of three consecutive compressive strength tests meets or exceeds the Specified Compressive Strength.

### **501-3.04 PREPARATION FOR CONCRETE PLACEMENT.**

Allow time for inspection prior to concrete placement.

Remove debris, concrete splatter, oil, paint, and other foreign substances from the surfaces of forms and reinforcing steel, against which the concrete is to be placed.

Remove soil and other debris from pipe piles to the bottom of concrete elevation shown on the Plan.

Prepare foundations according to **Section 205**.

Moisten foundations and forms with water before the concrete is placed. Remove standing water on the foundation, in the pile, and in the forms before placing concrete.

### **501-3.05 PLACING CONCRETE.**

Do not begin concrete placement without the Engineer's authorization. Place concrete conforming to the approved Job Mix Design. Place and consolidate each layer within 30 minutes and before the preceding layer takes initial set.

If concrete placement operations are delayed so initial set occurs before placement of the succeeding section or layer, place a joint according to **Subsection 501-3.11**. The resulting joint will be considered a construction joint. If, in the opinion of the Engineer, the location of the construction joint will affect the strength or durability of the concrete, the Engineer may reject the concrete, the structure, or a portion of the structure.

Place concrete in a sequence to obtain a well-consolidated concrete and to prevent cracks. Place concrete as near as possible to final position. Prevent segregation of the mix, displacement of reinforcing steel, and spattering of mortar on the reinforcing steel and forms above the elevation of the layer being placed. Do not deposit a large quantity of concrete at any point and run or work the concrete along the forms. Do not allow concrete to slide down the sides of the forms.



Regulate concrete placement so the pressures do not exceed the load capacity of the forms. Limit layer thickness to no more than 2.5 feet, or the capacity of the vibrators to consolidate and merge the concrete with the previous layer, whichever is less.

Unless otherwise specified, use a tremie, tube, or other such device to limit the free-fall height to less than 5.0 feet when placing operations would otherwise allow concrete to drop more than 5.0 feet. When using a tremie to place concrete, use a watertight tremie with an inside diameter of at least 10 inches. When using a concrete pump to place concrete, use concrete pump lines that are watertight with an inside diameter of at least 5 inches.

Concrete placed in piles or in dry-shaft process may free-fall more than 5 feet without use of tremie, tube or other such device, provided the falling concrete does not contact rebar or other objects before reaching the top surface of the placed concrete. When free-falling concrete more than 5 feet, use a drop chute at least 3 feet long.

After initial set, prevent movement of forms, projecting ends of reinforcing steel, and other embedded items.

Do not use aluminum components in contact with fresh concrete.

Place concrete in the superstructure only after substructure forms are removed and the substructure has been inspected.

1. Concrete Placement Plan. Submit a concrete placement plan to the Engineer, for concrete decks and drilled shafts. Submit each concrete placement plan to the Engineer, at least 30 days before placing concrete. Do not place concrete until after the Engineer has approved the plan. Include the following in each concrete placement plan:
  - a. concrete placement sequence,
  - b. schedule of concrete placement and curing,
  - c. estimated concrete volume of each section,
  - d. placement rate and duration,
  - e. description of finishing equipment,
  - f. placement procedure,
  - g. name of the concrete foreman,
  - h. curing materials, equipment, and procedure.
2. Pre-concreting Conference. Hold a pre-concreting conference for concrete decks and Drilled Shafts, at least 5 working days before placing concrete. Include the Engineer, the Superintendent and foremen in charge of placing reinforcing steel, placing concrete, finishing concrete, and curing operations. Discuss construction procedures, personnel, and equipment to be used.

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If the project includes more than one concrete placement operation, and if key personnel change between concreting operations, hold additional conferences to include replacement personnel before placing successive concrete sections.

3. Pumping Concrete. Use a pump producing a continuous stream of concrete without air pockets. When pumping is completed, the concrete remaining in the pipeline, if used, must eject without contaminating the concrete or separating the ingredients. Discard concrete contaminated by priming or cleaning the pump.
4. Conveying Concrete. Concrete may be conveyed if the equipment will handle the class of concrete, with the slump and air content specified and without segregation of the aggregate, and no equipment vibrations will damage freshly placed concrete or reinforcing steel. Limit the length of conveyor belts to prevent aggregate segregation or 300 feet, whichever is less. Cover the belt to protect the concrete from heat, evaporation, precipitation, or when the Engineer determines precipitation is likely.
5. Piles. Do not place concrete underwater in piles.
6. Drilled Shaft Foundations. Place concrete following either the wet-shaft process or dry-shaft process, as applicable.

The dry-shaft process may be used where the ground water level and soil and rock conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft can be visually inspected by the Engineer prior to placing the concrete. Relatively dry excavation conditions exist when excavation fluids have been removed from the shaft and the rate of water intrusion is less than 6 inches of water accumulating above the base in a 1-hour period without pumping or other methods to drain or remove water. Suitable soil and rock conditions exist when the sides and bottom of the hole remain stable without caving, sloughing, or swelling between completion of excavation and concrete placement; and loose material and water can be satisfactorily removed prior to inspection and concrete placement. Do not begin concrete placement if there is more than 1 inch of water in the bottom of the shaft excavation. Use wet-shaft process if the requirements for dry-shaft process cannot be satisfied.

Provide process control testing during concrete placement. Test slump and air content before placing each batch of concrete in the drilled shaft. Perform sampling and testing according to [Subsection 501-3.03.2](#) using a WAQTC qualified concrete testing technician or ACI certified concrete field testing technician. Test every batch of concrete before placement. Record the time when each sample is collected. Submit test results in writing to the Engineer immediately after completing each test.

- a. Wet-Shaft Process. Place concrete using a tremie or concrete pump. Place concrete continuously until good quality concrete, as determined by the Engineer, is evident at top of the shaft or nearest construction joint. Good quality concrete is considered concrete of the same consistency, appearance, and quality as the concrete being delivered and meeting the applicable mix acceptance requirements. Remove a sufficient volume of concrete to ensure elimination of contaminated concrete at the top of shaft before continuing with subsequent construction operations.

Remove concrete laitance during or immediately after concrete placement operations have ended.

Do not allow water, fluids, drilling aids, or concrete from the top of the shaft to enter streams or other waterways.

Construct the discharge end of the tremie or pump line to prevent water intrusion and permit the free flow of concrete during concrete placement. Use caps, bottom plates, pigs, or other such devices inserted into or attached to discharge pipe to separate the concrete from the excavation fluid during initial charging of the discharge pipe. Ensure the discharge pipe has sufficient length and weight to rest on the shaft base before starting concrete placement.

When using a tremie, provide adequate support so the tremie can be raised to increase the discharge of concrete and lowered to reduce the discharge of concrete. Do not shake, vibrate, or rapidly raise or lower the tremie to increase the discharge of the concrete.

Maintain a positive head of concrete inside the tremie or pump line relative to the excavation fluid level. Position the discharge orifice within one pipe diameter of the shaft base. Do not re-position the discharge pipe until the orifice is at least 8 feet below the concrete surface. Maintain at least 8 feet of concrete above the discharge orifice during concrete placement. Monitor the concrete level during placement to ensure the tremie or pump line discharge orifice remains at least 8 feet below the concrete surface throughout placement.

If the discharge orifice rises above the concrete surface before concrete placement is complete, the shaft will be considered defective. Immediately terminate concrete placement operations and notify the Engineer.

- (1) Concrete Flowability Requirements. Ensure concrete placed in the shaft remains flowable throughout placement operations by maintaining a slump of at least 6 inches until placement is completed. Collect samples from the first batch of concrete. Test slump from the first batch of concrete at the beginning of the concrete placement operations and immediately after concrete placement operations are complete. Record the time when samples are collected and when tests are performed. Submit test results in writing to the Engineer immediately after completing each test.
- b. Dry-Shaft Process. Place concrete continuously until concrete is evident at top of the shaft or nearest construction joint. Concrete may be permitted to free-fall into place if the concrete does not contact the sides of the shaft, reinforcing steel, or other objects while free falling.

Remove concrete laitance during or immediately after concrete placement operations have ended.

- (1) Concrete Plasticity Requirements. Ensure concrete placed in the shaft remains plastic throughout placement operations by completing placement operations before initial set occurs.

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7. Concrete Decks and Approach Slabs. Before placing concrete, operate the finishing machine over the entire length of the deck to check screed deflection, reinforcing steel clearance, and concrete thickness.

Limit the rate of placing concrete to what can be finished before initial set.

- a. Placement Sequence. Place the concrete deck in the sequence shown on the Plans. The Engineer may approve a revised placement sequence for casting the concrete deck continuously from one end to the other provided the following:
- (1) Stockpile the materials necessary to complete the placement and have the equipment, incidentals, and workers on the site before beginning concrete placement operations.
  - (2) Ensure the continuous concrete placement and finishing operation proceeds at a minimum rate of 30 feet per hour, measured longitudinally along the axis of the span.
  - (3) The Engineer determines the revised placement sequence will not reduce the stability during construction and will not reduce the quality, capacity, or durability of the completed structure.

If the Engineer approves the proposal for a continuous concrete placement operation, the Owner will observe and evaluate performance to the first planned construction joint in the sequence. At this point, the Engineer may authorize you to proceed with the continuous concrete placement operation or suspend the placement and install a construction joint. The Engineer's decision will be based on whether the concrete can be produced, delivered, and finished at a continuous rate permitting the structure to accommodate final dead load deflections while the concrete is plastic.

If the Engineer suspends the continuous concrete placement operations after the first sequential placement, submit modifications for improving the continuous concrete placement operations, beginning at the other end of the deck. If a second attempt at continuous concrete placement is authorized, the placement will be evaluated and allowed or terminated based on the same criteria as the first sequential placement.

If the Engineer suspends the continuous concrete placement operation after the second attempt, additional attempts will not be permitted. Follow the deck placing sequence shown on the Plans.

### **501-3.06 CONSOLIDATION OF CONCRETE.**

Consolidate concrete to make a dense homogeneous mass free of voids and rock pockets. Consolidate each layer to leave a compact, dense, and impervious concrete with smooth faces on exposed surfaces with no visible line of separation between adjoining layers.

Consolidate concrete, except underwater or other exempted placements, by mechanical vibration at the point of deposit. Use vibrators capable of visibly affecting concrete with a 1-inch slump for a distance of at least 18 inches from the vibrator.

Use vibrators and regulate placement in order to consolidate the fresh concrete within 15 minutes of placement and before initial set. Effectively vibrate the full depth of each layer.

For immersion-type vibrators, insert vibrators vertically to a depth penetrating into the previous layer. Withdraw vibrators slowly to avoid segregation or grout pockets. Vibrate in a uniform pattern spaced less than 1.5 times the radius of visible effectiveness.

Avoid vibration of initially set layers and reinforcing steel below the succeeding placement. Do not hold vibrators against reinforcing steel or use them to flow or spread the concrete into place. Manipulate vibrators to produce concrete free of voids, with proper texture on exposed faces, and maximum consolidation. Do not allow the concrete to segregate, form pools of mortar, or form laitance on the surface.

When immersion-type vibrators are used to consolidate concrete around epoxy-coated reinforcing steel, use rubber or nonmetallic vibrator heads that will not damage epoxy coatings.

Concrete may be placed directly into drilled shaft foundations and piles without mechanical vibration; except, vibrate the top 5 feet of concrete. For drilled shaft foundations, consolidate the top 5 feet of concrete after good quality concrete is evident at the top of the shaft and after water, slurry, drilling aids, and other materials other than concrete have been removed.

### **501-3.07 FINISHING CONCRETE SURFACES.**

After the concrete is consolidated and prior to the application of curing materials, strike off unformed concrete surfaces to the required elevation and slope. Finish the surface by floating the surface to remove local irregularities and leave sufficient mortar to seal the concrete surface. Do not use mortar topping for concrete surfaces. Do not use aluminum finishing equipment.

Complete initial floating operations before bleed water or excess moisture is present on the surface and before the concrete takes initial set. Complete final finishing before final set occurs. Do not use finishing aids or additional water to assist in finishing concrete surfaces. Do not finish concrete surfaces if bleed water, excess moisture, or curing materials are present.

Provide formed concrete surfaces with an ordinary finish unless otherwise noted.

1. Ordinary Finish. An ordinary finish is the finish left on a surface after removing the forms, filling the holes left by the form ties, and repairing defects. Ensure the surface is true and even and free from rock pockets and depressions or projections.

Immediately after removing the forms, remove the metal devices holding the forms in place and passing through the body of the concrete, or cut them back at least 1 inch beneath the surface of the concrete. Remove fins of mortar and irregularities caused by form joints.

Patch cavities produced by form ties, depressions, holes, and voids greater than 1/4 inch. Fill the cavity with stiff mortar composed of one part of Portland cement to two parts of fine aggregate. Proportion the mortar by loose volume with only enough water to form a small ball when squeezed gently by hand. Clean the cavity and

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saturate the concrete with water before filling the cavity. Thoroughly tamp the mixture into place. Float the surface of the mortar before initial set to make the surface neat in appearance. Cure the patch according to [Subsection 501-3.08](#).

Do not repair concrete with rock pockets, cracks, or other defects until the concrete is inspected by the Engineer. Concrete repaired prior to inspection by the Engineer may be rejected. If, in the opinion of the Engineer, the defect will affect the strength or durability of the concrete, the Engineer may reject the concrete, the structure, or portion of the structure. If the defect is greater than 3/4 inch in depth, submit a repair plan including complete details of the method, materials, and equipment proposed for use in repairing the concrete. Obtain the Engineer's approval of the repair plan before repairing the defect. A repair plan is not required if the defect is less than 3/4 inch in depth.

Repair broken corners and edges, rock pockets, and other defects. If the defect is greater than 3/4 inch in depth, repair the defect according to the approved repair plan. If the defect is less than 3/4 inch in depth, chip away coarse or broken material according to Subsection 501-3.16 to obtain a dense, uniform surface of concrete exposing solid coarse aggregate. Cut feathered edges to form faces perpendicular to the surface. Apply an epoxy bonding agent to the concrete mating surfaces according to the manufacturer's instructions. Patch the repaired area with stiff mortar composed of one part of Portland cement to two parts of fine aggregate. Proportion the mortar by loose volume with only enough water to form a small ball when squeezed gently by hand.

Perform repairs prior to releasing falsework, prestressing, or applying additional loads to the concrete.

2. Rubbed Finish. Provide a rubbed finish at locations shown on the Plans. When forms can be removed, wet the surface and then rub with a wooden float until irregularities and form marks are removed and the surface is covered with a lather composed of cement and water. A thin grout composed of one part Portland cement and one part fine aggregate may be used. Allow this lather to set for at least 5 days. Then, smooth the surface by lightly rubbing with a fine carborundum stone.

If the concrete has hardened before being rubbed, use a medium coarse carborundum stone to finish the surface at least 4 days after placing the concrete. Spread a thin grout composed of one part Portland cement and one part fine aggregate over a small area of the surface. Immediately rub the surface with the stone until form marks and irregularities are removed and the surface is covered with a lather. Allow this lather to set for at least 5 days. Then, smooth the surface by rubbing lightly with a fine carborundum stone.

Complete ordinary finish work before applying the rubbed finish.

3. Concrete Decks and Approach Slabs. Obtain a smooth riding surface of uniform texture, true to the required grade and cross section.

Use a self-propelled mechanical finishing machine

- a. capable of forward and reverse movement,
- b. with a rotating cylindrical single or double drum screed,

- c. with necessary adjustments to produce the required cross-section, line, and grade,
- d. allowing screeds to be raised and lowered, and
- e. with an upper vertical limit of screed travel permitting the screed to clear the finished concrete surface.

When placing concrete abutting previously placed concrete, equip the finishing machine to travel on the existing concrete.

The Engineer may approve hand-operated motorized roller screeds (friction screeds) where jobsite conditions prohibit the use of conventional configuration finishing machines described above, for small areas less than 12 feet wide, and on approach slabs in which conventional configuration finishing machines are not used to finish the concrete deck. Do not use vibratory screeds.

Use equipment capable of striking off the full placement width without intermediate supports or rails. Use rails resting on adjustable supports that can be removed with the least disturbance to the concrete. Place the supports on structural members or on forms rigid enough to resist deflection. Use supports that are removable to at least 2 inches below the finished surface. If possible, place rails outside the finishing area. If not possible, place them above the finished surface.

Use rails (with their supports) that are strong and stiff enough for operation of the equipment without excessive deflection. Place and secure rails for the full length of the deck before placing concrete. Set the rails to the proper grade and elevations to ensure the required profile is provided.

After placing and consolidating the concrete, carefully strike off the concrete surface. Correct imperfections left on the deck. Provide a float finish to surfaces receiving a waterproof membrane. Texture other surfaces with a heavy-broom finish perpendicular to the direction of traffic.

Do not place finishing machines or other loads on the screed rail supports or on features supporting fresh concrete after the concrete has initially set and before the concrete attains at least 80 percent of the Specified Compressive Strength.

Do not release falsework or wedges supporting concrete on either side of a joint until each side has cured as specified.

4. Curb, Sidewalk, and Concrete Barrier Surfaces. Finish exposed faces of curbs, sidewalks, and concrete barriers to true surfaces and provide a broom finish. Broom finish sidewalks perpendicular to the direction of traffic.
5. Sandblasted Finish. Sandblast the cured concrete surface with hard, sharp abrasive media to produce an even fine-grained surface in which the mortar has been cut away, leaving the aggregate exposed.
6. Trowel Finish. Trowel the surface smooth and free of trowel marks.

#### **501-3.08 CURING CONCRETE.**

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Maintain a satisfactory moisture content and temperature in the concrete immediately after finishing operations are completed.

1. Initial Curing Period. Before final curing, ensure the surface of the concrete is kept moist. Concrete surface is beginning to dry when no bleed water is present and the surface color changes. If the concrete surface begins to dry before the final curing method can be applied, prevent further loss of moisture by one or more of the following methods:
  - a. Fog Spray. Use equipment producing a fog spray from an atomizing nozzle with sufficient velocity to cover the entire concrete surface. Direct the atomized water spray above the concrete surface to allow the fog to drift down to the concrete surface. Do not apply the discharge of the atomized water spray directly at the concrete surface. Continue fogging to maintain the reflective appearance of the damp concrete. Do not allow the surface to dry, or to undergo cycles of drying and wetting. Keep the concrete surface damp, but do not accumulate water until after final set has occurred. Use water meeting the requirements of [Subsection 712-2.01](#).
  - b. Evaporation Rate Reducer. Apply a monomolecular film intended specifically as an evaporation rate reducer to entrap bleed water or excess moisture on the concrete surface. Apply the evaporation rate reducer according to the manufacturer's written instructions. Do not use the evaporation rate reducer during finishing operations or as a finishing aid. Do not use evaporation rate reducers on concrete surfaces receiving a waterproofing membrane such as concrete decks, approach slabs, end diaphragms and decked precast concrete members.
2. Final Curing Period. Unless otherwise noted, employ the final curing method immediately following finishing operations.

Use wet curing on construction joints, concrete with a mix design water-cement ratio less than 0.40, concrete decks, approach slabs, and other concrete surfaces subject to tire contact in the completed structure. For other concrete, use wet curing, liquid membrane-forming curing, forms-in-place curing, or a combination of these curing methods.

Do not use liquid membrane-forming curing compounds on concrete surfaces to which other materials will be cast against or bonded such as concrete and waterproofing membranes.

In addition to the requirements in this section, precast concrete members may use accelerated curing.

- a. Wet Curing. Until the end of the curing period, provide continuous moisture by:
  - (1) watering a covering of heavy burlap blankets or quilted cotton mats,
  - (2) keeping concrete surfaces wet with water continuously,
  - (3) wetting the outside surfaces of wood forms.



Wait to install curing materials until the concrete has sufficiently hardened to permit such operations without damaging the concrete or marring the finish. While waiting to employ curing materials, maintain the concrete surface moisture as specified for the initial curing period.

Uniformly distribute absorbent materials across the entire concrete surface. Apply water in a manner that will not displace the curing materials or erode the concrete surface. Keep the concrete surfaces continuously wet. Do not allow concrete surfaces to dry or alternate with wetting and drying cycles. Cover the concrete, wooden forms and absorbent material with impermeable sheeting. Use white reflective impermeable sheeting if direct sunlight is present, or if the Engineer determines direct sunlight may be present during the curing period.

Do not use absorbent materials containing harmful substances such as sugar or fertilizer, or materials that may discolor the concrete.

- b. Liquid Membrane-Forming Curing Compounds. Apply liquid membrane-forming compounds immediately after final finishing and as soon as the free water has disappeared, no water sheen is visible, and bleeding has essentially ceased. Apply two coats of liquid membrane-forming compound with the second coat at right angles to the first. Apply both coats of liquid membrane-forming compounds uniformly until the original color of the concrete is obscured. Apply liquid membrane-forming compound according to the manufacturer's instructions.

Do not apply the liquid membrane-forming compound to dry concrete surfaces. Moisten the concrete surface, without standing water, before applying the liquid membrane-forming compound. Protect the membrane from damage for the duration of the curing period. Re-apply the liquid membrane-forming compound if the membrane is cracked or damaged during the curing period.

- c. Forms-In-Place Curing. Formed concrete surfaces may be cured by retaining the forms in place for the entire curing period. Keep the forms moisture tight. Do not loosen forms. For wooden forms, keep the forms wet as required for wet curing. If gaps develop between the forms or between the forms and concrete:

- (1) remove the forms and implement another curing method
- (2) keep the gaps continuously filled with water for the remainder of the curing period.

- d. Accelerated Curing. Accelerated curing may be used only for precast concrete members with Class P Concrete.

During the curing period, keep the concrete in a saturated curing atmosphere until the concrete achieves the required release strength.

The curing period may be accelerated by using saturated low-pressure steam, convection-heat, or radiant-heat in a suitable curing chamber to contain the live steam or heat. Provide at least 3 inches of clearance between the enclosure and forms to allow adequate circulation.

If accelerated curing methods are used, embed at least one temperature-recording device in the concrete to verify concrete temperatures are within the

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specified limits. Install one temperature-recording device, accurate to  $\pm 5^{\circ}\text{F}$ , near the member's midpoint, 6 to 8 inches from the top or bottom, and along the member's centerline. Monitor the concrete temperature with the temperature-recording device sensor arranged and calibrated to continuously record, date, and identify the concrete temperature throughout the heating cycle. Begin recording temperatures once concrete is placed in the forms. Stop recording temperatures after the heating cycle is complete and when the concrete temperature is within  $20^{\circ}\text{F}$  of the air temperature to which the concrete will be exposed. Upon request, submit the temperature record to the Engineer for each precast concrete member.

While waiting to begin the heating cycle, maintain the concrete temperature between  $50^{\circ}\text{F}$  and  $90^{\circ}\text{F}$  and maintain concrete surface moisture as specified for the initial curing period. Do not apply steam, convection-heat or radiant-heat prior to initial set except to maintain the concrete temperature. Determine the time of initial set according to AASHTO T 197.

Begin the heating cycle immediately after the initial set. Prevent hot air and steam from blowing directly onto the concrete or forms. Increase the concrete temperature at an average rate not exceeding  $40^{\circ}\text{F}$  per hour until the curing temperature is reached. Limit curing temperature within the concrete to  $175^{\circ}\text{F}$  maximum. Decrease the concrete temperature not more than  $40^{\circ}\text{F}$  per hour until reaching a temperature  $20^{\circ}\text{F}$  above the temperature of the air to which the concrete will be exposed.

Apply radiant heat by pipes circulating steam, hot oil, or hot water, or by electric heating elements.

3. Curing Temperature. Maintain concrete temperature at or above  $50^{\circ}\text{F}$  for the first 6 days after placement. After 6 days you may choose to maintain concrete temperature between  $32^{\circ}\text{F}$  and  $50^{\circ}\text{F}$  with the addition of curing time as specified under 501-3.08.4a.
4. Ending Curing Operations. Continue curing operations uninterrupted until the required concrete properties, strength, and durability have developed or until there is reasonable assurance these properties will be achieved after the curing operations have been terminated.

Curing operations may be terminated after both [Subsections 501-3.08.4.a](#) and [501-3.08.4.b](#) are satisfied:

- a. The concrete has cured for:
  - (1) at least 7 days.
  - (2) at least 10 days when fly ash or ground granulated blast furnace slag in excess of 10 percent by weight of the Portland cement are used in the mix.

Add one additional day of curing to the requirements of [Subsections 501-3.08.4.a\(1\)](#) and [501-3.08.4.a\(2\)](#), for each day or portion of a day the concrete temperature falls below  $50^{\circ}\text{F}$  during the curing period.

- b. The compressive strength from informational field tests reaches the following:

- (1) 70 percent of the Specified Compressive Strength if post curing concrete temperature is expected to remain at or above 50°F until 100 percent of the Specified Compressive Strength is attained.
- (2) 100 percent of the Specified Compressive Strength, if post curing conditions are expected to allow the concrete temperature to fall below 50°F before 100 percent of the Specified Compressive Strength is attained.

**501-3.09 PROTECTION OF CONCRETE.**

Protect concrete from damage. Do not apply loads to the concrete until the end of the curing period and until the Engineer determines the concrete has attained sufficient strength to safely carry the applied loads without damage. Unless otherwise noted, sufficient strength is attained when the concrete has attained a compressive strength, determined from informational field tests, of at least 80 percent of the Specified Compressive Strength.

Release forms and falsework according to [Section 512](#).

During the curing period, protect concrete from damaging mechanical disturbances. Protect concrete surfaces from damage by construction traffic, equipment, materials, rain or running water, and Cold Weather Conditions, and other adverse weather conditions. Meet the vibration limits during pile driving of [Section 505](#).

Do not backfill against concrete structures until the end of the curing period and until the concrete has attained a compressive strength, determined from informational field tests, of at least 80 percent of the Specified Compressive Strength.

Obtain authorization from the Engineer before driving vehicles or equipment, or storing materials on the structure. Keep the structure closed to traffic until the end of the curing period and until the concrete has attained a compressive strength determined from informational field tests, of at least 100 percent of the Specified Compressive Strength. Obtain authorization from the Engineer before opening the structure to traffic.

1. Rain Protection. Provide materials and equipment on site to protect concrete until final set. During precipitation, or when the Engineer determines precipitation is likely before final set, employ materials and equipment to protect the concrete until final set occurs. Do not expose the concrete to rain or flowing water before final set occurs.
2. Cold Temperature Protection. Place and cure concrete according to an approved cold temperature concreting plan whenever the air temperature in the shade, away from artificial heat, is expected to be below 40° F during placement or curing, or in the opinion of the Engineer, the air temperature in the shade, away from artificial heat, is likely to be below 40°F during placement or curing.

Prevent damage to concrete throughout the curing period. Prevent concrete from freezing, rapid cooling of concrete surfaces, or from large temperature differences within the concrete. Have materials and equipment ready to protect concrete from exposure to cold during placement and throughout the curing period. Maintain the concrete temperature with methods such as insulated forms, enclosures, and indirect heat. Vent flue gases to the outside of the enclosure when using combustion heaters. Prevent overheating areas or drying of concrete during the curing period by directing heaters and ducts away from the concrete surface. Do not heat the curing

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concrete to a temperature more than 90°F except as permitted in [Subsection 501-3.08.2.d](#).

Measure and record air temperature in the work area, away from sunlight and artificial heat, at approximate 12 hour intervals, at least twice each 24-hour period. Air temperature measurement is not required when air temperature is expected to remain above 40°F throughout concrete placement and the curing period.

- a. Cold temperature concreting plan submittals. Submit cold temperature concreting plan to the Engineer at least 5 days before beginning concrete placement when Cold Weather Conditions are present or expected.

For each concrete placement include:

- (1) Procedures for the production, transport and placement
- (2) Considerations for section size and outside air temperature during the pour
- (3) Concrete placement temperatures
- (4) Methods that ensure adequate curing conditions are maintained as required in [Subsection 501-3.08](#)
- (5) Procedures for measuring and reporting concrete temperatures
- (6) Procedures for abrupt changes in weather conditions and equipment failures
- (7) Methods for verification of in-place strength

- b. Temperature of Concrete During Batching and Placement. Obtain concrete batching and placement temperatures by heating the mixing water and/or aggregates. Avoid overheating aggregates so spot temperatures of aggregates do not exceed 212°F and average temperature of aggregates does not exceed 150°F when added to the batch.

Ensure temperature of combined ingredients does not exceed 85°F when cementitious materials and admixtures are added. Ensure concrete is between 50°F and 90°F during placement.

- c. Preparation. Remove snow, ice, and frost from all surfaces that will touch fresh concrete. Thaw the subgrade to at least 2 feet below the concrete to be placed before beginning concrete placement.

Preheat surfaces that will be in contact with placed concrete. Maintain these temperatures to no more than 10°F greater or 15°F less than that of the concrete during placement.

- d. Ending Cold Temperature Protection. Cold temperature protection may be terminated when the air temperature in the shade, away from artificial heat, is rising, above 40°F, and is expected to remain above 40°F until the end of the curing period. At the end of the protection period, remove the protection so the concrete surface drops in temperature gradually at a rate not more than 1.25°F per hour until the concrete temperature is within 20°F of the air temperature in the shade, away from artificial heat. If water curing is used, terminate the addition of water to the surface and allow the concrete surface to dry prior to exposure of the concrete to freezing temperatures.

3. Hot Temperature Protection. Do not begin concrete placement when air temperatures are expected to exceed 90°F during concrete placement without an

approved hot temperature concreting plan. When air temperatures are expected to, have materials and equipment in place to prevent the concrete temperature from exceeding 90°F before final set and exceeding 150°F during the final curing period. Implement the hot temperature concreting plan when the air temperature in direct sunlight is greater than 90°F.

- a. Submittals. Submit a hot temperature concreting plan to the Engineer at least 5 days before placing concrete when the air temperature is expected to exceed 90°F during the concrete placement. Submit detailed procedures for the production, transport, placement, protection, curing, and temperature monitoring of concrete during hot temperatures for each concrete placement. Include procedures for abrupt changes in temperature conditions or equipment failures.
- b. Preparation. Prior to placing concrete, plan to minimize the exposure of the concrete to hot temperatures and direct sunlight. Cool surfaces that will touch the concrete to less than 90°F.

Do not sprinkle fine aggregate piles with water. If sprinkling coarse aggregates, monitor the moisture content and adjust the mixing water for the free water in the aggregate.

If replacing all or part of the mixing water with crushed ice, then ensure the ice is completely melted and thoroughly mixed with the other concrete materials before beginning concrete placement.

- c. Temperature of Concrete Before Placement. Ensure concrete being placed in forms is between 50°F and 90°F. Obtain these temperatures by cooling the mixing water and/or aggregate.
- d. Temperature of In-place Concrete. Protect the concrete from damage due to hot weather immediately after concrete placement and ensure adequate curing conditions are maintained as required in [Subsection 501-3.08](#).

Provide extra protection in areas especially vulnerable to temperatures above 90°F such as exposed top surfaces, corners and edges, thin sections, and concrete placed against steel.

Protection may be terminated when the air temperature in direct sunlight drops below 90°F and is expected to remain below 90°F for at least 24 hours.

### **501-3.10 TOLERANCES.**

Produce concrete elements conforming to the following tolerances:

1. Length:  $\pm 3/4$  inch for members 100' and shorter.  $\pm 1$  inch for members longer than 100'
2. Cross-sectional Dimensions:
  - a. For dimensions 6 inches or less:  $-1/8$  inch to  $+1/4$  inch.
  - b. For dimensions over 6 inches but not over 18 inches:  $-1/8$  inch to  $+3/8$  inch.
  - c. For dimensions over 18 inches:  $-1/4$  inch to  $+3/8$  inch.

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3. Distortion of Cross-section: Limit the slope with respect to the specified surface, plane, or line to less than  $\pm 1/16$  inch per foot, but not to exceed  $\pm 1/4$  inch measured perpendicular to the long axis of member.
4. Surface Irregularities (deviation from a 10-foot straight edge):
  - a. For surfaces receiving a topping or are buried:  $\pm 1/4$  inch.
  - b. For surfaces not receiving a topping or are visible in the completed work:  $\pm 1/8$  inch.
5. Camber: Do not vary from the approved camber more than  $\pm 1/8$  inch per 10 feet of length, but not to exceed 1 inch. In addition, the camber of each girder may not differ from the camber or the other girders by more than 1 inch.
6. Lateral Sweep (deviation from a straight line parallel to centerline of member):
  - a. For member length 40 feet or less:  $\pm 1/4$  inch.
  - b. For member length over 40 feet but not over 60 feet:  $\pm 3/8$  inch.
  - c. For member length over 60 feet:  $\pm 1/2$  inch.
7. Deck Width (measured out-to-out): Zero to +2 inches, except not more than +1/2 inch where more precision is dictated by the substructure details such as anchor bolts, parallel wing walls, etc.
8. Position and Alignment:
  - a. Bottom of footing elevation:  $\pm 0.1$  feet.
  - b. Profile grade:  $\pm 0.05$  feet.
  - c. Lateral position:  $\pm 0.1$  feet.
  - d. Skew:  $\pm 0.05$  degrees.
9. Bearing Seats:
  - a. Elevation:  $\pm 0.01$  feet
  - b. Variation between bearing seats: Do not vary from a straight line coincident with the centerline of bearings and parallel to the surface of the bottom flanges more than 0.01 feet.
  - c. Grade and cross slope:  $\pm 0.005$  feet per foot.
10. Openings:
  - a. Size of opening:  $\pm 1/4$  inch.
  - b. Location of centerline of opening:  $\pm 1/2$  inch.
11. Embedded Items:
  - a. Bolts:  $\pm 1/4$  inch.

- b. Utility hangers:  $\pm 1/2$  inch.
- c. Weld Plates:  $\pm 1/2$  inch measured along the length of the member,  $\pm 1/8$  inch measured perpendicular to the length of the member.
- d. Inserts:  $\pm 1$  inch.
- e. Rail post anchor plates:  $\pm 1/4$  inch.
- f. Expansion joints:  $\pm 1/8$  inch.
- g. Electrical conduits:  $\pm 1/2$  inch.
- h. Deck drains:  $\pm 1/2$  inch.
- i. Other embedded items:  $\pm 1/2$  inch.

**501-3.11 CONSTRUCTION JOINTS.**

Unless otherwise noted, locate construction joints where specified in the Contract documents. Obtain approval before adding, deleting, or relocating construction joints specified in the Contract documents. Make requests for such changes in writing, accompanied by a drawing depicting the joint. The Engineer will evaluate the proposed construction joint to determine if the joint will affect the strength or durability of the concrete. Joints noted as "permissible" do not need the Engineer's approval before deleting. When permitted, place the joints where they will not be exposed to view in the finished structure.

At horizontal construction joints, place gage strips 1-1/2 inches thick inside the forms along exposed faces to give the joints straight lines.

Do not use wire mesh forming material.

If the Plans require a roughened surface on the joint, create grooves at right angles to the length of the member. Make grooves that are 1/2 to 1 inch wide, 1/4 to 1/2 inch deep, and spaced equally at twice the width of the groove. Terminate the grooves within 1-1/2 to 2 inches from the edges of the joint.

If the Plans require a smooth surface on the joint, provide a trowel finish.

Include shear keys at the joint when the Contract documents do not require a roughened surface or a smooth surface. Make shear keys of formed depressions with slight beveling to ensure ready form removal. Do not use raised shear keys. Make shear keys that meet the following:

1. For tops of beams, at the tops and bottoms of boxed girder webs, in diaphragms, and in crossbeams, use shear keys 1-1/2 inches deep, 8 inches long, and spaced at 16 inches.
2. In other locations, use shear keys at least 1-1/2 inches deep and 1/3 of the joint width.

Terminate the shear keys within 1-1/2 to 2 inches of the joint edge.

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Clean construction joints of surface laitance and other foreign materials before fresh concrete is placed against the surface of the joint. Flush construction joints with water and allow the joint to dry to a surface-dry condition immediately prior to placing concrete.

### **501-3.12 FORMS AND FALSEWORK.**

Use forms and falsework designed and constructed according to [Section 512](#).

### **501-3.13 PRECAST CONCRETE MEMBERS.**

In addition to the requirements listed in this Section, conform to [Section 502](#) when fabricating prestressed concrete members.

1. Shop Drawings. Provide shop drawings for precast concrete members. Include details not provided in the Plans for the construction and erection of the members. Cast members only after shop drawings are approved. Use precast methods for cast-in-place elements when approved. Submit shop drawings, showing construction joint details and other required information.
2. Manufacture. Prestress concrete according to [Section 502](#). Fabricate and install reinforcing steel according to [Section 503](#).
  - a. Unless otherwise noted, use Class P concrete for precast concrete members meeting the Specified Compressive Strength noted on the Plans.
3. Storage and Handling. Handle and move precast concrete members without damage. Store and transport precast concrete members in an upright position with the directions of the support reactions on the member during storage or transport as if in the final position. Locate support points during transport and storage within 30 inches of their final position, or as shown on approved shop drawings. Ship only after the member has cured at least 7 days and has a compressive strength not less than 100 percent of the Specified Compressive Strength.
4. Erection. Maintain member stability during transport, lifting, and erection operations. Limit concrete tension stresses due to transport, lifting, and erection operations to less than 500 psi.

Set interchangeable precast concrete members so the initial difference between the top surfaces of the edges of adjacent precast concrete members is no more than 1/2 inch at midspan and no more than 1/4 inch at the bearings.

Set and securely brace precast concrete members within a span before making shear connections. Secure the member to the structure, and provide temporary braces necessary to resist wind or other loads immediately after erecting each precast concrete member.

Provide and use forcing devices as shown in the Plans or as recommended by the precast concrete member manufacturer. Use devices maintaining the top edges of adjacent members at the same elevation while casting or welding diaphragms, welding shear connector plates, and while placing and curing grout in the shear keys.

Make field welds according to [Section 503](#) and [Section 504](#).



Install cast-in-place diaphragms within 2 weeks after setting precast concrete members on their bearings.

If cast-in-place diaphragms cannot be placed within the prescribed time limit, ensure the members are adequately braced to resist movement and rotation. Submit a bracing plan including complete details and substantiating calculations, sealed by a Professional Engineer registered in the State of Alaska.

Erect and place precast deck panels so the mating surfaces do not allow grout leakage. Seal joints where grout leakage may occur.

When the Plans require filling keyways between adjacent concrete members with grout, place grout according to the manufacturer's written instructions. Clean joints of surface laitance and other foreign material before placing grout. Do not place loads on the grouted members until the grout compressive strength has reached 5000 psi.

Tightly pack and rod the grout in the keys and spaces. Keep the grout surface smooth and neat. Ensure the grout surface meets the member edges throughout their lengths and matches the surface elevation of the members with a tolerance of  $\pm 1/8$  inch.

#### **501-3.14 PLACING ANCHOR BOLTS.**

Secure anchor bolt assemblies where shown on the Plans.

When casting anchor bolts in concrete, secure anchor bolts before placing concrete in the forms. Do not disturb anchor bolts after concrete has been placed.

When installing anchor bolts in pipe sleeves, pre-cast holes, cored holes, or drilled holes, completely fill the cavity with grout. Do not allow water to freeze in the cavity. Do not allow foreign material in the cavity.

#### **501-3.15 UTILIDUCTS, PIPES, CONDUITS, DUCTS, AND UTILITY HOLES.**

When utiliducts, pipes, conduits, and ducts will be encased in concrete, install them in the forms before placing the concrete. Support the utiliducts, pipes, conduits, and ducts to prevent displacement during concrete placement.

Install utiliducts and utility holes parallel to the roadway centerline unless noted otherwise. Prevent bond between the utiliducts and concrete by tightly wrapping the utiliducts with at least two layers of asphalt felt.

#### **501-3.16 REMOVING CONCRETE.**

Do not damage other portions of the structure remaining in place when removing concrete.

Determine and delineate the extent of removal area. Outline the area with a 3/4-inch deep saw cut to form faces perpendicular to the surface prior to the removal of concrete. Do not cut or damage existing reinforcing steel or prestressing steel. During the course of removal, the Engineer may suspend removal or may require additional removal and outline saw cut.

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Use any combination of mechanical methods, water-blast cleaning, or abrasive-blast cleaning to remove coarse or broken concrete until a dense, uniform surface of concrete exposing solid coarse aggregate is obtained. When using mechanical methods for removal of concrete, meet the following:

1. Use impact tools weighing less than 15 lbs.
2. Operate impact tools at an angle less than 45 degrees relative to the surface of the concrete being removed.
3. Use hand tools such as hammers and chisels or small air chisels, water blast cleaning, or abrasive blast cleaning to remove final particles of unsound concrete.

During the removal operation do not damage existing reinforcing steel, prestressing steel, or concrete to remain in place.

Before applying the repair material, clean the surface according to ASTM D4258 within 24 hours of applying the repair material.

Use water meeting the requirements of [Subsection 712-2.01](#) for removal operations.

### **501-3.17 CRACK EVALUATION.**

The Engineer will evaluate concrete that is cracked during execution of the Contract. Measure cracks at their widest point.

For concrete decks and approach slabs, allow the Engineer to inspect any surface cracking immediately after termination of concrete curing operations, before prestressing (if applicable), and before releasing falsework. If any 500 square foot portion of the concrete deck or approach slab has cracks, whose width exceeds 0.020 inches and combined lengths total more than 16 feet, treat the surface by performing low-viscosity resin crack repair.

For other concrete, cracks will be evaluated based on the crack width.

1. For crack widths equal to and greater than 0.060 inches, the concrete will be considered unacceptable.
2. For cracks widths equal to and greater than 0.013 inches but less than 0.060 inches, the Engineer will evaluate the cracked concrete for structural adequacy and durability. If the Engineer determines the crack may affect structural adequacy or durability, the Engineer may reject the concrete, the structure, or a portion of the structure. If the Engineer determines the cracked concrete is acceptable, repair the crack by performing low-pressure crack repair according to [Subsection 501-3.18](#).
3. For cracks widths less than 0.013 inches wide, the crack will be considered acceptable with no additional evaluation or repairs required.

### **501-3.18 CRACK REPAIR.**

Perform crack repairs and replace unacceptable concrete at no cost to the Department. No contract time extension will be given for repairing, removing, and replacing unacceptable material.

1. Low-Pressure Crack Repair. Repair cracked concrete according to the following requirements:
  - a. Crack Repair Plan. Submit a crack repair plan to the Engineer. Do not repair the crack until the Engineer has approved the crack repair plan. Include the following in the crack repair plan:
    - (1) Experience of the injection equipment technicians
    - (2) Evaluation of the crack width and the recommended epoxy viscosity allowing the epoxy to achieve and maintain the penetration requirements
    - (3) Material information including manufacturer's product data sheets
    - (4) Equipment
    - (5) Crack preparation, injection procedures, and injection sequence
    - (6) Cleanup procedures
  - b. Experience. Provide epoxy injection technicians who have a minimum of 2 years experience in performing repairs using the methods and materials of the selected system.
  - c. Materials. Use epoxy adhesive for crack injection with viscosity capable of filling at least 90 percent of the crack volume. Use epoxy adhesive for crack sealing capable of containing the epoxy adhesive for crack injection.
  - d. Equipment. Use positive displacement plural component pumps, specifically designed to meter, mix, and to inject epoxy, and capable of filling at least 90 percent of the crack volume.
  - e. Surface and Crack Preparation. Remove contaminants and other foreign material reducing the effectiveness of the surface seal and repaired crack. Allow adequate time for drying. If cleaning solutions are used, perform trial tests to verify the contaminants can be removed. Prepare the surface and crack according to the epoxy manufacturer's instructions.
  - f. Entry and Venting Ports. Install entry/venting ports spaced equal to the thickness of the concrete member along one face of the crack. Acceptable types of entry/venting ports are fittings inserted into drilled holes, bonded flush fittings, and gasket devices covering unsealed portions of interrupted seals, allowing injection of epoxy directly into the crack without leaking epoxy.
  - g. Mixing Epoxy for Crack Sealing. Mix the epoxy adhesive for crack sealing to the volume ratio prescribed by the manufacturer.
  - h. Surface Sealing. Seal the surface of the crack with epoxy adhesive for crack sealing.
  - i. Mixing Epoxy for Crack Injection. Mix the epoxy adhesive for crack injection to the volume ratio prescribed by the manufacturer.

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- j. Epoxy Injection. Assure the crack seal is cured and capable of containing the crack injection epoxy. Inject the epoxy according to the epoxy manufacturer's instructions. Do not inject epoxy until the air, substrate, and epoxy are within the manufacturer's application temperature range. Limit injection pressure to prevent propagation of the crack, prevent additional damage, and injection pressure in excess of 50 psi.
    - (1) Inject the epoxy in the sequence noted in the approved crack repair plan. Ensure at least 90 percent of the crack volume is filled.
    - (2) Maintain the epoxy temperature within the manufacturer's application temperature range during injection operations and until the epoxy is cured.
  - k. Finishing and Cleanup. After the injected epoxy is cured, remove ports and surface seal flush with the concrete surface. Do not damage the injected epoxy and do not heat the surface seal to aid in removal.
2. Low-Viscosity Resin Crack Repair. When concrete deck or approach slab crack repair is required, the Engineer will define the repair area with the following boundary limits:
- a. Beginning and ending on straight lines perpendicular to the direction of traffic and extending across the entire width of the concrete deck or approach slab, between the concrete barriers or curbs.
  - b. Beginning and ending at least 5 feet beyond the furthest opposing cracks, measured from where the crack widths exceeds 0.020 inches

If grinding is required, treat the concrete before grinding.

Before treatment, ensure the concrete surface is clean, sound and free of foreign materials that may reduce the effectiveness of the repaired cracks. If the concrete surface becomes contaminated before placing the resin, repeat the cleaning process.

Apply low-viscosity resin to the repair area. Protect barriers, railing, joints, and drainage facilities to prevent contamination by the treatment material.

Completely cover the deck surface with resin so the resin penetrates and fills cracks. Ensure the relative humidity is less than 80 percent, the prepared area is dry, and the surface temperature is at least 50°F and not more than 90°F when the resin is applied. Apply the resin and distribute excess material within the manufacturer's listed pot life. For textured surfaces, including grooved surfaces, remove excess material from the texture indentations.

For concrete decks and approach slabs not receiving a waterproofing membrane, apply aggregate for abrasive finish within 20 minutes of resin application and before setting occurs. Broadcast the aggregate for abrasive finish evenly over the entire treated area at a rate of 1.5 to 2.5 pounds per square yard.

### **501-3.19 CLEANUP.**

Remove concrete splatter, paint marks, laitance, rust staining, chamfer strips, and other material not providing a uniform texture and color to the concrete surface.

**501-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

1. Cubic Yard. The lesser of the actual volume or neat line volume of each class of concrete accepted in place in the finished structure.
2. Class DS Concrete. The sum of the lengths of drilled shafts complete in place, measured along the centerline of the drilled shaft from the bottom to the top.
3. Precast Concrete Members. Measured per unit, complete in place.

Crack repair for unacceptable concrete will not be measured for payment.

**501-5.01 BASIS OF PAYMENT.**

Material not appearing in the Bid Schedule and contained within, embedded, or attached to concrete elements is subsidiary.

Crack repair for unacceptable concrete is subsidiary.

Precast Concrete Member. Payment for precast concrete member includes materials and work for the following items: Class P concrete, reinforcing steel contained in the member, prestressing steel, plates, nuts, inserts contained within the concrete member, bolts, studs, anchor bars, blockouts, elastomeric bearing pads, grout, drains, and other miscellaneous steel embedded in or attached to the precast concrete member.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
501.0001.____	Class A Concrete	LS
501.0002.____	Class A-A Concrete	LS
501.0004.____	Class A Concrete	CY
501.0007.____	Precast Concrete Member, (Identification)	EACH
501.0009.____	Class DS Concrete, (Identification)	LF

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## SECTION 503 REINFORCING STEEL

### 503-1.01 DESCRIPTION.

Furnish and place reinforcing steel for reinforced concrete structures.

### 503-1.02 DEFINITIONS.

**BAR SIZE / DIAMETER.** Nominal dimensions equivalent to those of a circular area having the same weight per foot as the AASHTO/ASTM designated bar.

**COVER.** The minimum distance between the surface of embedded reinforcing steel and the outer surface of the concrete.

**HOOK.** A bend in the end of a bar.

**HOOP.** A one-piece closed tie or continuously wound tie, with hooked or welded ends, enclosing the longitudinal reinforcing steel.

**LATERAL REINFORCING STEEL.** Reinforcing steel perpendicular to the length of a concrete member.

**LONGITUDINAL REINFORCING STEEL.** Reinforcing steel parallel to the length of a concrete member.

**LOT.** A defined quantity.

**SPIRAL.** Continuously wound reinforcing steel in the form of a cylindrical helix.

**STIRRUP.** Lateral reinforcing steel formed of individual or paired units, open or closed, used to resist shear and diagonal tension stresses in a structural member.

**TIE.** Reinforcing steel with hooked ends tied at right angles to and enclosing the other reinforcing steel, and used to provide confinement.

### 503-2.01 MATERIALS.

Reinforcing Steel Bars	Subsection <a href="#">709-2.01</a>
Epoxy-Coated Reinforcing Steel Bars	Subsection <a href="#">709-2.01</a>
Headed Reinforcing Steel Bars	Subsection <a href="#">709-2.01</a>
Epoxy Coating Patch Material	Subsection <a href="#">709-2.01</a>
Bar Supports	Subsection <a href="#">709-2.03</a>
Epoxy for Bonding Dowels	Subsection <a href="#">712-2.21</a>

## CONSTRUCTION REQUIREMENTS

### 503-3.01 PLACING DRAWINGS.

Submit placing drawings, detailed according to ACI 315, Chapter 3.

Do not substitute reinforcing steel bars of different size, material, coating, or grade without prior approval of the Engineer. When substituting epoxy-coated reinforcing steel for uncoated reinforcing steel, protect and repair epoxy-coated bars according to [Subsection 503-3.02](#).

### 503-3.02 PROTECTION OF MATERIALS.

Protect reinforcing steel from damage. Before placing reinforcing steel in the work, ensure that the reinforcing steel is free of salt and foreign substances that may affect the performance of the reinforcing steel.

Do not weld or tack weld reinforcing steel, unless otherwise noted.

Do not field cut reinforcing steel unless approved by the Engineer. Do not flame cut reinforcing steel.

Do not drop or drag the epoxy-coated reinforcing steel bars or bundles.

Store epoxy-coated reinforcing steel off the ground.

Protect epoxy-coated reinforcing steel from sunlight, salt spray, and weather exposure. The Engineer may reject epoxy-coated reinforcing steel when the cumulative environmental exposure time, including uncovered storage time after coating application to full embedment in concrete, exceeds 2 months.

The Engineer may reject epoxy-coated reinforcing steel when the extent of damaged coating exceeds 2 percent of the surface area in any 1-foot length of bar. When the extent of damaged coating does not exceed 2 percent of the surface area in any 1-foot length of bar, repair damaged coating. Coating damage includes cracks, abrasions, chips, bond loss (the coating can be removed with a peeling action by the finger), and exposed steel areas visible to a person with normal or corrected vision. Repair coating damage before visible oxidation appears on the steel surface.

Protect mechanical splice assemblies, headed bar assemblies, and connecting elements (including bar ends) against physical damage, corrosion, and coating damage. Keep assemblies and connecting elements clean and free of foreign materials that adversely affect the performance of the assembly.

1. Repairing Damaged Epoxy-Coating. Clean and remove disbonded areas of coating. Remove loose and deleterious materials. The Engineer may reject epoxy-coated reinforcing steel when the removed coating exceeds 2 percent in any 1-foot length of bar or if the weight, dimensions, cross-sectional area, or tensile properties are less than the minimum requirements of the applicable specification.

Use an approved epoxy coating patch material according to the material manufacturer's recommendations. Apply patching material according to the patching material manufacturer's instructions. Allow the patching material to cure before placing concrete. The Engineer may reject epoxy-coated reinforcing steel when the surface area covered by patching material exceeds 5 percent in any 1-foot length of bar.

Rejected epoxy-coated reinforcing steel may not be substituted for uncoated reinforcing steel or used as bar supports.

### **503-3.03 FABRICATION.**

Fabricate reinforcing steel to the size and dimension shown on the Plans. Reinforcing steel dimensions shown are out-to-out of bar, unless otherwise noted.

Meet fabrication tolerances in ACI 117, Section 2.1.

Weld reinforcing steel according to AWS D1.4. and meet the Qualifications and Submissions requirements of Subsection 503-3.05.3 b.

1. Bends. Bend bars when the bar temperature is above 45°F and less than 150°F. Bend bars to the diameter shown on the Plans. If the bend diameter is not shown, bend the bar with

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inside diameters as shown in **Table 503-1**. The Engineer may reject reinforcing steel bent with an inside diameter less than the minimum diameter shown in Table 503-1.

Do not re-bend or straighten bars without approval by the Engineer.

**TABLE 503-1  
BEND DIAMETER**

BAR SIZE	STIRRUPS AND TIES	STANDARD HOOKS AND OTHER BENDS
No. 3	1½"	2¼"
No. 4	2"	3"
No. 5	2½"	3¾"
No. 6	4½"	4½"
No. 7	5¼"	5½"
No. 8	6"	6"
No. 9	-	9½"
No. 10	-	10¾"
No. 11	-	12"
No. 14	-	18¼"
No. 18	-	24"

Fabricate bar end hooks meeting the following requirements:

a. Stirrup and Tie Hooks.

(1) 90° Hook: 90° bend plus:

- (a) For No. 5 bar and smaller, a 6.0 nominal bar diameter extension at the free end of the bar.
- (b) For No 6, No. 7, and No. 8 bars, a 12.0 nominal bar diameter extension at the free end of the bar.

(2) 135° Hook: 135° bend plus a 6.0 nominal bar diameter extension, but not less than 2.5 inches, at the free end of the bar.

b. Standard Hooks.

(1) Std 180° Hook: 180° bend plus a 4.0 nominal bar diameter extension, but not less than 2.5 inches, at the free end of the bar.

(2) Std 90° Hook: 90° bend plus a 12.0 nominal bar diameter extension at the free end of the bar.

2. Bar Repairs. The Engineer will evaluate improperly bent bars and bars bent at locations not required by the Plans for structural adequacy and durability. Do not repair improperly bent bars until the bars are inspected by the Engineer and the Engineer approves repairing the bar. Bars repaired prior to inspection by the Engineer may be rejected. If, in the opinion of the Engineer, the bend is of such extent or character as to affect the strength or durability of the bar, the Engineer may reject the bar. Otherwise, the bar may be re-bent or straightened by means meeting the requirements of this Section and in a manner that will not damage the material, coating, or concrete.

If the Engineer approves repairing the bar, preheat the reinforcing steel before bending. Apply heat by any method that does not damage the reinforcing steel or concrete. Preheat



the reinforcing steel at least 5.0 nominal bar diameters in each direction from the center of the bend but do not extend preheating below the surface of the concrete. Insulate concrete within 6 inches of the heated bar area. Do not allow the temperature of the reinforcing steel at the concrete interface to exceed 500°F. Preheat the reinforcing steel to at least 1100°F. Ensure the maximum reinforcing steel temperature never exceeds 1200°F. Maintain a uniform temperature throughout the thickness of the bar by using at least 2 heat tips simultaneously at opposite sides of bars larger than No. 6. Maintain the preheat temperature of the reinforcing steel until bending or straightening is complete. Make the bend gradually with smooth continuous application of force. When straightening, move a bender progressively around the bend. When bending or straightening is complete, gradually reduce the temperature of the reinforcing steel to the ambient air temperature. Do not artificially cool the bars with water, forced air, or any other means.

**503-3.04 PLACING AND FASTENING.**

Place reinforcing steel in the position as shown on the Plans. Secure the reinforcing steel to prevent movement during concrete placement. Do not place bars in addition to those shown on the Plans without prior approval of the Engineer. Do not place bars of different size, material, or grade without prior approval of the Engineer. Space reinforcing steel evenly unless noted otherwise. Provide 2 inches of concrete clear cover, measured from the surface of the reinforcing steel to the outside surface of the concrete, unless noted otherwise.

Do not place bars on layers of fresh concrete or adjust bars while placing concrete.

1. **Fastening Requirements.** Tie the bars with No. 14 or No.16 gauge steel wire. When the spacing between bars is 1 foot or more, tie the bars at all intersections. When the bar spacing is less than 1 foot, tie every other intersection. If the Plans require bundled bars, tie bundled bars together at not more than 6-foot centers. Tie all intersections of epoxy-coated reinforcing steel in the top mat of concrete decks and approach slabs. Use wire coated with plastic, epoxy, or similar non-conductive material when tying epoxy-coated reinforcing steel. Obtain the Engineer's written authorization before welding reinforcing steel. Provide at least 1 inch clear cover to the tie wire by turning the tie wire away from concrete surfaces.

For slip-formed concrete, tie reinforcing steel at all intersections. Provide additional reinforcing steel cross bracing to keep the cage from moving during concrete placement. Place cross bracing both longitudinally and transversely.

2. **Bar Supports.** Maintain distances from the forms using approved precast mortar blocks, metal supports, or plastic supports strong enough to resist permanent movement under construction loads. If supports extend to exposed concrete surfaces, use metal or plastic supports. To support and fasten epoxy-coated reinforcing steel, use plastic supports or metal supports coated with plastic, epoxy, or similar non-conductive material. Do not use wooden or aluminum supports.

Place supports at frequent intervals to maintain the cover between the reinforcing and the surface of the concrete. Space supports under concrete deck reinforcing steel and approach slab reinforcing steel not more than 4 feet apart in each direction.

**503-3.05 SPLICING.**

Splice reinforcing steel bars at locations shown on the Plans and specified in this Section. Obtain the written approval of the Engineer before splicing bars at other locations. The Engineer will evaluate splices at locations not designated in the Contract documents for structural adequacy.

Splice reinforcing steel bars using lap splicing, welded butt joints, electric resistance butt welded joints, welded lap splicing, mechanical butt splicing, or mechanical lap splicing, unless noted

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otherwise. Do not splice reinforcing steel bars at locations where splices in the reinforcing steel are not allowed.

Splices will not be permitted in bars 40 feet or less in plan length, unless otherwise noted in the Contract documents. For bars exceeding 40 feet in plan length, ensure the distance center-to-center of splices is not less than 30 feet, with no individual bar length less than 10 feet. Stagger splices in adjacent bars, unless otherwise noted. Stagger lap splices a distance greater than the lapped splice length. Stagger butt splices at least 2 feet.

Reinforcing steel may be continuous at locations where splices are noted in the Contract documents.

Do not use lap splicing for No. 14 or No. 18 bars.

Do not lap splice spiral reinforcing steel. Anchor each end unit of reinforcing steel spiral by lapping the free end of the spiral to the continuous spiral and using either a welded lap splice or a mechanical lap splice.

Do not field weld epoxy-coated reinforcing steel bars.

### 1. Lap Splicing.

- a. General. Place reinforcing steel bars in contact and securely tie the bars together. Provide a minimum clear distance of 2 inches between the spliced bars and the nearest adjacent bar. Do not reduce the minimum clearance to the surface of the concrete.

Use lapped splices meeting the minimum lengths as shown in Table 503-2, unless otherwise noted:

**TABLE 503-2  
LAPPED SPLICE LENGTH**

<b>BAR SIZE</b>	<b>UNCOATED</b>	<b>EPOXY-COATED</b>
No. 3	1' - 4"	1' - 11"
No. 4	1' - 9"	2' - 7"
No. 5	2' - 2"	3' - 3"
No. 6	2' - 7"	3' - 10"
No. 7	3' - 5"	5' - 2"
No. 8	4' - 6"	6' - 9"
No. 9	5' - 9"	8' - 7"
No. 10	7' - 3"	10' - 10"
No. 11	8' - 11"	13' - 4"

- b. Qualifications and Submittals. No qualifications apply when lap splicing.
- c. Testing/Inspection. Field verify lap splice length.

### 2. Electric Resistance Butt Welded Joints.

- a. General.

Produce electric resistance butt welds by a fabricator qualified by California Department of Transportation (Caltrans).

Correct deficiencies in materials and workmanship without additional compensation.

Do not weld or tack brackets, clips, shipping devices or other material not required by the Contract documents to the reinforcing steel, unless shown on the approved working drawings.

- b. Qualifications and Submittals. At least 30 days prior to welding, submit for approval the fabricator's proof of Caltrans qualification for electric resistance butt welding and the following:

- (1) Welding procedure (WPS) and pertinent welding information and calibration
- (2) Equipment operators' name and qualifications
- (3) Equipment name and serial number
- (4) Description of identification and tracking system
- (5) Quality control inspector's name and qualifications
- (6) Quality control manual and procedures
- (7) Type and extent of Nondestructive Examination (NDE) to be conducted, as required in the specifications
- (8) Nondestructive testing personnel qualifications
- (9) Sample QC and Test Reports

- c. Testing/Inspection.

Perform job control tests using a testing laboratory with experience with ASTM A370 and California Test 670. A job control test consists of the fabrication, under the same conditions used to produce the splice, and the physical testing of 4 sample splices for each lot of splices. An authorized Department representative will designate when samples for job control tests are to be fabricated and will determine the limits of the lot represented by each job control test.

A lot of shop produced resistance welded butt joints is defined as no more than 150 splices of the same type of welds used for each combination of bar size and bar deformation pattern that is used in the work.

The Engineer or the Engineer's authorized representative shall witness the job control tests performed by the testing laboratory. Give the Engineer at least 7 working days' notice before beginning control tests.

Identify sample splices with tamper proof and weatherproof markings prior to shipment to the testing laboratory.

The sample shall consist of a resistance welded butt splice bar and a control bar that are identified and marked as a set. The same reinforcing bar (hoop) may be used to provide the test weld and control bar.

Test each sample to failure in accordance with ASTM A370 including Appendix A9, *Methods for Testing Steel Reinforcing Bars*, and Caltrans December 1, 2013 California Test 670. Determine the ultimate tensile strength for all control bars by testing the bars to failure.

The production lot will be rejected if:

- (1) a sample fails within one bar diameter of the splice at less than 95 percent of the ultimate tensile strength of the associated control bar
- (2) necking of the bar prior to rupture, as defined in California Test 670, is not observed
- (3) a sample does not meet the mechanical requirements of ASTM A706 Grade 60

3. Welded Lap Splicing.

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- a. General. Use direct lap joint welds conforming to the requirements in AWS D1.4 except as noted below.

Use the joint details and dimensions as shown in Figure 3.4 (A), "Direct Lap Joint with Bars in Contact" of AWS D1.4.

Use electrodes classified as "Nickel-Steel" as referenced in AWS A5.5, A5.28, or A5.29.

- b. Qualifications and Submittals. Perform welds using qualified welders and qualified Welding Procedure Specifications (WPS) meeting AWS D1.4. The operator and procedure qualification tests may be performed simultaneously.

Perform quality control inspection necessary to ensure the materials and workmanship meets the requirements of the Contract documents using an inspector currently certified as an AWS Certified Welding Inspector (CWI) according to the provisions of AWS QC1.

Submit a welding plan stamped and signed by the CWI responsible for quality control and consisting of the following documents:

- (1) Quality control inspector qualifications including CWI number.
- (2) Welding Procedure Specifications (WPS).
- (3) Procedure Qualification Records (PQR) and test results.
- (4) Welder Performance Qualification Records (WPQR) with documentation of current welder certification.
- (5) Type and extent of Nondestructive Examination (NDE) to be conducted, as required in the specifications.
- (6) Nondestructive testing personnel qualifications.
- (7) Methods of protecting the welding area.
- (8) Certified test report(s).

Submit quality control inspection documents, test results, and required test assemblies.

- c. Testing/Inspection. Perform inspection according to AWS D1.4.

### 4. Mechanical Butt Splices.

- a. Types. Use one of the following types of mechanical butt splices:

- (1) Sleeve-Threaded Mechanical Butt Splices. Use a sleeve-threaded mechanical butt splice consisting of a steel splice sleeve with tapered interior threads that joins the bars with matching tapered threads.
- (2) Sleeve-Swaged Mechanical Butt Splices. Use a sleeve-swaged mechanical butt splice consisting of a seamless steel sleeve applied over the ends of the reinforcing steel bars and swaged to the bars by means of a hydraulic press.
- (3) Sleeve-Lock Shear Bolt Mechanical Butt Splices. Use a sleeve-lock shear bolt mechanical butt splice consisting of a seamless steel sleeve with serrated steel strips welded to the inside of the sleeve, center hole with centering pin, and bolts tightened until the bolt heads shear off and the bolt ends are embedded in the reinforcing steel bars.
- (4) Two-Part Sleeve-Forged Ends Mechanical Butt Splices. The two-part sleeve-forged ends bar type of mechanical butt splices consists of a shop machined two-part threaded steel sleeve coupling forged ends of the reinforcing steel bar.

- b. General. Conform to the manufacturer's instructions when splicing.

Cut the reinforcing steel bars perpendicular to the long axis of the bar.

Provide a clear cover of not less than 1-1/2 inches measured from the surface of the concrete to the outside of the splice sleeve. Adjust stirrups, ties and other reinforcing steel if necessary to provide clear cover.

For epoxy-coated bars, use epoxy-coated mechanical splices.

Mark each splice with the lot, heat, or batch number that identifies the splice.

- c. Qualifications and Submittals. A splice will be considered qualified if the splice can develop a minimum tensile strength of 80000 psi, based on the nominal bar area, and the bars within the splice do not exceed a total slip shown in **Table 503-3**, when tested according to ASTM A370, including Appendix A9 and California Test 670.

**TABLE 503-3  
TOTAL SLIP LENGTH**

Reinforcing Bar No.	Total Slip (inch)
4	0.020
5	0.020
6	0.020
7	0.028
8	0.028
9	0.028
10	0.036
11	0.036
14	0.048
18	0.060

Submit the following information:

- (1) the manufacturer's name;
  - (2) the name of the product or assembly;
  - (3) the lot, heat, or batch number that identifies the splice;
  - (4) the bar grade and size number to be spliced by the material;
  - (5) a complete description of the splice and installation procedure; and,
  - (6) test results indicating the splice, used according to the manufacturer's procedures, complies with the minimum tensile strength requirements and the total slip requirements.
- d. Testing/Inspection. Perform job control tests consisting of the fabrication, under conditions used to produce the splice, and tensile testing of 6 sample splices for each lot of splices. The Engineer will designate when samples for job control tests are to be fabricated and will determine the limits of the lot represented by each job control test.

A lot of mechanical butt joints is defined as no more than 150 splices of the same type of mechanical butt splice used for each combination of bar size and bar deformation pattern that is used in the work.

Make splice samples using the same splice materials, position, equipment, and following the same procedures as used to make splices in the work. Make splice samples at least

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5 feet long with the splice at mid-length. Shorter sample splice bars may be used if approved by the Engineer.

Perform job control tests in the presence of the Engineer. Splices tested in the absence of the Engineer may be rejected. Notify the Engineer, in writing, at least 7 working days prior to performing testing.

Identify sample splices with weatherproof markings prior to shipment to the testing laboratory.

Test each sample according to ASTM A370, including Appendix A9. Tensile test each sample until partial or total fracture of the parent bar material, mechanical splice material, or bar-to-splice connection.

All splices in the lot represented by a test will be considered to meet the tensile strength requirements when the minimum individual tensile strength of the sampled splices is not less than 80000 psi, based on the nominal bar area.

### 5. Mechanical Lap Splices.

- a. General. Conform to the manufacturer's instructions when splicing.

Provide a clear cover of not less than 1-1/2 inches measured from the surface of the concrete to the outside of the splice sleeve. Adjust stirrups, ties and other reinforcing steel if necessary to provide clear cover.

For epoxy-coated bars, use epoxy-coated mechanical splices.

Mark each splice with the lot, heat, or batch number that identifies the splice.

- b. Qualifications. A splice will be considered qualified if the splice can develop a minimum tensile strength of 75000 psi, based on the nominal bar area, when tested according to ASTM A370, including Appendix A9.

Submit the following information:

- (1) the manufacturer's name;
- (2) the name of the product or assembly;
- (3) the lot, heat, or batch number that identifies the splice;
- (4) the bar grade and size number to be spliced by the material;
- (5) a complete description of the splice and installation procedure; and,
- (6) test results indicating the splice, used according to the manufacturer's procedures, complies with the minimum tensile strength requirements.

- c. Testing/Inspection. Perform job control tests consisting of the fabrication, under conditions used to produce the splice, and tensile testing of 6 sample splices for each lot of splices. The Engineer will designate when samples for job control tests are to be fabricated and will determine the limits of the lot represented by each job control test.

A lot of mechanical butt joints is defined as no more than 150 splices of the same type of mechanical butt splice used for each combination of bar size and bar deformation pattern that is used in the work.

Make splice samples using the same splice materials, position, equipment, and following the same procedures as used to make splices in the work. Make splice samples at least 5 feet long with the splice at mid-length. Shorter sample splice bars may be used if approved by the Engineer.

Perform job control tests in the presence of the Engineer. Splices tested in the absence of the Engineer may be rejected. Notify the Engineer, in writing, at least 7 working days prior to performing testing.

Identify sample splices with weatherproof markings prior to shipment to the testing laboratory.

Test each sample according to ASTM A370, including Appendix A9. Tensile test each sample until partial or total fracture of the parent bar material, mechanical splice material, or bar-to-splice connection.

All splices in the lot represented by a test will be considered to meet the tensile strength requirements when the minimum individual tensile strength of the sampled splices is not less than 75000 psi, based on the nominal bar area.

### **503-3.06 HEADED BAR REINFORCING STEEL.**

Use headed bar reinforcing steel consisting of deformed reinforcing steel bars with a head attached to one or both ends. Attachment can be accomplished through welding or forging of heads onto the bar ends, by internal threads in the head mating to threads on the bar end or by a separate threaded nut to secure the head to the bar. Heads may be forge formed, machined from bar stock, or cut from plate.

Perform production control tests consisting of the installation, using the same procedure as used in the work, and tensile testing of 3 sample headed bar assemblies for each lot of heads.

A production lot of headed bar reinforcing steel is defined as no more than 150 headed bar assemblies of the same bar size, with heads of the same size and type, and manufactured by the same method, produced from bar material of a single heat number and head material of a single heat number. For bars having heads on both ends, the bar will be counted as 2 reinforcing steel bars for the purposes of establishing and testing production lots.

Test each sample according to ASTM A970.

All headed bar assemblies in the lot represented by a test will be considered to meet the tensile strength requirements when the minimum individual tensile strength of the sampled headed bar assemblies meets the tensile strength requirements of ASTM A970. Failure of one or more sample headed bar assemblies will result in the rejection of the entire lot.

Provide the test reports to the Engineer for approval prior to placing concrete.

### **503-3.07 DRILLING AND BONDING DOWELS.**

Install dowels at locations shown on the Plans or as authorized by the Engineer. Drill holes by methods that do not shatter or damage the concrete adjacent to the holes. Do not damage reinforcing steel or prestressing steel when drilling through reinforced concrete members, unless approved by the Engineer. The Engineer will evaluate holes in which reinforcing steel or prestressing steel is encountered during drilling for structural adequacy and durability.

Drill each hole to the diameter and depth recommended by the manufacturer to develop the ultimate strength of the dowel or to the depth shown on the Plans, whichever is greater.

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Prepare each hole according to the manufacturer's instructions before placing the epoxy and the dowels. Fill the hole with epoxy and install the dowel according to the manufacturer's instructions. Completely fill drilled holes with epoxy using a method that will not trap air or create voids. Support dowels and prevent movement during curing. Do not disturb the dowels until the epoxy has cured.

Do not use dowels made from epoxy-coated reinforcing steel, except as noted on the Plans.

**503-3.08 PLACEMENT TOLERANCES.**

When placing reinforcing steel, do not reduce the total number of bars specified. Place reinforcing steel within the following tolerances:

1. Clear Cover: +1/4 inch, -3/8 inch, but not reducing the clear cover to less than 1 inch (or the minimum clear distance specified in the contract documents or Plans, whichever is greater)
2. Placement of Reinforcing Steel: ±1/2 inch.
3. Spacing of Reinforcing Steel: ± One-quarter of the specified spacing, but not to exceed 1 inch.
4. Spacing for Bundled Reinforcing Steel: 1 inch or 2 times the individual nominal bar diameter between bundles, whichever is greater.
5. Embedment Length and Length of Lap Splices: -1 inch for No. 3 through No. 11 bars, -2 inches for No. 14 and No. 18 (embedment only).
6. Location of Bends in Bars and Ends of Bars: ±2 inch.

**503-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

Drill and Bond Dowels. Measured per dowel, complete in place.

**503-5.01 BASIS OF PAYMENT.**

Reinforcing Steel. Reinforcing steel will be paid for at the Contract lump sum price. The lump sum price is full compensation for furnishing, fabricating, placing, splicing, heading, inspecting and testing reinforcing steel as indicated in the Contract documents. Increase in weight of reinforcing due to splices, heads, and additional support bars will not be paid for.

Payment for reinforcing steel used in precast concrete members is included in the Contract price for the precast members, as provided in **Section 501**.

Drill and Bond Dowels. Payment for Drill and Bond Dowels includes materials and work for installing dowels.

Payment for reinforcing steel used in minor structures is subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
503.0001._____	Reinforcing Steel	LS
503.0002._____	Epoxy-Coated Reinforcing Steel	LS
503.0003._____	Drill and Bond Dowels	EACH





## **SECTION 504 STEEL STRUCTURES**

### **504-1.01 DESCRIPTION.**

Construct steel structures and the structural metal portions of composite structures according to the Plans and in accordance with Chapter 15 of the 2023 edition of AREMA.

Furnish, fabricate, erect, and coat structural metals shown on the Plans, including structural steel of all grades, bolts and fasteners, stud shear connectors, welding, special and alloy steels, metallic electrodes, steel forgings and castings, and iron castings. Furnish, fabricate, and install incidental metal construction and elastomeric material not otherwise provided for, according to the Contract.

### **504-2.01 MATERIALS.**

Use materials that conform to the following:

Paint	Subsection <a href="#">708-2.01</a>
Structural Steel	Section <a href="#">716</a>
Arc Welding Electrodes	Section <a href="#">716</a>
Fasteners	Section <a href="#">716</a>
Steel Grid Floors	Section <a href="#">716</a>
Steel Pipe	Section <a href="#">716</a>
Galvanizing	Section <a href="#">716</a>
Steel Forgings	Section <a href="#">718</a>
Steel Pins & Rollers	Section <a href="#">718</a>
Castings	Section <a href="#">719</a>

With written approval, substitute a grade of steel, for that specified, for a particular application where it is desired. Substituted steel must be equal or superior in both physical and chemical properties.

## **CONSTRUCTION REQUIREMENTS**

### **504-3.01 FABRICATION.**

Fabricate railway bridges in accordance with Part 3, Chapter 15 of the 2023 edition of AREMA, and the following:

1. Shop Inspection. Furnish 30 days' notice of when work will begin at the fabrication shop to allow for an inspection.

Furnish 4 signed copies of mill reports covering all steel used on the project.

2. General. Fabricate steel bridge members, except for rolled shapes, at a plant certified under the American Institute of Steel Construction (AISC) Quality Certification Program for Steel Bridge Fabricators at the "Advanced Bridge" level with a Fracture Control Endorsement.

Protect structural steel from corrosion, dirt, grease, or other foreign matter. Store structural steel at least 12 inches above the ground.

Dimensional tolerances must conform to AREMA Chapter 15 Article 3.1.7.

Ensure that rolled material is straight before being laid off or worked. If straightening is necessary, use methods that will not injure the metal. Do not use material with sharp kinks or bends.

Steel or wrought iron may be flame cut provided a mechanical guide is used to secure a smooth surface. Flame cut by hand only where approved, and smooth the surface by planing, chipping, or grinding. Manipulate the cutting flame to avoid cutting beyond the prescribed lines. Fillet re-entrant cuts to a radius of at least 3/4 inch.

Ensure that finished members are true to line and free from twists, bends, and open joints.

Plane sheared edges of plates more than 5/8 inch thick and carrying calculated stresses to a depth of 1/4 inch deep. Fillet re-entrant cuts before cutting.

Make sure the surface finish of bearing and base plates and other bearing surfaces that will contact each other or concrete meets the surface roughness requirements as defined in ANSI/ASME B-46.1, surface roughness, waviness and lay, Part I and Section 5.9, Chapter 15 of the most current edition of AREMA:

Steel slabs	ANSI 2,000
Masonry Bearing Plates (surface in contact with rubber)	500
Heavy Plates in contact to be welded or bolted	250
Milled ends of compression members, stiffeners, and fillers	ANSI 500
Rocking surfaces of rocker plates	250
Slide bearings	ANSI 125

Face and bring to an even bearing abutting joints in compression members and girder flanges, and in tension members where specified on the drawings. Where joints are not faced, keep the opening at 1/4 inch or less.

Build floor beams, stringers, and girders with end construction angles to the exact length shown on the Plans, as measured between the heels of the connection angles. The permissible tolerance is plus 0 inch to minus 1/16 inch. Where continuity is required, face end connections.

Cold bend load-carrying rolled-steel plates as follows:

Take the rolled-steel plates from the stock plates so that the bend line is at right angles to the direction of rolling. Before bending, round the edges of the plate to a radius of 1/16 inch throughout the portion of the plate to be bent.

Bend until the radius of the bends, measured to the concave face of the metal, is not less, and preferably more, than shown in the following table, where T is the thickness of the plate.

Angle Through Which Plate is Bent	Minimum Radius
61-90 degrees	1.0 T
91-120 degrees	1.5 T
121-150 degrees	2.0 T

If a shorter radius is essential, bend the plates when hot, but not shorter than a radius of 1.0 T.

Fit up and attach end and intermediate stiffeners as shown on the Plans. Do not weld ends of stiffeners and other attachments to flanges unless shown on the Plans.

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Submit shop drawings in one complete submittal package. Partial or incomplete submittals will not be reviewed or considered. Partial or incomplete submittals will be rejected. No additional contract time will be permitted due to partial, incomplete, or inadequate submittals.

3. Shop Splices. In addition to those shown on the Plans, girder webs and flanges may contain a maximum of 2 shop splices per plate per span. Indicate all splices on the shop drawings. These splices are subject to approval and are subject to the following limitations:

Make splices complete penetration butt welds. Grind flange splices flush. Grind web splices flush on the outside face of exterior girders only. Grind parallel to the longitudinal axis of the girder.

Do not place a bottom flange splice within the middle third of any span. Use tension flange splices only as shown on the Plans or as approved.

Completely weld each element of a girder, such as flange or web, before attaching it to another element.

Make all splices at least 6 inches from the nearest stiffener plate. Offset web and flange splices at least 6 inches.

4. Bolt Holes. Either drill or punch bolt holes. Make finished bolt holes 1/16 inch larger than the nominal diameter of the bolt. Ensure holes are clean cut and without burrs or ragged edges. Material with poorly matched holes will be rejected.

When material forming parts of a member is composed of not more than 5 thicknesses of metal, and whenever the thickness of the metal is not greater than 3/4 inch for structural carbon steel or 5/8 inch for alloy steel, either punch or drill the holes to full size.

When there are more than 5 thicknesses or when any of the main material is thicker than 3/4 inch in carbon steel, or 5/8 inch in alloy steel, or when required under paragraph 7 below, subpunch or subdrill the holes 3/16 inch smaller. After assembling, ream them to size or drill them from the solid to full size.

For punched holes, the diameter of the die must not exceed the diameter of the punch by more than 1/16 inch. Ream any holes that must be enlarged to admit bolts.

Ream holes cylindrical and perpendicular to the member. Direct reamers mechanically, where practicable.

Ream and drill using twist drills. Assemble connecting parts requiring reamed or drilled holes and securely hold them while reaming or drilling them. Match mark them before disassembling.

Subpunch (or subdrill if required) holes for field connections and field splices of arch members, continuous beams, towers (each face), bents, plate girders, and rigid frames while assembled in the shop. Obtain approval of the assembly, including camber, alignment, and accuracy of holes and milled joints before beginning reaming.

Subpunch and ream holes for floor beam and stringer field end connections to a steel template, or ream them while assembled. When partial assembly is permitted ream holes for web member connections with steel templates.

When using templates to ream field connections of web members of an arch, bent or tower, mill or scribe at least one end of each web member normal to the long axis of the member. Accurately set the templates at both ends from this milled or scribed end.

Ream or drill the full size of the field connection through templates after carefully locating the templates as to position and angle and firmly bolting them. Use exact duplicate templates used to ream matching members or the opposite faces of one member. Accurately locate templates for connections that duplicate so that like members are duplicates and require no matchmarking.

Accurately punch holes full-size, subpunch them, or subdrill them so that after assembling (before reaming), a cylindrical pin 1/8 inch smaller in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member, without drifting, in at least 75 percent of the contiguous holes in the same plane. If the requirement is not fulfilled, the badly punched pieces will be rejected. If any hole will not pass a pin 3/16 inch smaller in diameter than the nominal size of the punched hole, the material will be rejected.

Ream or drill holes so that 85 percent of the holes in any contiguous group after being reamed or drilled show no offset greater than 1/32 inch between adjacent thicknesses of metal.

Provide in steel templates hardened steel bushings in holes accurately dimensioned from the center lines of the connection as inscribed on the template. Use the center lines to locate accurately the template from the milled or scribed ends of the members.

5. Shop Assembling. Completely shop assemble the entire structure. When the Contract Documents indicate "partial assembly," assemble continuous beams and plate girders in lengths of 3 or more abutting panels.

Clean metal surfaces in contact before assembling them. Assemble, pin well, and firmly draw together the parts of a member with bolts before beginning reaming. Make milled ends of compression members in full bearing before starting reaming. Take apart assembled pieces, if necessary, to remove burrs and shavings produced by reaming. Keep the members free of twists, bends, and other deformities.

To prepare to shop bolt material punched full-size, spear-ream the bolt holes, if necessary, to admit the bolts. Make the reamed holes no more than 1/16 inch larger than the nominal diameter of the bolts.

Secure end connection angles, stiffeners, and similar parts using shipping bolts to prevent damage in shipment and handling.

Furnish a camber diagram showing the camber at each panel for each truss. Take the camber from actual measurement while the truss is assembled, or base it on calculated values when full assembly is not required.

Allow holes to drift during assembly only as needed to position the parts, and not enough to enlarge the holes or distort the metal. To enlarge holes to admit the bolts, ream them.

Match mark connecting parts assembled in the shop to allow for reaming holes in field connections. Furnish a diagram showing the marks.

6. Bolted Connections, High-Strength Bolts. Make all bolted connections in accordance with Section 3.2 of Chapter 15 of the most current edition of AREMA and the following:

Determine bolt lengths by adding the values given in **Table 504-1** to the total thickness of connected material. These values compensate for thickness of nut, bolt point, and washers. Add 5/32 inch to the grip length per each additional flat washer. Adjust the total length to the next longer 1/4 inch increment up to a 5 inch length and to the next longer 1/2 inch increment for lengths over 5 inches.

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Fit bolted parts solidly together when assembling them and do not separate them by gaskets or other interposed compressible material. Place hardened washers under the turned element.

**TABLE 504-1  
BOLT LENGTH DETERMINATION**

<b>Bolt Diameter (inches)</b>	<b>Added Length (inches)</b>
1/2	11/16
5/8	7/8
3/4	1
7/8	1-1/8
1	1-1/4
1-1/8	1-1/2
1-1/4	1-5/8

Keep assembled joint surfaces, including those adjacent to washers, free of scale except tight mill scale. Clean off dirt, loose rust, burrs, and other defects that would prevent the parts from seating. Keep contact surfaces free of oil, paint, or lacquer.

When the outer face of the bolted parts has a slope of more than 1:20, use a smooth beveled washer in contact with the sloped surface.

Tighten fasteners to give at least the required minimum tension values shown in **Table 504-2** when the joint is completed. Use bolts and nuts made by the same manufacturer in a connection.

**TABLE 504-2  
MINIMUM TENSION OF INSTALLED BOLTS**

<b>Bolt Size (inches)</b>	<b>Required Minimum Tension (pounds)</b>	
	<b>Grade A325 Bolts</b>	<b>Grade A490 Bolts</b>
1/2	12,000	15,000
5/8	19,000	24,000
3/4	28,000	35,000
7/8	39,000	49,000
1	51,000	64,000
1-1/8	64,000	80,000
1-1/4	81,000	102,000
1-3/8	97,000	121,000
1-1/2	118,000	148,000

Use **zinc coated** load indicating washers (direct-tension indicators), in accordance with 2023 AREMA 15.3.2.3.h. Demonstrate the suitability of the device by testing a representative sample of at least three devices for each diameter and grade of fastener used in the structure. Test with a calibration device capable of indicating bolt tension. Include in the test assembly flat, hardened washers, if required in the actual connection, arranged as those in the actual connection to be tensioned. Demonstrate with the calibration test that the device indicates a tension at least 5 percent greater than that required by **Table 504-2**. Follow manufacturer's installation procedures when installing bolts in the calibration device and in all connections. Be careful to properly install flat, hardened washers when using load indicating devices with bolts installed in oversized or slotted holes and when using the load indicating

devices under the turned element. The load indicating device will count as one washer for the purpose of determining bolt length. Use load indicators and hardened washers in accordance with 2023 AREMA 15.3.2.3.d.

The device must indicate full tensioning requirement defined in 2023 AREMA 15.3.2.3.h.(3).

Install bolts in all holes of the connection and bring them to a snug tight condition. Then, tighten fasteners, progressing systematically from the most rigid part (usually near the center) of the connection to the free edges, or as directed. Keep previously tightened fasteners from relaxing. Multiple systematic tightening cycles may be required.

Do not reuse high-strength bolts that have been tensioned beyond snug tight unless otherwise approved by the Engineer. Remove previously fully tightened bolts that were loosened by tightening adjacent bolts. Replace them with new bolts, nuts, and load indicating devices.

7. Welding. Perform welding in accordance with Section 3.3.1 of Chapter 15 of the 2023 edition of AREMA and the following:

Perform all welding and Nondestructive Examination (NDE) as specified or shown on the Plans. Conform to ANSI/AASHTO/AWS *Bridge Welding Code* D1.5 when welding new steel bridge girders, beams, and stringers. Conforming to Section 1.14, Chapter 15 of the 2023 edition of AREMA when welding on Fracture-Critical Members. Conform to the *Structural Welding Code* AWS D1.1 when welding all other steel structures.

At least 30 days prior to welding, submit for approval a welding plan stamped and signed by an American Welding Society Certified Welding Inspector per QC1 (CWI) responsible for the Quality Control (QC) and consisting of the following documents

- a. Quality control personnel qualifications including CWI number
- b. Welding Procedure Specifications (WPS) using forms in AWS D1.1, Sample Welding Forms
- c. Procedure Qualification Records (PQR) when applicable, using forms in AWS D1.1, Sample Welding Forms
- d. Welder Performance Qualification Records (WPQR) using forms in AWS D1.1, Sample Welding Forms with documentation of current welder certification
- e. Type and extent of NDE to be conducted, as required in the specifications

Using a CWI, perform all quality control inspection necessary to ensure the materials and workmanship meet the requirements of the contract documents. Submit results to the Owner on a weekly basis.

The Fabricator shall be responsible for obtaining inspection services from an independent third-party inspection firm to perform Nondestructive Examination (NDE) as specified on the Plans.

Correct deficiencies in materials and workmanship revealed by Quality Control and Quality Assurance inspections per AWS D1.5 and retest until they pass inspection without additional compensation. Furnish all completed quality control inspection documents.

Do not weld or tack brackets, clips, shipping devices, or other material not required by the Contract documents to the permanent structure, unless shown on the Plans and approved by the Engineer.

All field welds, transverse tack welds on tension flanges, and partial penetration groove welds are prohibited unless specifically called for in the Plans.

**504-3.02 ERECTION.**

Erect railway bridges in accordance with Part 4, Chapter 15 of the 2023 edition of AREMA, and the following:

1. General. Provide the falsework and all tools, machinery, and appliances, including driftpins and fitting-up bolts, needed to perform the work efficiently. Erect the structural steel, remove the temporary construction, and do the work to complete the structure, as required by the Contract Documents. Make temporary field welds to structural steel according to the procedures required by these Specifications. Steel with sharp kinks or bends will be rejected.
2. Handling and Storing Materials. Store material in accordance with Chapter 15, Section 4.8 of the most current edition of AREMA on skids above the ground. Keep it clean and properly drained. Place girders and beams upright and shore them. Adequately support long members, such as columns and chords, on skids to prevent injury from deflection.
3. Falsework. Use falsework according to **Section 512** and Chapter 15 of the most current edition of AREMA.
4. Erection Plan. Submit an erection plan for approval stamped by a Professional Engineer registered in the State of Alaska. Submit the erection plan not less than 30 days prior to erecting the structural steel. Do not erect structural steel without the written approval of the Engineer.

The erection plan must include, but is not limited to the following:

- a. Drawings indicating geometry, member sizes, material properties, foundations capacities, design assumptions, and other relevant information required to erect the structural steel.
- b. Support and lifting reactions for each stage of the erection procedure.
- c. Equipment type, size, capacity, position, work radius and other relevant information.
- d. Schedule, duration of each portion of work and other timing considerations.

If multiple segments will be connected and supported or lifted as a single member, the following additional information is required:

- e. Stress sheets for each state of the erection procedure.
- f. Deflection diagrams including camber effects and adjustments.
- g. Bolted field splice stress calculations
- h. Falsework, if required, details and supporting calculations in accordance with **Section 512**.

The erection plan shall conform to the requirements of Chapter 15, Section 4.11 of the most current edition of AREMA and the Contract Documents. Do not exceed the permissible stresses defined in Chapter 15, Section 4.13 of the 2023 edition of AREMA using a construction load factor of 1.25 for essentially static loads and 1.50 for dynamically applied loads. The Engineer will make the determination which loads shall be designated as static and dynamic loads.

Do not induce buckling or other instabilities at any time during shipping, handling or erection.

Submit changes needed to accommodate the erection plan for approval. Do not submit shop drawings until the Engineer has approved the erection plan.

Submit plans and calculations for the erection plan in one complete submittal package. Partial or incomplete submittals will not be reviewed or considered. Partial or incomplete submittals will be rejected. No additional contract time will be permitted due to partial, incomplete, or inadequate submittals.



Do not deviate from the approved erection plan without the written permission of the Engineer.

5. Assembling Steel. Accurately assemble the parts as shown on the Plans in accordance with Chapter 15, Section 4.15 of the 2023 edition of AREMA. and follow match-marks. Handle the material carefully to avoid bending, breaking, or otherwise damaging the parts. Do not hammer if doing so will injure or distort the members. Clean bearing surfaces and surfaces to be in permanent contact before assembling the members.
6. Attachment of Formwork. When approved, use 1-inch maximum diameter holes in steel girder webs for attaching formwork. Place holes 6 inches minimum clear distance from all horizontal or vertical welds and space them at least 4 feet center to center. Drill or subpunch and ream holes. Do not provide empty bolt holes. Fill empty holes with tensioned high-strength bolts. Welding on any portion of the superstructure to attach formwork is not permissible without written consent from the Chief Engineer.

Include in the request enough detail of the formwork for determining the stresses that will be imposed on the girder.

### **504-3.03 PAINTING.**

1. Preparing Metal Surfaces for Painting. Prepare metal surfaces according to Specification SSPC-SP 10, Near White Blast Cleaning to a profile depth of 1 to 3 mils. Use a profile comparator to ensure minimum profile depth. Do not reuse sand or flint abrasives.

Clean grit or shot of contamination before reusing it. Blow dust and grit from the surface with clean dry air. Remove weld spatter and round sharp edges to a smooth curve. To remove contamination, jet wash or scrub with a stiff brush and clear water or brush blast. Remove light rust with a steel brush or mechanical tool.

2. Schedule of Paint Coats for Metals. Unless otherwise specified, if structural steel will be exposed to weathering, shop-paint it at least 3 coats: prime coat, intermediate coat, and finish coat.
3. Painting Metal Surfaces.

- a. Time of Application. Apply 1 or more applications of prime coat. Apply the initial application within 4 hours after blast cleaning. Allow the manufacturer's recommended drying time between primer applications. Before painting and after preparing the surface, remove any oil, grease, soil, dust, or foreign matter on the surface. If rusting occurs after the surface is prepared, clean the surface again.

Avoid contaminating cleaned surfaces with salts, acids, alkali, or other corrosive chemicals before applying the prime coat and between applications of the remaining coats of paint. Remove any contamination from the surface.

- b. Storage of Paint and Thinner. Store paint and thinner in a separate building or in a room that is well ventilated and free from excessive heat, sparks, flame, or direct sun rays. Keep paints susceptible to damage from freezing in a heated storage space when necessary.

Leave paint containers unopened until required for use. Use open containers first. Seal left-over, partial containers.

Do not use paint that has begun to polymerize, solidify, gel, or deteriorate.

- c. Mixing and Thinning. Mix paint thoroughly before use and agitate often during application.

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Do not transfer paint mixed in the original container until all settled pigment is incorporated into the vehicle. Pouring off part of the vehicle temporarily to simplify mixing, is permitted.

Mix by mechanical methods, except use hand mixing for containers up to 5 gallons.

Do not use an air stream bubbling under the paint surface to mix paint or keep it in suspension. Remove and discard any skin that has formed in the container. Do not use the paint if the skin exceeds 2 percent of the paint volume.

When mixing paint, break up all lumps, completely disperse settled pigment, and create a uniform composition. If mixing by hand, pour off most of the vehicle into a clean container.

Lift the pigment in the paint from the bottom of the container using a broad, flat paddle. Break up lumps and thoroughly mix the pigment with the vehicle. Return the poured-off vehicle to the paint by simultaneously stirring or pouring repeatedly from one container to another until the composition is uniform. Inspect the bottom of the container for unmixed pigment.

Wet tinting pastes or colors with a small amount of thinner, vehicle, or paint and thoroughly mix them. Add the thinned mixture to the large container of paint and mix until the color is uniform.

If paint does not have a limited pot life, or does not deteriorate on standing, mix it at any time before use. However, if it has settled, remix it immediately before use. Do not keep paint in spray pots, painters' buckets, etc., overnight. Gather it into a container and remix it before use.

When the Engineer deems it necessary to obtain satisfactory application, add paint thinner according to the manufacturer's instructions.

- d. Application of Paint. Use the oldest of each kind of paint first. Apply paint by spraying. Use brushes, daubers, or sheepskins when no other method can properly apply paint in difficult access areas. Use dipping, roller coating, or flow coating only when authorized.

Blast clean all areas with mudcracking in the zinc-rich primer and then paint them with primer to the specified thickness.

After applying the prime coat, apply the intermediate and finish coats to exposed surfaces according to the manufacturer's recommendations.

Apply the intermediate coat in 2 applications. Apply the first application as a mist coat. Apply the second application after the mist coat has dried to a set-to-touch condition.

Apply the finish coat in 1 application.

Apply paint within the environmental limitations specified by the coating manufacturer. Do not apply paint when the temperature of the steel surface is less than 40 °F or more than 125 °F.

Do not apply paint in fog or mist, when it is raining or snowing, or when the relative humidity exceeds the manufacturer's recommendations. Do not apply paint to wet or damp surfaces. Do not apply paint on frosted or ice-coated surfaces.

With approval, apply paint in damp or cold weather, and only under the following conditions. Paint the steel under cover and protect and shelter it, or heat the surrounding air and the steel to a satisfactory temperature. Meet the above temperature and humidity

conditions. Keep the steel under cover or protected until it is dry or until weather conditions permit its exposure.

Allow to dry any applied paint exposed to freezing, excess humidity, rain, snow, or condensation. Then, remove damaged areas of paint, prepare the surface again, and repaint it with the same kind as the undamaged areas.

Stripe paint before applying each coat of paint. Spot paint edges, corners, crevices, rivets, bolts, welds, and sharp edges before applying the full coat of paint on the steel. Extend striping for at least 1 inch from the edge. Let this stripe coat dry before applying the full coat, if possible. Otherwise, set-to-touch the stripe coat before applying the full coat. However, do not permit the stripe coat to dry long enough to allow the unprimed steel to rust.

Apply each coat of paint as a continuous film of uniform thickness, free of pores. Repaint any thin spots or areas missed in the application. Allow them to dry before applying the next coat.

Wait until each coat of paint is in the proper state of cure or dryness before applying the next coat.

Ensure a minimum dry film thickness of 3 mils and a maximum dry film thickness of 5 mils for each coat of paint. The dry film thickness of the paint will be measured in place with a calibrated magnetic film thickness gauge. If any coat of paint is thinner than specified, obtain the minimum dry film thickness by applying additional coats of paint.

A Tooke gauge may be used to perform destructive testing of each coat's dry film thickness. Repair damaged areas.

- e. Brush Application. Brush paint areas inaccessible to a spray gun. Work paint into crevices and corners. Paint surfaces not accessible to brushes using daubers or sheepskins. Brush out runs or sags. Leave a minimum of brush marks in the applied paint.
- f. Spray Application of Paint. To apply paint by spraying, use equipment capable of properly atomizing the paint to be applied. Use equipment with pressure regulators and gauges and use air caps, nozzles, and needles recommended by the equipment manufacturer for the material being sprayed. Keep the equipment in satisfactory condition to permit proper paint application. In closed or recirculating paint spray systems, where gas is used under pressure over the liquid, use an inert gas, such as nitrogen.

Provide adequately sized traps or separators to remove oil and water from the compressed air. Drain them periodically during operations. Ensure that the air from the spray gun impinging against the surface shows no water or oil.

Keep paint ingredients properly mixed in the spray pots or containers while applying the paint. Use either continuous mechanical agitation or frequent intermittent agitation.

Adjust the pressure on the material in the pot and adjust the air pressure at the gun for optimum spraying effectiveness. Adjust the pressure on the material in the pot when changing the elevation of the gun above the pot. Keep the atomizing air pressure at the gun high enough to atomize the paint properly but not so high as to cause the paint to fog or the solvent to evaporate, or to cause loss by overspray.

Keep spray equipment clean to avoid depositing dirt, dried paint, and other foreign materials in the paint film. Remove any solvents left in the equipment before applying paint to the surface.

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Apply paint in a uniform layer, overlapping at the edge of the spray pattern. During application, hold the gun perpendicular to the surface and at a distance that will deposit a wet layer of paint on the surface. Release the gun's trigger at the end of each stroke.

Apply coats free of runs, sags, and dry spray.

- g. Shop Painting. Perform shop painting after fabrication and before the surface is damaged from weather or other exposure.

Do not paint shop contact surfaces. Paint surfaces to be in contact after field erection.

Apply only a mist coat (0.5 to 0.8 mil dry film thickness) of inorganic zinc-rich primer, meeting SSPC Paint Specification No. 30, Weld-Through Inorganic Zinc Primer, Class 5, on the following surfaces:

- (1) High strength bolted connection contact surfaces
- (2) Top flange steel surfaces
- (3) Areas within 2 inches from the edges to be welded
- (4) Areas where the full 3 coats of paint will interfere with field assembly

Apply the full paint coats specified to steel surfaces that will contact wood.

Remove anti-weld spatter coatings before painting.

Before abrasive blasting, grind smooth all metal defects, fins, slivers, burrs, weld spatter, and sharp edges from shearing or similar operations, including flame hardened edges from cutting or burning. Grind flame hardened edges to a 1/16 inch minimum radius. Repair defects that become evident after abrasive blasting or prime coat application. Retexture the surface to match the blasted profile.

Copy erection marks and weight marks on areas that have been previously painted with the shop coat.

- h. Field Painting. If steel surfaces have not received the full paint coats, paint them as soon as possible after erection.

Touch up metal that has been shop coated with the same type of paint as the shop coat. Touch up by cleaning and painting field connections, welds, bolts and all damaged or defective paint and rusted areas.

If concreting or other operations damage any paint, clean the surface and repaint it. Remove concrete spatter and drippings before applying paint.

Protect wet paint against damage from dust or other detrimental foreign matter.

- i. Drying of Painted Metal. Allow the paint to dry before recoating or exposing it. Do not add a dryer to paint on the job unless the paint specification calls for one. Do not immerse painted metal until the paint has dried. Protect paint from rain, condensation, contamination, snow, and freezing until dry.
- j. Handling of Painted Steel. Do not handle painted steel until the paint has dried except for turning it for painting or stacking it for drying. Minimize damage to paint films from stacking steel members.

Remove paint that is damaged during handling and touch it up with the same number of coats and kinds of paint previously applied.

Wait until painted steel is dry before loading it for shipment.

Repair damaged galvanized coating per **Subsection 716-2.07**.

- k. **System Durability and Certification.** Have the coating manufacturer review the project and the proposed service environment and issue you written recommendations and instructions to properly prepare the surface, apply the coating, and achieve maximum durability on this project.

Certify to the Department that the system was applied according to the manufacturer's recommendations and instructions. Enclose a copy of the recommendations and instructions with the certificate.

**504-3.04 CLEANUP.**

Upon completion and before final acceptance of the structure, remove falsework and falsework piling down to 2 feet below the finished ground line.

**504-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

Structural steel measured by weight, will include castings, forgings, alloy steels, steel plates, high-strength bolts and nuts, anchor bolts and nuts, stud shear connectors, shoes, rockers, rollers, pins and nuts, expansion dams, roadway drains and scuppers, weld metal, and structural shapes for expansion joints and pier protection.

The weight of the metal in the completed structure will be computed, based on the following:

- 1. **Unit Weights, pounds per cubic foot:**

Aluminum, cast or rolled	173
Bronze or copper alloy	536
Copper sheet	558
Iron, cast	445
Iron, malleable	470
Lead, sheet	707
Steel, cast or rolled, including alloy, copper bearing, and stainless	490
Zinc	450

- 2. **Shapes, Plates, Railing and Flooring.** By their nominal weights and dimensions as shown on the contract drawings, deducting for copes, cuts and open holes, exclusive of bolt holes. The weights of plates more than 36 inches wide will include an estimated overrun computed as one-half the "permissible variation in thickness and weight" as tabulated in ASTM A 6.

The weight of railing will be included as structural steel unless the bid schedule contains a pay item for bridge railing under **Section 507**.

The weight of steel grid flooring will be computed separately.

- 3. **Castings.** From the dimensions shown on the Plans, deducting for open holes. To this weight will be added 5 percent for fillets and overruns. Scale weights may be used for castings of small complex parts, since it would be difficult to compute their weight accurately.

- 4. **Welds.** From the following for shop and fillet welds:

<u>Size of weld (inches)</u>	<u>Pounds per linear foot</u>
1/4	0.20

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5/16	0.25
3/8	0.35
1/2	0.55
5/8	0.80
3/4	1.10
7/8	1.50
1	2.00

The weight of other welds will be computed on the basis of the theoretical volume from dimensions of the welds, adding 50 percent to the weight to allow for overrun.

5. High-Strength Bolts. From the following for bolt heads and nuts for high-strength bolts:

<u>Bolt Diameter (inches)</u>	<u>Pounds per 100 Heads or Nuts</u>
5/8	15
3/4	25
7/8	37
1	50
1-1/8	75

6. Excluded Items. The weight of the following will not be measured: erection bolts, shop and field paint, galvanizing; boxes, crates, and other containers used for shipping; together with sills, struts, and rods used for supporting members during transportation; and bridge hardware connectors used for joining timber members.

**504-5.01 BASIS OF PAYMENT.**

If no pay item is included in the bid schedule for structural steel, the quantities of metal drains, scuppers, conduits, ducts and structural shapes for expansion joints and pier protection measured as provided above, will be paid for as reinforcing steel under Section 503.

No additional payment will be made for increases in structural steel quantities due to the Contractors erection method.

Structural steel for precast or prestressed concrete bridges is subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
504.0001._____	Structural Steel	LS
504.0002._____	Structural Steel	LB

## **SECTION 510 REMOVAL OF CONCRETE FOR REPAIRS**

### **510-1.01 DESCRIPTION.**

Remove, wholly or in part, and satisfactory dispose of concrete to the depth and limits shown on the Plans and/or as directed. Remove all unsound (spalled, cracked and/or delaminated) concrete.

### **510-2.01 MATERIALS.**

Use falsework meeting **Section 512**.

### **CONSTRUCTION REQUIREMENTS**

#### **510-3.01 GENERAL.**

Perform work to meet the applicable requirements of **Section 202**.

Prevent damage to reinforcing steel designated to remain in place.

Following the concrete removal, the Engineer will inspect any exposed reinforcing steel. Remove and replace bars or sections of bars that are damaged or deteriorated at any point to less than 80 percent of their original cross section, including cracked or broken bars.

Remove sufficient concrete to allow for splicing of a new piece of reinforcing steel. Extend the spliced reinforcing steel 32 inches beyond each end of the damage or deterioration.

Replace damaged or deteriorated steel reinforcing bars under General Condition Article 10, if:

1. not damaged by Contractor operations, or
2. damage from milling is a result of the concrete cover being 1 inch or less.

#### **510-3.02 METHOD OF REMOVAL.**

Remove concrete to specified depth using hydrodemolition equipment. For areas of the deck not accessible to hydrodemolition, use mechanical impact methods. You may use power operated rotary milling machines to scarify the upper deck to a nominal depth of 3/4 inch.

#### **510-3.03 MILLING.**

Use rotary type milling machines, capable of scarifying a minimum width of 4 feet per pass.

#### **510-3.04 HYDRODEMOLITION.**

1. Equipment. Use high-pressure water pumping system, low-pressure water filtration and feed systems, and remote-control stations for two remote-controlled demolishing units. Ensure a nozzle pressure of 25,000 psi.

Employ qualified personnel, certified by the equipment manufacturer, to operate the equipment. Submit operator certification(s) to the Engineer for approval before beginning concrete removal operation.

2. Concrete Removal. Perform concrete deck removal as shown on the Plans. Perform hydrodemolition removal resulting in a rough finished surface, free of debris.

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Before concrete removal begins, the Engineer will select a trial area of sound concrete of the deck approximately 30 ft<sup>2</sup> in size. Advance the demolishing unit over this area and establish the operating parameters to achieve the depth of removal called for on the Plans. Submit a list of operating parameters to be used for production work to the Engineer for approval.

During production work, the Engineer may require recalibration of the equipment if, in the Engineer's opinion, satisfactory concrete removal is not being obtained.

Remove debris immediately after demolition operation to prevent rebonding to the surface of sound concrete. Remove any material which is allowed to rebond without extra compensation and with no contract time extension. Avoid damage to remaining sound concrete and reinforcing steel.

Furnish and erect rigid safety shields adjacent to hydrodemolition equipment, or otherwise protect adjacent traffic and property from flying debris.

Protect traffic from hazardous glare of work lights during nighttime operations.

Furnish water to operate the hydrodemolition equipment.

3. Controlling Wastewater and Debris. Submit a work plan no less than 5 working days prior to the preconstruction conference describing environmental protection and procedures including BMPs for hazardous and non-hazardous waste, including but not limited to testing, handling, treatment, temporary storage, transportation, and disposal according to federal, state, and local requirements. The plan must be stamped by an Engineer registered in the State of Alaska and must be acceptable to the Alaska Department of Environmental Conservation.

Perform the following:

- a. Capture and contain all wastewater and debris within the work area.
  - b. Filter wastewater to ensure that it is free of concrete particles and sediment before being discharged.
4. Reinforcing Steel. Clean all reinforcing steel that is to remain in place and has been exposed by removal operations. Remove all rust and corrosive products immediately prior to concrete placement. Remove oil, dirt, concrete fragments, laitance, loose scale, and other coating that would destroy or inhibit the bond with the new concrete.

Protect cleaned reinforcing steel from the elements and from contamination. Sandblast reinforcing steel contaminated as a result of your failure to provide adequate protection, at your expense.

### **510-3.05 MECHANICAL METHODS.**

In areas not accessible to hydrodemolition remove concrete by mechanical impact methods to the same depth as adjacent areas. Avoid damage to sound concrete structures by the improper use of mechanical tools. Repair, cracked or damaged structures, as required.

Also use mechanical methods if either of the following conditions exists:

1. There is unsound concrete remaining after the hydrodemolition is done in an area
2. There is a lack of bond between the existing concrete and the reinforcing steel

If unsound concrete exists or if the bond is broken around existing reinforcing steel, remove concrete to provide a 3/4 inch minimum clearance around the reinforcing steel. Do not damage any of the existing reinforcing steel that is to remain in place.



Operate the mechanical impact tool at angles less than 45 degrees as measured from the deck surface to the tool. Do not use jack hammers heavier than the nominal 30 lb class or chipping hammers heavier than the nominal 15 lb class.

**510-3.06 Cleanup.**

Following concrete removal, clean the job site and remove debris. Dispose of debris at a Department of Environmental Conservation approved landfill. Remove dust and loose particles by flushing with water and/or vacuum cleaning.

**510-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and by the area of removed surface, regardless of the depth of removal.

**510-5.01 BASIS OF PAYMENT.**

The contract price includes full compensation for containment structures, debris collection systems, wastewater filtration systems, disposal of debris, and incidentals required to complete the work.

Removal and disposal of incidental items such as deck drains or dowels, repair of electrical conduits, replacement of electrical conduit expansion fittings, removal and reinstallation of pipe hangers, and removal and reinstallation of light fixtures or illuminated signs, are subsidiary.

Payment for falsework is covered under **Section 512**.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
510.0001. _____	Removal of Concrete For Repairs	SF

## **SECTION 512 FORMS AND FALSEWORK**

### **512-1.01 DESCRIPTION.**

Design, construct, maintain and remove forms and falsework used to form or temporarily support structural concrete until the structure is self supporting.

### **512-1.02 DEFINITIONS.**

**COMPRESSIVE STRENGTH.** See definitions in [Subsection 501-1.02](#).

**FALSEWORK.** A temporary structure erected to support the permanent structure, in the process of construction, until the permanent structure attains adequate strength to become self-supporting and capable of supporting other imposed loads.

**FORMS.** Also known as formwork, are a temporary structure or mold used to retain the plastic concrete in its designated shape while the concrete is curing and gaining sufficient strength to maintain its designated shape.

**HAUNCH.** A thickened portion of a concrete deck filling the space between the top of the girder and the bottom of the roadway slab.

**INFORMATIONAL FIELD TEST.** See definitions in [Subsection 501-1.02](#).

### **512-2.01 MATERIALS.**

As specified or approved.

## **DESIGN AND CONSTRUCTION REQUIREMENTS**

### **512-3.01 SUBMITTALS.**

1. Falsework Plan. When complete details for falsework are not shown on the Plans, prepare and submit a falsework plan, prepared and sealed by a Professional Engineer registered in the State of Alaska. When the structure is not open to traffic and is not over or adjacent to railroads or roadways, a falsework plan and independent design check are not required.

Include detailed working drawings, material specifications, and supporting calculations to allow for complete review of the falsework plan. For manufactured or proprietary falsework components, include the manufacturer's information, technical bulletins, design data, and other necessary information used in the calculations.

Include an independent design check to verify that the design satisfies the Contract requirements. Perform the independent design check by a Professional Engineer registered in the State of Alaska. Independent means the Professional Engineer performing the independent design check is not associated as a subordinate, subsidiary, employee, or member of the business employing the Professional Engineer sealing the falsework design.

Submit an independent design check letter, sealed by the Professional Engineer performing the independent design check, certifying the falsework plan meets the Contract requirements of this Section. Include the independent design check letter with the falsework plan submittal.

2. Falsework Inspection Verification. Prior to placing reinforcing steel or other loads, perform a falsework inspection by the Professional Engineer sealing the falsework design. Do not place reinforcing steel until a written verification, signed by the Professional Engineer sealing the

falsework design, stating that the falsework meets the design and construction requirements is provided to the Engineer.

3. Concrete Deck Haunch Dimensions. Prior to placing falsework, submit the girder elevations, required haunch dimensions, and supporting calculations for review. Ensure the haunch dimensions meet the requirements of **Subsection 512-3.05**.

### **512-3.02 FALSEWORK DESIGN.**

Design falsework according to the AASHTO Guide Design Specifications for Bridge Temporary Works and these specifications. When the structure is supported by falsework and is open to traffic, also design the falsework for highway loads according to the AASHTO Standard Specifications for Highway Bridges.

1. Falsework Foundations. Where spread footing type foundations are used, determine the bearing capacity of the soil and include the bearing capacity on the plans.

Design and construct pile type foundation according to this specification and Section 505.

2. Falsework Over Or Adjacent to Roadways. Provide a minimum vertical clearance of 17.5 feet through falsework, unless otherwise shown on the Plans. Install advance warning devices and vertical clearance signs at falsework openings according to the Alaska Traffic Manual. When the vertical clearance is less than 18.5 feet, post a W12-2 low clearance sign with a vertical clearance as 3 inches less than the minimum clearance.
3. Falsework Over Or Adjacent to Railroads. Meet the clearance requirements of the American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering.

### **512-3.03 FALSEWORK CONSTRUCTION.**

Construct falsework to conform to the approved falsework plan. Do not begin falsework construction without an approved falsework plan. Do not modify or alter the structure to accommodate falsework unless otherwise noted or authorized by the Engineer.

When welding falsework, meet the welding requirements of **Section 504**.

Build camber into the falsework to compensate for falsework deflection and anticipated structure deflection. Camber shown on the Plans or specified by the Engineer is for anticipated structure deflection only.

Do not use driven devices to attach falsework to concrete. Do not modify or alter the structure to attach falsework unless otherwise noted or authorized by the Engineer.

**512-3.04 FORMS.** For surfaces that are exposed in the completed work, use plywood forms meeting the requirements of the American Plywood Association (APA) grade High Density Overlaid (HDO) Plyform Class I or other approved material that will produce an equivalent smooth and uniform concrete surface. For other surfaces, use plywood forms meeting the requirements of the American Plywood Association (APA) grade B-B Plyform Class I. Use only form panels in good condition free of defects on surfaces in contact with concrete.

Furnish and place form panels for exposed surfaces in uniform widths of not less than 3 feet and in uniform lengths of not less than 6 feet except where the width of the member formed is less than 3 feet.

Arrange form panels in symmetrical patterns conforming to the general lines of the structure. Place panels for vertical surfaces with the long dimension horizontal and with horizontal joints level and continuous. For walls with sloping footings that do not abut other walls, placement of panels with the long dimension parallel to the footing is permitted.

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Follow the manufacturer's written recommendations when using form liners.

Increase the thickness of concrete members that receive an architectural finish to maintain the specified cover to reinforcing steel.

Bevel exposed corners and edges with 3/4 inch chamfers built into the forms.

Do not modify or alter the structure to attach forms unless otherwise noted or authorized by the Engineer. Form ties, anchors, and other devices may be cast into the concrete for supporting forms or for lifting precast members. Ensure form ties and anchors can be removed without damaging the concrete surface. Do not use driven devices to attach forms to concrete. Do not use anchors coated with materials that will stain the concrete for supporting forms. Construct metal ties or anchorages within the forms to permit their removal to a depth of at least 1 inch from the concrete surface without damage to the concrete.

Construct concrete forms mortar-tight. Clean the inside surfaces of forms free of contaminants that affect the concrete finish. When forms are supported by existing concrete, ensure the forms fit tightly against the existing concrete and mortar will not pass through the joint.

Forms may be omitted when the sides of a footing excavation is in rock. If the excavation is larger than the plan dimensions, any additional concrete placed will be at the Contractor's expense.

Coat forms to be removed with form release agent prior to use. Use a commercial quality product, designed specifically to release forms, and that will not discolor the concrete surfaces.

### **512-3.05 FORMS AND FALSEWORK FOR CONCRETE DECKS.**

Use forms and falsework that span between adjacent girders without altering or damaging the supporting girders. Hangers may be cast into the concrete for supporting deck falsework. Do not use driven devices to attach forms or falsework to concrete. Do not use materials that will stain the concrete to support the falsework. Construct hangers to permit their removal to a depth of at least 1 inch from the concrete surface without damage to the concrete.

Adjust the falsework haunch dimensions to accommodate the camber and elevation of the installed girders. Measure the installed girder elevations along the centerline of the girders at locations shown on the Plans after erection but before installing falsework, forms, reinforcing steel, or applying other loads. Determine the required haunch dimensions accounting for the variations in the girder elevations and anticipated deflection due to additional dead loads.

Prestressed concrete girder elevations shown on the Plans are based on estimated girder deflections at 40 and 120 days after release of the prestressing strands. The girder elevations shown in the Plans are intended to advise the Contractor as to the expected range of girder deflection at the time of deck forming.

Construct falsework supporting concrete work on steel structures so that loads applied to girder webs are applied within 6 inch of the flange or stiffener. Construct Falsework to distribute loads so that local distortion of the web is not produced.

1. Forms. Do not use permanent forms including metal, wood, or precast concrete for concrete deck construction, unless otherwise noted. Provide concrete deck forms meeting the following requirements:
  - a. Maintain the deck thickness despite irregularities in and between the girders.
  - b. Accommodate haunch variation along the length and between the girders.
2. Haunches. Limit haunch dimensions to meet the following requirements:

- a. 1/2 inch maximum embedment of the top flange into the deck measured at the edge of the flange.
- b. 2-1/2 inch minimum clearance between the top of deck and shear stud or shear stirrup.
- c. 2 inch minimum penetration of shear stud or shear stirrup into the deck.
- d. 4 inch maximum haunch measured at the centerline of the girder.

### **512-3.06 REMOVAL OF FORMS AND FALSEWORK.**

Remove forms and falsework without damaging the concrete member.

Forms may be removed after the concrete has cured for at least 24 hours, will not be damaged, and has a compressive strength of at least 1400 psi as determined from informational field test cylinders cured on the site under temperature and moisture conditions similar to the concrete in the structure. Protect exposed concrete surfaces from damage. Maintain curing operations according to Section 501 if forms are removed before curing operations may be terminated.

Completely remove forms, including the roadway deck forms, from cells of box girders which have permanent access. Unless otherwise shown in the Plans, the roadway slab interior forms in cells where no permanent access is available may be left in place.

Falsework may be removed after the concrete has a compressive strength, determined from informational field test cylinders cured on the site under temperature and moisture conditions similar to the concrete in the structure, as specified in [Table 512-1](#). If informational field test cylinders are not available, meet the minimum number of curing days specified in [Table 512-1](#).

Do not release falsework for cast-in-place prestressed portions of structures until the prestressing steel has been tensioned.

**TABLE 512-1  
FALSEWORK RELEASE CRITERIA**

<b>Structural Element</b>	<b>Percent of Specified 28-Day Strength (f'c), min.</b>	<b>Curing Days, min.<sup>1</sup></b>
(a) Concrete decks	70	10
(b) Simple span girders, slab bridges, cross beams, pier caps, struts, and top slabs of concrete box culverts	80	14
(c) Box girders	90	21
(d) Continuous span girders	90	21
(e) Other elements	80	14

<sup>1</sup> Cured according to Section 501.

### **512-3.07 CLEANUP.**

Upon completion of the structure and before final acceptance, leave the structure and entire site in a clean and orderly condition. Remove temporary structures, equipment, unused materials, debris, forms, and falsework. Remove falsework piling at least 2 feet below the finished ground line, unless noted otherwise.

### **512-4.01 METHOD OF MEASUREMENT.**

Forms and Falsework will not be measured for payment.

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**512-5.01 BASIS OF PAYMENT.**

When either Item 512.0001.\_\_\_\_ or 512.0002.\_\_\_\_ does not appear in the bid schedule, the work required for that item is subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
512.0001.____	Forms	LS
512.0002.____	Falsework	LS

## SECTION 516 EXPANSION JOINTS, BEARINGS, AND WATERSTOPS

**516-1.01 DESCRIPTION.** Furnish and install expansion joints, bearings, and waterstops.

**516-2.01 MATERIALS.** Use materials that conform to the following:

Grout	Subsection 701-2.03
Bridge Seals	Subsection 705-2.03
Expanded Polyethylene	Subsection 705-2.06
Structural Steel	Section 716
Elastomeric Bearing Pads	Subsection 720-2.01
Epoxy Adhesive for Elastomeric Bearing Pads	Subsection 720-2.02
Polytetrafluoroethylene (PTFE) Bearings	Subsection 720-2.03
Waterstops	Section 723

### CONSTRUCTION REQUIREMENTS

**516-3.01 EXPANSION JOINTS.** Locate and form expansion joints as shown on the Plans.

1. Shop Drawings. Provide shop drawings for expansion joints having a total movement of more than 1.75 inches. Submit drawings showing installation procedures and joint assembly details. Install joints only after shop drawings are approved.

2. Manufacture and Fabrication.

- a. Open Joints. Place open joints where shown on the Plans. Remove forms without chipping or breaking the corners of the concrete. Do not extend reinforcement across an open joint, unless shown on the Plans.
- b. Filled Joints. Construct expansion joints with expanded polyethylene joint filler as thick as the width of the joint.

Cut the joint filler to the same shape and size as the adjoining surfaces. Fix the joint filler against the concrete surfaces in place to keep the joint filler from displacing when concrete is placed.

Immediately after removing the forms, inspect the expansion joints. Remove concrete or mortar that has sealed across the joint.

- c. Compression Seals. Shape the joint as shown on the Plans. Install the seal according to the manufacturer's instructions.

Install the seal in one piece for the full width of the roadway joint. Install the seal immediately after the curing period of the concrete.

- d. Strip Seals. Use expansion joint strip seals in one piece for the length of the joint. Shape the steel components to conform to the section of the concrete. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint.

Install the expansion joints according to the manufacturer's recommendations. Adjust the joint opening for the dimensions indicated on the Plans.

- e. Steel Joints. At the shop, shape the plates, angles, or other structural components to conform to the section of the concrete. Fabricate and paint structural shapes to meet the

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specifications covering those items. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint. Meet the joint opening dimension shown on the Plans.

- f. Modular Seals. Shape the joint as shown on the Plans. Use expansion joint modular seals in one piece for the length of the joint. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint.

Install the expansion joints according to the manufacturer's recommendations. Adjust the joint opening for the dimensions indicated on the Plans.

- g. Silicone Expansion Joint Seals. Prepare concrete surface by sandblasting each face until the surface is roughened and all contaminants are removed. Ensure all joint faces are sound, clean, dry, and free of frost immediately prior to sealant application. Install a bond breaking backing material that is configured per the sealant manufacturer's specifications. Install the sealant according to the manufacturer's recommendations.

3. Tolerances. Install expansion joints conforming to the following tolerances:

- a. Top Surface Profile: 1/4 to 5/8 inch recessed from the finished roadway profile.
- b. Surface Irregularities (deviation from a 10-foot straight edge):  $\pm 1/8$  inch.
- c. Gap Width:  $\pm 1/4$  inch.

**516-3.02 BEARINGS**. Install bearing at locations shown on the Plans.

1. Shop Drawings. Provide shop drawings showing all details of the bearings and of the materials proposed for use. Fabricate bearings only after shop drawings are approved.
2. Packaging, Handling, and Storage. Prior to shipment from the point of manufacture, package the bearings in a manner to ensure that each bearing will be protected from damage during shipment, handling, and storage. Store the bearings in an area that provides protection from environmental and physical damage. Prior to installation, clean the bearings of all foreign substances.
3. Construction and Installation. Set the bearing plates, sole plates and elastomeric bearing pads as shown on the Plans in the exact position with full and even bearing on properly finished bearing seats. Do not use shims to set bearing plates, sole plates, or elastomeric bearing pads.

Finish bearing areas or grind them to elevation and parallel to the roadway grade and parallel to the roadway cross slope or crown, unless otherwise shown on the Plans.

When shown on the Plans, place grout under masonry plates. Mix and place grout according to the manufacturer's written recommendations. Clean concrete areas that will contact the grout. Remove loose or foreign matter that would prevent the bond between the mortar and the concrete surfaces.

Tightly pack the grout under the masonry plates to provide full bearing. After placing, cover exposed surfaces of grout pads with a heavy thickness of burlap saturated with water for 3 days. Do not place a load on the grout until the grout has attained a compressive strength of 5000 psi as determined by field specimen.



Locate sole plates to correspond with the temperature during erection. Anchor bearing securely. Adjust the nuts on anchor bolts at the expansion ends of spans to permit the span to move freely. Burr threads sufficiently to prevent removal of nuts.

Apply epoxy adhesive to the bottom surface of the elastomeric bearing pads before placing them. Do not move the pad until the epoxy has cured and full adhesion is achieved. Do not apply epoxy adhesive to elastomeric bearings used in PTFE bearing assemblies.

4. Tolerances. Install bearings conforming to the following tolerances:

- a. Horizontal Position:  $\pm 1/8$  inch
- b. Elevation:  $\pm 1/8$  inch
- c. Grade and cross slope:  $\pm 1/16$  inch per foot.

**516-3.03 WATERSTOPS.**

Furnish a waterstop that is capable of accommodating joint movement equal to half the bearing pad height or as shown on the Plans.

1. Waterstop Sealing Systems. Furnish and install a waterstop sealing system where specified on the Plans. Use full-length segments of waterstop strip tape for straight portions of joints.

Prepare the surface and install the waterstop sealing system following the manufacturer's instructions. Overlap strip tape according to the manufacturer's recommendations, but not less than 2 inches

2. Embedded Waterstop. Furnish and install embedded waterstop where and as specified on the Plans. Use full-length segments of embedded waterstop for straight portions of joints. Follow the manufacturer's instructions for the embedded waterstop and concrete application.

Remove and replace damaged waterstops.

**516-4.01 METHOD OF MEASUREMENT.** See SC-01.02 and the following:

- 1. Expansion Joint. The sum of the lengths of joints complete in place, measured along the centerline of the joint.
- 2. Bearings. Measured per unit, complete in place.
- 3. Waterstops. The sum of the lengths of waterstops complete in place, measured along the centerline of the waterstop.

**516-5.01 BASIS OF PAYMENT.**

When Items 516.0001.\_\_\_\_, 516.0002.\_\_\_\_, or 516.0003.\_\_\_\_ do not appear on the bid schedule, this work is subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
516.0001.____	Expansion Joint,_____	LF
516.0002.____	Bearings, (Type)	EACH
516.0003.____	Waterstops	LF

## **SECTION 618 SEEDING**

### **618-1.01 DESCRIPTION.**

Establish a perennial stand of grass or other specified living vegetative cover, by seeding, in the areas indicated on the Plans. Maintain the cover for the term of the Contract.

### **618-2.01 MATERIALS.**

Use materials that conform to the Special Provisions and the following:

Seed  
Fertilizer  
Water

Section 724  
Section 725  
Subsection 712-2.01

## **CONSTRUCTION REQUIREMENTS**

### **618-3.01 SOIL PREPARATION.**

Clear all areas to be seeded of stones 4 inches in diameter and larger and of all weeds, plant growth, sticks, stumps, and other debris or irregularities that might interfere with the seeding operation, growth of grass, or subsequent maintenance of the grass-covered areas.

Make areas to be seeded reasonably free of ruts, holes, and humps.

When specified, apply topsoil according to [Section 620](#).

Roughen the surface to be seeded by grooving the soil in a uniform pattern that is perpendicular to the fall of the slope. Use one or more of the following grooving methods prior to the application of seed:

1. Manual raking with landscaping rakes;
2. Mechanical track walking with track equipment; or
3. Mechanical raking with a scarifying slope board. Form one inch wide grooves spaced no more than six inches apart.

You may round the top and bottom of slopes to facilitate tracking or raking and to create a pleasant appearance, but you may not disrupt drainage flow lines.

### **618-3.02 SEEDING SEASONS.**

Seed and fertilize during the local growing season.

Do not seed during windy conditions or when climatic conditions or ground conditions would hinder placement or proper growth.

Seed disturbed areas that require seeding within fourteen days of the permanent cessation of ground-disturbing activities in that area.

Seed between May 15 and August 15, or obtain written approval from the Engineer to seed at a different date.

### **618-3.03 Application.**

Apply seed mix, fertilizer, and mulch (if required) at the rate specified in the special provisions. If no seed mix, seed mix application rate, or fertilizer rate are specified in the special provisions, use the recommendations of the Alaska Department of Natural Resources (DNR) and the Revegetation Manual for Alaska.

Do not seed areas of bedrock, plant beds, and areas indicated on the plans as “no seeding”.

Water and fertilizer required for application are subsidiary to the Seeding bid item.

Use any of the following methods:

1. Hydraulic Method.
  - a. Furnish and place a slurry made of seed, fertilizer, water, and other components as required by the Special Provisions.
  - b. Use hydraulic seeding equipment that will maintain a continuous agitation and apply a homogeneous mixture through a spray nozzle. The pump must produce enough pressure to maintain a continuous, nonfluctuating spray that will reach the extremities of the seeding area with the pump unit located on the roadbed. Provide enough hose to reach areas not practical to seed from the nozzle unit situated on the roadbed.
  - c. If mulch material is required, it may be added to the water slurry in the hydraulic seeder after adding the proportionate amounts of seed and fertilizer. Add seed to the slurry mixture no more than 30 minutes before application.
  - d. Mix the slurry and apply it evenly.
2. Dry Methods.
  - a. Use mechanical spreaders, seed drills, landscape seeders, aircraft, cultipacker seeders, fertilizer spreaders, or other approved mechanical spreading equipment when seed and fertilizer are to be applied in dry form.
  - b. Spread fertilizer separately at the specified rate.

#### **618-3.04 MAINTENANCE AND WATERING.**

Protect seeded areas against traffic by approved warning signs or barricades. Repair surfaces gullied or otherwise damaged following seeding. Maintain seeded areas in a satisfactory condition until final acceptance of work.

Water and maintain seeded areas. Water applied by this Subsection is a paid contract item. If, in the opinion of the Engineer, too much water is being applied, reduce amount of water as directed.

Reseed areas not showing evidence of satisfactory growth within 3 weeks of seeding. Bare patches of soil more than 10 square feet in area must be reseeded. Erosion gullies over 4 inches deep must be filled and reseeded. Fill the entire erosion gully to surrounding grade, even the portions less than 4 inch deep.

Contact DNR for advice or corrective measures, when seeded areas are not showing evidence of satisfactory growth. You are responsible for retracking, reseeding, refertilizing and remulching areas that do not show satisfactory growth, and those actions are subsidiary.

#### **618-3.05 ACCEPTANCE.**

The Engineer will perform a visual inspection of seeding to determine final stabilization. During the visual inspection each station and each side of the road will be considered a separate area.

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The Engineer will accept seeding that has become a vegetative matt with 70 percent cover density in the inspection area.

Reseed areas that are not acceptable to the Engineer.

**618-3.06 PERIOD OF ESTABLISHMENT.**

Establishment periods extend for one complete growing season following acceptable seeding. Employ all possible means to preserve the new vegetative matt in a healthy and vigorous condition to ensure successful establishment. Reseed areas that do not meet the specifications. Watering and reseeding after the final inspection are subsidiary.

The Engineer may, but is not required to, determine the Project is complete except for the period of establishment, and issue a letter of final acceptance. After final acceptance, work or materials due under this Subsection during any remaining period of establishment are considered warranty obligations that continue to be due following final acceptance in accordance with **SC-05.16.**

**618-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

Seeding by the Acre. By the area of ground surface acceptably seeded and maintained.

Seeding by the Pound. By the weight of dry seed acceptably seeded and maintained.

Water for Seeding. If weighed, a conversion factor of 8.34 pounds per gallon will be used to convert weights to gallons.

Seeding by the Square Yard. By the area of ground surface acceptably seeded and maintained.

**618-5.01 BASIS OF PAYMENT.**

Mulching will be paid for under **Section 619.** Soil preparation, fertilizer, and water required for hydraulic method are subsidiary.

Seeding by the Acre. Payment is for established vegetative matt.

Seeding by the Pound. Payment is for established vegetative matt.

Water for Seeding. Water applied for growth of vegetative matt. Water for hydraulic seeding, fertilizing or mulching is subsidiary. Water after project completion is subsidiary.

Seeding by the Square Yard. Payment is for established vegetative matt.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
618.0001.	Seeding	ACRE
618.0002.	Seeding	LB
618.0003.	Water for Seeding	MGAL
618.0004.	Seeding	SY
618.0005.	Seeding	LS

## **SECTION 620 TOPSOIL**

### **620-1.01 DESCRIPTION.**

Furnish and spread topsoil where shown on the Plans.

### **620-2.01 MATERIALS.**

Use materials that conform to the following:

Topsoil      **Section 726**

### **620-3.01 PLACING.**

Spread the topsoil evenly on the designated areas to the depth (after settlement) shown on the Plans. Do not place when the ground or topsoil is frozen, excessively wet, or in a condition detrimental to the work. Keep the roadway surfaces clean of topsoil during hauling and spreading operations.

### **620-3.02 MAINTENANCE AND REPAIR.**

Maintain the areas covered by topsoil until subsequent seeding or landscaping is accomplished. Complete any repairs or topsoil replacement, including damage or loss resulting from winter shutdown, without extra compensation.

### **620-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and measured on the slope of the ground surface.

### **620-5.01 BASIS OF PAYMENT.**

Stockpiling and rehandling of topsoil during the stripping operations or during placement are subsidiary.

Topsoil repair, maintenance, and replacement are subsidiary.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
620.0001.	Topsoil	SY
620.0002.	Topsoil	CY
620.0003.	Topsoil	LS

# **SECTION 631**

## **GEOTEXTILE FOR SUBSURFACE DRAINAGE AND EROSION CONTROL**

### **631-1.01 DESCRIPTION.**

Prepare ground surface, and furnish and place geotextiles for subsurface drainage and erosion control, as shown on the Plans.

### **631-2.01 MATERIALS.**

Use materials that conform to the following for the class specified in the bid schedule:

Geotextiles and Sewn Seam Strength

**Subsection 729-2.01**

Sewing Thread.

Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

### **631-3.01 CONSTRUCTION REQUIREMENTS.**

1. **Surface Preparation.** Prepare ground surface by removing stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer. Construct smooth and stable trench walls.
2. **Geotextile Placement.** Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Place geotextile in a manner which will ensure intimate contact between the trench wall and the geotextile (i.e., no voids, folds, or wrinkles). The geotextile may be held in place with securing pins at 3-foot spacing along all edges (but not closer than 2 inches from the edge) to prevent movement during construction. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextile rolls to get wet prior to installation.
  - a. **Subsurface Drainage.** In trenches, after placing the geotextile and material shown on the Plans, fold the geotextile over the top of the material shown on the Plans to produce a minimum overlap of 12 inches, for trenches greater than 12 inches wide. In trenches less than 12 inches wide, make the overlap equal to the width of the trench. Then cover the geotextile with the subsequent course of material.
  - b. **Erosion Control.** Place and anchor geotextile on the approved surface so it will not be torn or excessively stretched by placement of the overlying materials. Secure the geotextile to the slope but secure it loosely enough so that the geotextile will not tear when riprap or other cover material is placed on the geotextile. The geotextile shall not be keyed at the top of the slope until the riprap or other cover material is in place at the top of the slope. Anchor the terminal ends of the geotextile using key trenches or aprons with a minimum of 24 inches depth into the soil substrate at the crest and toe of slope, or as shown on the Plans. Place geotextile with the machine direction parallel to the direction of water flow (normally parallel to the slope for erosion control runoff and wave action, and parallel to the stream or channel).
3. **Joining.** Join geotextile by sewing or overlapping.
  - a. Sew seams with a Butterfly or J-Seam using a double thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches ( $\pm 1/4$  inch) from the folded edge of the seam and at least 1/2 inch from the

free edge of the geotextile. Sew seams so that they can be easily inspected by the Engineer or representative. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008. Conform both factory and field sewn seams to the strength requirements of Table 1 as outlined in the AASHTO M288 for subsurface drainage and erosion control applications.

- b. Overlap geotextile sections by a minimum of 3 feet at all longitudinal and transverse joints. Overlap successive geotextile sheets in the direction of flow so that the upstream sheet is placed over the downstream sheet and/or upslope over downslope. In trenches, where overlapped seams are constructed in the longitudinal trench direction, make the overlap equal to the width of the trench.
4. **Placement of Cover Material.** Following placement of the geotextile on the prepared surface, place cover material of the type shown on the Plans. Place the cover material and armor from the bottom to the top of the slope using methods which minimize tearing and/or excessive stretching of the geotextile. In underwater applications, place the geotextile and the required thickness of cover material in the same day. Maintain proper overlap and geotextile continuity. Do not exceed the allowable drop heights for cover material shown in Table 631-1. Do not allow stones with a weight of more than 100 pounds to roll down the slope on the geotextile. Do not grade the slope in a way that will disturb the cover material or armor stone once it has been placed. Backfill all voids in the riprap or other cover material, which allows the geotextile to be visible, with material shown on the Plans, so that the geotextile is completely covered.

**TABLE 631-1  
ALLOWABLE DROP HEIGHT FOR GEOTEXTILE**

INDIVIDUAL STONE Max. Weight (lbs)	ALLOWABLE DROP HEIGHT (ft)	
	UNPROTECTED GEOTEXTILE	PROTECTED GEOTEXTILE*
< 5	3	3
5-250	0	3
> 250	0	0**

\* Protected geotextile is defined as having a gravelly covering (cushion layer) at least 6 inches thick.

\*\* If stones greater than 250 pounds must be dropped or if a height of drop greater than 3 feet is required, then perform field trials to determine the minimum cushion thickness and/or maximum height of safe drop without damaging the geotextile.

Maintain a minimum depth of 12 inches of cover material between the geotextile and the wheels or tracks of the construction equipment.

- 5. **Geotextile Repair.** Should the geotextile be torn, punctured, or the overlaps or sewn joints disturbed – as evidenced by visible geotextile damage – remove the backfill around the damaged area and repair or replace the damaged area at no additional expense to the State. Make repairs to the damaged area with a patch of the same type of geotextile originally placed. Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn area. Ensure that the patch remains in place when material is placed over the affected area.

**631-4.01 METHOD OF MEASUREMENT.**

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By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for geotextile in key trenches or for overlap, whether at joints or patches.

**631-5.01 BASIS OF PAYMENT.**

Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes will be paid for under separate materials pay items at the unit price for the type of material used.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
631.0001._____	Geotextile, Drainage, Class 2	SY
631.0002._____	Geotextile, Erosion Control, Class 1	SY



## **SECTION 640 MOBILIZATION AND DEMOBILIZATION**

### **640-1.01 DESCRIPTION.**

Perform work and operations necessary to:

1. move personnel, equipment, supplies, and incidentals to the project site;
2. establish offices, buildings, and other facilities, except as provided under **Section 644**;
3. perform other work and operations and pay costs incurred, before beginning construction;
4. complete similar demobilization activities; and
5. furnish required submittals such as as-builts, certificates, payrolls, civil rights reports, and equipment warranties.
6. comply with the Alaska Department of Labor and Workforce Development (DOLWD) requirements for Worker Meals and Lodging, or Per Diem; as described in the Laborers' and Mechanics' Minimum Rates of Pay (Pamphlet 600), current issue. On Federal-aid projects, PL 109-59, 119 STAT. 1233, Sec. 1409(c) also applies.
7. ensure subcontractors comply with the Federal and State DOLWD requirements.

Ensure facilities meet the Alaska Administrative Code 8 AAC 61.1010 and 8 AAC 61.1040 Occupational Safety and Health Standards, 18 AAC 31 Alaska Food Code, and U. S. Code of Federal Regulations 29 CFR Section 1910.142 Temporary Labor Camps.

Do not consider the cost of Meals and Lodging, or Per Diem in setting wages for the worker or in meeting wage requirements under AS 23.10.065 or AS 36.05.

### **640-2.01 MATERIALS.**

None.

### **640-3.01 CONSTRUCTION REQUIREMENTS.**

None.

### **640-4.01 METHOD OF MEASUREMENT.**

Numbered items 1. through 4. apply only to items 640.0001. \_\_ and 640.0002. \_\_:

1. When you earn 4 percent of the original contract amount from other bid items: 40 percent of the amount bid for mobilization and demobilization, or 4 percent of the original contract amount, whichever is less, will be paid.
2. When you earn a total of 8 percent of the original contract amount from other bid items: An additional 40 percent of the amount bid for mobilization and demobilization, or an additional 4 percent of the original contract amount, whichever is less, will be paid.
3. The remaining balance of the amount bid for Mobilization and Demobilization will be paid after all submittals required under the Contract are received and approved.

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4. Progress payments for Worker Meals and Lodging, or Per Diem will be computed as equivalent to the percentage, rounded to the nearest whole percent, of the original contract amount earned.

Under Item 640.0005, the pay unit is calculated by calendar day.

**640-5.01 BASIS OF PAYMENT.**

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
640.0001.	Mobilization and Demobilization	LS
640.0004.	Worker Meals and Lodging, or Per Diem	LS
640.0005.	Worker Meals and Lodging, or Per Diem	CDAY

## **SECTION 641 EROSION, SEDIMENT, AND POLLUTION CONTROL**

### **641-1.01 DESCRIPTION.**

Provide project administration and Work relating to control of erosion, sedimentation, and discharge of pollutants, according to this section and applicable local, state, and federal requirements, including the APDES Construction General Permit. The state APDES program is administered by DEC. Section 301(a) of the Clean Water Act (CWA) and 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except as allowed by the CGP.

### **641-1.02 DEFINITIONS.**

These definitions apply only to **Section 641**.

#### **ACTIVE TREATMENT SYSTEM (ATS) OPERATOR.**

The Contractor's qualified representative who is responsible for maintaining and operating an active treatment system (as defined in the CGP) for stormwater runoff.

**ALASKA CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (AK-CESCL).** A person who has completed training, testing, and other requirements of, and is currently certified as, an AK-CESCL from an AK-CESCL Training Program (a program developed under a Memorandum of Understanding between the Department and others). The Department recognizes AK-CESCLs as "qualified personnel" required by the CGP. An AK-CESCL must be recertified every three years. (See Qualified Person.)

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC).** The state agency authorized by EPA to administer the Clean Water Act's National Pollutant Discharge Elimination System.

**ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM (APDES).** A system administered by DEC that issues and tracks permits for stormwater discharges.

**BEST MANAGEMENT PRACTICES (BMPS).** Temporary or permanent structural and non-structural devices, schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or minimize the discharge of pollutants to waters of the United States. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from material storage.

**CLEAN WATER ACT (CWA).** Federal Water Pollution Control Amendments of 1972, as amended (33 U.S.C. 1251 et seq.).

**CONSTRUCTION ACTIVITY.** Physical activity by the Contractor, Subcontractor or utility company; that may result in erosion, sedimentation, or a discharge of pollutants into stormwater. Construction Activity includes soil disturbing activities (e.g. clearing, grubbing, grading, excavating); and establishment of construction materials or equipment storage or maintenance areas (e.g. material piles, borrow area, concrete truck chute washdown, fueling); and industrial activities that may discharge stormwater and are directly related to the construction process (e.g. concrete or asphalt batch plants).

**CONSTRUCTION GENERAL PERMIT (CGP).** The permit authorizing stormwater discharges from Construction Activities, issued and enforced by Alaska DEC. It authorizes stormwater discharges provided permit conditions and water quality standards are met.

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**CORPS OF ENGINEERS PERMIT (COE PERMIT).** A U.S. Army Corps of Engineers Permit for construction in waters of the US. Such permit may be issued under Section 10 of the Rivers and Harbors Act of 1899, or Section 404 of the Clean Water Act.

**ELECTRONIC NOTICE OF INTENT (ENOI).** The electronic Notice of Intent submitted to DEC, to obtain coverage under the CGP.

**ELECTRONIC NOTICE OF TERMINATION (ENOT).** The electronic Notice of Termination submitted to DEC, to end coverage under the CGP.

**ENVIRONMENTAL PROTECTION AGENCY (EPA).** A federal agency charged to protect human health and the environment.

**ERODIBLE STOCKPILE.** Any material storage area or stockpile consisting of mineral aggregate, organic material, or a combination thereof, with greater than 5 percent passing the #200 sieve, and any material storage where wind or water transports sediments or other pollutants from the stockpile. Erodible Stockpile also includes any material storage area or stockpile, where the Engineer determines there is potential for wind or water transport, of sediments or other pollutants away from the stockpile.

**EROSION AND SEDIMENT CONTROL PLAN (ESCP).** The Department's project specific document that illustrates measures to control erosion and sediment on the project. The ESCP provides bidders with the basis for cost estimating and guidance for developing an acceptable Storm Water Pollutant Prevention Plan (SWPPP).

**FINAL STABILIZATION.** Is defined in this section as it is defined in the CGP, Appendix C.

**HAZARDOUS MATERIAL CONTROL PLAN (HMCP).** The Contractor's detailed project specific plan for prevention of pollution from storage, use, transfer, containment, cleanup, and disposal of hazardous material (including, but are not limited to, petroleum products related to construction activities and equipment). The HMCP is included as an appendix to the SWPPP.

**INSPECTION.** An inspection required by the CGP or the SWPPP, usually performed together by the Contractor's SWPPP Manager and Department's Stormwater Inspector.

**MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT.** A DEC stormwater discharge permit issued to certain local governments and other public bodies, for operation of stormwater conveyances and drainage systems. See CGP for further definition.

**MULTI-SECTOR GENERAL PERMIT (MSGP).** The Alaska Pollutant Discharge Elimination System General Permit for stormwater discharges associated with industrial activity.

**OPERATOR(S).** The party or co-parties associated with a regulated activity that has responsibility to obtain permit coverage under the CGP. "Operator" for the purpose of the CGP and in the context of stormwater associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
2. The party has day to day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g. they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

**POLLUTANT.** Any substance or item meeting the definition of pollutant contained in 40 CFR § 122.2. A partial listing from this definition includes: dredged spoil, solid waste, sediment, sewage,

garbage, sewage sludge, chemical wastes, biological materials, wrecked or discarded equipment, rock, sand, cellar dirt and industrial or municipal waste.

**PROJECT ZONE.** The physical area provided by the Department for Construction. The Project Zone includes the area of highway or facility under construction, project staging and equipment areas, and material and disposal sites; when those areas, routes and sites, are provided by the Contract.

Material sites, material processing sites, disposal sites, haul routes, staging and equipment storage areas; that are furnished by the Contractor or a commercial operator, are not included in the Project Zone.

**QUALIFIED PERSON.** A person knowledgeable in the principles and practice of erosion and sediment controls. A Qualified Person must be certified either under the Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) training program. One of the following training and certification programs may substitute for AK-CESCL certification: CPESC, CESSWI, CPSWQ, or CISEC (CGP, Appendix C).

**RECORDS.** Any record, report, information, document or photograph required to be created or maintained pursuant to the requirements of the CGP, the CGP stormwater requirements of the Clean Water Act; and applicable local, state, and federal laws and regulations regarding document preservation.

**SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC PLAN).** The Contractor's detailed plan for petroleum spill prevention and control measures that meet the requirements of 40 CFR 112.

**SPILL RESPONSE FIELD REPRESENTATIVE.** The Contractor's representative with authority and responsibility for managing, implementing, and executing the HMCP and SPCC Plan.

**STORM EVENT.** A rainfall event that produces more than 0.5 inch of precipitation in 24 hours and that is separated from the previous storm event by at least 3 days of less than 0.1 inch of rain per day.

**STORM WATER POLLUTION PREVENTION PLAN (SWPPP).** The Contractor's detailed project specific plan to minimize erosion and contain sediment within the Project Zone, and to prevent discharge of pollutants that exceed applicable water quality standards. The SWPPP includes, but is not limited to, amendments, records of activities, inspection schedules and reports, qualifications of key personnel, and all other documentation, required by the CGP and this specification, and other applicable local, state, and federal laws and regulations.

**STORM WATER POLLUTION PREVENTION PLAN TWO (SWPPP2).** The Contractor's detailed project specific plan to comply with CGP or MSGP requirements, for Contractor construction-related activities outside the Project Zone.

**SUBCONTRACTOR SPILL RESPONSE COORDINATOR.** The subcontractor's representative with authority and responsibility for coordinating the subcontractor's activities in compliance with the HMCP and SPCC Plan.

**SUBCONTRACTOR SWPPP COORDINATOR.** The subcontractor's representative with authority to direct the subcontractor's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the subcontractor's compliance with the SWPPP.

**SUPERINTENDENT.** The Contractor's duly authorized representative in responsible charge of the work. The Superintendent has responsibility and authority for the overall operation of the Project and for Contractor furnished sites and facilities directly related to the Project.

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**SWPPP AMENDMENT.** A revision or document that adds to, deletes from, or modifies the SWPPP.

**SWPPP MANAGER.** The Contractor's qualified representative who conducts Inspections, updates SWPPP records, and has authority to suspend work and to implement corrective actions required for CGP compliance.

**SWPPP PREPARER.** The Contractor's qualified representative who is responsible for developing the initial SWPPP.

**TEMPORARY STABILIZATION.** Protecting soils from erosion and sediment loss by rainfall, snow melt, runoff, or wind with a temporary vegetative and/or non-vegetative protection cover. Temporary stabilization may include a combination of seeding, geotextiles, mulches, surface tackifiers, rolled erosion control products, low erodible gravel or paving, or the mentioned BMP's combined together with trackwalking.

**UTILITY SPILL RESPONSE COORDINATOR.** The Utility's representative with authority and responsibility for coordinating the Utility's activities in compliance with the HMCP and SPCC Plan.

**UTILITY SWPPP COORDINATOR.** The Utility's representative with authority to direct the Utility's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the Utility's compliance with the SWPPP.

### **641-1.03 PLAN AND PERMIT SUBMITTALS.**

For plans listed in **SC-06.02** (SWPPP, HMCP, and SPCC), use the Contractor submission and Owner review deadlines identified in **Subsection 641-1.03**.

Partial and incomplete submittals will not be accepted for review. Any submittal that is re-submitted or revised after submission, but before the review is completed, will restart the submittal review timeline. No additional Contract time or additional compensation will be allowed due to delays caused by partial or incomplete submittals, or required re-submittals.

1. Storm Water Pollution Prevention Plan. Submit an electronic copy and three hard copies of the SWPPP to the Engineer for approval. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. Organize and bind the SWPPP and related documents for submittal according to the requirements of **Subsection 641-2.01.2**.

The Department will review the SWPPP submittals within 14 days after they are received. Submittals will be returned to the Contractor, and marked as either "rejected" with reasons listed or as "approved" by the Department. When the submittal is rejected, the Contractor must revise and resubmit the SWPPP. The 14 day review period will restart when the contractor submits an electronic copy and three hard copies of the revised SWPPP to the Engineer for approval.

After the SWPPP is approved by the Department, the Contractor must sign and certify the approved SWPPP using Form 25D-111. See **Subsection 641-1.03.4** for further SWPPP submittal requirements.

2. Hazardous Material Control Plan. The HMCP Template can be found at the following webpage: [http://www.dot.state.ak.us/stwddes/dcsconst/pop\\_constforms.shtml](http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml). Submit an electronic copy and three hard copies of the HMCP, as an appendix to the SWPPP, to the Engineer for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.
3. Spill Prevention, Control and Countermeasure Plan. When a SPCC Plan is required under **Subsection 641-2.03**, submit an electronic copy and three signed hard copies of the SPCC

Plan to the Engineer. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. The Department reserves the right to review the SPCC Plan and require modifications.

4. CGP Coverage. The Contractor is responsible for permitting of Contractor and subcontractor Construction Activities related to the Project. Do not use the SWPPP for Construction Activities outside the Project Zone where the Department is not an operator. Use a SWPPP2 for Construction Activities outside the Project Zone.

After Department approval of the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to DEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and DEC's written acknowledgement (by letter or other document), to the Engineer as soon as practicable and no later than three days after filing eNOI or receiving a written response.

Do not begin Construction Activity until the conditions listed in [Subsection 641-3.01.1](#) are completed.

The Department will submit an eNOI to DEC for Construction Activities inside the Project Zone. The Engineer will provide the Contractor with a copy of the Department's eNOI and DEC's written acknowledgement (by letter or other document), for inclusion in the SWPPP.

Before Construction Activities occur, transmit to the Engineer an electronic copy of the approved and certified SWPPP, with signed Delegations of Signature Authorities on Forms 25D-107 and 25D-108, SWPPP Certifications on Forms 25D-111 and 25D-109, both permittee's signed eNOIs and DEC's written acknowledgement.

5. Ending CGP Coverage. Submit an eNOT to DEC within 30 days after the Engineer has determined the conditions listed in [Subsection 641-3.01.6](#) have been met. Submit a copy of the signed eNOT and DEC's acknowledgement letter to the Owner within three days of filing the eNOT or receiving a written response.
6. DEC SWPPP Review. When CGP Part 2.1.3, requires DEC SWPPP review:
  - a. Transmit a copy of the Department-approved SWPPP to DEC using delivery receipt confirmation;
  - b. Transmit a copy of the delivery receipt confirmation to the Engineer within seven (7) days of receiving the confirmation; and
  - c. Retain a copy of delivery receipt confirmation in the SWPPP.
7. Local Government SWPPP Review. When local government or the CGP Part 2.1.4, requires local government review:
  - a. Transmit a copy of the Department-approved SWPPP and other information as required to local government, with the required fee. Use delivery receipt confirmation;
  - b. Transmit a copy of the delivery receipt confirmation to the Engineer within seven days of receiving the confirmation;
  - c. Transmit a copy of any comments by the local government to the Engineer within seven days of receipt;
  - d. Amend the SWPPP as necessary to address local government comments and transmit SWPPP Amendments to the Engineer within seven days of receipt of the comments;
  - e. Include a copy of local government SWPPP review letter in the SWPPP; and

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- f. File a notification with local government that the project is ending.
8. Modifying Contractor's eNOI. When required by the CGP Part 2.7, modify your eNOI to update or correct information within 30 calendar days of the change. Reasons for modification include a change in start or end dates, change in Owner/Operator address and contact information, change in site information, any changes in number of acres to be disturbed, change in decision to use or not use treatment chemicals, or change in location of SWPPP records.

The Contractor must submit an eNOT and then submit a new eNOI instead of an eNOI modification when the operator has changed.

### **641-1.04 PERSONNEL QUALIFICATIONS.**

Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications.

1. The SWPPP Preparer.
  - a. Total disturbed acreage 20 acres or less, must meet at least one of the following qualifications:
    - (1) Current certification as a Certified Professional in Erosion and Sediment Control (CPESC);
    - (2) Current certification as AK-CESCL, and at least two years' experience in erosion and sediment control, as a SWPPP Manager or SWPPP writer, or equivalent. Provide documentation including project names, project timelines, and work responsibilities demonstrating the experience requirement; or
    - (3) Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.
  - b. Total disturbed acreage greater than 20 acres, meet **Subsection 641-1.04.1.a.** above, and complete a SWPPP Preparation course.
2. The Superintendent must meet the following qualifications:
  - a. Current certification as AK-CESCL; and
  - b. Duly authorized representative, as defined in the CGP, Appendix A, Part 1.12.3.
3. The SWPPP Manager must have current certification as AK-CESCL. The SWPPP Manager must meet the experience, and authority requirements identified in the CGP for the Stormwater Lead and Stormwater Inspector positions.
4. The Active Treatment System (ATS) operator must have current certification as AK-CESCL, and be knowledgeable in the principles and practices of treatment systems in general, and the operation of the project-specific ATS. The ATS operator must have at least three months field experience with ATS, or completion of an ATS manufacturer's training course, or completion of system operator certification course.
5. The Department accepts people having any of the following certificates as equivalent to AK-CESCL, if the certificates are current according to the sponsoring organization's policies:
  - a. CPESC, Certified Professional in Erosion and Sediment Control; or
  - b. CISEC, Certified Inspector in Sediment and Erosion Control.



**641-1.05 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS.**

1. eNOI and eNOT. The eNOI and eNOT must be signed and certified by a responsible corporate officer according to CGP Appendix A, Part 1.12. Signature and certification authority for the eNOI and eNOT cannot be delegated.
2. Delegation of Signature Authority for Other SWPPP Documents and Reports. Use Form 25D-108 to delegate signature authority and certification authority to the Superintendent position, according to CGP Appendix A, Part 1.12.3, for the SWPPP, Inspection Reports and other reports required by the CGP. The Superintendent position is responsible for signing and certifying the SWPPP, Inspection Reports, and other reports required by the CGP, except the eNOI and eNOT.

The Engineer will provide the Department's delegation on Form 25D-107, which the Contractor must include in the SWPPP.

3. Subcontractor Certification. Subcontractors must certify on Form 25D-105, that they have read and will abide by the CGP and the conditions of the project SWPPP.
4. Signatures and Initials. Handwrite signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

**641-1.06 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.**

1. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.
2. The Contractor is responsible for permitting and permit compliance outside the Project Zone. The Contractor has sole responsibility for compliance with DEC, COE and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits. **SC-08.01** describes the requirement to obtain permits, and to provide permit documents to the Engineer.
3. An entity that owns or operates, a commercial plant (see ARRC Procurement Manual) or material source or disposal site outside the Project Zone, is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage. **SC-08.01** describes the requirement to obtain permits, and to provide permit documents to the Engineer.
4. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:
  - a. For areas outside the Project Zone;
  - b. For Construction Activity and Support Activities outside the Project Zone; and
  - c. For commercial plants, commercial material sources, and commercial disposal sites.

**641-1.07 UTILITY. (RESERVED FRO DISTRICTS)**

**641-2.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS.**

1. SWPPP Preparer and Pre-Construction Site Visit.

Use a SWPPP Preparer to develop the SWPPP and associated documents, according to the requirements of the CGP and COE permit. The SWPPP Preparer must put their name,

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qualifications (including the expiration date of any certifications), title and company name in the SWPPP.

The SWPPP Preparer must conduct a pre-construction inspection at the Project site before construction activity begins. If the SWPPP Preparer is not a Contractor employee, the SWPPP Preparer must visit the site accompanied by the Contractor. Give the Department at least seven days advance notice of the site visit, so that the Department may participate.

During the pre-construction inspection, the SWPPP Preparer must identify, or if a draft of the SWPPP has already been prepared verify that the SWPPP fully addresses and describes:

- a. Opportunities to phase construction activities;
- b. Appropriate BMPs and their sequencing; and
- c. Sediment controls that must be installed prior to beginning Construction Activities.

Document the SWPPP Preparer's pre-construction inspection in the SWPPP on Form 25D-106, SWPPP Pre-Construction Site Visit, including the names of attendees and the date.

### **2. Developing the SWPPP.**

Use the Department's ESCP, Environmental commitments, and other Contract documents as a starting point for developing the SWPPP. The approved SWPPP replaces the ESCP.

Develop the SWPPP with sections and appendices, according to the current DOT&PF SWPPP template. Include information required by the Contract and described in the CGP Part 5.0.

- a. Obtain the following forms after they have been completed by the Department and include them in the SWPPP:
  - (1) SWPPP Delegation of Signature Authority – DOT&PF (25D-107)
  - (2) SWPPP Certification for DOT&PF (25D-109)
  - (3) SWPPP Delayed Action Item Report (25D-113), if needed
- b. Use the following Department forms for recording information in the SWPPP:
  - (1) SWPPP Amendment Log (25D-114)
  - (2) SWPPP Certification for Contractor (25D-111)
  - (3) SWPPP Construction Site Inspection Report (25D-100)
  - (4) SWPPP Corrective Action Log (25D-112)
  - (5) SWPPP Daily Record of Rainfall (25D-115)
  - (6) SWPPP Delegation of Signature Authority – Contractor (25D-108)
  - (7) SWPPP Grading and Stabilization Activities Log (25D-110)
  - (8) SWPPP Pre-Construction Site Visit (25D-106)
  - (9) SWPPP Project Staff Tracking (25D-127)
  - (10) SWPPP Subcontractor Certification (25D-105)

(11)SWPPP Training Log (25D-125)

(12)SWPPP Noncompliance (25D-143)

SWPPP Template, forms, and instructions are available online at: [http://www.dot.state.ak.us/stwddes/dcsconst/pop\\_constforms.shtml](http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml)

Compile the SWPPP in three ring binders with tabbed and labeled dividers for each section and appendix.

3. SWPPP Considerations and Contents.

- a. The SWPPP must provide erosion and sediment control measures for all Construction Activity within the Project Zone. Construction activity outside the Project Zone must have permit coverage, using a separate SWPPP2, and separate Contractor Inspections.
- b. The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. The SWPPP must describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. The SWPPP must identify all operators for the Project, including utility companies performing Construction Activity, and identify the areas:
  - (1) Over which each operator has operational control; and
  - (2) Where the Department and Contractor are co-operators.
- c. For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:
  - (1) Dedicated to the Project and where the Department is not an operator; and
  - (2) Not dedicated to the project, but used for the project.
- d. Account for the Contractor's construction methods and phasing. Identify the amount of mean annual precipitation.
- e. Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges. List locations where authorized non-stormwater will be used, including the types of water that will be used on-site.
- f. Include the Department's Antidegradation Analysis in the SWPPP if stormwater from the Project Zone discharges into receiving water that is considered a high quality water and that constitutes an outstanding national resource, according to CGP Part 2.1.6.
- g. Where the project intersects a Public Water System (PWS), the Engineer will notify the PWS contact for the Department and Contractor according to the CGP Part 4.10. Contractor Amend a copy of the communications in Appendix Q.
- h. There are special requirements in the CGP Part 3.2, for stormwater discharges into an impaired water body, and they may include monitoring of stormwater discharges. For Projects meeting the permit criteria, the Contractor shall implement a monitoring plan approved by the Department for the stormwater within the Project Zone, and shall provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.
- i. Preserve natural topsoil unless infeasible. Delineate the site according to CGP Part 4.2.1. Use stakes, flags, or silt fence, etc. to identify areas where land disturbing activities will

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occur and areas that will be left undisturbed. Minimize the amount of soil exposed during Construction activity according to CGP Part 4.2.2.

- j. Comply with CGP Part 4.4, and the DEC General Permit for Excavation Dewatering (AKG002000), requirements for dewatering for trenches and excavations.
- k. The SWPPP must identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion must be addressed. The potential for erosion at drainage structures must be addressed.
- l. Describe methods and time limits, to initiate temporary or final soil stabilization, CGP Part 4.5.1.1. Begin stabilization no later than the end of the next work day, following the day when the earth-disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding:
  - (1) Seven days for areas with mean annual precipitation 40 inches or greater; or
  - (2) Fourteen days for areas with mean annual precipitation less than 40 inches.

Time allotted to complete temporary and final stabilization, [Subsection 641-2.01, 3.m.](#)

- m. Within seven days of initiating final stabilization, CGP Part 4.5.1.4, either complete final stabilization or continue maintenance of work until final stabilization is complete. Complete temporary stabilization within fourteen days of initiating stabilization, CGP Part 4.5.1.2.
- n. Include in the "Stabilize Soils" section of the SWPPP, a description of how you will minimize the amount of disturbed and unstabilized ground in the fall season. Identify anticipated dates of fall freeze-up and spring thaw. Describe how you will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Include a plan for final stabilization.
- o. Plans for Active Treatment Systems must be submitted to DEC for review at least 14 days prior to use of the system and the Operator of the ATS identified in the SWPPP. Any use of treatment chemicals must be identified on the NOI, documented in the SWPPP, and meet with the requirements in the CGP Part 4.6.
- p. The SWPPP must provide designated areas for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities must be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washout, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water that doesn't contain detergent may be discharged on-site if it is treated before discharge.
- q. Design temporary BMPs for a 2 year 24 hour precipitation amount. Describe BMPs in the SWPPP and in SWPPP Amendments, including source controls, sediment controls, discharge points, and temporary and final stabilization measures. Describe the design, placement, installation, and maintenance of each BMP, using words and drawings as appropriate. Describe the design capacity of sediment basins (including sediment ponds and traps). Provide a citation to the BMP Manual or publication used as a source for the BMP, including the manufacturer's or BMP manual specifications for installation (CGP Part 5.3.6.2). If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment must state that "No BMP manual or publication was used for this design."

- r. Describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Phase earth disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization quickly. Whenever practicable incorporate final stabilization work into excavation, embankment and grading activities. Include drawings showing each phase of the project with the BMPs implemented in the phase.
  - s. Provide a legible site map or set of maps in the SWPPP, showing the entire site and identifying boundaries of the property where construction and earth-disturbing activities will occur, as described in the CGP Part 5.3.5. Include all BMPs on the site map.
  - t. Identify the inspection frequency in the SWPPP.
    - (1) For areas of the state where the mean annual precipitation is less than 40 inches:
      - (a) Inspect at least once every seven calendar days; or
      - (b) Inspect at least once every 14 calendar days and within 24 hours of the end of a storm event that resulted in a discharge from the site.
    - (2) For areas of the state where the mean annual precipitation is 40 inches or greater:
      - (a) Inspect at least once every seven calendar days.
  - u. Linear Project Inspections, described in CGP Part 6.5, are not applicable to this contract.
  - v. The SWPPP must cite and incorporate applicable requirements of the Project permits, environmental commitments, COE permit, and commitments related to historic preservation. Make additional consultations or obtain permits as necessary for Contractor specific activities that were not included in the Department's permitting and consultation.
  - w. The SWPPP is a dynamic document. Keep the SWPPP current by noting installation, modification, and removal of BMPs, and by using amendments, SWPPP amendment logs, Inspection Reports, corrective action logs, records of land disturbance and stabilization, and any other records necessary to document stormwater pollution prevention activities and to satisfy the requirements of the CGP and this specification. See Subsection 641-3.03 for more information.
4. Recording Personnel and Contact Information in the SWPPP.

Identify the SWPPP Manager as the Stormwater Lead and Stormwater Inspector positions in the SWPPP. Document the SWPPP Manager's responsibilities in Section 2.0 Stormwater Contacts, of the SWPPP template and:

- a. Identify that the SWPPP Manager does not have authority to sign inspection reports (unless the SWPPP Manager is also the designated project Superintendent).
- b. Identify that the SWPPP Manager cannot prepare the SWPPP unless the SWPPP Manager meets the Contract requirements for the SWPPP Preparer.

Include in the SWPPP proof of AK-CESCL or equivalent certifications for the Superintendent and SWPPP Manager, and for any acting Superintendent and acting SWPPP Managers. If the Superintendent or SWPPP Manager is replaced permanently or temporarily, by an acting Superintendent or acting SWPPP Manager; record in the SWPPP (use Form 25D-127) the names of the replacement personnel, the date of the replacement. For temporary personnel record their beginning and ending dates.

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Provide 24 hour contact information for the Superintendent and SWPPP Manager. The Superintendent and SWPPP Manager must have 24 hour contact information for all Subcontractor SWPPP Coordinators and Utility SWPPP Coordinators.

Include in the SWPPP proof of AK-CESCL or equivalent certifications of ATS operators. Record names of ATS operators and their beginning and ending dates, on Form 25D-127.

The Department will provide proof of AK-CESCL, or equivalent certifications for the Department's Project Engineer, Stormwater Inspectors, and Monitoring Person (if applicable), and names and dates they are acting in that position. Include the Department's staff certifications in Appendix E. Include Owner's staff names, dates acting, and assignments, in Section 2.0 of the SWPPP.

### **641-2.02 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS.**

1. Prepare the HMCP using the DOT&PF template located at the following DOT&PF link; ([http://www.dot.state.ak.us/stwddes/dcsconst/pop\\_constforms.shtml](http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml)) for prevention of pollution from storage, use, containment, cleanup, and disposal of all hazardous material, including petroleum products related to construction activities and equipment. Include the HMCP as an appendix to the SWPPP. Compile Material Safety Data Sheets in one location and reference that location in the HMCP.
2. Designate a Contractor's Spill Response Field Representative with 24-hour contact information. Designate a Subcontractor Spill Response Coordinator for each subcontractor. The Superintendent and Contractor's Spill Response Field Representative must have 24-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.
3. List and give the location and estimated quantities of hazardous materials (Including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials must be stored in covered storage areas. Include secondary containment for all hazardous material storage areas.
4. Identify the locations where fueling and maintenance activities will take place, describe the activities, and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.
5. List the types and approximate quantities of response equipment and cleanup materials available on the Project. Include a list and location map of cleanup materials, at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials must be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.
6. Describe procedures for containment and cleanup of hazardous materials. Describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills. Describe a plan for dealing with contaminated soil and water encountered during construction. Clean up spills or contaminated surfaces immediately.
7. Describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Identify haul methods and final disposal areas. Assure final disposal areas are permitted for hazardous material disposal.
8. Describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75. Include contact information for

reporting hazardous materials and petroleum product spills to the Project Engineer and reporting to federal, state, and local agencies.

**641-2.03 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC Plan) REQUIREMENTS.**

Prepare and implement an SPCC Plan when required by 40 CFR 112 when both of the following conditions are present on the Project:

1. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and
2. Total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons)

Reference the SPCC Plan in the HMCP and SWPPP.

**641-2.04 RESPONSIBILITY AND AUTHORITY OF THE SUPERINTENDENT AND SWPPP MANAGER.**

The Superintendent is responsible for the overall operation of the Project and all Contractor furnished sites and facilities directly related to the Project. The Superintendent shall sign and certify the SWPPP, Inspection Reports, and other reports required by the CGP, except the NOI and NOT. The Superintendent may not delegate the task or responsibility of signing and certifying the SWPPP submitted under [Subsection 641-1.03.1](#), Inspection Reports, and other reports required by the CGP.

The Superintendent may assign certain duties to the SWPPP Manager.

1. Ensuring Contractor's and subcontractor's compliance with the SWPPP and CGP;
2. Ensuring the control of erosion, sedimentation, or discharge of pollutants;
3. Directing and overseeing installation, maintenance, and removal of BMPs;
4. Performing Inspections; and
5. Updating the SWPPP including adding amendments and forms.

When Bid Item 641.0007.\_\_\_\_ is part of the Contract, the SWPPP Manager must be available at all times to administer SWPPP requirements, and be physically present within the Project Zone or the project office, for at least eight hours per day when construction activities are occurring.

The Superintendent and SWPPP Manager shall be knowledgeable in the requirements of this Section 641, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental commitments, and historic preservation commitments.

The Superintendent and SWPPP Manager shall have the Contractor's complete authority and be responsible for suspending construction activities that do not conform to the SWPPP or CGP.

**641-2.05 MATERIALS.**

Use materials suitable to withstand hydraulic, wind, and soil forces, and to control erosion and trap sediments according to the requirements of the CGP and the Specifications.

Use the temporary seed mixture specified in the contract or as directed by the Engineer.

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Use soil stabilization material as specified in **Section 727**.

Use silt fences as specified in **Section 729**.

Use straw and straw products certified weed free of prohibited and restricted noxious weed seed and quarantined pests, according to Alaska Administrative Code, Title 11, Chapter 34 (11 AAC 34). When straw or straw products certified according to 11 AAC 34 are not available, use non-certified products manufactured within Alaska before products manufactured in another state, country or territory. Grass, legumes, or any other herbaceous plants produced as hay, shall not be substituted for straw or straw products.

Use Oregon Scientific RGR126 wireless rain gauge with temperature, or Taylor 2751 Digital Wireless Rain Gauge with Thermometer, or approved equivalent

### **641-3.01 CONSTRUCTION REQUIREMENTS.**

Comply with the SWPPP and the requirements of the CGP Part 5.0.

#### **1. Before Construction**

The following actions must be completed before Construction Activity begins:

- a. The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP Form (25D-106), and the SWPPP must be developed (or amended) with findings from the visit;
- b. The SWPPP must be approved by the Engineer on Form 25D-109;
- c. The Contractor must be authorized to begin by the Engineer;
- d. The Project eNOIs for the Department and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the DEC website;
- e. The Department approved SWPPP must be submitted to DEC and Local Government (when required); and
- f. The Contractor has transmitted to the Engineer an electronic copy and at least one hardcopy of the approved SWPPP.
- g. The Delegation of Authority (Forms 25D-108 and 25D-107) for both the Contractor and DOT&PF Engineer are signed.
- h. Begin winter construction activity according to CGP Part 4.12.2, provided actions a, c, and g are completed. If winter construction activities may extend beyond spring thaw, the following actions must be completed before spring thaw:
  - (1) Actions a through g, listed above, and
  - (2) Appropriate control measures to minimize erosion and sediment runoff during spring thaw and summer rainfall are installed.
- i. Post notices. Include the following information:
  - (1) Copy of all eNOIs related to this project;
  - (2) Location of the SWPPP.



Post notices on the outside wall of the Contractor's project office, and near the main entrances of the construction project. Protect postings from the weather. Locate postings so the public can safely read them without obstructing construction activities or the traveling public (for example, at an existing pullout). Do not use retroreflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where the signs may be confused with traffic control signs or devices. Update the notices if the listed information changes.

- j. Install an outdoor rain gauge per manufacturer's guidance in a readily accessible location on the Project. Projects may utilize the nearest National Weather Service (NWS) precipitation gauge station, if within 20 miles of the project, to determine rainfall amounts during storm events.
- k. Delineate the site for both land disturbing activities and areas that will be left undisturbed.
- l. Install sediment controls and other BMPs that must be placed prior to the initiation of Construction Activity.

## 2. During Construction.

Before subcontractors or utility companies begin soil disturbing activities, provide to them copies of applicable portions of the SWPPP, and require them to sign a SWPPP Subcontractor Certification, Form 25D-105. Include SWPPP Subcontractor Certifications as an appendix to the SWPPP. Ensure subcontractors and utility companies understand and comply with the SWPPP and the CGP. Inform subcontractors and utility companies of SWPPP amendments that affect them in a timely manner. Coordinate with subcontractors and utility companies doing work in the Project Zone so BMPs, including temporary and final stabilization are installed, maintained, and protected from damage.

Provide on-going training to employees and subcontractors, on control measures at the site and applicable stormwater pollution prevention procedures. Training must be specific to the installation, maintenance, protection, and removal of control measures CGP 4.14. Training must be given at a frequency that will be adequate to ensure proper implementation and protection of control measures, and no less frequently than once a month during construction activity. Document on the SWPPP Training Log, Form 25D-125, the dates and attendees to these trainings. Include the SWPPP Training Log as an appendix to the SWPPP.

Notify the Engineer immediately if the actions of any utility company or subcontractor do not comply with the SWPPP and the CGP.

Comply with SSHC Subsection 107-1.11 Protection and Restoration of Property and Landscape. Concrete washout must be fully contained. When SSHC Subsection 107-1.02 is referenced see SC-08.

Comply with CGP Part 4.8.2 for fueling and maintenance activities. Place absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.

Comply with requirements of the HMCP and SPCC Plan, and all local, state and federal regulations that pertain to the handling, storage, containment, cleanup, and disposal of petroleum products or other hazardous materials.

Keep the SWPPP and HMCP current (refer to [Subsection 641-2.01.3](#), SWPPP Considerations and Contents)

## 3. Pollutant Reporting Requirements.

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If an incident of non-compliance occurs that may endanger health or the environment a report must be made, CGP, Appendix A, Part 3.4:

- a. Immediately report the incident to the Engineer verbally,
- b. Report to DEC verbally within 24 hours after the permittee becomes aware of the incident, and
- c. Report to DEC in writing within five days after the permittee becomes aware of the circumstances. To report in writing, complete the written noncompliance report on Form 25D-143, and file the written report with DEC. Coordinate the report with the Engineer. Include in the report:
  - (1) A description of the noncompliance and its causes;
  - (2) The exact dates and times of noncompliance;
  - (3) If not yet corrected the anticipated time the project will be brought back into compliance; and
  - (4) The corrective action taken or planned to reduce, eliminate and prevent reoccurrence.

Notify the Engineer and COE Regulatory Program immediately if there is incident of noncompliance with COE Permits.

#### **4. Hazardous Materials Reporting Requirements.**

Any release of a hazardous substance must be reported immediately, to the Engineer as soon as the person has knowledge of the discharge.

Report spills of petroleum products or other hazardous materials to the Engineer and other agencies as required by law, and according to CGP Part 9.3.

- a. To water; any amount released must be reported immediately to the Engineer, DEC, and the Coast Guard.
- b. To land:
  - (1) Any release of a petroleum product in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge CGP Part 9.3.2.
  - (2) Any release of a petroleum product in excess of 10 gallons but less than 55 gallons must be reported to the Engineer and must be reported to DEC within 48 hours after the person has knowledge of the discharge CGP Part 9.3.2.
  - (3) Any release of a petroleum product in excess of 1 gallon to 10 gallons must be recorded and logged and provided to DEC on a monthly basis.
- c. Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.
- d. Within seven calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release to the nearest DEC Area Response Team Office listed CGP Part 9.3.2.
- e. Implement measures to prevent the reoccurrence of and to respond to such releases.

## 5. Corrective Action and Maintenance of BMPs.

Implement maintenance as required by the CGP, SWPPP, and manufacturer's specifications, whichever is more restrictive.

### a. Implement corrective action:

- (1) If an incident of noncompliance with the SWPPP, or CGP is identified;
- (2) If an Inspection or the Engineer identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants;
- (3) If a required BMP was not installed according to the SWPPP schedule or phasing, or was installed incorrectly, or was not installed according to the CGP Part 4.0;
- (4) If a BMP is not operating as intended, has not been maintained in an effective operation condition, or is unable to effectively perform the intended function;
- (5) If sediment accumulates more than one-third of the distance of the above-ground height of the silt fence;
- (6) If sediment accumulates to more than one-half retention height for an inlet BMP, check dam, berm, wattle, or other control measures;
- (7) If a prohibited discharge of pollutants, as specified in CGP Part 4.7, is occurring or will occur; or
- (8) If there is accumulation of sediment or other pollutants, that is in or near any stormwater conveyance channels, or that may enter a discharge point or storm sewer system. If there is accumulation of sediment or other pollutants that is being tracked outside the project zone.

### b. Implement corrective actions so that they comply with the following time requirements:

- (1) For conditions that are easily remedied (i.e. removal of tracked sediment, maintenance of control measure, or spill clean-up), initiate corrective action within 24 hours and complete as soon as possible;
- (2) If a discharge occurs during a local 2-year, 24-hour storm event, initiate a corrective action the day after the storm event ends;
- (3) If installation of a new control measure is needed or an existing control measure requires redesign and reconstruction or replacement to make it operational, the corrective action must be completed within seven calendar days from the time discovered.
- (4) For all other conditions initiate corrective actions so both of the following requirements are met:
  - (a) Corrective action is completed in time to protect water quality; and
  - (b) Corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see [Subsection 641-3.03.2](#) for more information).

If a corrective action is not implemented within the time requirements of this section, document the situation in the SWPPP, notify the Engineer and implement corrective action as soon as possible.

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If a corrective action could affect a subcontractor, notify the subcontractor within three days of taking the corrective action. Require in your written subcontract, that subcontractors must notify the Contractor within 24 hours of becoming aware of a condition that requires a corrective action.

### 6. Stabilization.

- a. Stabilization may be accomplished using temporary or permanent measures. Initiate stabilization of disturbed soils, erodible stockpiles, disposal sites, and of erodible aggregate layers so that all of the following conditions are satisfied:
  - (1) Not later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased (CGP 4.5.1.1).
  - (2) As soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants; and
  - (3) As identified in the SWPPP.
- b. Land may be disturbed and stabilized multiple times during a project. Coordinate work to minimize the amount of disturbed soil at any one time. Do not disturb more soil than you can stabilize with the resources available.
- c. Temporarily stabilize from wind and water erosion portions of disturbed soils, portions of stockpiles, and portions of disposal sites, that are not in active construction. Temporary stabilization measures may require a combination of measures including but not limited to vegetative cover, mulch, stabilizing emulsions, blankets, mats, soil binders, low-erodible cover, dust palliatives, or other approved methods.
- d. When temporary or permanent seeding is required, provide a working hydro seeding equipment located within 100 miles of the project by road; with 1,000 gallon or more tank capacity, paddle agitation of tank, and the capability to reach the seed areas with an uniform mixture of water, seed, mulch and tackifier. If the project is located in an isolated community the hydro-seeder must be located at the project.
- e. Before applying temporary or permanent seeding, prepare the surface to be seeded to reduce erosion potential and to facilitate germination and growth of vegetative cover. Apply seed and maintain seeded areas. Reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.
- f. Apply permanent seed according to **Sections 618** and **724**, within the time periods allowed by the CGP and the contract, at locations where seeding is indicated on the plans and after land-disturbing activity is permanently ceased.
- g. When installing a culvert or other drainage structure where stream bypass is not used, install temporary or final stabilization concurrently or immediately after placing the culvert or drainage structure in a manner that complies with the SWPPP, applicable project permits and prevents discharge of pollutants. Install temporary or final stabilization:
  - (1) At the culvert or drainage structure inlet and outlet; and
  - (2) In the areas upstream and downstream that may be disturbed by the process of installing the culvert, culvert end walls, culvert end sections, or drainage structure.
- h. Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, install final or temporary stabilization when approved by the Engineer:

- (1) At the inlet and outlet of the culvert, drainage structure, or bridge;
- (2) In the area upstream and downstream of the culvert, drainage structure, or bridge, that is disturbed during installation or construction of the culvert, drainage structure, or bridge; and
- (3) Under the bridge.

Within seven days of initiating final stabilization, either complete final stabilization or continue maintenance of work until final stabilization is complete, CGP Part 4.5.1.5.

Complete temporary stabilization within 14 day of initiating stabilization, CGP Part 4.5.1.2.

7. Ending CGP Coverage and BMP Maintenance in the Project Zone.

- a. The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:
  - (1) Land disturbing activities have ceased;
  - (2) Final Stabilization has been achieved on all portions of the Project Zone, according to the CGP PART 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.); and
  - (3) Temporary BMPs have been removed.
- b. After the Engineer has determined the conditions for ending CGP coverage have been met, the Department will:
  - (1) Send written notice to the Contractor with the date that the conditions were met;
  - (2) Submit an eNOT to DEC; and
  - (3) Provide a copy of the eNOT and DEC's acknowledgement letter to the Contractor.

The Contractor is responsible for ending permit coverage within the Project Zone, by submitting an eNOT to DEC within 30 days of meeting the conditions for ending CGP coverage. The Contractor is responsible for BMP maintenance and SWPPP updates until permit coverage is ended.

If the Contractor's CGP eNOI acreage includes Support Activities and any other areas where the Department is not an Operator, the Contractor may not be able to file an eNOT at the same time as the Department. In this case, the Contractor must amend the SWPPP and separate SWPPP2(s), to indicate the Department's CGP coverage has ended, and the Department is no longer an Operator within the Project Zone.

The Contractor must indicate in the SWPPP the areas that have reached Final Stabilization, and the dates land disturbing activities ended and Final Stabilization was achieved. The Contractor must submit an eNOT to DEC, and insert copies of the Department's and the Contractor's eNOTs with DEC's acknowledgement letters in the appendix of the SWPPP.

The Contractor must submit a copy of each signed eNOT and DEC's acknowledgement letter to the Department within three days of filing the eNOT or receiving a written response.

The Contractor is responsible for coordinating local government inspections of work and ending permit coverage with local government. See [Subsection 641-1.03.5](#) for more information.

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### 8. Transmit final SWPPP.

Transmit one copy of the final SWPPP, including all amendments, appendices and maps, to the Engineer; when the project eNOTs are filed, or within 30 days of the Department's eNOT being filed, whichever is sooner. Transmittal must be by both electronic and at least one hard copy.

### **641-3.02 SWPPP DOCUMENTS, LOCATION ON-SITE, AVAILABILITY, AND RECORD RETENTION.**

The SWPPP and related documents maintained by the Contractor are the Record for demonstrating compliance with the CGP. Copies of SWPPP documents transmitted to the Engineer under the requirements of this specification are informational and do not relieve the Contractor's responsibility to maintain complete records as required by the CGP and this specification.

Keep the SWPPP, HMCP and SPCC Plan at the on-site project office. If there is not an on-site project office, keep the documents at a locally available location that meets CGP requirements and is approved by the Engineer. Records may be moved to another office for record retention after the eNOTs are filed. Records may be moved to another office during winter shutdown. Update on-site postings if records are relocated during winter shutdown. Provide the Department with copies of all Records.

Retain Records and a copy of the SWPPP, for at least three years after the date of eNOT. If EPA or DEC inspects the project, issues a Notice of Violation (NOV), or begins investigation for a potential NOV before the retention period expires, retain the SWPPP and all Records related to the SWPPP and CGP until at least three years after EPA and/or DEC has determined all issues related to the investigation are settled.

The SWPPP and related documents must be made available for review and copy, to the Department and other regulatory agencies that request them. See CGP Parts 5.10, 6.6 and 9.5.

### **641-3.03 SWPPP INSPECTIONS, AMENDMENTS, REPORTS, AND LOGS.**

Perform Inspections, prepare Inspection Reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP. Update SWPPP Corrective Action Log Form 25D-112, SWPPP Amendment Log Form 25D-114, SWPPP Grading and Stabilization Activities Log Form 25D-110, SWPPP Project Staff Tracking Form 25D-127, and SWPPP Daily Record of Rainfall Form 25D-115. For active projects update the Records daily.

#### 1. Inspection during Construction.

Conduct Inspections according to the schedule and requirements of the SWPPP and CGP.

Inspections required by the CGP and SWPPP must be performed by the Contractor's SWPPP Manager and the Department's Stormwater Inspector jointly, unless approved by the Engineer, when:

- a. One of the inspectors is not on site, access is only by air, and weather delayed or canceled flights;
- b. One of the inspectors is sick;
- c. The project is on a reduced frequency inspection schedule with no staff on site, the only access to the site is by air, and it is economical to send only one inspector; or
- d. When the Engineer determines a safety concern that makes joint inspection impracticable.

When this is the case, the Operator who conducts the Inspection must provide a copy of the Inspection Report to the other Operator within three days of the Inspection date and document the date of the report transmittal.

## 2. Inspection Reports.

Use only the DOT&PF SWPPP Construction Site Inspection Report, Form 25D-100 to record Inspections. Changes or revisions to Form 25D-100 are not permitted; except for adding or deleting data fields that list: Location of Discharge Points, and Site Specific BMPs. Complete all fields included on the Inspection Report form; do not leave any field blank.

Insert a Complete-by-Date for each corrective action listed that complies with:

- a. **Section 641-3.01 (4)**, and
- b. The CGP.

Provide a copy of the completed, unsigned Inspection Report to the Engineer by the end of the next business day following the inspection.

The Superintendent must review, correct errors, and sign and certify the Inspection Report, within three days of the date of Inspection. The Engineer may coordinate with the Superintendent to review and correct any errors or omissions before the Superintendent signs the report. Corrections are limited to adding missing information or correcting entries to match field notes and conditions present at the time the Inspection was performed. Deliver the signed and certified Inspection Report to the Engineer on the same day the Superintendent signs it.

The Engineer will sign and certify the Inspection Report and will return the original to the Contractor within three working days.

The Engineer may make corrections after the Superintendent has signed and certified the Inspection Report. The Engineer will initial and date each correction. If the Engineer makes corrections, the Superintendent must recertify the Inspection Report by entering a new signature and date in the white space below the original signature and date lines. Send a copy of the recertified Inspection Report to the Engineer on the day it is recertified.

If subsequent corrections to the certified Inspection Report are needed, document the corrections in an amendment memo that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent and the Engineer must both sign and certify the amendment memo. The issuance of an amendment memo does not relieve the Contractor of liquidated damages that may have been incurred as a result of the error on the original certified inspection report.

## 3. Inspection before Seasonal Suspension of Work.

Conduct an Inspection before seasonal suspension of work to confirm BMPs are installed and functioning according to the requirements of the SWPPP and CGP.

## 4. Reduced Inspection Frequencies.

Conduct Inspections according to the inspection schedule indicated in the approved SWPPP. Any change in inspection frequency must be approved by the Engineer, and beginning and ending dates documented as an amendment to the SWPPP.

If the Engineer approves and the entire site is stabilized, the frequency of inspections may be reduced to at least one inspection every 30 days. At actively staffed sites, inspect within two business days of the end of a storm event that results in a discharge from the site.

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When work is suspended due to fall freeze-up, the Engineer may suspend inspection requirements after fourteen days of freezing conditions if:

- a. Soil disturbing activities are suspended; and
- b. Soil stabilizing activities are suspended.

Inspections must resume according to the normal inspection schedule identified in the SWPPP, at least 21 days before anticipated spring thaw. See CGP Part 6.2.3.

The Engineer may waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall during seasonal suspension of work. If so, resume collecting and recording weather data on the Daily Record of Rainfall form one month before thawing conditions are expected to result in runoff. Resume recording land disturbance and stabilization activities on the Grading and Stabilization Activities Log when Construction Activity resumes.

### 5. Stabilization before Fall Freeze up and Spring Thaw.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to the anticipated date of fall freeze up, in accordance with the CGP, Part 4.12.

Exceptions to stabilization prior to anticipated date of fall freeze up include:

- a. When stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, or
- b. When winter construction activity is authorized by the Engineer and conducted according to the contract.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to spring thaw, as defined in the CGP.

### 6. Inspection before Project Completion.

Conduct Inspection to ensure Final Stabilization is complete throughout the Project, and temporary BMPs that are required to be removed are removed. Temporary BMPs that are biodegradable and are specifically designed and installed with the intent of remaining in place until they degrade, may remain in place after project completion.

### 7. Items and Areas to Inspect.

Conduct Inspections of the areas required by the CGP and SWPPP.

### 8. SWPPP Amendments and SWPPP Amendment Log.

The Superintendent and the SWPPP Manager are the only persons authorized to amend the SWPPP and update the SWPPP Amendment Log, Form 25D-114. The Superintendent or the SWPPP Manager must sign and date amendments to the SWPPP and updates to the SWPPP Amendment Log.

SWPPP Amendments must be approved by the Engineer.

Amendments must occur:

- a. Whenever there is a change in design, construction operation, or maintenance at the construction site that has or could cause erosion, sedimentation or the discharge of pollutants that has not been previously addressed in the SWPPP;



- b. If an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;
- c. Whenever an Inspection identifies a problem that requires additional or modified BMPs
- d. Whenever a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;
- e. If the Inspection frequency is modified (note beginning and ending dates); or
- f. When there is a change in personnel who are named in the SWPPP, according to [Subsection 641-2.01.4](#).

Amend the SWPPP narrative as soon as practicable after any change or modification, but in no case, later than seven days following identification of the need for an amendment. Every SWPPP Amendment must be signed and dated. Cross-reference the amendment number with the Corrective Action Log or SWPPP page number, as applicable. When a BMP is modified or added, describe the BMP according to [Subsection 641-2.01.3](#).

Keep the SWPPP Amendment Log current. Prior to performing each scheduled Inspection, submit to the Engineer a copy of the pages of the Amendment Log that contain new entries since the last submittal. Include copies of any documents amending the SWPPP.

Keep the SWPPP Amendment Log as an appendix to the SWPPP.

9. Site Maps.

Document installation, routine maintenance, and removal of BMPs by making notes on the SWPPP Site Maps. Include the date and the recording person's initials by these notes. Identify areas where Construction Activities begin, areas where Construction Activities temporarily or permanently cease, and areas that are temporarily or permanently stabilized.

10. Corrective Action Log.

The Superintendent and SWPPP Manager are the only persons authorized to make entries on the SWPPP Corrective Action Log, Form 25D-112. Document the need for corrective action within 24 hours of either:

- a. Identification during an inspection; or
- b. Discovery by the Department's or Contractor's staff, a subcontractor, or a regulatory agency inspector.

Modification or replacement of a BMP, installation of a new BMP not shown in the original SWPPP, overdue BMP maintenance, or other reasons listed as corrective actions in 641-3.01.4 must be documented on the Corrective Action Log.

Within 24 hours of discovery, update the Corrective Action Log, Form 25D-112, with the date of discovery and proposed corrective action. If discovered during an inspection, update log with inspection date and proposed corrective actions noted on the Inspection Report. If discovered outside of an inspection, update the log with the date of discovery, the proposed corrective action, and the date the corrective action was completed.

After the corrective action has been accomplished, note in the Corrective Action Log the action taken and if a SWPPP amendment was needed. Date and initial the entry.

Keep the Corrective Action Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection.

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Keep the Corrective Action Log as an appendix to the SWPPP.

### **11. Grading and Stabilization Activities Log.**

The Superintendent and SWPPP Manager are the only persons authorized to date and initial entries on the SWPPP Grading and Stabilization Activities Log, Form 25D-110. Use the SWPPP Grading and Stabilization Activities Log, to record land disturbance and stabilization activities.

Keep the Grading and Stabilization Activities Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection. Keep the Grading and Stabilization Activities Log organized and completed to demonstrate compliance with the CGP Part 4.5.

Keep the Grading and Stabilization Activities Log as an appendix to the SWPPP.

### **12. Daily Record of Rainfall.**

Use SWPPP Daily Record of Rainfall, Form 25D-115, to record weather conditions at the Project. Update the form daily and include the initials of the person recording each day's entry. Submit a copy to the Engineer prior to performing each scheduled Inspection. Keep the Daily Record of Rainfall as an appendix to the SWPPP.

### **13. Staff Tracking Log.**

Use the SWPPP Project Staff Tracking Form 25D-127, to keep staff records current. Include Records of the AK-CESCL or equivalent qualifications for the Superintendent, SWPPP Manager, ATS operator, any acting Superintendent and acting SWPPP Managers, and beginning and end dates for temporary personnel assignments related to administration of the CGP or **Section 641**. Update the SWPPP Staff Tracking Log within 24 hours of any changes in personnel, qualifications, or other staffing items related to administration of the CGP or **Section 641**.

### **641-3.04 FAILURE TO PERFORM WORK.**

The Engineer has authority to suspend work and withhold monies according to SC-05.01 and SC-06.05 for the reasons listed within SC-06.05 and for an incident of noncompliance with the CGP or SWPPP, that may endanger health or the environment or for failure to perform work related to **Section 641**.

An incident of noncompliance includes, but is not limited to, the Contractor's failure to:

1. Obtain appropriate permits before Construction Activities occur;
2. Perform SWPPP Administration;
3. Perform timely Inspections;
4. Update the SWPPP;
5. Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;
6. Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;
7. Perform duties according to the requirements of **Section 641**; or

- 8. Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.
- 9. Any other requirements established or included in the contract.

No additional Contract time or additional compensation will be allowed due to delays caused by the Engineer's suspension of work.

**641-3.05 ACCESS TO WORK.**

The Project, including any related off-site areas or support activities, must be made available for inspection, or sampling and monitoring, by the Department and other regulatory agencies. See CGP Part 6.6.

**641-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

Items 641.0001.\_\_\_\_, 641.0003.\_\_\_\_ and 641.0007.\_\_\_\_, are lump sum.

Items 641.0002.\_\_\_\_, 641.0004.\_\_\_\_ and 641.0005.\_\_\_\_, measured on a contingent sum basis as specified by the Directive authorizing the work.

Item 641.0006.\_\_\_\_ measured on a contingent sum basis with withholding determined by the Department.

**TABLE 641-1 BMP VALUES – RESERVED**

Liquidated Damages assessed according to **Table 641-2** are not an adjustment to the Contract amount. These damages charges are related to Contract performance but are billed by the Owner to the Contractor, independent of the Contract amount. An amount equal to the Liquidated Damages may be withheld for unsatisfactory performance, from payment due under the Contract, until the Contractor remits payment for billed Liquidated Damages.

**TABLE 641-2 - VERSION C  
EROSION, SEDIMENT AND POLLUTION CONTROL – LIQUIDATED DAMAGES**

<b>Code</b>	<b>Specification Section Number and Description</b>	<b>Deductible Amount in Dollars</b>	<b>Cumulative Deductible Amounts in Dollars</b>
<b>A</b>	641-1.04 Failure to have a qualified (AK-CESCL or equivalent) SWPPP Manager	Calculated in Code B or F	
<b>B</b>	Failure to meet SWPPP requirements of: (1) 641-2.01.1 Name of SWPPP Preparer (2) Not Applicable (3) 641-3.03.8 Sign and Date SWPPP amendments by qualified person (4) 641-3.02 Records maintained at project and made available for review	\$750 per omission	
<b>C</b>	Not Applicable		
<b>D</b>	641-3.03.5 Failure to stabilize a Project prior to fall freeze up.	\$5,000 per Project per year	
<b>E</b>	641-2.01.1 Failure to conduct pre-construction inspections before Construction Activities on all projects greater than 1 acre.	\$2,000 per Project	

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<b>Code</b>	<b>Specification Section Number and Description</b>	<b>Deductible Amount in Dollars</b>	<b>Cumulative Deductible Amounts in Dollars</b>
<b>F*</b>	641-3.03. Failure to conduct and record CGP Inspections 641-3.03.1 Personnel conducting Inspections and Frequency 641-3.03.2 Inspection Reports, use Form 25D-100, completed with all required information	\$750 per Inspection	Additional \$750 for every additional 7 day period without completing the required inspection.
<b>G</b>	641-3.01.4 Corrective action, failure to timely accomplish BMP maintenance and/or repairs. In effect until BMP maintenance and/or repairs is completed.	\$500 per Project per day	
<b>H</b>	641-3.01.3 Failure to provide to the Engineer and DEC a timely oral noncompliance report of violations or for a deficient oral noncompliance report	\$750 for the first day the report is late or deficient	Additional \$750 for every 14 day period with- out the required information
<b>I</b>	641-3.01.3 Failure to provide to the Engineer and DEC a timely written noncompliance report, use Form 25D-143, of violations or for a deficient written noncompliance report	\$750 for the first day the report is late or deficient	Additional \$750 for every 14 day period without the required information
<b>J</b>	641.3.04 Failure to comply with the requirements of the CGP, approved SWPPP, and Section 641, except as listed above	\$750 per occurrence for the first day of noncompliance	Additional \$750 for every day the deficiency remains uncorrected

**Code F\*** Liquidated Damages according to Code F will not be billed for typographic errors and minor data entry errors, except the liquidated damages will be assessed for these errors when:

- a. the Contractor has previously been notified and subsequent inspection reports repeat the same or similar error,
- b. multiple inspection reports are submitted after the submission due date and the same or similar errors are repeated on multiple overdue reports,
- c. an error in recording the inspector's AK-CESCL certification date results in an inspector performing the inspection during a period when their certification was lapsed or was otherwise invalid.

**641-5.01 BASIS OF PAYMENT.**

See **Subsection 641-3.04** Failure to Perform Work, for additional work and payment requirements.

Item 641.0001. \_\_\_\_\_ Erosion, Sediment and Pollution Control Administration. At the Contract lump sum price for administration of all work under this Section. Includes, but is not limited to, SWPPP and HMCP and SPCC Plan preparation, agency fees for SWPPP reviews, SWPPP amendments, pre-construction Inspections, Inspections, monitoring, reporting, and Record keeping or copying Records related to the SWPPP and required by the CGP, and Record retention.

Item 641.0002. \_\_\_\_\_ Temporary Erosion, Sediment and Pollution Control. At the contingent sum prices specified for all labor, supervision, material, equipment, and incidentals to install, maintain, remove and dispose of approved temporary erosion, sedimentation, and pollution control BMPs required to implement the SWPPP and SPCC Plan.

Item 641.0003. \_\_\_\_\_ Temporary Erosion, Sediment and Pollution Control. At the Contract lump sum price for all labor, supervision, material, equipment, and incidentals to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs identified in the SWPPP and SPCC Plan.

Item 641.0004.\_\_\_\_ Temporary Erosion Sediment and Pollution Control Additives. At the contingent sum prices specified in the Directive to authorize the work, for all labor, supervision, materials, equipment, and incidentals for extra, additional, or unanticipated work, to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs not covered by Item 641.0003.\_\_\_\_. All additional Erosion, Sediment, and Pollution Control Administration necessary due to this item will not be paid for separately but will be subsidiary to other bid items.

Item 641.0005.\_\_\_\_ Temporary Erosion Sediment and Pollution Control by Directive. At the contingent sum prices specified in the Directive using time and materials to authorize the work, for all labor, supervision, materials, equipment, and incidentals to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs. Prices for this item will be by time and materials according to General Condition Article 10, or by mutual agreement between the Engineer and Contractor. All additional Erosion, Sediment, and Pollution Control Administration necessary due to this item will not be paid for separately but will be subsidiary to other bid items.

Item 641.0006.\_\_\_\_ Withholding. The Engineer may withhold an amount equal to Liquidated Damages, assessed according to Section 641, from payment due the Contractor. Liquidated Damages for violations of the Contract, CWA, and CGP, are determined by the Engineer according to Table 641-2. The Engineer may withhold payment due the Contractors until the Contractor pays the Liquidated Damages to the Department.

The Owner will not release performance bonds until Liquidated Damages assessed according to Section 641 are paid to the Department, and all requirements according to ARRC Procurement Manual are satisfied.

Item 641.0007.\_\_\_\_ SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item 641.0007.\_\_\_\_ appears in the Bid Schedule, the SWPPP Manager must be a different person than the superintendent, and must be physically present during construction activity with duties and authority as described in Subsection 641-2.04. When Item 641.0007.\_\_\_\_ does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item 641.0001.\_\_\_\_.

Subsidiary Items. Temporary erosion, sediment and pollution control measures that are required outside the Project Zone are subsidiary. Work required by the HMCP and SPCC Plan including hazardous material storage, containment, removal, cleanup and disposal, are subsidiary to Item 641.0001.\_\_\_\_ Erosion, Sediment and Pollution Control Administration.

Work under other pay items. Work that is paid for directly or indirectly under other pay items will not be measured and paid for under Section 641. This work includes but is not limited to:

1. Dewatering;
2. Shoring;
3. Bailing;
4. Permanent seeding;
5. Installation and removal of temporary work pads;
6. Temporary accesses;
7. Temporary drainage pipes and structures;
8. Diversion channels;
9. Settling impoundment; and
10. Filtration.

Permanent erosion, sediment and pollution control measures will be measured and paid for under other Contract items, when shown on the bid schedule.

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Work at the Contractor's Expense. Temporary erosion, sediment and pollution control measures that are required due to carelessness, negligence, or failure to install temporary or permanent controls as scheduled or ordered by the Engineer, or for the Contractor's convenience, are at the Contractor's expense.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
641.0001.____	Erosion, Sediment and Pollution Control Administration	LS
641.0002.____	Temporary Erosion, Sediment and Pollution Control	CS
641.0003.____	Temporary Erosion, Sediment and Pollution Control	LS
641.0004.____	Temporary Erosion, Sediment and Pollution Control Additives	CS
641.0005.____	Temporary Erosion, Sediment and Pollution Control by Directive	CS
641.0006.____	Withholding	CS
641.0007.____	SWPPP Manager	LS

## SECTION 643 TRAFFIC MAINTENANCE

### 643-1.01 DESCRIPTION.

Protect and control traffic during the contract. Furnish, erect, maintain, replace, clean, move and remove the traffic control devices required to ensure the traveling public's safety. Perform all administrative responsibilities necessary to implement this work.

Maintain all roadways and pedestrian and bicycle facilities affected by the work in a smooth and traversable condition. Construct and maintain approaches, crossings, intersections, and other necessary features throughout the project for the life of the contract.

Illuminate construction activities listed in **Table 643-4** during hours of night work on roads open to the public within project limits.

### 643-1.02 DEFINITIONS.

These definitions apply only to **Section 643**.

**ATM.** When used in this Section, ATM stands for the *Alaska Traffic Manual*, which is comprised of the Manual on Uniform Traffic Control Devices (MUTCD), the Alaska Traffic Manual Supplement, any adopted revisions or interim addenda to either document issued subsequently, and corrections to known errors to either document.

**BALLOON LIGHT.** Light surrounding by a balloon-like enclosure kept inflated by pressurized air or helium, and producing uniform light through 360 horizontal degrees.

**CONSTRUCTION PHASING PLAN.** A plan for each phase of the project showing how to accommodate traffic. Show the sequence of work by segment or phase, if required.

**FIXED OBJECTS.** Private vehicles, parked flagger vehicles, idle construction equipment, construction material stockpiles, culvert ends, individual trees, power poles, utility poles and appurtenances, and other items deemed by the Engineer to present a hazard to motorists, pedestrians, or bicyclists traveling through the work zone.

**NIGHT WORK.** Work occurring between sunset and sunrise on all days except the "No Lighting Required" period shown in the **Table 643-1** below:

**TABLE 643-1  
PROJECT LOCATIONS – NIGHT TIME ILLUMINATION EXCLUSION**

Latitude (degrees)	No Lighting Required		Nearby Cities
	Start	End	
South of 61	Lighting Required All Year		Everything South of Hope
61	June 11	July 1	Anchorage, Valdez, Girdwood
62	June 2	July 13	Wasilla, Palmer, Glennallen, Talkeetna
63	May 27	July 17	Cantwell, Paxson, McGrath
64	May 22	July 21	Tok, Delta, Nome
65	May 18	July 25	Fairbanks
66	May 14	July 29	Circle City
67	May 10	August 2	Coldfoot, Kotzebue
68	May 7	August 6	Galbraith Lake

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69	May 3	August 9	Happy Valley
70	April 30	August 12	Deadhorse
71	April 27	August 15	Barrow
72	April 24	August 19	

**TRAFFIC.** The movement of vehicles, pedestrians, and bicyclists through road construction, maintenance operations, utility work, or similar operations.

**TRAFFIC CONTROL PLAN (TCP).** A drawing or drawings indicating the method or scheme for safely guiding and protecting motorists, pedestrians, bicyclists, and workers in a traffic control zone. The TCP depicts the traffic control devices and their placement and times of use.

**TRAFFIC CONTROL ZONE.** A portion of a road construction project, maintenance operation, utility work or similar operation that affects traffic and requires traffic control to safely guide and protect motorists, pedestrians, bicyclists, or workers.

### **643-1.03 TRAFFIC CONTROL PLAN.**

Implement an approved TCP before beginning work within the project limits.

The TCP includes, but is not limited to, signs, barricades, traffic cones, plastic safety fence, sequential arrow panels, portable changeable message board signs, special signs, warning lights, portable concrete barriers, crash cushions, flaggers, pilot cars, interim pavement markings, temporary lighting, temporary roadways and all other items required to direct traffic through or around the traffic control zone according to these Specifications and the ATM. Address in the TCPs placement of traffic control devices, including location, spacing, size, mounting height and type. Include code designation, size, and legend per the ATM and the Alaska Sign Design Specification (ASDS). Include longitudinal buffer space for the posted speed limit, according to Table 6C-2 of the ATM unless project conditions or geometric features prohibit including all or a portion of the buffer length.

When a TCP is included in the Plans, use it, modify it, or design an alternative TCP. When a TCP is omitted from the Plans, provide one according to this Section and the ATM.

Submit new or modified TCPs to the Engineer for approval. All TCPs must include the following information:

1. Project name and number.
2. A designated TCP number and name on each page.
3. For TCPs more than one page, each page must be numbered.
4. The posted speed limit for each roadway.
5. Existing striping width, lane width, and road surfacing.
6. Construction lane widths, striping layout, and temporary pavement marker layout.
7. Provisions for Pedestrian, Bicycle, and ADA travel through the work zone.
8. Dates and times the TCP will be in effect and why it is being used.
9. The Worksite Traffic Supervisor's signature certifying that all TCPs conform with the ATM and the Contract.
10. The Project Superintendent's signature confirming the TCP is compatible with the work plan.
11. The name(s) of the Worksite Traffic Supervisor, his/her alternate and their 24 hour telephone number(s).
12. Signs to be used and the ASDS designation number and size.
13. Location and spacing of all devices and signs.



14. A plan to address any possible slopes, drop offs, paving joints, or similar temporary features that may occur during use of the TCP.
15. For TCPs proposed to be used at night, note how the requirements will be met for the required lighting and retroreflective material.

TCPs submitted for approval without all the required information will be rejected. Allow 7 days for review of each TCP submittal. All required modifications to a TCP require a new submission and an additional 7 days for review.

A minor revision to a previously approved TCP during construction requires 48 hours for review and approval by the Engineer.

The TCPs, Plans, and Alaska Department of Transportation & Public Facilities' Standard Plans show the minimum required number of traffic control devices. If unsafe conditions occur, the Engineer may require additional traffic control devices.

Use of oversize and overweight equipment within the project must conform to an approved TCP, including all traffic control devices these operations require.

#### **643-1.04 WORKSITE TRAFFIC SUPERVISOR.**

Provide a Worksite Traffic Supervisor responsible for maintaining 24-hour traffic operations.

1. Qualifications. The Worksite Traffic Supervisor shall be knowledgeable and experienced regarding the requirements of the ATM and the implementation of those requirements. The Worksite Traffic Supervisor shall be familiar with the Plans, the Specifications, proposed operations, and certified as one of the following:
  - a. Traffic Control Supervisor, American Traffic Safety Services Association (ATSSA)
  - b. Work Zone Temporary Traffic Control Technician, or Work Zone Safety Specialist, International Municipal Signal Association (IMSA)

Certify according to Form 25D-124 that the Worksite Traffic Supervisor has a minimum 4000 hours of temporary traffic control work experience, is competent and capable, and has the authority to perform the duties and responsibilities in accordance with this section.

- c. Temporary traffic control work experience shall demonstrate an understanding of concepts, techniques, and practices in the installation and maintenance of traffic control devices, and skill in reading, interpreting, implementing, and modifying TCPs.
- d. Temporary traffic control work experience includes: flagging; installing traffic control devices in accordance with TCPs; monitoring traffic control devices and TCP performance; and recognizing and reporting deficiencies in traffic control devices and TCPs for correction.
- e. Temporary traffic control work experience is gained while serving as a Worksite Traffic Supervisor-in-training, temporary traffic control support personnel, and Flagger.
- f. Four thousand hours of experience serving solely as a Flagger does not satisfy these requirements.

Worksite Traffic Supervisors shall maintain current certification and be able to show their certification anytime they are on the project.

2. Duties.
  - a. Prepare the TCPs and public notices and coordinate traffic control operations between the Project Superintendent and the Engineer.

- b. Physically inspect the condition and position of all traffic control devices used on the project at least twice each day and at approximately 12 hour intervals. Ensure that traffic control devices work properly, are clean and visible, and conform to the approved TCP. Complete and sign a detailed written report of each inspection within 24 hours. Use Traffic Control Daily Review Form 25D-104.
  - c. Supervise the repair or replacement of damaged or missing traffic control devices.
  - d. Review and anticipate traffic control needs. Make available proper traffic control devices necessary for safe and efficient traffic movement.
  - e. Review work areas, equipment storage, and traffic-safety material handling and storage.
  - f. Hold traffic safety meetings with superintendents, foremen, subcontractors, and others as appropriate before beginning construction, prior to implementing a new TCP, and as directed. Invite the Engineer to these meetings.
  - g. Supervise all traffic control workers, flaggers, and pilot car drivers.
  - h. Certify that all flaggers are certified as required by **Subsection 643-3.04.4**. Submit a copy of all flagger certifications to the Engineer.
  - i. Supervise lighting for night work.
3. Authority. The Worksite Traffic Supervisor shall have the Contractor's authority to stop work and implement immediate corrective action to unsafe traffic control, in locations where unsafe traffic control is present.

#### **643-1.05 CONSTRUCTION PHASING PLAN.**

Submit a Construction Phasing Plan for approval no less than 5 working days prior to the preconstruction conference. Include the following:

1. Form 25D-124 designating the Worksite Traffic Supervisor, providing the 24-hour telephone number, and certifying minimum 4,000 hours of work experience as described in **Subsection 643-1.04** Worksite Traffic Supervisor.
2. A construction phasing plan for each phase or segment of the project.
3. TCPs for the first phase of the project. Show permanent and temporary traffic control measures, including the times each TCP will be used.

Submit any changes to the Engineer for approval 7 days before proposed implementation.

#### **643-1.06 TRAFFIC MAINTENANCE SETUP.**

When shown on the bid schedule, Traffic Maintenance Setup items are site specific and are detailed as individual TCPs on the plan sheets. They depict the method or scheme required to route traffic safely and efficiently when any of the following restrictions occur:

1. Lane Closure. The closure of one or more lanes on a roadway.
2. Detour. The redirection of traffic through or around a traffic control zone.
3. Road Closure. The closure of a roadway with or without a specified detour route.
4. One Lane Road. A two-way roadway reduced to a single-lane roadway with flaggers, pilot cars, traffic signals, stop signs, or yield signs.

**643-2.01 MATERIALS.**

Provide traffic control devices meeting the following requirements:

1. Signs. Use signs, including sign supports, that conform to [Section 615](#), the ATM, and ASDS.
  - a. Construction Signs: Regulatory, guide, or construction warning signs designated in the ASDS.
  - b. Permanent Construction Signs: As designated on the Plans or an approved TCP.
  - c. Special Construction Signs: All other signs are Special Construction Signs. Neatly mark the size of each sign on its back in 3-inch black numerals.
2. Portable Sign Supports. Use wind-resistant sign supports with no external ballasting. Use sign supports that can vertically support a 48 X 48 inch traffic control sign at the height above the adjacent roadway surface required by the ATM.
3. Barricades and Vertical Panels. Use barricades and vertical panel supports that conform to the ATM. Use Type III Barricades at least 8 feet long. Use retroreflective sheeting that meets ASTM D4956 Type II or III.
4. Portable Concrete Barriers. Use portable concrete barriers that conform to the Contract. For each direction of traffic, equip each 12.5-foot section of barrier with at least two side-mounted retroreflective tabs placed approximately 6 to 8 feet apart, or a continuous 4-inch wide horizontal retroreflective stripe mounted 6 inches below the top of the barrier. Use yellow tabs or stripe when barriers are placed at centerline. Use white tabs or stripe when barriers are placed on the roadway shoulder. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V.
5. Warning Lights. Use Type A (low intensity flashing), Type B (high intensity flashing) or Type C (steady burn) warning lights that conform to the ATM.
6. Drums. Use plastic drums that conform to the requirements of the ATM. Use retroreflective sheeting that meets ASTM D4956 Type II or III.
7. Traffic Cones and Tubular Markers. Use reflectorized traffic cones and tubular markers that conform to the requirements of the ATM. Use traffic cones and tubular markers at least 28 inches high. Use retroreflective sheeting that meets ASTM D4956 Type II or III.
8. Interim Pavement Markings. Apply markings according to Section 670 and the manufacturer's recommendations. Use either:
  - a. Paint meeting Subsection 708-2.03 with glass beads meeting [Subsection 712-2.08](#),
  - b. Preformed Marking Tape (removable or non-removable) meeting [Subsection 712-2.14](#), or
  - c. Temporary Raised Pavement Markers meeting [Subsection 712-2.15](#) or [712-2.16](#), as appropriate.
9. High-Level Warning Devices. Use high-level warning devices that conform to the ATM.
10. Temporary Crash Cushions. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V. Application of crash cushion must be appropriate for the intended use and be installed per manufacturer's recommendation. Temporary crash cushions that are barrels or barricade filled with sand or water may only be used when the forecasted temperature during their use is above 32 degrees Fahrenheit.

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11. Sequential Arrow Panels. Use Type A (24 X 48 inch), Type B (30 X 60 inch) or Type C (48 X 96 inch) panels that conform to the ATM.
12. Portable Changeable Message Board Signs. Use truck or trailer mounted portable changeable message board signs with a self-contained power supply for the sign and with the following features:
  - a. Message sign panel large enough to display 3 lines of 9 inch high characters
  - b. Eight character display per message line
  - c. Fully programmable message module
  - d. The capacity to create, preview, and display new messages and message sequences
  - e. A waterproof, lockable cover for the controller keyboard
  - f. An operator's manual, a service manual, and a wiring diagram
  - g. Quick release attachments on the display panel cover
  - h. Variable flash and sequence rates
  - i. Manual and automatic dimming capabilities on lamp bulb matrix models
  - j. Locate the bottom of the sign panel at least 7 feet above the pavement
  - k. Operate with a battery pack a minimum of 2 hours under full load
  - l. Power cords shall comply with the National Electrical Code (NEC) Article 600.10 Portable or Mobile Signs, paragraphs 600.10(C)(1) Cords and 600.10(C)(2) Ground-Fault Circuit Interrupter (GFCI). The cord will have integral GFCI protection located in either the attachment plug or 12-inches or less from the plug.
13. Plastic Safety Fence. Use 4 foot high construction orange fence manufactured by one of the following companies, or an approved equal:
  - a. "Safety Fence" by Jackson Safety, Inc., Manufacturing and Distribution Center, 5801 Safety Drive NE, Belmont, Michigan, 49306. Phone (800) 428-8185.
  - b. "Flexible Safety Fencing" by Carsonite Composites, LLC, 19845 U.S. Highway 76, Newberry, South Carolina, 29108. Phone (800) 648-7916.
  - c. "Reflective Fencing" by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, Ohio 44104. Phone (800) 662-6338.
14. Temporary Sidewalk Surfacing. Provide temporary sidewalk surfacing as required by an approved TCP and the following:
  - a. Use plywood at least 1/2 inch thick for areas continuously supported by subgrade. Use plywood at least 1 inch thick for areas that are not continuously supported.
  - b. Do not use unsupported 1-inch plywood longer than 30 inches.
  - c. Use plywood with regular surfaces. Do not overlap plywood joints higher than 1/2 inch. Bevel overlap joints so the maximum slope of the overlapping edge is 2 horizontal to 1 vertical.
  - d. Fasten so wind and traffic will not displace temporary surfacing.

15. Temporary Guardrail. Use temporary guardrail that meets Section 606, except that posts may require placement under special conditions, such as in frozen ground.
16. Flagger Paddles. Use flagger paddles with 24 inches wide by 24 inches high sign panels, 8 inch Series C lettering (see ASDS for definition of Series C), and otherwise conform to the ATM. Use retroreflective sheeting that meets ASTM D4956 Type VIII, IX, or XI. Use background colors of fluorescent orange on one side and red on the other side.
17. Truck Mounted Attenuator, TMA. The TMA shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight per the manufacturer's recommendations.
18. Portable Steel Barriers. Use portable steel barriers that conform to the contract. For each direction of traffic, equip each section of barrier with side-mounted retroreflective tabs placed approximately 6 to 8 feet apart, or a continuous 4-inch wide horizontal retroreflective stripe mounted 6 inches below the top of the barrier. Use yellow tabs or stripe when barriers are placed at centerline. Use white tabs or stripe when barriers are placed on the roadway shoulder. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V.

### **643-2.02 CRASHWORTHINESS.**

Temporary Work Zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of Manual for Assessing Safety Hardware (MASH). Such devices manufactured on or before this date, and successfully tested to National Cooperative Highway Research Program (NCHRP) Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

Submit documentation, by the method indicated on **Table 643-2**, that the following devices comply with Test Level 3 requirements of NCHRP Report 350 or MASH. Submit documentation of compliance to the Engineer before installing devices on the project.

**TABLE 643-2  
WORK ZONE TRAFFIC CONTROL DEVICE AND  
BARRIER CRASH TESTING COMPLIANCE**

<b>Category</b>	<b>Devices</b>	<b>Devices Manufactured Before Dec. 31, 2019 <sup>1</sup></b>	<b>Devices Manufactured After Dec. 31, 2019 <sup>1</sup></b>	<b>Method of Documentation</b>
1	Low-mass single-piece devices w/o attachments: traffic cones, tubular markers, single piece drums, delineators	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	Manufacturer's Certification for devices exceeding height and weight limits
2	Category 1 devices with attachments, barricades, portable sign supports, drums w/lights, other devices weighing less than 100 pounds but not included in category 1	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, if available, at Test Level 3 <sup>2</sup> , or DOT&PF eligibility determination
3	Fixed sign supports, truck mounted attenuators, temporary crash cushions, bridge railing, bridge and guardrail transitions, and guardrail and barrier end treatments.	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, if available, at Test Level 3 <sup>2</sup> , or DOT&PF eligibility determination

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Portable concrete and steel barriers	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, if available, at Test Level 3, or DOT&PF eligibility determination, unless otherwise required in the contract.
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- 1 The Engineer will determine whether a device is in serviceable condition. Serviceable means the device will function equivalent to a new device of the same manufacture.
- 2 When no test level is specified in an FHWA Eligibility letter; it is implied that the tests were run for Test Level 3.

In **Table 643-2**, Category 1 devices that exceed the following weights and heights require certification that they meet the evaluation criteria of NCHRP Report 350 or MASH, Test Level 3. This certification may be a one-page affidavit signed by the vendor. Documentation supporting the certification (crash tests and/or engineering analysis) must be kept on file by the certifying organization. No certification is required for devices less than or equal to both the weight and height on the schedule below:

Device	Composition	Weight	Height
Cones	Rubber	20 lb.	36 in.
	Plastic	20 lb.	48 in.
Candles	Rubber	13 lb.	36 in.
	Plastic	13 lb.	36 in.
Drums	Hi Density Plastic	77 lb.	36 in.
	Lo Density Plastic	77 lb.	36 in.
Delineators	Plastic or Fiberglass	N/A	48 in.

**643-3.01 GENERAL CONSTRUCTION REQUIREMENTS.**

Keep the work, and portions of the project affected by the work, in good condition to accommodate traffic safely. Provide and maintain traffic control devices and services inside and outside the project limits, day and night, to guide traffic safely.

Unless otherwise provided in this Section, keep all roadways, business accesses, and pedestrian facilities within the project limits open to traffic. Obtain the Engineer’s approval before temporarily closing residential, commercial, or street approaches. Provide access through the project for emergency vehicles and school and transit buses. Properly sign and/or flag all locations where the traveling public is redirected or stopped. Organize construction operations so the total of all construction related stoppages experienced by a vehicle traveling through the project does not exceed 20 minutes except when indicated otherwise in the Contract.

Stop equipment at all points of intersection with the traveling public unless an approved TCP shows otherwise.

Continue to operate all illumination and signalization according to the requirements of **Subsection 660-3.09**. When moving approach lanes, realign signal heads as necessary according to the ATM. Coordinate any modifications to existing traffic signals with the agency that maintains and operates them. Operate flood lighting at night according to the ATM. Adjust flood lighting so that it does not shine into oncoming traffic.

Provide and maintain safe routes for pedestrians and bicyclists through or around traffic control zones at all times, except when regulations prohibit pedestrians or bicyclists.

Immediately notify the Engineer of any traffic related accident that occurs within the project limits as soon as an employee, or a subcontractor becomes aware of the accident.

**643-3.02 ROADWAY CHARACTERISTICS DURING CONSTRUCTION.**

Obtain an approved TCP before reducing existing roadway lane and shoulder widths and before starting construction. Maintain a clear area with at least 2 feet between the edge of traveled way and the work area. Use barricades, traffic cones, or drums to delineate this area. Place traffic control devices on the work side of the clear area. Space them according to the ATM.

If maintaining traffic on an unpaved surface, provide a smooth and even surface that public traffic can use at all times. Properly crown the roadbed surface for drainage. Before beginning other grading operations, place sufficient fill at culverts and bridges to permit traffic to cross smoothly and unimpeded. Use part-width construction techniques when routing traffic through roadway cuts or over embankments under construction. Excavate the material or place it in layers. Alternate construction activities from one side to the other. Route traffic over the side opposite the one under construction.

Detour traffic when the Plans or an approved TCP allows. Maintain detour routes so that traffic can proceed safely. When detours are no longer required, obliterate the detour. Topsoil and seed appropriate areas.

If two-way traffic cannot be maintained on the existing roadway or detour, you may use half-width construction or a road closure if it is shown on an approved TCP. Make sure the TCP indicates closure duration and conditions. Schedule roadway closures so you do not delay school buses or peak-hour traffic. For road closures, post closure-start and road-reopen times at the closure site, within view of waiting traffic.

**643-3.03 PUBLIC NOTICE.**

Give notice at least 3 days before major changes, delays, lane restrictions, or road closures to local officials and transportation organizations, including but not necessarily limited to:

1. Alaska Railroad Corporation
2. Alaska Trucking Association
3. Alaska State Troopers
4. Division of Measurement Standards
5. Local Police Department
6. Local Fire Department
7. Local Government Traffic Engineer
8. School and Transit Authorities
9. Local Emergency Medical Services
10. Local Media (newspapers, radio, television)
11. U.S. Postal Service
12. Major Tour Operators

Provide local traffic enforcement and maintenance agencies 24 hour notice before shutting down a traffic signal system. Provide notice as required by utility companies before repairing or replacing a utility.

Provide the Alaska State Troopers, local police and fire department with the radio frequencies used on the project and the 24-hour telephone numbers of the Worksite Traffic Supervisor and the Project Superintendent. These telephone numbers are used to alert construction employees when emergency vehicles must pass through the project. When notified of emergencies make every necessary effort to expedite rapid passage.

Additional notices may be given through the Navigator or 511 System for selected projects. Check the special provisions for those requirements.

**643-3.04 TRAFFIC CONTROL DEVICES.**

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Before starting construction, erect permanent and temporary traffic control devices required by the approved TCPs. Either the Engineer or the Alaska Department of Transportation & Public Facilities' Engineer will determine advisory speeds when necessary.

For lane closures on multilane roadways, use sequential arrow panels. During hours of darkness when required by the approved TCP use flashing warning lights to mark obstructions or hazards and steady-burn lights for channelization.

Use only one type of traffic control device in a continuous line of delineating devices, unless otherwise noted on an approved TCP. Use drums or Type II barricades for lane drop tapers.

During non-working hours and after completing a particular construction operation, remove all unnecessary traffic control devices. Store all unused traffic control devices in a designated storage area which does not present a nuisance or visual distraction to traffic. If sign panels are post mounted and cannot be readily removed, cover them entirely with either metal or plywood sheeting. Completely cover signal heads with durable material that fully blocks the view of signal head and will not be damaged or removed by weather.

Keep signs, drums, barricades, and other devices clean at all times.

Use only traffic control devices that meet the requirements of the "Acceptable" category in ATSSA (American Traffic Safety Services Association) "Quality Guidelines for Temporary Traffic Control Devices" and meet crashworthiness requirements per [Subsection 643-2.02](#).

Immediately replace any devices provided under this Section that are lost, stolen, destroyed, inoperable or deemed unacceptable while used on the project. Stock repair parts for each Temporary Crash Cushion used on the project. Repair damaged crash cushions within 24 hours.

Maintain pre-existing roadside safety hardware at an equivalent or better level than existed prior to project implementation until the progress of construction necessitates removing the hardware. All existing hazards that are currently protected with roadside safety hardware or new hazards which result from project improvements shall be protected or delineated as required in the plans, specifications, and approved TCPs until permanent roadside safety hardware is installed. All temporary roadside safety hardware shall meet crashworthiness requirements of [Subsection 643-2.02](#).

All items paid under this Section remain the property of the Contractor, unless noted otherwise in the contract. Remove them after completing the project.

1. Embankments. Install portable concrete or steel barrier, plastic drums, barricades, tubular markers, plastic safety fence, and cones as specified on the Plans or TCPs to delineate open trenches, ditches, other excavations and hazardous areas when they exist along the roadway for more than one continuous work shift.
2. Adjacent Travel Lane Paving. When paving lifts are 2 inches or greater and you cannot finish paving adjacent travel lanes or paved shoulders to the same elevation before the end of the paving shift, install: W8-11 (Uneven Lanes), W8-9 (Low Shoulder), W8-17 (Shoulder Drop-Off), W14-3 (No Passing Zone), R4-1 (Do Not Pass), R4-2 (Pass with Care), and W8-1 (Bump) signs as appropriate. Place additional signs every 1500 feet if the section is longer than 1/2 mile.
3. Fixed Objects And Construction Vehicles And Equipment Working On Or Next To The Traveled Way. Do not park equipment in medians. Locate fixed objects at least 30 feet from the edge of traveled way. Fixed objects that exist prior to construction activity are not subject to this requirement unless the proposed temporary traffic routing moves the edge of traveled way closer to the pre-existing fixed object. Vehicles and other objects within parking lots in



urban environments are considered preexisting fixed objects regardless of whether they are or are not present continuously throughout the day.

When worksite restrictions, land features, right of way limitations, environmental restrictions, construction phasing, or other construction conditions allow no practicable location meeting the preceding requirements, the Engineer may approve alternate locations for fixed objects. Alternate locations shall be as far as practicable from the edge of traveled way. When the alternate location provides 15 feet or more separation from the edge of traveled way, the Engineer may verbally approve the alternate location. When the alternate location provides less than 15 feet separation, written approval is required.

When the Engineer determines a fixed object or fixed objects present unacceptable hazard, use drums or Type II barricades with flashing warning lights, or use portable concrete or steel barriers, or temporary crash cushion to delineate or shield the hazard, as approved by the Engineer.

4. Flagging. Furnish trained and competent flaggers and all necessary equipment, including lighting of the flagging position during nighttime operations, to control traffic through the traffic control zone. The Engineer will approve each flagging operation before it begins and direct adjustments as conditions change.
  - a. Flaggers must be certified as one of the following:
  - b. Flagging Level I Certification by IMSA
  - c. Flagger Certification by ATSSA
  - d. Traffic Control Supervisor, ATSSA
  - e. Work Zone Safety Specialist, IMSA
  - f. ATSSA Flagging Instructor

Flaggers shall maintain current flagger certification. Flaggers must be able to show their flagger certification anytime they are on the project.

Flaggers must maintain their assigned flagging location at all times, unless another qualified flagger relieves them, or the approved traffic control plan terminates the flagging requirements. Remove, fully cover, or lay down flagger signs when no flagger is present. Keep the flaggers' area free of encumbrances. Keep the flagger's vehicle well off the roadway and away from the flagging location so the flagger can be easily seen.

Provide approved equipment for two-way radio communications between flaggers when flaggers are not in plain, unobstructed view of each other.

Obtain the Engineer's written approval before flagging signalized intersections. When flagging a signalized intersection, either turn off and cover the traffic signal or place it in the All-Red Flash mode. Coordinate changing traffic signal modes and turning off or turning on traffic signals with the agency responsible for signal maintenance and operation and the Engineer. Get their written approval in advance. Only uniformed police officers are permitted to direct traffic in an intersection with an operating traffic signal.

5. Pilot Cars. You may use pilot cars when part of an approved TCP, if the Engineer determines one-way traffic is necessary, or if the route through the traffic control zone is particularly hazardous, involved, or frequently altered to preclude adequate signing. Do not use pilot cars to avoid localized traffic control at several locations. Pilot car operators may not control Automated Flagger Assistance Devices while operating a pilot car.

Organize construction operations so the total of all stoppages experienced by a vehicle traveling through a project does not exceed 20 minutes. However, this does not imply that you may allow 20 minutes in all cases. Coordinate multiple pilot-car operations within a project or adjoining projects to minimize inconvenience to the traveling public. Two or more pilot cars may be used to provide two-way traffic through the traffic control zone to reduce the waiting period. The flagger or pilot car operator must record each pilot car's departure time in a bound field book furnished by the Engineer. Whenever practical, the flagger should tell the motorist the reason for and approximate length of the delay. Make every reasonable effort to yield right-of-way to the public and prevent excessive delay.

Use an automobile or pickup as the pilot car, with the company logo prominently displayed. Equip the pilot car with a two-way radio for contact with flaggers and other pilot cars. Mount a G20-4 sign (Pilot Car Follow Me) on the rear at least 5 feet above the driving surface. Use high intensity flashing strobe lights, oscillating beacons, or rotating beacons on all Pilot Cars. Vehicle hazard warning lights may supplement but are not permitted to be used instead of high intensity flashing strobe lights, oscillating beacons, or rotating beacons. Identify the last vehicle in the column.

When pilot car operations are approved, establish all required pilot car traffic control devices before beginning work. Continue pilot car operations until no longer necessary and an approved TCP is in place for operations without pilot car, including all required traffic control devices.

6. Street Sweeping. Use a street sweeper that collects material to keep the project and affected areas free of loose material. Include paved portions of the roadway within project limits, haul routes open to the public, and sections of roadway outside of project limits where your operations have deposited loose material.
7. Watering. Furnish, haul, and place water for dust control and pavement flushing, as directed. Use water trucks that can provide a high-pressure water stream to flush the pavement and a light-water spray to control dust. If the flushing operations contaminate or fill adjacent catch basins, clean and restore them to their original condition. This requirement includes sections of roadway off the project where flushing is required. The Engineer will control water application.

Obtain an Alaska Department of Natural Resources permit for water removal before taking water from a lake, stream, or other natural water body. Comply with the Alaska Department of Fish and Game screening requirements for all water removal operations.

8. Portable Changeable Message Board Signs. Furnish Changeable Message Signs when approved on a TCP. Display only messages approved on the TCP. Follow application guidelines in the ATM.
9. Truck Mounted Attenuator (TMA.) TMAs are mounted on the rear of work vehicles. Impact attenuators shall meet crashworthiness requirements of **Subsection 643-2.02**. TMAs shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight in accordance with the manufacturer's recommendations. TMAs shall have an adjustable height so that it can be placed at the correct elevation during usage and to a safe height for transporting. Approach ends of TMAs shall have impact attenuator markings in accordance with the ATM. Do not use a damaged attenuator in the work. Replace any damaged TMA at your expense.
10. Traffic Control Vehicles. Use high intensity flashing strobe lights, oscillating beacons, or rotating beacons on the Work Zone Supervisor's vehicle and on vehicles being used to transport and set-up traffic control devices. Vehicle hazard warning lights may supplement but are not permitted to be used instead of high intensity flashing strobe lights, oscillating beacons, or rotating beacons.

**643-3.05 AUTHORITY OF THE ENGINEER.**

The Engineer will provide written notice when conditions may adversely affect the traveling public's safety and/or convenience. The notice will state the defect(s), the corrective action(s) required, and the time required to complete the corrective action(s). If corrective action(s) are not completed within the specified time, the Engineer may immediately suspend work on the offending operations until the defect(s) are corrected. The Engineer may require outside forces to correct unsafe conditions. The cost of work by outside forces will be deducted from any monies due under the terms of this Contract.

**643-3.06 TRAFFIC PRICE ADJUSTMENT.**

A Traffic Price Adjustment, under Item 643.0023.\_\_\_\_, will be assessed for unauthorized lane closures or reductions. Unauthorized lane reductions will be assessed as one full lane closure, for each lane reduced without authorization

Authorized lane closures and/or lane reductions are those shown in the Contract, an approved TCP, or authorized in writing.

Unauthorized lane reductions include unacceptable roadway, pedestrian walkway or route, and bicycle route or pathway surfaces, such as severe bumps, ruts, washboarding, potholes, excessive dust or mud, and non-conforming or out of place traffic control devices. Failure to install temporary crash cushions or barriers, when required according to the Contract or TCP, is also considered an unauthorized lane reduction. The Engineer will make the sole determination whether unauthorized lane reductions or closures are present.

Adjustment Rates are listed in **Table 643-3**. These rates are liquidated damages which represent highway user costs, based on Average Daily Traffic (ADT). The Engineer will use the rate shown for the current ADT for this project, as published in the Regional Traffic Volume Report prepared by the Department's Planning Section. Adjustment rates for unauthorized reduction or closure of each lane of pedestrian walkways or route, and bicycle route or pathway, are the same as for one full roadway lane closure.

**TABLE 643-3  
ADJUSTMENT RATES**

<b>Published ADT</b>	<b>Dollars/Minute of Unauthorized Lane Reduction or Closure</b>
Less than 1,000	\$2
1,000-4,999	\$10
5,000-9,999	\$30
10,000+	\$40

**643-3.07 MAINTENANCE OF TRAFFIC DURING SUSPENSION OF WORK.**

Approximately one month before work is suspended for the season, schedule a preliminary meeting with the Engineer and Maintenance & Operations to outline the anticipated roadway condition and the work expected to be completed before shutdown. Schedule a field review with the Department for winter maintenance acceptance. At the field review the Engineer will prepare a punch list for implementation before acceptance.

To be relieved of winter maintenance responsibility, leave all roads with a smooth and even surface for public use at all times. Properly crown the roadbed surface for drainage and install adequate safety facilities. Make sure all illumination and signals, including vehicle detectors, are in good working order.

After the project is accepted for winter maintenance and until you are ordered to resume construction operations, the Owner is responsible for maintaining the facility. The Owner will accept maintenance responsibility only for portions of the work that are open to the public, as determined by the Engineer. The Owner will not accept maintenance responsibility for incomplete work adjacent to accepted roads. You are responsible for maintaining all other portions of the work. The Engineer will issue a letter of "Acceptance for Winter Maintenance" that lists all portions of the work that the Owner will maintain during a seasonal work suspension. You retain all contractually required maintenance responsibilities until receipt of this letter.

If you suspend work due to unfavorable weather (other than seasonal) or due to your failure to correct unsafe conditions, carry out Contract provisions, or carry out the Engineer's orders, you must bear all costs for traffic maintenance during the suspended period.

When you resume work, replace or renew any work or materials lost or damaged during temporary use. If the Owner caused damage during winter suspension, payment will be made for repairs by unit pay item or in accord with General Condition Article 10. When the Engineer directs, remove any work or materials used in the temporary maintenance. Complete the project as though work has been continuous.

#### **643-3.08 CONSTRUCTION SEQUENCING.**

The construction sequencing detailed in these provisions, the Special Provisions, and the Plans is suggested only. You may propose alternative construction sequencing.

Throughout the project, maintain the existing roadway, pedestrian walkway or route, and bicycle route or pathway configuration (such as the number of lanes and their respective widths) except for restrictions to traffic allowed in the Special Provisions or on the Plans, and addressed through approved TCPs. A restriction to traffic is any roadway surface condition, work operation, or traffic control setup that reduces the number of lanes or impedes traffic. Obtain an approved TCP before restricting traffic.

Do not restrict traffic or shut down signals during the times listed in the Special Provisions.

#### **643-3.09 INTERIM PAVEMENT MARKINGS.**

Place permanent or interim pavement markings according to this Subsection, details shown on the Plans, approved TCPs, and Parts III and VI of the ATM before opening existing paved roadways, temporary paved roadways, detours, interim paving lifts, and roadways with seal coats and surface treatments for more than one continuous work shift. This work may include restriping the existing roadway before beginning construction, before seasonal suspension, and/or after seasonal suspension.

Remove conflicting pavement markings according to **Subsection 670-3.04**, Paint Removal. Pavement markings that are temporarily conflicting (markings that will be restored when construction is complete) may be removed according to **Subsection 670-3.04** or covered with black removable preformed marking tape.

Mark existing roadway sections that will be opened to traffic during the winter. Mark over the existing lines and markings, unless shown otherwise on the Plans or an approved TCP.

Maintain all interim pavement markings for their intended life including reapplication when necessary. There will be no compensation to upgrade interim pavement markings required for work operations lasting up to 2 weeks.

Use only temporary raised pavement markers or removable preformed retroreflective marking tape as interim pavement markings on final pavement surfaces. Completely remove and dispose of them when placing the final markings. Completely remove any residual adhesive that might

misguide motorists. Place final pavement markings on finished pavement surfaces and interim pavement surfaces before suspending work for the winter.

Stage construction to avoid routing traffic over conflicting markings for more than one continuous workshift. If traffic is routed over conflicting markings during a work shift, delineate the roadway with a complement of warning signs, channelizing devices, and flaggers as required by the ATM.

Use only temporary raised pavement markers meeting **Subsection 712-2.16** as interim markings on seal coat and surface treatment pavements. Install the markers according to the manufacturer's instructions before applying the asphalt surface material and cover coat. Remove the vinyl protective covers after applying the asphalt pavement.

On multicourse surface treatments, install the temporary raised pavement markers after applying the full width of the first layer of cover coat. Install the markers on each day's completed surface before removing the pilot car operations and allowing unescorted traffic on the surface treatment.

Do not place final pavement markings until traffic has traveled over the seal coat or surface treatment for at least 14 days. Apply final pavement markings within 10 days of completing the final sweeping or brooming of the mainline seal coat or surface treatment.

**643-3.10 LIGHTING FOR NIGHTWORK.**

Illuminate the night work areas according to **Table 643-4**.

**Table 643-4** does not provide a comprehensive list of operations that require lighting. Provide lighting for other operations when necessary.

Use balloon lighting as the main light sources. Do not use floodlights without prior approval by the Engineer. When approved, install floodlighting in a manner that minimizes glare for motorists, workers, and residents living along the roadway. Locate, aim, louver, and/or shield light sources to reduce glare.

The Engineer shall be the sole judge of when glare is unacceptable, either for traffic or for adjoining residences. When notified of unacceptable glare, modify the lighting system to reduce glare to an acceptable level.

**TABLE 643-4  
NIGHT WORK ILLUMINATION EQUIPMENT AND LOCATION REQUIREMENTS**

Type of Work or Equipment	Lighting Configuration
Paving, Milling, Striping, Pavement Marking Removal, Rumble Strip Installation	At least one machine-mounted balloon light of at least 2000 watts. Provide additional lights or wattage if necessary to provide complete coverage.
Rolling, pavement sweeping	At least 4 sealed beam halogen lamps in the front and four in the back. Each should be at least 55 watts.
Flagging	One balloon light of at least 2000 watts, located within 30 feet of the flagger location. Locate so the flagger and the flagging location are illuminated. Provide additional lights or wattage if necessary to provide complete coverage of the flagging location.

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Truck Crossings where haul vehicles cross or enter a road with more than 10,000 ADT, or where the haul vehicle crossing or entering location is controlled by portable traffic signals or flaggers	At least one balloon light of at least 2000 watts, located on the main road on the far right side of the intersection. Locate light within 30 feet of the edge of the side street. If there is a flagger at the crossing, locate the lights or lights so the lighting requirements for Flagging are also satisfied.
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If the Contractor fails to provide required lighting equipment or provides lighting that creates unacceptable glare, the Contractor shall cease all construction activities that require illumination, including flagging operations, until the condition or conditions are corrected.

Use lighting equipment in good operating condition and that complies with applicable state and local adopted codes and standards, and OSHA, NEC, and NEMA requirements.

Provide suitable brackets and hardware to mount lighting fixtures and generators on machines and equipment. Design mountings so lights can be aimed and positioned as necessary to reduce glare. Locate mounting brackets and fixtures so they don't interfere with the equipment operator or overhead structures. Connect fixtures securely in a manner that minimizes vibration.

Ensure ground, trailer, and equipment-mounted light towers or poles are sturdy and freestanding without the aid of guy wires. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Position ground and trailer-mounted towers and trailers to minimize the risk of being impacted by traffic on the roadway or by construction traffic or equipment.

Raise trailer or equipment mounted lights to maximum height, except do not exceed the clearance required for overhead objects such as overhead signals, overhead signs, trees, aerial utilities, or bridges. Aim and adjust lights to provide the required light levels. Provide uniform illumination on the hopper, auger, and screed areas of pavers. Illuminate the operator's controls on all machines uniformly.

Furnish each side of non-street legal equipment with a minimum of 75 square inches high intensity retroreflective sheeting in each corner, so at least 150 square inches of sheeting is visible from each direction. Provide red sheeting on the rear of the equipment and yellow sheeting elsewhere.

Existing street and highway lighting and conventional vehicle headlights may supplement but do not relieve the Contract requirement to provide lighting for night work, according to the requirements of **Table 643-4**.

Provide sufficient fuel, spare lamps, spare generators, and qualified personnel to ensure that all required lights operate continuously during nighttime operations. Ensure generators have fuel tanks of sufficient capacity to permit operation of the lighting system for a minimum of 12 hours. In the event of any failure of the lighting system, discontinue the operation that requires illumination until the required level and quality of illumination is restored.

Maintain a supply of at least twenty emergency flares for use in the event of emergency or unanticipated situations. Comply with local noise ordinances.

Install all post-mounted electroliers located within the clear zone, on NCHRP 350 or MASH compliant breakaway bases.

**643-3.11 HIGH VISIBILITY GARMENTS.**

Ensure all workers within project limits wear outer garments that are highly visible and comply with the following requirements:

1. Standards. Use high visibility garments conforming to the requirements of ANSI/ISEA 107-2004, Class 2 for tops or Class E for bottoms, and Level 2 retroreflective material.
2. Labeling. Use garments labeled in conformance with Section 11.2 of ANSI/ISEA 107-2004 or ANSI/ISEA 107-2010.
3. Tops. Wear high visibility vests, jackets, or coverall tops at all times.
4. Bottoms. Wear high visibility pants or coverall bottoms during nighttime work (sunset to sunrise). Worksite traffic supervisors, employees assigned to traffic control duties, and flaggers wear high visibility pants or coverall bottom at all times.
5. Outer Raingear. Wear raingear tops and bottoms conforming to the requirements of this **Subsection 643-3.11**.
6. Exceptions. When workers are inside an enclosed compartment of a vehicle, they are not required to wear high visibility garments.
7. Condition. Furnish and maintain all vests, jackets, coveralls, rain gear, hard hats, and other apparel in a neat, clean, and presentable condition. Maintain retroreflective material to Level 2 standards.

Payment for high visibility garments for workers is subsidiary to other traffic contract items.

#### **643-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following: Quantities will not be measured during winter suspension of work.

1. Traffic Maintenance. Calendar Day: Every day shown on the calendar, beginning and ending at midnight. Measurement begins on the day following receipt of the Notice to Proceed or on the first day of work at the project site, whichever is later, and ends on the date of project completion.
2. Traffic Control Device Items. By the number of units of each bid item shown on the bid schedule (or the Traffic Control Rate Schedule, if item 643.0025.\_\_\_\_, Traffic Control, is included) that are installed, accepted, and operational. Incomplete or unsatisfactory devices will not be measured. Special Construction Signs are measured by the total area of legend-bearing sign panel, as determined under **Subsection 615-4.01**. Items measured by the day are for each item per 24-hour period.
3. Traffic Maintenance Setup Items. By each lane closure or one-lane road in place per hour. By each detour or road closure in place per 24-hour period.
4. Portable Concrete Barrier. By each nominal 12.5 foot section placed according to the approved TCPs, for the initial placement and for each subsequent relocation when moved more than 10 feet in any direction. Each transition piece (sloping end) will be measured as a single section.
5. Temporary Crash Cushion. By each acceptable installation.
6. Interim Pavement Marking. By the single-stripe station. A single stripe is a marking or a temporary raised pavement marker 4 inches wide. Wider striping is measured in multiples of 4 inches. Centerline gaps are not deducted from measurements.

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7. Flagging and Pilot Car. By the number of approved hours, supported by certified payroll.
8. Street Sweeping. By the number of operated hours, supported by certified payroll and approved by the Engineer.
9. Watering. By the 1,000 gallons (M-Gallon) of water applied. The Engineer may specify measurement by weight or volume. If by weight, convert to gallons at 8.34 pounds per gallon. If by volume, convert to gallons at 7.48 gallons per cubic foot.
10. Traffic Price Adjustment. By each minute that any lane of traffic is not open to full use by the traveling public, measured to the nearest minute. The Engineer will determine whether the roadway is opened to full use.
11. Traffic Control. By the units specified in the Special Provisions.
12. Portable Changeable Message Board Sign. By the 24-hour period for each sign, as shown on an approved TCP and displaying an approved message.
13. Plastic Safety Fence. By the linear foot, as placed, to protect or channelize pedestrian traffic as shown on an approved TCP. Any adjustments in configuration of the fence at the same location that does not result in an increased amount of fence is not measured. Opening and closing the fence to gain access to and from the worksite is not measured.
14. Temporary Sidewalk Surfacing. By the square yard as shown on an approved TCP.
15. Temporary Guardrail. By the linear foot, including end treatments, as shown on an approved TCP.
16. Portable Steel Barrier. By the linear foot placed according to the manufacturer's recommendation and approved TCPs, for the initial placement, and for each subsequent relocation when moved more than 10 feet in any direction.

### **643-5.01 BASIS OF PAYMENT.**

1. Traffic Maintenance. The contract price includes all resources required to provide the Worksite Traffic Supervisor, all required TCPs and public notices, the Construction Phasing Plan, and the maintenance of all roadways, approaches, crossings, intersections and pedestrian and bicycle facilities, as required. This item also includes any Traffic Control Devices required but not shown on the bid schedule.

Items required by the Contract that are not listed on the bid schedule or not included in other items are subsidiary to Item 643.0001.\_\_\_\_ or 643.0002.\_\_\_\_ Traffic Maintenance, except the following:

- a. Traffic Price Adjustment
  - b. Traffic Maintenance Setup
2. Traffic Control Device Items. The contract price includes all resources required to provide, install, maintain, move, and remove the specified devices. Warning lights, high-level warning devices, vertical panels, and sign supports required for traffic control devices are subsidiary.
  3. Traffic Maintenance Setup Items. Each setup consists of all traffic control devices, flaggers, pilot cars, and subsidiary items necessary to implement the TCP shown on the Plans. Warning lights, high-level warning devices, vertical panels, and sign supports required for traffic control devices are subsidiary.



Construction and obliteration of temporary roadways, when required on the Plans or approved TCP under a traffic maintenance setup item, is paid for under their respective roadway pay items.

When topsoil or seeding is required for detours, payment will be made under Sections 620 and/or 618.

4. Portable Concrete Barrier. The contract price includes all resources required to provide, install, maintain, and remove each barrier section.
5. Temporary Crash Cushion. The contract price includes all resources required to provide, install, maintain, repair, and remove each crash cushion.
6. Interim Pavement Marking. The contract price includes all resources required to provide, install, maintain, and remove the specified markings. Installation of word and symbol markings are subsidiary. The No-Passing Zone signing, described in Subsection 643-3.04, is subsidiary.
7. Flagging and Pilot Car. The contract price includes all required labor, vehicles, radios, flagger paddles and pilot car signs, and transportation to and from the worksite.
8. Street Sweeping. The contract price includes all resources required to keep the roadway free of loose material.
9. Watering. The contract price includes all resources required to provide watering, as directed.
10. Traffic Price Adjustment. If Item 643.0023.\_\_\_\_, Traffic Price Adjustment, is shown on the bid schedule, the total value of this contract will be adjusted, for unauthorized lane reductions or closures, at the rates listed in Table 643-3.
11. Traffic Control. Payment for Item 643.0025.\_\_\_\_, Traffic Control, will be made at the unit rate value contained in the Traffic Control Rate Schedule shown in the Special Provisions for the accepted units of traffic control devices.
12. Portable Changeable Message Board Sign. The contract price includes all resources required to furnish, move, and operate the sign.
13. Plastic Safety Fence. The contract price includes all resources required to install, maintain, and remove the fence.
14. Temporary Sidewalk Surfacing. The contract price includes all resources required to construct, maintain, and remove the surfacing.
15. Temporary Guardrail. The contract price includes all resources required to construct, maintain, and remove the guardrail.
16. Portable Steel Barrier. The contract price includes all resources required to provide, install, maintain, move and remove each barrier.
17. Lighting for Night Work. Payment for illuminating night work areas and any required adjustments to work zone illumination is subsidiary to other items.

Traffic control devices, barriers, and crash cushions required to delineate or shield fixed objects will not be measured or paid for separately, but will be subsidiary

Traffic control devices, barriers, and crash cushions required to delineate or shield guardrail posts or non-crashworthy ends will not be measured or paid for separately, but will be subsidiary, when required for failure to meet completion timelines in Subsection 606-3.01.

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Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
643.0001.	Traffic Maintenance	CDAY
643.0002.	Traffic Maintenance	LS
643.0003.	Permanent Construction Signs	LS
643.0004.	Construction Sign	DAY
643.0005.	Type II Barricade	DAY
643.0006.	Type III Barricade	DAY
643.0007.	Traffic Cone/Tubular Marker	DAY
643.0008.	Plastic Safety Fence	LF
643.0009.	Drum	DAY
643.0010.	Sequential Arrow Panel, Type C	DAY
643.0011.	Special Construction Signs	SF
643.0012.	Portable Concrete Barrier	EACH
643.0013.	Temporary Crash Cushion	EACH
643.0014.	Interim Pavement Marking	STA
643.0015.	Flagging	HR
643.0016.	Pilot Car	HR
643.0017.	Street Sweeping	HR
643.0018.	Watering	MGAL
643.0019.	Lane Closure	HR
643.0020.	Detour	DAY
643.0021.	Road Closure	DAY
643.0022.	One Lane Road	HR
643.0023.	Traffic Price Adjustment	CS
643.0024.	Portable Changeable Message Board Sign	DAY
643.0025.	Traffic Control	CS
643.0026.	Temporary Sidewalk Surfacing	SY
643.0027.	Temporary Guardrail	LF
643.0030.	Portable Steel Barrier	LF
643.0031.	Interim Pavement Marking	LS
643.0032.	Flagging	CS
643.0033.	Detour	LS

## **SECTION 646 CPM SCHEDULING**

### **646-1.01 DESCRIPTION.**

Provide and maintain a Critical Path Method (CPM) progress schedule for the project. Use the schedule in coordinating and monitoring of all work under the Contract including activity of subcontractors, manufacturers, suppliers, and utility companies, and reviews by the Owner. Update CPM, as required.

Provide work plans.

### **646-2.01 SUBMITTAL OF SCHEDULE.**

Submit a detailed initial CPM schedule at least 5 working days prior to the preconstruction conference, for the Engineer's approval. Meet the requirements set forth below.

The construction schedule, for the entire project, may not exceed the specified contract time.

Following the Engineer's review, if revisions to the proposed CPM schedule are required, do so promptly. The CPM schedule must be finalized and accepted before beginning construction work.

### **646-3.01 REQUIREMENTS AND USE OF SCHEDULE.**

1. Schedule Requirements. Prepare the CPM schedule as a Precedence Diagram Network developed in the activity-on-node format which includes:
  - a. Activity description
  - b. Activity duration
  - c. Resources required for each of the project activities, including:
    - (1) Labor (showing work days per week, holidays, shifts per day, and hours per shift)
    - (2) Equipment (including the number of units of each type of equipment)
    - (3) Materials

Show on the activity-on-node diagram the sequence and interdependence of all activities required for complete performance of all items of work under this Contract, including shop drawing submittals and reviews and fabrication and delivery activities.

No activity duration may be longer than 15 work days without the Engineer's approval.

The Engineer reserves the right to limit the number of activities on the schedule.

Consider that schedule float time is shared equally with the Department.

The contract completion time will be adjusted only for causes specified in this Contract.

2. Schedule Updates. Hold job site progress meetings on a frequency satisfactory to the Engineer for the purpose of updating the CPM schedule. Review progress and verify finish dates of completed activities, remaining duration of uncompleted activities, and any proposed logic and/or time estimate revisions. Submit a revised CPM schedule, within 5 working days after this meeting, showing the finish dates of completed activities and updated times for the

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remaining work, including any addition, deletion, or revision of activities required by Contract modification.

3. Work Plans. In addition to the CPM schedule, submit a work plan every two weeks during construction detailing your proposed operations for the forthcoming two weeks. Include:
  - a. work activities
  - b. manpower involved by trade
  - c. work hours
  - d. equipment involved
  - e. location of the work to be performed

**646-4.01 METHOD OF MEASUREMENT.**

See SC-01.02 and the following:

1. Upon approval of CPM and work plan, 15 percent of the amount bid on the pay item.
2. Starting in the month after approval of CPM through estimated month of project completion, equal monthly payments that total 75 percent of the amount bid on the pay item.
3. Upon project completion, the remaining 10 percent of the amount bid on the pay item.

**646-5.01 BASIS OF PAYMENT.**

Non-compliance with CPM Schedule update requirements is considered unsatisfactory performance and may result in withholding progress payments according to SC-01.04.

Payment will be made under:

<b>PAY ITEM</b>		
<b>Item Number</b>	<b>Item Description</b>	<b>Unit</b>
646.0001.	CPM Scheduling	LS

# **SECTION 701 HYDRAULIC CEMENT AND SUPPLEMENTARY CEMENTITIOUS MATERIALS**

## **701-1.01 GENERAL.**

Meet the following general requirements for all cementitious materials furnished:

Before using, retest Portland cement stored longer than 3 months in bags or 6 months in bulk for compressive strength, time of setting, and loss on ignition according to AASHTO M 85. Store separately different types or brands of cementitious materials, or cementitious materials from different mills.

Protect cementitious materials from dampness during shipment and storage. Do not use partially set cement or cement which contains caked lumps. Do not use cement salvaged from discarded or used bags.

## **701-2.01 PORTLAND CEMENT.**

Conform to Article 1.2.2.a(1), Chapter 8 of the most current edition of AREMA for the material types shown in Table 8-1-1 of the aforementioned Article.

## **701-2.02 BLENDED HYDRAULIC CEMENT.**

Meet AASHTO M 240, Type IP, or Type IS. Report the weight of pozzolan and ground granulated blast furnace slag as percent of weight of the total cementitious material. Do not vary the pozzolan and ground granulated blast furnace slag constituent content from the certified value more than  $\pm 5$  percent by weight of the total cementitious material. Limit pozzolan in Type IP to fly ash. Meet the replacement limits in [Table 701-1](#)

**TABLE 701-1  
BLENDED HYDRAULIC CEMENT LIMITS**

<b>Cement Type</b>	<b>Constituent</b>	<b>Percent of Total Cementitious Material by Weight Maximum</b>
Type IP	Fly Ash	35%
Type IS	Slag cement	40%

## **701-2.03 GROUT.**

Non-shrink, non-corrosive, non-metallic, cement-based grout meeting ASTM C1107, except develop a 28-day compressive strength of at least 9,000 psi when tested according to AASHTO T 106 or ASTM C109.

## **701-2.04 FLY ASH.**

Meet AASHTO M 295, Class C or Class F, including optional chemical requirements as set forth in Table 2—Supplementary Optional Chemical Requirement.

**701-2.05 GROUND GRANULATED BLAST-FURNACE SLAG.**

Meet AASHTO M 302, Grade 100 or Grade 120.

**701-2.06 SILICA FUME.**

Meet AASHTO M 307.

**701-2.07 DS GROUT.**

Use drilled shaft (DS) grout conforming to the following requirements:

1. Portland Cement Type I or Type II cement meeting the requirements of **Subsection 701-2.01**.
2. Fine Aggregate: Use fine aggregate meeting **Subsection 703-2.01**, except 100 percent passing the No. 4 sieve.
3. Potable Water: Use water meeting the requirements of **Subsection 712-2.01**.
4. Proportioning: Mix grout in proportions using at least 564 lbs/yd<sup>3</sup> of Portland cement, fine aggregate, and with enough water to produce a flowable mixture. Do not exceed 67 gal/yd<sup>3</sup> of water.

Thoroughly mix DS grout to a uniform consistency before injecting into soil surrounding drilled shaft casing and filling CSL tubes.

**701-2.08 POST-TENSIONED GROUT. (RESERVED)**

**701-2.09 CERTIFICATION.**

Furnish a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number;
2. the manufacturer's name;
3. the name of the product or assembly;
4. a complete description of the material;
5. country of origin;
6. the lot, heat, or batch number that identifies the material;
7. all required test results for the specified material from the same lot, heat, or batch defined in **Subsection 701-2.09.6**;
8. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product

or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

## SECTION 703 AGGREGATES

### 703-2.01 FINE AGGREGATE FOR CONCRETE.

Meet AASHTO M 6, Class A, except as follows:

Delete paragraph 8.2 of AASHTO M 6.

Delete the following methods of sampling and testing:

AASHTO T 11	Amount of Material Finer than No. 200 Sieve
AASHTO T 27	Sieve Analysis
AASHTO T 103	Soundness (freezing and thawing)

And substitute the following:

ATM 304 (Method A)	Sieve Analysis of Fine and Coarse Aggregates and Material Finer Than No. 200 Sieve in Mineral Aggregates by Washing
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Add the following: Meet AASHTO T 104 using sodium sulfate solution.

In AASHTO M 6, Section 7.1, table entitled "Deleterious Substances Limits", change the maximum percent of material by mass finer than No. 200 Sieve in a. (concrete subject to surface abrasion), from 2.0 to 3.0.

### 703-2.02 COARSE AGGREGATE FOR CONCRETE.

AASHTO M 80, Class B, except as follows:

Delete the following methods of sampling and testing:

AASHTO T 11	Amount of Material Finer than No. 200 Sieve
AASHTO T 27	Sieve Analysis

And substitute the following:

ATM 304 (Method A)	Sieve Analysis of Fine and Coarse Aggregates and Material Finer Than No. 200 Sieve in Mineral Aggregates by Washing
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Add the following: Meet AASHTO T 104 using sodium sulfate solution.

### 703-2.03 AGGREGATE FOR BASE AND SURFACE COURSE.

Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious matters. Meet **Table 703-1**:

**TABLE 703-1  
AGGREGATE QUALITY PROPERTIES FOR BASE AND SURFACE COURSE**

PROPERTY	BASE COURSE	SURFACE COURSE	TEST METHOD
L.A. Wear, %	50, max.	45, max.	AASHTO T 96
Degradation Value	45, min.	45, min.	ATM 313
Fracture, %	70, min.	70, min., 1 Face	ATM 305
Liquid Limit	---	35, max.	ATM 204
Plastic Index	6, max.	10, max.	ATM 205



Sodium Sulfate Loss, %	9, max. (5 cycles)	9, max. (5 cycles)	AASHTO T 104
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Meet Table 703-2 aggregate gradation requirements, as determined by ATM 304:

**TABLE 703-2**  
**AGGREGATE GRADATION FOR BASE AND SURFACE COURSE**  
Percent Passing by Weight

SIEVE	GRADATION			
	BASE COURSE		SURFACE COURSE	
	C-1	D-1	E-1	F-1
1-1/2 in.	100			
1 in.	70-100	100	100	100
3/4 in.	60-90	70-100	70-100	85-100
3/8 in.	45-75	50-80	50-85	60-100
No. 4	30-60	35-65	35-65	50-85
No. 8	22-52	20-50	20-50	40-70
No. 50	6-30	6-30	15-30	25-45
No. 200	0-6	0-6	8-15	8-20

**703-2.04 AGGREGATE FOR HOT MIX ASPHALT.**

Process and crush aggregate that is free from clay balls, organic matter, other deleterious material, and not coated with dirt or other finely divided mineral matter. Aggregate used must consist of sound, tough, durable rock of uniform quality.

Remove all natural fines passing a No. 4 sieve before crushing aggregates for Type IV mixes.

Coarse Aggregate. Aggregate retained on the No. 4 Sieve.

Meet **Table 703-3** requirements:

**TABLE 703-3**  
**COARSE AGGREGATE QUALITY FOR HMA**

Description	Specification	Type II, Class A	Type I, Type II Class B, Type III	Type IV	Type V	Type SP
LA Wear, % max.	AASHTO T 96	45	45	45	45	45
Degradation Value, min.	ATM 313	30	30	30	30	30
Sodium Sulfate Loss % max. (5 cycles)	AASHTO T 104	9	9	9	9	9
Fracture, % min.	ATM 305	90, 2 face	80, 1 face	90, 2 face	98, 2 face	90, 2 face
Flat-Elongated Pieces, % max. 1:5	ATM 306	8	8	8	8	8
Absorption, % max.	ATM 308	2.0	2.0	2.0	2.0	2.0
Nordic Abrasion, % max.	ATM 312	-	-	-	8.0	8.0

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Fine Aggregate. Aggregate passing the No. 4 sieve. Fine aggregate shall meet the quality requirements of AASHTO M 29, including S1.1, Sulfate Soundness.

Fine aggregate for Type II, Class A mix shall not contain more than 20 percent natural fines (blend sand and mineral filler) added to the crushed aggregate, and shall not exhibit rut depth larger than 6.0 mm, as determined by ATM 419.

Fine aggregate for Type IV mixes:

1. do not blend back natural sand
2. shall be non-plastic as determined by ATM 205
3. shall have a minimum uncompacted void content (Fine Aggregate Angularity) determined by AASHTO T 304, Method A, of 45 percent

**TABLE 703-4**  
**BROAD BAND GRADATIONS FOR HOT MIX ASPHALT AGGREGATE**  
Percent Passing by Weight

Sieve	Gradation					
	Type I	Type II	Type III	Type IV	Type V	Type SP
1 inch	100	-	-	-	-	-
3/4 inch	80-90	100	-	-	100	100
1/2 inch	60-84	75-90	100	100	65-90	90-100
3/8 inch	48-78	60-84	80-90	80-95	55-80	74-90
No. 4	28-63	33-70	44-81	55-70	40-60	42-54
No. 8	14-55	19-56	26-70	35-50	≤ 45	25-35
No. 16	9-44	10-44	16-59	20-40	≤ 35	-
No. 30	6-34	7-34	9-49	15-30	≤ 25	-
No. 50	5-24	5-24	6-36	10-24	≤ 20	-
No. 100	4-16	4-16	4-22	5-15	≤ 12	-
No. 200	4-7	4-7	4-7	4-7	4-7	2-10

**703-2.05 AGGREGATE FOR COVER COAT AND SURFACE TREATMENT.**

Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious matters, and with no adherent films or coatings of dirt, clay, dust or other deleterious matter that could impede adherence of the bituminous material. Wash the aggregate if necessary. Meet [Table 703-5](#).

**TABLE 703-5**  
**QUALITY PROPERTIES FOR COVER COAT AND SURFACE TREATMENT**

L.A. Wear,%	AASHTO T 96	45, max.
Degradation Value	ATM 313	50, min.
Sodium Sulfate loss,%	AASHTO T 104	9, max. (5 cycles)
Fracture,%	ATM 305	90, min. (single face)

Cover Coat Material. Meet the gradation requirements of [Table 703-6](#), as determined by ATM 304.

**TABLE 703-6**  
**AGGREGATE GRADATION FOR COVER COAT MATERIAL**  
 Percent Passing By Weight

SIEVE	TYPE 2 COVER	TYPE 3 COVER AGGREGATE		
	AGGREGATE	Grading A	Grading B	Grading C
1/2 in.	--	--	--	100
3/8 in.	100	100	100	90-100
No. 4	85-100	85-100	60-100	10-30
No. 8	--	0-25	0-10	0-8
No. 50	0-20	--	--	--
No. 200	0-1	0-1	0-1	0-1

Surface Treatment Material. Meet the gradation requirements of **Table 703-7**, as determined by ATM 304.

**TABLE 703-7**  
**AGGREGATE GRADATION FOR ASPHALT SURFACE TREATMENT**

SIEVE	GRADING						
	Percent Passing by Weight						
	A	B	C	D	E	F	G
1-1/2 in.	100	--	--	--	--	--	--
1 in.	90-100	100	--	--	--	--	--
3/4 in.	--	90-100	100	--	--	--	--
1/2 in.	0-15	20-55	90-100	100	100	--	--
3/8 in.	--	0-15	40-75	90-100	90-100	100	100
No. 4	--	--	0-15	0-10	10-30	75-100	85-100
No. 8	--	--	0-5	0-5	0-8	0-10	60-100
No. 200	0-1	0-1	0-1	0-1	0-1	0-1	0-10

**703-2.06 MINERAL FILLER.**

Meet AASHTO M 17. Determine material grading using AASHTO T 37.

**703-2.07 SELECTED MATERIAL.**

Meet the following requirements for the type specified. Obtain the Engineer's approval for the intended purpose, prior to use on the project.

- Type A. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by ATM 204 and ATM 205. Meet the following gradation as tested by ATM 304:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
No. 4	20-60%
No. 200	0-6%, determined on the minus 3-inch portion of the sample

- Type B. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by ATM 204 and ATM 205. Meet the following gradation as tested by ATM 304:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
No. 200	0-10% determined on the minus 3-inch portion of the sample

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3. Type C. Earth, sand, gravel, rock, or combinations thereof containing no muck, peat, frozen material, roots, sod, or other deleterious matter and is compactable under the provisions of Subsections 203-3.04 or 203-3.05.

**703-2.08 FILTER BLANKET.**

Meet AASHTO M 80, Class A. Meet the following gradation: AASHTO M 43, size No. 467.

**703-2.09 SUBBASE.**

Hard, durable particles or fragments of stone or gravel. Do not use materials that break up when alternately frozen and thawed or wetted and dried. Do not include muck, frozen material, roots, sod, or other deleterious matter. Meet Table 703-8.

**TABLE 703-8  
QUALITY PROPERTIES FOR SUBBASE**

L.A. Wear,%	AASHTO T 96	50, max.
Liquid Limit	ATM 204	25, max.
Plasticity Index	ATM 205	6, max.
Degradation Value	ATM 313	40, min.

Meet the grading requirements of Table 703-9 as determined by ATM 304.

Grading C and Grading D: Crushed aggregate with at least 50 percent by weight of the particles retained on the No. 4 sieve having at least one fractured face as tested by ATM 305.

**TABLE 703-9  
AGGREGATE GRADATION FOR SUBBASE**  
Percent Passing by Weight

SIEVE	GRADING				
	A	B	C	D	E
4 in.	100	--	--	--	--
2 in.	85-100	100	--	--	--
1 in.	--	--	100	--	--
3/4 in.	--	--	--	100	--
No. 4	15-60	15-60	40-75	45-80	--
No. 16	--	--	20-43	23-50	--
No. 200 *	10 Max.	0-6	4-10	4-12	0-6

\* Gradation shall be determined on that portion passing the 3-inch screen.

**703-2.10 POROUS BACKFILL MATERIAL.**

Gravel consisting of crushed or naturally occurring granular material containing not more than 1 percent clay lumps or other readily decomposed material (AASHTO T 112). Meet the grading requirements of Table 703-10 as determined by ATM 304.

**TABLE 703-10  
AGGREGATE GRADATION FOR POROUS BACKFILL MATERIAL**

SIEVE	PERCENT PASSING BY WEIGHT	
	GRADATION A	GRADATION B
3 in.	100	--
2 in.	--	100
1.5 in.	--	95-100
1 in.	0-10	--

3/4 in.	--	0-20
3/8 in.	--	0-5
No. 200	0-5	0-2

**703-2.11 GABION BACKFILL.**

Stone and gravel, uniformly graded from 4 to 12 inches in least dimension and having no more than 60 percent wear (AASHTO T 96).

**703-2.12 SAND BLANKET.**

Sand containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as determined by ATM 204 and ATM 205. Meet the grading requirements of [Table 703-11](#) as determined by ATM 304.

**TABLE 703-11  
SAND BLANKET MATERIAL GRADATION**

SIEVE	PERCENT PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 200	0-6

**703-2.13 STRUCTURAL FILL.**

Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as determined by ATM 204 and ATM 205. Meet the grading requirements of [Table 703-12](#) as determined by ATM 304.

**TABLE 703-12  
AGGREGATE GRADATION FOR STRUCTURAL FILL**

SIEVE	PERCENT PASSING BY WEIGHT
3 in.	100
3/4 in.	75-100
No. 4	15-60
No. 16	10-30
No. 200	0-6

**703-2.14 AGGREGATE FOR ABRASIVE FINISH.**

Crushed silica sand, oven dried, and stored in moisture-proof bags. Free from clay balls, vegetative matter, or other deleterious matter (AASHTO T 112). Not coated with dirt or other finely divided mineral matter. Meet the grading requirements of [Table 703-13](#) as determined by ATM 304.

**TABLE 703-13  
GRADATION FOR SAND FOR ABRASIVE FINISH**

SIEVE	PERCENT PASSING BY WEIGHT
No. 12	100

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No. 40	0-5
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**703-2.15 CRUSHED GLASS.**

Up to 10 percent by weight crushed glass (cullet) smaller than 3/8-inch may be uniformly blended with natural soil-aggregate material prior to project delivery and placement. Glass cullet must be free of soil, paper, plastic, metals, organic material and other deleterious and hazardous substances. No more than 2.0 percent debris should be present as determined by Section X3 of AASHTO M318.

Eligible glass products from which glass cullet might be produced include: food and beverage container glass; plain ceramic or china dinnerware; or building window glass.

Prohibited glass products include: automobile windshields or other glass from automobiles; light bulbs of any type; porcelain products; laboratory glass; television, computer or other cathode ray monitor tubes.

Provide documentation identifying the origin of the glass products and certifying the glass cullet:

1. Does not contain prohibited materials,
2. Meets debris content requirement.

Uniformly blend glass cullet and natural soil-aggregate and meet the gradation requirements of **Table 703-14**.

**TABLE 703-14  
COMBINED AGGREGATE/GLASS CULLET GRADATION**

Type (Section)	Section/Table
Selected Material (203-3.03)	Section 703-2.07
Aggregate Base Course (301)	Table 703-2
Subbase	Table 703-8

For the natural soil-aggregate used in the blend, meet quality requirements as shown in **Table 703-1**, **Section 703-2.07**, or **Section 703-2.09** for the type specified.

**703-2.16 RECYCLED ASPHALT PAVEMENT (RAP).**

RAP shall be free of contamination and deleterious materials. RAP maximum particle size shall not exceed 1.5-in.

For HMA, the combined gradation of all aggregates, virgin and recycled, shall meet the requirements of **Table 703-4** for the specified HMA Type.

**703-2.17 BALLAST.**

Crushed shot rock or crushed pit-run rock, size No. 3, composed of hard, strong and durable particles, free from injurious amounts of clay balls, deleterious substances, vegetable matter. **Table 703-15**:

**TABLE 703-15  
AGGREGATE QUALITY PROPERTIES FOR BALLAST**

PROPERTY	BASE COURSE	TEST METHOD
L.A. Wear,%	50, max. after 500 revs.	AASHTO T 96
Freeze/Thaw	5% mas. Loss after 100 cycles	ASTM D 5312
Wet/Dry	1% max. loss	ASTM D 5313
Clay Lumps and Friable Particles	0.5% max.	ASTM C 142
Bulk Specific Gravity (SSD)	2.60 min.	AASHTO T 85
Absorption	1% max.	ASTM C 97
Degradation Value	30, min.	ATM 313
Fracture,%	80, min., two face	ASTM D5821
Magnesium Sulfate Soundness	1% max.	ASTM C 88 (Five Cycles)
Flat and/or Elongated Particles	5.0% max.	USACE CRD-C119

Meet 703-16 gradation

Table ballast

requirements, as determined by ATM 304:

**TABLE 703-16  
AGGREGATE GRADATION FOR BALLAST**  
Percent Passing by Weight

SIEVE	TYPE		
	3	4A	5
2-1/2 in.	100	100	--
2 in.	95-100	90-100	--
1-1/2 in.	35-70	60-90	100
1 in.	0-15	10-35	90-100
3/4 in.	--	0-10	40-75
1/2 in.	0-5	--	15-35
1/4 in.	0-3	0-5	0-15
No. 4	--	--	0-5
No. 200	0-0.3	0-0.3	0-0.3

## SECTION 709 REINFORCING STEEL AND WIRE ROPE

### 709-2.01 REINFORCING STEEL.

1. Reinforcing Steel Bars. Furnish deformed reinforcing steel bars of the type, grade, and size as specified. For steel reinforcing bars used in bridge structures, use bars meeting ASTM A706, Grade 60. For all other structures, use bars meeting AASHTO M 31, Grade 60.
2. Headed Reinforcing Steel Bars. Furnish headed reinforcing steel bars meeting the requirements of ASTM A970, Class HA. Use reinforcing steel meeting [Subsection 709-2.01.1](#) unless otherwise noted.
3. Epoxy-Coated Reinforcing Steel Bars. Furnish epoxy-coated steel bars meeting the requirements of ASTM A775. Coat epoxy-coated reinforcing steel in an epoxy coating applicator plant certified in accordance with the Concrete Reinforcing Steel Institute (CRSI) Voluntary Certification Program. Use reinforcing steel meeting [Subsection 709-2.01.1](#) unless otherwise noted.
4. Steel Wire. Furnish plain steel wire of the size specified that meets the requirements of AASHTO M 32.
5. Steel Bar Mats. Furnish deformed steel bar mats of the type, grade, size, and spacing as specified. Unless otherwise noted, furnish steel bar mats meeting the requirements of AASHTO M 54, Grade 60.
6. Steel Welded Wire Fabric. Furnish plain steel welded wire fabric of the size and spacing specified that meets the requirements of AASHTO M 55.
7. Epoxy-Coating Patch Material. Furnish epoxy-coating patch material meeting the requirements of ASTM D3963.
8. Certification. Furnish a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
  - a. the project name and number;
  - b. the manufacturer's name;
  - c. the name of the product or assembly;
  - d. a complete description of the material;
  - e. country of origin;
  - f. the lot, heat, or batch number that identifies the material;
  - g. all required test results for the specified material from the same lot, heat, or batch defined in [Subsection 709-2.01.8](#); and,
  - h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.



Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

### **709-2.02 WIRE ROPE OR WIRE CABLE.**

Meeting AASHTO M 30, 3/4 inch Type 1, Class A.

### **709-2.03 BAR SUPPORTS.**

1. Precast Mortar Blocks. Provide mortar blocks meeting the following:
  - a. Ensure the mortar blocks have compressive strength at least equal to the strength of the concrete in which the mortar blocks are embedded. Sample and test the mortar for compressive strength according to AASHTO T 106. Each test will be considered to represent no more than 2,500 mortar blocks made of the same mortar and cured under the same conditions.
  - b. Ensure the bearing area of the mortar block is less than 2 inches in each dimension.
  - c. Secure to the reinforcing steel with either a grooved top that will hold the bar in place or a protruding embedded wire that is tied to the reinforcing steel.
2. Metal Supports. Provide metal supports meeting at least one of the following:
  - a. Galvanized after fabrication according to AASHTO M 232 Class D,
  - b. Stainless steel meeting the requirements of ASTM A493, Type 302, or
  - c. Plastic coated using coatings that do not react chemically with the concrete, have a minimum thickness of 3/32 inch where the support touches the form, do not crack at or above -5°F, and do not deform enough to expose the metal at or below 200°F.
3. Plastic Supports. Provide plastic supports meeting the following:
  - a. Non-porous.
  - b. Chemically inert in concrete.
  - c. Have rounded seats.
  - d. Do not deform under load during normal temperatures.
  - e. Do not shatter or crack under impact loading in cold weather.
  - f. Have at least 25 percent of their gross area perforated.

Do not use plastic supports that prevent complete concrete consolidation in and around the support or require supports less than 1 foot apart along the length of the bar.

## **SECTION 711 CONCRETE CURING MATERIALS AND ADMIXTURES**

### **711-2.01 CURING MATERIALS.**

## **SECTION 709**

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Burlap Cloth made from Jute or Kenaf	AASHTO M 182, Class 4
Sheet Materials for Curing Concrete	ASTM C171
Liquid Membrane-Forming	
Compounds for Curing Concrete	ASTM C309, Type 1-D Class B, except do not use compounds containing linseed oil.

### **711-2.02 CHEMICAL ADMIXTURES.**

Air-Entraining Admixtures	AASHTO M 154
Water-Reducing Admixtures	AASHTO M 194, Type A
Set-Retarding Admixtures	AASHTO M 194, Type B
Set-Accelerating Admixtures	AASHTO M 194, Type C
Water-Reducing and Set-Retarding Admixtures	AASHTO M 194, Type D
Water-Reducing and Set-Accelerating Admixtures	AASHTO M 194, Type E
Water-Reducing Admixtures	AASHTO M 194, Type F
High Range Water-Reducing and Set-Retarding Admixtures	AASHTO M 194, Type G
Specific Performance Admixtures	ASTM C494, Type S

## **SECTION 712 MISCELLANEOUS**

### **712-2.01 WATER.**

Use water for mixing and curing concrete meeting ASTM C1602 including the optional chemical limits. Water from 'Community' or 'Non-Transient Non-Community' sources regulated by the Alaska Department of Environmental Conservation Division of Environmental Health Drinking Water Program, or equivalent in other states, do not require testing under ASTM C1602. For all other water sources, consider the water to be 'combined' as employed in ASTM C1602.

Use water for irrigating trees, plants, and seeded areas that is free of elements harmful to plant growth.

### **712-2.02 CALCIUM CHLORIDE.**

AASHTO M 144.

### **712-2.03 LIMESTONE.**

Use limestone containing not less than 85 percent of calcium and magnesium carbonates. Meet the standards of the Association of Official Agricultural Chemists. Meet the following gradation for agricultural ground limestone suitable for application by a fertilizer spreader:

<b>Sieve</b>	<b>Percent Passing, by Weight, Min.</b>
No. 10	100
No. 20	90
No. 100	50

Use soluble or ground limestone in a hydraulic sprayer. Ground limestone must permit complete suspension of insoluble particles in water.

### **712-2.04 PRECAST CONCRETE CURBING.**

Portland cement concrete curb units conforming to the lengths, shapes, and other details of the Plans. Use steel reinforcement, where shown on the Plans, meeting [Subsection 709-2.01](#).

Furnish a depressed or modified section of curb, when shown on the Plans, for driveways, crossing, closures, or for other reasons.

### **712-2.05 PRECAST CONCRETE MANHOLE SECTIONS.**

Meet AASHTO M 199, except that the absorption test will not be required. Reject units with cracks and honeycombed or patched areas in excess of 30 square inches.

### **712-2.06 FRAMES, GRATES, AND COVERS.**

Conform to the plan dimensions and to the following materials requirements.

Gray iron castings	AASHTO M 306 and AASHTO M 105, Class 35B.
Carbon-steel castings	AASHTO M 103. Grade is optional.
Structural steel	ASTM A709
Galvanizing	AASHTO M 111
Malleable iron castings	ASTM A47. Grade is optional.

Manhole frames and cover bearing surfaces are machine finished and all covers interchangeable.

## **SECTION 712**

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### **712-2.07 CORRUGATED METAL UNITS.**

Meet AASHTO M 36. When bituminous coating is specified, meet AASHTO M 190, Type A.

### **712-2.08 GLASS BEADS.**

Submit certifications of compliance for each lot of glass beads used on the contract. Glass beads shall contain no more than 200 ppm of lead or 200 ppm of arsenic when tested in accordance with EPA testing methods 3062, 6010B, or 6010C. Glass Beads shall meet AASHTO M 247, Type 1, with a moisture resistant coating when tested in accordance with AASHTO T346.

### **712-2.09 CORPORATION STOPS AND CURB STOPS.**

Use threaded corporation stops meeting AWWA C800. Use tapped couplings and service saddles as detailed on the Plans and per the manufacturer's recommendations.

### **712-2.10 GATE VALVES.**

All valves must open counter-clockwise, and have ends corresponding to the type of conduit being used.

Valves Larger than 3-inch. Iron body, fully bronze mounted, double disc, parallel seat valves, as manufactured to meet AWWA Specifications C500.

Valves 3-inch and Smaller. Meet ASTM B62. Solid bronze, wedge disc, non-rising stem, Class 125, with threaded ends.

### **712-2.11 VALVE SERVICE BOXES.**

Furnish the specific style box, stem, and cover shown on the Plans. Inscribe cover with "water" or "W". Furnish service box of sufficient length to be adjusted an equal amount above and below the final ground surface. Dip boxes in coal tar pitch.

Furnish special wrenches, keys, or other tools needed to operate valve and to open valve box lid. Furnish a minimum of one of each type for each style and size of box and lid.

Boxes for Valves Larger than 3-inch. Cast iron, not less than 5-1/4 inch shaft, with extension stem adjustable for elevation.

Boxes for Valves, 3-inch and Smaller. Cast iron, not less than 4-1/4 inch shaft, with screw type extension stem.

### **712-2.12 HYDRANTS.**

Meet AWWA Specifications C-502, "Dry-Barrel Fire Hydrants". Equip hydrants with 5-inch main valve openings and 6-inch standard mechanical joint hub ends for connection to the auxiliary gate valve. Equip hydrants with an auxiliary gate valve and valve box as shown on the standard details. Use mechanical joints for all connections. Furnish the following types of hose connections, as indicated on the drawings and bid schedule:

Single Pumper Hydrants. Two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection.

Double Pumper Hydrants. One 2-1/2 inch hose connection and two 4-1/2 inch pumper connections.

Furnish hydrants in lengths indicated on the drawings. Furnish hydrants with working parts made of bronze or non-corrodible metal. Paint and coat to meet the cited AWWA Specifications.

**712-2.13 GABIONS.**

**Wire Mesh:** Use 11 gage minimum wire, except that the selvage may be heavier. Meet or exceed ASTM A641 medium hardness and tensile strength; Class 3 coating. Furnish at least one sample of each component of the mesh for testing.

Use mesh with 4-inch openings in the longest dimension.

Use wire mesh that is designed to be non-raveling. It must resist pulling apart at any of the connections forming the mesh when a single wire strand in a section of mesh is cut.

**Tie and Connecting Wire:** Conform to the same specifications as wire used in the mesh except that it may be not more than 2 gauges smaller. Supply sufficient quantity for securing and fastening all edges of the gabion baskets and diaphragms, for fastening adjacent gabion baskets together, and to provide cross connecting wires in each gabion cell as specified below.

**Gabion Baskets.** Supply baskets, as specified, in various lengths and heights. Make the lengths multiples (2, 3, or more) of the horizontal width. Furnish all gabion baskets in uniform width of not less than 24 inches or more than 48 inches.

Fabricate the sides, ends, lid, and diaphragms for field assembly into a rectangular basket of the required size. Construct gabions as a unit. The base, ends and sides are either to be woven into a single unit or one edge of these members connected to the base so that strength and flexibility at the point of connection is at least equal to that of the mesh.

**Diaphragms.** Where the length of the gabion exceeds its horizontal width, divide the gabion equally with diaphragms of the same mesh and gage as the gabion basket and make compartments of a length approximately equal to horizontal width. Furnish the gabion with the necessary diaphragms secured in proper position on the base section so that no additional tying at this juncture is necessary.

Securely selvage or bind all perimeter edges so that the joints formed by tying the selvages have approximately the same strength as the body of the mesh.

**712-2.14 PREFORMED PAVEMENT MARKING TAPE.**1. **General Requirements:**

- a. Reflectorized plastic pavement markings and legends. Furnish a pliant polymer or homogenous preformed ribbon, 60 mils thick and of specified width, containing glass spheres uniformly distributed throughout the entire cross section. Furnish type that is designed to be inlaid on hot asphalt pavement or attached to existing bituminous pavement with a precoated pressure adhesive or liquid contact cement as herein specified.
- b. Use legends and symbols meeting the applicable shapes and sizes in the Alaska Traffic Manual and the Plans.
- c. Ensure that the plastic marker will mold itself to pavement contours, breaks, faults, etc. at normal pavement temperatures and fuse with itself and with previously applied markings of the same composition under normal conditions of use.

2. **Composition Requirements:** Furnish marker with the following materials uniformly distributed throughout its cross-sectional area, and with a reflective layer of beads bonded to the top surface:

<b>Material</b>	<b>(Composition by Weight, min.)</b>
Resins & Plasticizers	20%

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Pigments	30%
Graded Glass Beads	25%

3. Physical Requirements:

- a. Tensile Strength. Minimum tensile strength of 100 psi when tested according to ASTM D638.
- b. Plastic Pull Test. A test specimen made by cutting two 1-inch by 3-inch pieces of the plastic and attaching a 1-inch by 1-inch area at the end of each piece to the other, must support a dead weight of 4 pounds for not less than 5 minutes at a temperature between 70 °F and 80 °F.
- c. Pigmentation. Select and blend the pigments to provide a marking film which includes titanium dioxide for white markers and medium chrome yellow for yellow markers meeting standard highway colors through the expected life of the film.
- d. Glass Beads. Colorless glass with a minimum index of refraction of 1.50 when tested using the liquid oil immersion method. Use beads of size and quality to meet the performance requirements for the plastic.
- e. Skid Resistance. Meet a minimum skid resistance value of 40 BPN for the surface of the plastic using ASTM E303.
- f. Reflectance. Meet the following initial minimum reflectance values for white and yellow films at 0.2° and 0.5° observation angles and 86.0° entrance angle using FSS FED-STD-370. Use a test distance of 50 feet and a 2-foot x 2.5-foot rectangular sample. Express specific luminance (SL) as millicandelas per ft<sup>2</sup> per foot candle.

(1) Use an angular aperture of both the photoreceptor and light projector of 6 minutes of arc. Use the geometric center of the sample as the reference center and the reference axis perpendicular to the test sample.

Observation Angle	White		Yellow	
	0.2°	0.5°	0.2°	0.5°
Specific Luminance	550	380	410	250

- g. Reflectivity Retention Tests. Meet the following test requirements:
  - (1) Taber Abraser Simulation Test. Using a taber abraser with an H-18 wheel and a 125-gram load, inspect the sample at 50, 100 and 200 cycles, under a microscope, to observe the extent and type of bead failure.
 

No more than 10 percent of the beads may be lost due to popout and the predominant mode of failure must be “wear down” of the beads.
  - (2) Qualitative Test. Judge bead bond strengths under a microscope with a magnification of 5X. The beads when removed must show a portion of the polymer bead bond retained with the beads.
- h. Certification. In lieu of running the tests required by this Subsection, provide a certification from the manufacturer stating the product conforms to these requirements.
- i. Effective Performance Life. Provide a neat, durable marking that will not flow or distort due to temperature if the pavement surface remains stable.

The plastic must be weather resistant and through normal traffic wear, show no appreciable fading, lifting or shrinkage and show no significant tearing, roll back, or other signs of poor adhesion.

4. Application. Use a vendor-furnished mechanical applicator for the installation of a 4-inch wide pressure sensitive adhesive coated material. Provide the mechanical applicator on location for the duration of the installation period. Ensure that a manufacturer's representative is present during the time of the installation to provide technical assistance.

#### **712-2.15 RAISED AND RECESSED PAVEMENT MARKERS.**

Use reflectors for both raised and recessed pavement markers consisting of an acrylic plastic shell filled with tightly adherent potting compound. Use shells containing one or two glass-covered prismatic reflective faces as called for on the Plans to reflect incidental light from a single or opposite directions.

1. Shell. Molded Methyl Methacrylate meeting ASTM D788, Gr. 8.
2. Overall Dimensions. 4 x 2 x 3/8 inches.
3. Reflective Surface. Each reflective surface must have a minimum area of 3-1/4 in<sup>2</sup> and be located on a 30-degree angle from a horizontal plane.
4. Optical Requirements. Meet the following minimum optical requirements of the reflective faces for an observation angle of 0.2 degrees, with the incident light parallel to the base of the reflector:

Horizontal Entrance Angle	Specific Intensity*		
	White	Yellow	Red
0 degrees	3	1.8	0.75
20 degrees	1.2	0.72	0.30

\*Candelas per footcandle of illumination at the reflector on a plane perpendicular to the incident light.

5. Adhesive. Install pavement markers with an epoxy adhesive recommended by the marker manufacturer and approved by the Engineer.
6. Color. Match the color of the raised pavement markers to the color of the marking for which they supplement, substitute, or serve as a positioning guide.
7. Filler. Use a potting compound filler selected for strength, resilience, and adhesion.

Bond thin, smooth, untempered glass to the prismatic reflective faces to provide an extremely hard and durable abrasion resistant surface.

#### **712-2.16 TEMPORARY RAISED PAVEMENT MARKERS FOR SHORT-TERM OPERATIONS, SEAL COATS, AND SURFACE TREATMENTS.**

1. Marker. L-shaped polyurethane body with retroreflective tape on the top vertical section, with a self-adhesive base. Reflecterize both faces of the yellow marker and one face of the white marker. Make the marker body of 60 mil minimum thickness polyurethane meeting **Table 712-1** with vertical leg approximately 2 inches high by 4 inches wide and base approximately 1-1/4 inch wide.

**TABLE 712-1  
REQUIREMENTS FOR TEMPORARY RAISED PAVEMENT MARKERS**

PROPERTY	RESULT	ASTM TEST METHOD
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**SECTION 712**

PROPERTY	RESULT	ASTM TEST METHOD
Specific Gravity (min.)	1.19	D792
Hardness	80A	D2240
Tensile Strength (psi, min.)	4,600	D412
Ultimate Elongation (% min.)	330	D412
Modulus @ 300% (psi, min.)	1,000	D412
Stiffness		
@ -20 °F (psi, min.)	1,700	D1053
@ 72 °F (psi, min.)	900	D1053
Compression Set 22 hrs @ 160 °F max. %	65	D395
Taber Abrasion CS17 wheel wt loss mg/1000 cycles	3	----

2. Reflective Tape. Metalized polycarbonate microprism retroreflective material with acrylic backing or equal, a minimum 1/4-inch wide by 4 inches long. Provide the minimum optical performance shown in **Table 712-2**, for an observation angle of 0.2 degrees.

**TABLE 712-2  
OPTICAL PERFORMANCE FOR REFLECTIVE TAPE**

Horizontal Entrance Angle	Specific Intensity *	
	White	Yellow
0 degrees	3.5	3.0
30 degrees	2.7	1.7

\*Candelas per footcandle of illumination at the reflector on a plane perpendicular to the incident light.

3. Protective Cover. Where chip seals, slurry seals or tack coats are to be utilized after placement of the temporary raised pavement markers, furnish markers with a protective cover made of clear flexible polyvinyl chloride.
4. Adhesive. Pressure-sensitive material, a minimum of 1/8 inch thick and 3/4 inch wide, factory-applied to the marker base with release paper.

**712-2.17 METHYL METHACRYLATE PAVEMENT MARKINGS.**

1. Quality Requirements: Use a marking material formulated for spray application without reflective beads or anti-skid aggregate. Use glass beads and aggregate designed to be applied to freshly applied material to meet the specified retroreflectance and anti-skid properties.
2. Use a marking material manufactured from new materials and free from dirt and other foreign material. Use a methyl methacrylate-based resin system for Part "A". Use benzoyl peroxide liquid plasticizer for Part "B".
3. Submit a manufacturer certification for both the methyl methacrylate material and glass beads to ensure that the materials furnished conform to these Specifications.
4. Performance Properties:
  - a. No Track Time: Material must be track free after 15 minutes when applied at 40 mils (ASTM D711).
  - b. Hardness: Shore Durometer, A-1, 80 minimum after 24 hours.



- c. Tensile Strength: At break, minimum 125 psi (ASTM D638).
  - d. Percent Elongation: Minimum 20% (ASTM D638).
  - e. Water Absorption: Maximum 0.5% (ASTM D570).
  - f. Chemical Resistance: The material must show no effect after 7-day immersion in anti-freeze, motor oil, diesel fuel, gasoline, calcium chloride, sodium chloride or transmission fluid.
  - g. Ultra-violet Light: Ultra-violet light must have no effect.
  - h. Skid Resistance: Minimum 45 units, British pendulum (ASTM E303).
  - i. Reflectivity: 200 millicandelas, minimum initial
  - j. Viscosity: Spray Material: 5 - 12 Pa\*s (ASTM D2196 Method B, LV Model, Spindle #4 at 60 RPM).
5. Composition: The composition is at the discretion of the manufacturer, but must be essentially comprised of resins, reactive monomers, pigments, plasticizer, benzoyl peroxide, aggregate and glass beads. When mixed in the stated ratio, the material must cure to 99 percent minimum by weight and volume solids.

#### **712-2.18 GLASS BEADS FOR METHYL METHACRYLATE PAVEMENT MARKINGS.**

Meet the following requirements:

<b>Beadgun Position▶</b>	<b>Front</b> ▼	<b>Rear</b> ▼
<b>Glass Type▶</b>	1.5 RI*, Sinker	1.5 RI*, Floater
<b>Coating▶</b>	Adhesion (ACO2)	Fluorocarbon
<b>Sieve Size</b> ▼	<u>Percent Passing</u> <u>by Weight</u> ▼	<u>Percent Passing</u> <u>by Weight</u> ▼
No. 16	100	100
No. 20	90-100	100
No. 30		75-95
No. 40	10-35	
No. 50	0-10	15-35
No. 80	0-5	
No. 100		0-5
<b>Drop Rate, lb/ft<sup>3</sup>▶</b>	65	40

\* *Refractive Index*

#### **712-2.19 LOW-VISCOSITY RESIN.**

Meet AASHTO M 235, Type IV, Grade 1, with the following revisions:

*Amend AASHTO M 235 Table 1 as follows:*

Replace "2.0[20]" with "0.105[1.05]" in the row labeled "Grade 1, max".

#### **712-2.20 CONCRETE ANCHORS.**

## **SECTION 712**

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1. Anchor Bolts. Use hot-dip galvanized anchor bolts meeting ASTM F1554, Grade 36, unless noted otherwise.
2. Coil Anchor Inserts. Use 1-inch diameter galvanized inserts with a minimum safe working load of 7,500 pounds. Hot-dip galvanize anchors according to AASHTO M 111 or AASHTO M 232.
3. Threaded Anchor Inserts. Use 1-inch diameter galvanized ferrule inserts with a minimum safe working load of 6,500 pounds. Hot-dip galvanize anchors according to AASHTO M 111 or AASHTO M 232.

### **712-2.21 EPOXY FOR BONDING DOWELS.**

Use an epoxy cartridge system appropriate for the service temperature and ambient concrete temperature at the time of installation.

Use epoxy cartridge systems that meet the requirements of the "Acceptance Criteria for Adhesive Anchors in Masonry Elements," AC58, by the International Code Council Evaluation Service (ICC-ES) including the suitability requirements for creep, in-service temperature, dampness, freezing and thawing, and seismic tests.

### **712-2.22 CONTROLLED LOW-STRENGTH MATERIAL.**

Provide controlled low-strength material (CLSM) that is a self-compacting, cementitious, flowable material requiring no subsequent vibration or tamping to achieve consolidation in accordance with American Concrete Institute (ACI) 229R-99 "*Controlled Low-Strength Materials*" and meeting the following:

1. Cementitious Materials. Meet **Section 701**.
2. Water. Meet **Subsection 712-2.01**.
3. Chemical Admixtures. Meet **Subsection 711-2.02**.
4. Aggregate. Crushed stone or naturally occurring gravel, containing no deleterious matter, and with 100 percent of the aggregate passing a 3-inch sieve.
5. Strength. 500 psi minimum to 1,200 psi maximum 28-day compressive strength as determined by ASTM D4832.

**SECTION 716  
STRUCTURAL STEEL**

**716-2.01 SCOPE.**

Structural steel for highway bridges and other structural purposes.

**716-2.02 GENERAL REQUIREMENTS.**

Meet the following:

1. General requirements for delivery of rolled steel plates, shapes, and bars for structural ASTM A6
2. Structural Weathering Steel ASTM A709, Grade 50W
3. Structural Steel, Deck Plate ASTM A709, Grade 50 T3
4. Structural Steel, Fracture-Critical Members ASTM A709, Grade 50 F3
5. Structural Steel, Other ASTM A709, Grade 36
6. Filler Metal for Applicable Arc-Welding Electrodes AWS Specifications
7. Stud Shear Connectors ASTM A108 Gr. 1015, or 1020
8. Raised Pattern Plate. Where raised pattern plate is shown on the Plans, use plates with a raised pattern surface meeting the following requirements:
  - a. Use diagonal type pattern, with the intersecting diagonals at right angles to one another. Use the same material for the raised portions of the pattern as the base metal of the plate. The raised pattern must be an inherent part of the plate. The pattern must be continuous throughout the surface of the plate and the projections along any diagonal must be spaced alternately with the projections along the normal diagonals.
  - b. Use plate with projections that are self-draining and self-cleaning and provide a skid-resistant surface from all angles of approach. The projections must have flat tops and be designed not to chip, crack, split, or buckle at their intersection with the base metal.
9. Impact Test Requirements. Use structural steel and filler metal for applicable arc-welding electrodes meeting the following requirements:
  - a. For structural steel, meet the impact testing requirements and marking requirements of ASTM A709 for the specified grade, type of component, and impact testing temperature zone. If the grade is not specified, use Grade 36 steel. If the type of component is not specified, use steel grades marked with suffix T. If the impact testing temperature zone is not specified, use steel marked for Zone 3.
  - b. For filler metal for applicable arc-welding electrodes, meet the minimum average energy values of the base metals to be joined when tested at or below the

## **SECTION 716**

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temperature corresponding to the specified impact testing temperature zone of the base metal. Perform impact tests according to ASTM A370.

### **716-2.03 FASTENERS.**

Meet the following:

- |  |                                |
|--|--------------------------------|
| 1. High Strength Bolts                 | ASTM F3125, Grade A325 or A490 |
| 2. Nuts                                | ASTM A563                      |
| 3. Hardened Steel Washers              | ASTM F436                      |
| 4. Zinc Coated Load Indicating Washers | ASTM F959 Type 325             |

### **716-2.04 STEEL GRID FLOORS.**

Meet ASTM A709, Grade 36. If the material is not galvanized, ensure the steel has a copper content of 0.2 percent minimum.

Unless painting of floors is specified in the Special Provisions, open type floors must be galvanized.

### **716-2.05 MACHINE BOLTS.**

Meet ASTM A307.

### **716-2.06 STEEL PIPE.**

Meet ASTM A53 Grade B.

### **716-2.07 GALVANIZING.**

Hot-dip galvanize structural steel shapes, plates, bars and their products according to AASHTO M 111. Galvanize tubes and piles on inside and outside surfaces.

Hot-dip galvanize steel poles, mast arms, pedestals, and posts, according to AASHTO M 111. Submerge each component in the galvanizing kettle in one dip. Use only the dry kettle method of fluxing for high tower poles.

Hot-dip galvanize all anchor bolts, nuts, washers, tie-rods, clamps, and other miscellaneous ferrous parts in conformance with AASHTO M 232. After galvanizing, ensure that the bolt threads accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

Galvanize rigid metal conduit in conformance with AASHTO M 232.

For steel bridge members, apply 10 mils zinc galvanizing by spray-metalizing process according to Steel Structures Painting Council's coating system guide SSPC-CS 23.00. Prepare surfaces before galvanizing according to Steel Structures Painting Council's surface preparation guide SSPC-SP 5, White Metal Blast Cleaning.

Repair damaged coatings according to ASTM A780 Annex A1 or Annex A3, except as described herein. Clean the damaged area according to SSPC-SP 3, Power Tool Cleaning for repairs meeting Annex A1 and SSPC-SP 5/NACE No. 1, White Metal Blast Cleaning for repairs meeting Annex A3.. Extend the cleaned area 1/2 inch to 3/4 inch

into the undamaged section of the coating. Keep the cleaned area dry and free of rust and soiling. Within 24 hours of cleaning, coat the cleaned section with zinc to a thickness of not less than 10 mils when using the method in Annex A3 and not less than 3 mils when using the method in Annex A1. Taper the thickness of the repair coating to match the original coating thickness at the edges of the cleaned section. Where zinc coating is to be metallized in accordance with Annex A3, use zinc wire containing not less than 99.98 percent zinc.

#### **716-2.08 CERTIFICATION.**

Furnish a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number
2. the manufacturer's name
3. the name of the product or assembly
4. a complete description of the material
5. country of origin
6. the lot, heat, or batch number that identifies the material
7. all required test results for the specified material from the same lot, heat, or batch defined in **Subsection 716-2.08.6**.
8. an affidavit, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

## SECTION 720 BEARINGS

### 720-2.01 ELASTOMERIC BEARING PADS.

Elastomeric bearing pads include plain pads, consisting of elastomer only, and laminated pads with steel laminates conforming to Section 5.6, Chapter 15 of the most current edition of AREMA and the following.

1. General. Meet AASHTO M 251, with the following revisions:

#### **4.1 Properties of the Elastomer**

*Delete the first sentence and replace with the following:* Use elastomeric compound in the construction of the bearings containing only virgin natural polyisoprene (natural rubber) as the raw polymer. Do not use neoprene. Properties and requirements elsewhere in AASHTO M 251 pertaining solely to polychloroprene (neoprene) do not apply.

*Add the following:*

Use elastomer compound classified as low temperature Grade 5 and meeting the requirements of paragraph 8.9.1.

#### **5. FABRICATION**

*Add the following paragraph:*

5.5. Fabricate pads over 3/4 inch thick with alternating laminations of elastomer and metal or fabric reinforcements. The outside laminations must be metal or fabric with a minimum elastomer cover as shown on the Plans.

#### **Table 2 – Tolerances.**

*Delete Item 6 and replace with the following:*

6. Top, bottom, and edge cover of embedded laminates or connection members -0, +1/8 inch.

2. Certification. Furnish a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
  - a. the project name and number;
  - b. the manufacturer's name;
  - c. the name of the product or assembly;
  - d. a complete description of the material;
  - e. country of origin;
  - f. the lot, heat, or batch number that identifies the material;
  - g. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 720-2.01.2; and

- h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

**720-2.02 EPOXY ADHESIVE FOR ELASTOMERIC BEARING PADS.**

Meet AASHTO M 235, Type IV, Grade 3.

## **SECTION 724 SEED**

### **724-2.01 DESCRIPTION.**

Grass seed to provide a living vegetative cover.

### **724-2.02 MATERIALS.**

Provide seed mix as specified in the Special Provisions. Provide seed collected or harvested within 2 years of the targeted seeding date. Provide all seed in pure live seed (PLS) unless otherwise directed.

Furnish seed true of genus and species. Meet applicable requirements of the State of Alaska *Seed Regulations*, 11 AAC 34, Article 1 and Article 4, and the Federal Seed Act, 7 CFR Part 201.

The Engineer will review requests for species or cultivar substitution(s); genus substitution is not allowed. Substitution requests need to be submitted a minimum of 60 calendar days in advance of purchase.

1. Prohibited and Restricted Noxious Weeds and Quarantined Pests. Furnish seed and appliances certified to be free of prohibited noxious weeds or quarantined pests, and certified to contain no more than the maximum allowable tolerances for restricted noxious weeds, according to Alaska Administrative Code, Title 11, Chapter 34 (11 AAC 34).
  - a. Seed or appliances found to contain prohibited noxious weeds or quarantined pests will be rejected, according to 11 AAC 34.020(a) and 11 AAC 105-180, respectively.
  - b. Seed or appliances found to contain restricted noxious weed seed in excess of the maximum allowable tolerance per pound will be rejected, according to 11 AAC 34.020(b).

Prohibited and restricted noxious weeds are listed in 11 AAC 34.020, and can be viewed at the following URL: <http://plants.alaska.gov/invasives/noxious-weeds.htm>.

2. Labeling. Ensure each bag or container of individual seed species is labeled to meet requirements of 11 AAC 34.010. Do not remove labels from bags or containers.
3. Certification. Certify seed is free of prohibited noxious weeds and restricted noxious weeds are within allowable tolerances. Furnish to the Engineer a statement signed by the vendor identifying the lot number or lot numbers, certifying each lot of seed has been tested within the preceding nine months, by a recognized seed testing laboratory, a member of the Association of Official Seed Certifying Agency (AOSCA), or the Alaska Plant Materials Center.

Seed will be rejected if:

- a. Contains prohibited noxious weeds;
- b. Contains restricted noxious weeds above maximum allowable tolerances;
- c. Not certified as tested within the preceding nine months;
- d. Wet, moldy, or otherwise damaged in transit or storage; or
- e. Containers do not have labels or the labels have been removed.

Seed may be rejected for:



- f. Discrepancies in the lot numbers listed on the statement to the lot numbers indicated on the labels of the seed containers.

The Contractor shall immediately remove rejected seed from the project premises. If seed is rejected for containing prohibited noxious weeds or for exceeding maximum allowable tolerances of restricted noxious weeds, dispose of rejected seed according to 11 AAC 34.075(g).

## **SECTION 725 FERTILIZER**

### **725-2.01 DESCRIPTION.**

Standard commercial fertilizer supplied separately or in mixtures, and furnished in moisture proof containers. Mark each container with the weight and with the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein.

### **725-2.02 MATERIALS.**

Furnish a mixture of chemical ingredients providing the total available nitrogen, phosphoric acid, and potassium required by the soil analysis or as specified in the Special Provisions. Tolerances of the chemical ingredients are plus or minus 2 percent.

No Cyanamid compounds or hydrated lime are permitted in mixed fertilizers.

## SECTION 726 TOPSOIL

### 726-2.01 TOPSOIL.

Furnish a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. Meet the following:

1. Reasonably free of litter and free from roots, clods, hard clay, prohibited noxious weeds, tall grass, brush, sticks, stubble, and be free-draining and non-toxic. Prohibited and Restricted Noxious Weeds are listed in 11AAC 34.020 is located at the following URL: <http://plants.alaska.gov/invasives/noxious-weeds.htm>.
2. Contain between 3 percent and 20 percent organic matter as determined by loss-on-ignition of oven dried samples according to ATM 203.
3. Grading requirements:

Sieve	Percent Passing
2 in.	100
No. 4	75-100
No. 10	60-100
No. 200	10-70

Notify the Engineer of the source of topsoil at least 30 days prior to delivery of topsoil to the project from that location. The Engineer will inspect and test the topsoil and its source before approval will be granted for its use.

Unsuitable topsoil sources may be used if, prior to delivery to the project, sufficient organic matter in the form of pulverized peat moss or rich organic soil from other sources is thoroughly mixed with the topsoil to provide a product meeting the above requirements.

Use the application rates, determined by the Engineer, of fertilizer and limestone per acre of ground area of topsoil, based on soil analysis tests so that the total natural and applied chemical constituents are as follows:

Nitrogen	45 - 65 pounds per acre
Phosphoric Acid	45 - 90 pounds per acre
Potassium	45 - 90 pounds per acre

**TABLE 726-1  
LIMESTONE REQUIREMENTS**

Soil pH	Limestone, tons/acre
Above 6.0	0
5.0-6.0	1.5
Below 5.0	3.0

## SECTION 729 GEOSYNTHETICS

### **729-2.01 GEOTEXTILE FOR SUBSURFACE DRAINAGE, SEPARATION, STABILIZATION, EROSION CONTROL AND EMBANKMENT REINFORCEMENT.**

1. Subsurface Drainage. Meet AASHTO M 288 for Subsurface Drainage, except provide a minimum permittivity of  $0.50 \text{ sec}^{-1}$ , and meet Class 2 Strength Property Requirements.
2. Separation. Meet AASHTO M 288 for Separation, except provide a minimum permittivity of  $0.50 \text{ sec}^{-1}$ , and meet Class 3 Strength Property Requirements.
3. Stabilization. Meet AASHTO M 288 for Stabilization, except provides a minimum permittivity of  $0.50 \text{ sec}^{-1}$ , and meet Class 1 Strength Property Requirements.
4. Erosion Control. Meet AASHTO M 288 for Permanent Erosion Control and meet Class 1 Strength Property Requirements.
5. Reinforcement. Meet the requirements in **Table 729-1** for Type 1 or Type 2.

Package, label, handle and store geotextile materials according to ASTM D 4873.

**TABLE 729-1  
GEOTEXTILE REINFORCEMENT PROPERTIES**

Property	Test Method	Units	Requirement <sup>a</sup>	
			Type 1	Type 2
Grab Tensile	ASTM D4632	lb.	200/200	400/400
Grab Elongation	ASTM D4632	% (MD)	10	10
Wide Width Tensile	ASTM D4595	lb/in. (ultimate)	200/200	400/400
Wide Width Tensile	ASTM D4595	lb/in. (@ 5% strain)	100/100	200/200
Seam Breaking Strength	ASTM D4632	lb./in.	180	360
Puncture	ASTM D6241	lb.	500	1500
Trapezoidal Tear	ASTM D4533	lb.	100	150
AOS	ASTM D4751	U.S. sieve size	#30 <sup>b</sup>	#30 <sup>b</sup>
Permittivity	ASTM D4491	$\text{sec}^{-1}$	0.20	0.20
Flow Rate	ASTM D4491	gal./min./ft <sup>2</sup>	10	10

<sup>a</sup> Minimum Average Roll Values (MARV) in machine direction (MD) / cross-machine direction (XD) unless otherwise specified

<sup>b</sup> Maximum average roll value

### **729-2.02 SILT FENCE.**

Meet AASHTO M 288 for Temporary Silt Fence.

### **729-2.03 PAVING FABRIC.**

Meet AASHTO M 288 for Paving Fabric.

### **729-2.04 GEOGRID FOR EMBANKMENT AND ROADWAY STABILIZATION AND REINFORCEMENT.**

Provide geogrid consisting of a regular network of connected polymer tensile elements with aperture geometry sufficient to provide significant mechanical interlock with the surrounding material. Provide dimensionally stable geogrid that is able to retain its geometry during

construction. Provide geogrid structure that resists ultraviolet degradation and all forms of chemical and biological degradation encountered in the material in which it is buried.

Package, label, handle, and store geogrid material according to ASTM D 4873.

1. Stabilization. Provide geogrid that meets the survivability requirements in **Table 729-2** and meets the physical requirements in **Table 729-3**.
2. Reinforcement. Provide geogrid that meets the survivability requirements in **Table 729-2** and as shown on the Plans.

**TABLE 729-2  
GEOGRID SURVIVABILITY REQUIREMENTS**

Property	Test Method	Units	Requirement	
			CLASS 1	CLASS 2
Ultimate Multi-Rib Tensile Strength <sup>a</sup>	ASTM D6637	lb./ft.	1230	820
Junction Strength <sup>a</sup>	ASTM D7737	lb.	25	25
Ultraviolet Stability (Retained Strength)	ASTM D4355	%	50% after 500 hours of exposure	

<sup>a</sup> Minimum Average Roll Value (MARV) in any rib direction.

**TABLE 729-3  
GEOGRID PHYSICAL REQUIREMENTS**

Property	Test Method	Units	Requirement	
			CLASS 1	CLASS 2
2% Tensile Strength <sup>a</sup>	ASTM D6637	lb./ft.	≥ 400	≥ 260
5% Tensile Strength <sup>a</sup>	ASTM D6637	lb./ft.	≥ 800	≥ 540
Percent Open Area	COE, CW-02215	%	50 – 80	50 – 80
Aperture Size <sup>b</sup>	Direct measure	in.	0.5 – 3.0	0.5 – 3.0

<sup>a</sup> Minimum Average Roll Value (MARV) in machine and cross-machine directions.

<sup>b</sup> measured as the spacing between parallel ribs.

