

CHAPTER 600 – INCIDENTAL CONSTRUCTION

Section 601 – Riprap.....	3
<i>601 Checklist – Riprap</i>	<i>16</i>
Section 602 – Gabions and Revetment Mattresses.....	19
<i>602 Checklist – Gabions and Revetment Mattresses</i>	<i>35</i>
Section 603 – Steel Jetty Bank Protection.....	39
<i>603 Checklist – Steel Jetty Bank Protection</i>	<i>56</i>
Section 609 – Integral Curb, Combined Curb and Gutter, Bituminous Curb and Concrete Curb	60
<i>609 Checklist – Integral Curb, Combined Curb and Gutter, Bituminous Curb and Concrete Curb</i>	<i>79</i>
Section 610 – Concrete or Asphalt Sidewalks, Driveways, Dividing Strips, and Tactile Warning Devices	85
<i>610 Checklist – Concrete or Asphalt Sidewalks, Driveways, Dividing Strips, and Tactile Warning Devices</i>	<i>115</i>
Section 611 – Manholes, Drop or Curb Inlets, and Junction Boxes	121
<i>611 Checklist – Manholes, Drop or Curb Inlets, and Junction Boxes</i>	<i>145</i>
Section 612 – Adjustment of Existing Structures.....	151
<i>612 Checklist – Adjustment of Existing Structures</i>	<i>163</i>
Section 613 – Drainage Conduits.....	168
<i>613 Checklist – Drainage Conduits.....</i>	<i>200</i>
Section 614 – Wick Drains and Strip Drains	207
<i>614 Checklist – Wick Drains and Strip Drains</i>	<i>219</i>
Section 615 – Sanitary Sewer Pipe Conduits	223
<i>615 Checklist – Sanitary Sewer Pipe Conduits</i>	<i>239</i>
Section 616 – Water Pipe and Fittings	244
<i>616 Checklist – Water Pipe and Fittings</i>	<i>267</i>
Section 619 – Removal of Buildings, Structures, and Obstructions	272
<i>619 Checklist – Removal of Buildings, Structures, and Obstructions.....</i>	<i>286</i>
Section 620 – Removal of Underground Storage Tanks.....	289
<i>620 Checklist – Removal of Underground Storage Tanks</i>	<i>298</i>
Section 622 – Pipe Railing and Miscellaneous Pipe Work	300
<i>622 Checklist – Pipe Railing and Miscellaneous Pipe Work.....</i>	<i>308</i>
Section 623 – Guardrail and End Treatments.....	311
<i>623 Checklist – Guardrail and End Treatments</i>	<i>335</i>

Section 624 – Fences	340
<i>624 Checklist – Fences</i>	<i>369</i>
Section 625 – Removal and Storage or Reconstruction of Fencing and Guardrail.....	375
<i>625 Checklist – Removal and Storage or Reconstruction of Fencing and Guardrail.....</i>	<i>387</i>
Section 626 – Monuments.....	392
<i>626 Checklist – Monuments.....</i>	<i>406</i>
Section 627 – Concrete Longitudinal Barrier.....	411
<i>627 Checklist – Concrete Longitudinal Barrier.....</i>	<i>432</i>
Section 628 – High-Tension Cable Barrier	437
<i>628 Checklist – High-Tension Cable Barrier</i>	<i>460</i>
Section 629 – Mailboxes	465
<i>629 Checklist – Mailboxes</i>	<i>479</i>
Section 640 – Field Office or Laboratory	483
<i>640 Checklist – Field Office or Laboratory.....</i>	<i>491</i>
Section 641 – Mobilization	493
<i>641 Checklist – Mobilization</i>	<i>500</i>
Section 642 – Construction Staking.....	502
<i>642 Checklist – Construction Staking.....</i>	<i>511</i>
Appendix	511
<i>ODOT Form - ADA Facility Technically Infeasible Determination Process</i>	<i>512</i>

SECTION 601 – RIPRAP

601.01 GENERAL

This work consists of providing and placing riprap for slope protection. The Department defines the following types of riprap:

- Type I Plain Riprap,
- Type I-A Plain Riprap with Filter Blanket,
- Type II Special Plain Riprap,
- Type II-A Special Plain Riprap with Filter Blanket,
- Type III Laid Up Plain Riprap, or
- Type IV Grouted Riprap.

601.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various riprap, filter blanket and/or filter fabric pay items included in the Contract.
- Review special provisions included in the Contract for riprap pay items (electronic tickets, etc.).
- Review plan notes and details of installation included in the Plans for riprap, filter blanket and/or filter fabric pay items (thickness, toe wall dimensions, area to be covered, etc.).
- Review the US Army Corp of Engineers 404 Permit conditions when included in the Contract and any environmental notes in the Plans.
- Proposed sources of material and material requirements. Type A Material Certification required for filter blanket stone.
- Surface preparations prior to placement of riprap, filter blanket and/or filter fabric.
- Methods and equipment to be used including the delivery and initial unloading of the riprap material.
- Weather limitations for placement of filter fabric or grouted riprap.
- Contractor's schedule/plan for the work.

B. Acceptance of Materials

Review the Plans and distinguish the riprap pay items included in the contract. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the type of riprap construction performed (cement and fine

aggregates for grouted riprap, filter fabric, stone, etc.). Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the riprap items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

The Residency will verify that the proposed sources of materials for the riprap and filter blanket stone submitted by the Contractor are on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[Stone for Erosion Control](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Contractor must submit a Type A Material Certification for the filter blanket stone in accordance with the [FAST Guide](#). As stated in Section 106.04.C of the Standard Specifications, the Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment.

The Residency will verify that the proposed source of materials for the filter fabric product submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)). Ensure the product name and manufacturer is shown in the Section [712.02 – Fabric, Permanent Erosion Control](#) list on the QPL. If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

When grouted riprap is required on the project, the Residency will verify that the proposed source of material for the fine aggregate used in the grout submitted by the Contractor is on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[HC Concrete Aggregate, Fine](#)". Additionally, the Residency will verify that the proposed source of material for the portland cement used in the grout submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Hydraulic Cements](#)). If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division

to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

C. Preparatory Work and Contractor Work Plans

Consider the following before riprap construction work begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract. Review the Standard Specifications, Special Provisions and Plan Notes.

ODOT is implementing the use of electronic ticketing for material delivered to the project. If your Contract includes the special provision for electronic ticketing, ensure the Contractor or their designated subcontractor is prepared to comply with the terms of the provision. That includes registering to use the Department's Electronic Ticketing Portal system (HaulHub) and placing an identifying vehicle number on the driver side and the passenger or rear sides of every delivery vehicle.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Surface Preparation Inspection

Review plan notes and details of installation included in the Plans for the riprap pay items including the required thickness, toe wall dimensions, area to be covered, etc. Ensure that the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected with riprap. The Resident Engineer must notify the Contractor of any concerns so that a resolution can be determined prior to proceeding with the placement of the riprap.

3. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to place the riprap materials in their submittals prior to beginning construction. The various pieces of equipment required may include the following:

- Trucks and transport units,
- Trackhoes, and/or
- Loaders,

Discuss the proposed methods and equipment to be used by the Contractor for the delivery and initial unloading of the riprap material, to ensure it is done in a manner that will not damage the work. Any damage caused by the Contractor must be repaired in a manner approved by the Resident Engineer at no cost to the Department.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste concrete or materials. (Do not allow the Contractor to place surplus concrete, grout or other materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

601.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the riprap pay items included in the contract. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the type of riprap construction performed (cement and fine aggregates for grouted riprap, filter fabric, stone, etc.).

Ensure the Contractor has submitted its proposed sources of materials and mix designs in advance of any work beginning on the riprap items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

The Residency will verify that the proposed sources of materials for the riprap and filter blanket stone submitted by the Contractor are on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[Stone for Erosion Control](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Contractor must submit a Type A Material Certification for the filter blanket stone in accordance with the [FAST Guide](#). As stated in Section 106.04 of the Standard Specifications, the Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment. Type A and B Material Certifications must be approved by the ODOT Materials Division for compliance with the contract requirements. Certifications must include:

- the project number,
- name of the Contractor,

- identification markings on shipment (when applicable), and
- for Type A Material Certifications required by the FAST Guide, the quantity of material being certified.

The Materials Division has allowed the Type A Material Certification for filter blanket stone to be generic (not project specific) and not in strict accordance with the requirements of Section 106.04 of the Standard Specifications.

The Residency will verify that the proposed source of materials for the filter fabric product submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)). Ensure the product name and manufacturer is shown in the Section 712.02 – Fabric, Permanent Erosion Control list on the QPL. If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

When grouted riprap is required on the project, the Residency will verify that the proposed source of material for the fine aggregate used in the grout submitted by the Contractor is on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section “[HC Concrete Aggregate, Fine](#)”. Additionally, the Residency will verify that the proposed source of material for the portland cement used in the grout submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Hydraulic Cements](#)). If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project’s Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Verify the proposed sources of materials for the riprap and filter blanket stone submitted by the Contractor are on the Materials Division Approved Rock, Stone &

Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). [Document in Template AM5001]

- Riprap Stone - ([Stone for Erosion Control](#))
- Filter Blanket Stone - ([Stone for Erosion Control](#))
- Ensure the Contractor provides a Type A Material Certification for the Filter Blanket Stone. [Document in Template AM5001]
- Verify the Hydraulic Cement product and source to be used in the grout is listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Obtain a sample of the Fine Aggregate to be used in the grout and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Verify the proposed product/manufacturer for the filter fabric is listed on the QPL on the applicable list for permanent erosion control. [Document in Template AM5001]
 - Fabric, Permanent Erosion Control - ([QPL-Construction Fabrics](#))

The Materials Division has allowed the Type A Material Certification for filter blanket to be generic and not in strict accordance with the requirements of Section 106.04 of the Standard Specifications. Regardless of the certification, if there are any visual concerns with the filter blanket stone delivered to the project (inadequate size of stones, excessive fracturing, etc.), contact the Materials Division and supplier to confirm the adequacy of the material. The certification from the supplier can be accepted by the Resident Engineer with the following allowances from Section 106.04:

- 106.04.B – Project number, Name of Contractor, and Quantity of material is not required for filter blanket. Reference to a previous ODOT project or just a generic certification is acceptable.
- 106.04.C(1) – Detailed test results on samples obtained from the material in the shipment is not required for filter blanket. The test results should be from material tested within the previous year from the supplier.
- 106.04.E – An approval of the Type A Material Certification from ODOT's Materials Engineer is not required for filter blanket.

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 601.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the various types of riprap. The Contractor may place the riprap materials by hand or by machine to cover the areas and at the thickness shown on the Plans.

Ensure the methods and equipment to be used by the Contractor for the delivery and initial unloading of the riprap material is done in a manner that will not damage the work. Any damage caused by the Contractor during the unloading of riprap material and its handling must be repaired in a manner approved by the Resident Engineer at no cost to the Department.

C. Construction Operations

Review with the Contractor the plan notes and details of installation included in the Plans for the riprap pay items required on the project. Ensure the location and layout of the riprap complies with the Plans or as authorized by the Resident Engineer.

Type II Special Plain Riprap is rarely used by ODOT. The only difference in Type I Plain Riprap and Type II Special Plain Riprap is the method used to size the individual stones for each as defined in Section 713.01 of the Standard Specifications, as follows:

- Table 713:1, Stone for Plain Riprap (Type I) bases the sizing of the stones on the weight by defining a maximum, average and a limit on the amount of smaller sized stones for various riprap thicknesses as required in the Plans (smaller stones for thinner sections and larger stones for thicker sections).
- Table 713:2, Stone for Special Plain Riprap (Type II) bases the sizing of the stones on the volume of each stone regardless of the riprap thickness required in the Plans.

Ensure that the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected with riprap including the required thickness, toe wall dimensions, area to be covered, etc. The Resident Engineer must notify the Contractor of any concerns so that a resolution can be determined prior to proceeding with the placement of the riprap. If the Contract requires Type III or Type IV riprap, ensure the Contractor adequately compacts the base before placing the riprap.

Projects that include riprap will typically be on regulated waters that will require a US Army Corp of Engineers Permit (404 Permit). Ensure the Contractor complies with the conditions listed in the 404 Permit included in the Contract by special provision and any environmental plan notes included in the Plans. Any staging area proposed by the Contractor must also comply with any listed conditions and requirements in the Plans and Contract.

Section 601.04 of the Standard Specifications contains specific requirements for various types of riprap. Verify the Contractor meets the requirements of 601.04 of the Standard Specifications as follows.

1. Filter Blanket

Ensure the Contractor places the filter blanket in the areas and at the dimensions as shown on the Plans. Prior to installing the filter blanket, ensure the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected from erosion including the required thickness, toe wall dimensions, area to be covered, etc. Place the filter blanket in one or two layers, as shown on the Plans.

Each layer of the filter blanket stone must be uniformly spread on the prepared and shaped surface to be protected from erosion. If the filter blanket is damaged by the Contractor during placement, ensure it is repaired or replaced before proceeding, at no additional cost to the Department.

Ensure the filter blanket is installed to an even surface, free of mounds and windrows. Any noticeable deviations must be corrected before the placement of the overlying layer of riprap is placed.

2. Filter Fabric

Ensure the Contractor places the filter fabric in the areas as shown on the Plans. Filter fabric must be placed on a slope that is uniform, smooth, and free of debris that may damage the filter fabric.

The Contractor must install the filter fabric in accordance with the requirements of Sections 601.04.C and 602.04.D of the Standard Specifications, including the following details:

- Lay the material without stretching it.
- Overlap strips at adjacent roll joints at least 2 ft. Stagger overlaps at end-of-roll joints at least 5 ft.
- Use full rolls to minimize the number of end-of-roll laps.
- Place the uphill or upstream layer of a lap on top.
- Secure the top end of the fabric to prevent displacement.
- If using securing pins, place the pins in the adjacent joints, spaced on 10 ft centers. Place securing pins through both fabric strips near the overlap midpoint.
- Support the fabric to maintain its position.

The Resident Engineer must approve of the methods for fabric support and securing.

The Resident Engineer will reject filter fabric with defects or damage. The Contractor must repair torn or punctured fabric by covering the area with a layer of fabric that extends at least 2 ft beyond the damaged area. The Contractor must repair or replace damaged or displaced filter fabric at no additional cost to the Department.

Until the filter fabric is ready to be installed, it must be kept wrapped in a heavy-duty covering during shipment and storage to protect the filter fabric from the following:

- Temperatures greater than 140 °F,
- Direct sunlight,
- Ultraviolet rays, and
- Mud, dirt, dust and other debris.

Ensure the Contractor installs the overlying material (filter blanket, etc.) on the filter fabric within 3 days of placement. If the filter fabric remains exposed in excess of 3 days without the installation of the overlying material, it is the Contractor's responsibility to protect it from the aforementioned conditions. The Contractor must replace filter fabric uncovered or unprotected after 3 days, at no additional cost to the Department.

3. Type I and I-A – Plain Riprap (with/without Filter Blanket) and Type II and II-A – Special Plain Riprap (with/without Filter Blanket)

Ensure the Contractor places the riprap in the areas and at the dimensions and thickness as shown on the Plans. Prior to installing the riprap, ensure the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected with riprap including the required thickness, toe wall dimensions, area to be covered, etc.

Ensure the Contractor places the plain riprap and the special plain riprap over the area shown on the Plans and grades the area to uniformly distribute the smaller stone. The riprap may be placed by hand or machine to achieve the lines and thickness shown on the Plans.

4. Type III – Laid Up Riprap

Ensure the Contractor places the riprap in the areas and at the dimensions and thickness as shown on the Plans. Prior to installing the riprap, ensure the Contractor excavates the riprap foundation below the scour line or to the elevations shown on the Plans. The residency inspector must approve of the footing excavation before placing the riprap stone.

Ensure the Contractor places the riprap over the area shown on the Plans and grades the area to uniformly distribute the smaller stone by placing and working spalls into the spaces between stones. Ensure the riprap surface is finished even and tight. The Contractor must remove points of stones that project beyond the finished riprap surface.

5. Type IV – Grouted Riprap

Ensure the Contractor places the riprap in the areas and at the dimensions and thickness as shown on the Plans. Prior to installing the riprap, ensure the Contractor excavates the riprap foundation below the scour line or to the elevations shown on the Plans. The residency inspector must approve of the footing excavation before placing the riprap stone.

The Contractor must install the Type IV - Grouted Riprap in accordance with the requirements of Sections 601.04.F of the Standard Specifications, including the following details:

- Place the surface of the stones in contact with the protected slope at the angle shown on the Plans.
- Key the individual stones into the surrounding riprap, and lay them in close contact to break joints.
- Prevent earth and sand from filling the spaces between the stones.
- Wet the stones immediately after placement.
- Fill the spaces between the stones with grout, working from bottom to top.
- Sweep the surface with a stiff broom.

Do not allow the Contractor to grout the riprap at temperatures below 32 °F. In hot, dry weather, ensure the Contractor protects the work from the sun and keeps the grout moist for at least 3 days after grouting.

Ensure the Contractor uses a grout mixture consisting of one (1) part portland cement and three (3) parts fine aggregate by volume, mixed with water. The Department will allow re-tempering of grout, as long as the grout has not initially set as determined by the Resident Engineer.

D. Safety and Environmental Considerations

Monitor the Contractor's conformance with its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste concrete or materials. (Do not allow the Contractor to place surplus concrete, grout or other materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, bridge/abutment number, etc.) and pay item(s) being installed (filter blanket, filter fabric or type of riprap).
- Thickness of filter blanket or of type riprap placed.
- Dimensions of toe wall of filter blanket or riprap installed.
- Work being performed on the riprap items (excavating/preparing slopes, placing stone, pouring grout, etc.).
- Quantity of each pay item that is placed (tons or square yards).
- Receipt of materials invoice and certifications (if needed).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

The final quantity for these pay items will be determined by the methods defined in Section 601.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 601.05, refer to Section 109.01 of the Standard Specifications for clarification.

(a) Ton Unit of Measure Pay Items

The weight (tons) of filter blanket and riprap will be measured for payment as delivered from the supplier.

Documentation of the relevant filter blanket or riprap pay items paid by the Ton will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate filter blanket or riprap pay item from the list of contract pay items.
2. In the appropriate field, enter the station extents or descriptive location for each item being installed.
3. In the Placed Quantity field, enter the quantities (TON) of the pay items completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, tally of tickets, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.

5. For additional areas or additional locations, select the 'New' button to create a new row for the selected pay item.

(b) Square Yard Unit of Measure Pay Items

Measure the area covered by the *Filter Fabric* installed at locations shown in the Plans or approved by the Resident Engineer. Do not include overlaps between rows of fabric in any measurements in accordance with Section 601.05 of the Standard Specifications. The cost of providing the overlaps is to be included in the price paid for the area (SY) covered by the filter fabric.

Measure the area covered by *Type III Laid Up Plain Riprap* and *Type IV Grouted Riprap* installed at locations shown in the Plans or approved by the Resident Engineer.

Documentation of the relevant filter fabric or riprap pay items paid by the Square Yard will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate filter fabric or riprap pay item from the list of contract pay items.
2. In the appropriate field, enter the station extents or a descriptive location for each item being installed.
3. In the Placed Quantity field, enter the calculated quantity (SY) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

601.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously submitted and accepted sources of materials were used by the Contractor. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Division to confirm the status of source/product approvals. The use of unapproved materials will require action by

the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

Ensure the Contractor provides a Type A Material Certification for the filter blanket stone as required in the [FAST Guide](#). The Materials Division has allowed the Type A Material Certification for filter blanket to be generic and not in strict accordance with the requirements of Section 106.04 of the Standard Specifications. The certification from the supplier can be accepted by the Resident Engineer with the following allowances from Section 106.04:

- 106.04.B – Project number, Name of Contractor, and Quantity of material is not required for filter blanket. Reference to a previous ODOT project or just a generic certification is acceptable.
- 106.04.C(1) – Detailed test results on samples obtained from the material in the shipment is not required for filter blanket. The test results should be from material tested within the previous year from the supplier.
- 106.04.E – An approval of the Type A Material Certification from ODOT's Materials Engineer is not required for filter blanket.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

C. Protection of the Work

Ensure the filter blanket, riprap and filter fabric is satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Ensure the Contractor complied with all conditions stated in the 404 Permit included in the Contract and environmental requirements stated in the Plans.

601 CHECKLIST – RIPRAP

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant riprap pay items been identified and reviewed (type of riprap, filter blanket, filter fabric)?					
Have the proposed sources of materials (stone, filter fabric, components of grout, etc.) been submitted by the Contractor and reviewed for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Has a Type A Certification been submitted for the filter blanket material?					
Have the plan notes and details in the Plans for the installation of the riprap pay items been reviewed and discussed with the Contractor?					
Have the surface preparation requirements to facilitate the placement of the riprap to the required thickness for the area required to be covered been discussed with the Contractor?					
Has the compaction of the base for the placement of the Type III and Type IV riprap been discussed with the Contractor?					
Have the dimensions of the toe ditch for the riprap been reviewed and discussed with the Contractor?					
Have weather limitations for the placement of filter fabric or grouted riprap been discussed with the Contractor?					
Has the delivery and handling of the riprap stone been discussed with the Contractor to ensure no damage occurs to the pavement?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Has the Residency verified that the previously submitted and accepted sources of materials (stone, filter fabric, components of grout, etc.) are being used by the Contractor?					
Was the Type A Certification submitted for the filter blanket material?					
Did the Contractor complete the surface preparation required to facilitate the placement of the riprap to the required thickness for the area required to be covered in the Plans?					
Was the base adequately compacted for the placement of the Type III and Type IV riprap?					
Were the dimensions for the toe ditch for the riprap completed as required in the Plans?					
Is the filter fabric being placed on a slope that is uniform, smooth, and free of debris that may damage the filter fabric?					
Is the filter fabric being placed in accordance with Section 601.04.C (no stretching of fabric, adequate overlap of joints, securing fabric, etc.)?					
Are the weather limitations for the placement of filter fabric or grouted riprap being met?					
Did the Contractor install the overlying material (filter blanket/riprap) on the filter fabric within 3 days of placement?					
Is the filter blanket being installed to an even surface, free of mounds and windrows?					
Is the delivery and handling of the riprap stone being done in a manner to ensure no damage occurs to the pavement?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the filter blanket and riprap being placed to the thickness and area specified on the Plans?					
Is the grouted riprap being placed in accordance with Section 601.04.F (distribution of smaller stones, wetting stones prior to grouting, etc.)?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Verify that the previously submitted and accepted sources of materials were used by the Contractor?					
Verify the sampling and testing of the components of the grout met requirements of the FAST Guide?					
Verify the receipt of the Type A Certification approved by Materials Division for the filter blanket material?					
Did the Contractor install the overlying material (filter blanket, etc.) on the filter fabric within 3 days of placement without damage to the filter fabric?					
Was the filter blanket and riprap, including the toe ditch, placed to the thickness and dimensions specified on the Plans?					
Did the Contractor uniformly distribute the smaller stones in the riprap?					
Has the Contractor taken adequate precautions to protect the riprap from damage?					

SECTION 602 – GABIONS AND REVETMENT MATTRESSES

602.01 GENERAL

This work consists of providing and placing stone-filled wire-mesh baskets and plastic filter fabric for retaining embankments and controlling erosion. The Department defines the following types of stone-filled wire-mesh baskets used for permanent erosion control and embankment protection:

- **Gabion.** Square or rectangular wire-mesh basket with a thickness of at least 1 ft, filled with hard, durable stone.
- **Revetment Mattress.** Rectangular wire-mesh basket with a maximum thickness of 1 ft.

602.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various gabion, revetment mattress and/or filter fabric pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (filter sand thickness, basket dimensions, area to be covered, etc.).
- Review the US Army Corp of Engineers 404 Permit conditions when included in the Contract and any environmental notes in the Plans.
- Proposed sources of material and material requirements.
- Methods and equipment to be used, including the type of connections used for the basket.
- Technical representative from the basket manufacturer required to be on-site when installation of baskets begin.
- Foundation preparation requirements prior to installation of filter sand, filter fabric and gabion/mattress baskets.
- Methods and equipment to be used including the delivery and initial unloading of the gabion/mattress stone material.
- Weather limitations for placement of filter fabric.
- Contractor's schedule/plan for the work.

B. Acceptance of Materials

Review the Plans and distinguish the gabion, revetment mattress and/or filter fabric pay items included in the contract. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the type of gabion/revetment mattress construction performed (fine aggregates, filter fabric, wire

baskets, stone, etc.). Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the riprap items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

The Residency will verify that the proposed sources of materials for the gabion/mattress stone submitted by the Contractor are on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[Stone for Erosion Control](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the proposed source of material for the filter sand used for preparing the foundation surface submitted by the Contractor is on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[HC Concrete Aggregate, Fine](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the proposed source of materials for the filter fabric product submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)). Ensure the product name and manufacturer is shown in the Section [712.02 – Fabric, Permanent Erosion Control](#) list on the QPL. If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the wire baskets submitted by the Contractor comply with Sections 602.02.B and 732.09 of the Standard Specification, unless otherwise shown in the Plans. Any questions or concerns regarding the evaluation of the wire baskets may be directed to the Materials Division. Some of the requirements found in the Specifications include:

- Wire requirements
- Maximum opening size in basket
- Type of basket allowed (twisted-wire, welded-wire)
- Connection wire requirements (minimum gauge)

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of

materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

C. Preparatory Work and Contractor Work Plans

Consider the following before gabion/revetment mattress construction work begins.

1. Technical Supervision

Section 602.04.A of the Standard Specifications requires the Contractor to provide an experienced on-site technical representative from the basket manufacturer when construction of the gabion/revetment mattress installation begins. Ensure an experienced technical representative from the basket manufacturer is present when construction begins and is available as needed for consultation during gabion or revetment mattress construction.

2. Foundation Preparation and Filter Sand Placement

Review plan notes and details of installation included in the Plans for the gabion/revetment mattress pay items including the required layout of the baskets, basket dimensions, area to be covered, etc. Ensure that the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected with the gabion/revetment mattress. The Resident Engineer must notify the Contractor of any concerns so that a resolution can be determined prior to proceeding with the installation of the baskets.

When required in the Plans, ensure the Contractor uniformly spreads the filter sand on the prepared foundation surface, ensuring that segregation of the filter sand does not occur. The sand must be spread and compacted to an even surface. The Contractor must repair any damage to the foundation surface during filter sand placement.

3. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to place the gabion/revetment mattress materials in their submittals prior to beginning construction. The various pieces of equipment required may include the following:

- Trucks and transport units,
- Trackhoes, and/or
- Loaders,

Discuss the proposed methods and equipment to be used by the Contractor for the delivery and initial unloading of the gabion/revetment mattress stone material, to ensure it is done in a manner that will not damage the work. Any damage caused

by the Contractor must be repaired in a manner approved by the Resident Engineer at no cost to the Department.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess excavation, etc. (Do not allow the Contractor to place surplus materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

602.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the gabion/revetment mattress pay items included in the contract. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the type of gabion/revetment mattress construction performed (fine aggregates, filter fabric, wire baskets, stone, etc.).

Ensure the Contractor has submitted its proposed sources of materials and mix designs in advance of any work beginning on the gabion/revetment mattress items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

The Residency will verify that the proposed sources of materials for the gabion/revetment mattress stone submitted by the Contractor are on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[Stone for Erosion Control](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the proposed source of material for the filter sand used for preparing the foundation surface submitted by the Contractor is on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). Ensure the source is shown in the section "[HC Concrete Aggregate, Fine](#)". If a proposed source is not on the QPL or Approved Sources list, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the proposed source of materials for the filter fabric product submitted by the Contractor is on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)). Ensure the product name and manufacturer is shown in the Section [712.02 – Fabric, Permanent Erosion Control](#) list on the QPL. If a proposed product/source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

The Residency will verify that the wire baskets submitted by the Contractor comply with Sections 602.02.B and 732.09 of the Standard Specification, unless otherwise shown in the Plans. Any questions or concerns regarding the evaluation of the wire baskets may be directed to the Materials Division. Some of the requirements found in the Specifications include:

- Wire requirements
- Maximum opening size in basket
- Type of basket allowed (twisted-wire, welded-wire)
- Connection wire requirements (minimum gauge)

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Verify the proposed sources of materials for the gabion/revetment mattress stone submitted by the Contractor are on the Materials Division Approved Rock, Stone & Sand Sources list ([All Aggregate and Stone – Approved Sources](#)). [Document in Template AM5001]
 - Gabion Fill Stone - ([Stone for Erosion Control](#))
 - Revetment Mattress Fill Stone - ([Stone for Erosion Control](#))
- Obtain a sample of the Filter Sand to be used in the grout and verify the gradations comply with Table 703:9 of the Standard Specifications. [Document in Template T27]

- Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Verify the proposed product/manufacture for the filter fabric is listed on the QPL on the applicable list for permanent erosion control. [Document in Template AM5001]
 - Fabric, Permanent Erosion Control - ([QPL-Construction Fabrics](#))

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e., resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.). When using an approved quarry, notify Materials Division Aggregate Branch Manager if the material consistently fails to meet gradation or limits requirements.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product approval.

B. Equipment and Methods

Section 602.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the gabion/revetment mattress. The Contractor may fill the gabion/revetment mattress baskets with stone by hand or by machine to cover the areas and at the thickness shown on the Plans.

Ensure the methods and equipment to be used by the Contractor for the delivery and initial unloading of the gabion/revetment mattress stone material is done in a manner that will not damage the work. Any damage caused by the Contractor during the unloading of stone material and its handling must be repaired in a manner approved by the Resident Engineer at no cost to the Department.

C. Construction Operations

Review with the Contractor the plan notes and details of installation included in the Plans for the gabion/revetment mattress pay items required on the project. Ensure the location and layout of the baskets complies with the Plans or as authorized by the Resident Engineer.

Upon their delivery to the project site, ensure the gabion/revetment mattress baskets meet the requirements of the Plans and Sections 602.02.B and 732.09 of the Standard Specifications. The dimensions and layout of the baskets are shown in the Plans. Some of the requirements found in the Specifications include:

- Wire requirements (material type and minimum gauge)
- Type of basket allowed (twisted-wire, welded-wire)

- Maximum opening size in baskets (dimensions vary for twisted-wire and welded-wire baskets)
- Diaphragm material and layout requirements
- Connection wire requirements (minimum gauge)

Projects that include gabion/revetment mattress construction may be located within regulated waters that will require a US Army Corp of Engineers Permit (404 Permit). Ensure the Contractor complies with the conditions listed in the 404 Permit included in the Contract by special provision and any environmental plan notes included in the Plans. Any staging area proposed by the Contractor must also comply with any listed conditions and requirements in the Plans and Contract.

Section 602.04 of the Standard Specifications contains specific requirements for the construction and installation of gabions and revetment mattresses. Verify the Contractor meets the requirements of 602.04 of the Standard Specifications as follows.

1. Technical Supervision

Section 602.04.A of the Standard Specifications requires the Contractor to provide an experienced on-site technical representative from the basket manufacturer when construction of the gabion/revetment mattress installation begins. Ensure an experienced technical representative from the basket manufacturer is present when construction begins and is available as needed for consultation during gabion or revetment mattress construction.

2. Foundation Preparation and Filter Sand Placement

Review plan notes and details of installation included in the Plans for the gabion/revetment mattress pay items including the required layout of the baskets, basket dimensions, area to be covered, etc. Ensure that the slopes, ditches and grades are shaped in accordance with the Plans for the areas to be protected with the gabion/revetment mattress. The Resident Engineer must notify the Contractor of any concerns so that a resolution can be made prior to proceeding with the installation of the baskets.

When required in the Plans, ensure the Contractor uniformly spreads the filter sand on the prepared foundation surface, ensuring that segregation of the filter sand does not occur. The sand must be spread and compacted to an even surface. The Contractor must repair any damage to the foundation surface during filter sand placement.

3. Filter Fabric Placement

Ensure the Contractor places the filter fabric in the locations as shown on the Plans or as directed by the Resident Engineer. Verify the fabric is laid without folds, wrinkles, or creases, and is not stretched.

The Contractor must install the filter fabric in accordance with the requirements of Sections 602.04.D of the Standard Specifications, including the following details:

- Lay the material without stretching it.
- Overlap strips at adjacent roll joints at least 2 ft. Stagger overlaps at end-of-roll joints at least 5 ft.
- Use full rolls to minimize the number of end-of-roll laps.
- Place the uphill or upstream layer of a lap on top.
- Secure the top end of the fabric to prevent displacement.
- If using securing pins, place the pins in the adjacent joints, spaced on 10 ft centers. Place securing pins through both fabric strips near the overlap midpoint.
- Support the fabric to maintain its position.

The Resident Engineer must approve of the methods for fabric support and securing.

The Resident Engineer will reject filter fabric with defects or damage. The Contractor must repair torn or punctured fabric by covering the area with a layer of fabric that extends at least 2 ft beyond the damaged area. The Contractor must repair or replace damaged or displaced filter fabric at no additional cost to the Department.

Until the filter fabric is ready to be installed, it must be kept wrapped in a heavy-duty covering during shipment and storage to protect the filter fabric from the following:

- Temperatures greater than 140 °F,
- Direct sunlight,
- Ultraviolet rays, and
- Mud, dirt, dust and other debris.

Ensure the Contractor installs the overlying material (gabion/revetment mattress) on the filter fabric within 3 days of placement. If the filter fabric remains exposed in excess of 3 days without the installation of the overlying material, it is the Contractor's responsibility to protect it from the aforementioned conditions. The Contractor must replace filter fabric uncovered or unprotected after 3 days, at no additional cost to the Department.

4. Connections

Proper connecting of the adjacent gabion/revetment mattress baskets is critical to their long term effectiveness for retaining embankments and controlling erosion. If Polyvinyl Chloride (PVC) coating is required by the Contract, the Contractor must use PVC-coated or stainless steel connections. Discuss with the Contractor the

types of connections being used prior to beginning the assembly and installation of the baskets.

In accordance with Section 602.04.E of the Standard Specifications, the Contractor must use one or a combination of the following methods to connect gabions and revetment mattresses.

(a) 3/32" Tie Wire

When using 3/32" tie wire as the joint connection material, the Contractor must assemble the vertical edges of the adjacent gabion panels, forming groups of empty baskets.

For twisted-wire mesh baskets, the Contractor must construct the joint using a single loop-double loop lacing pattern (locked loops) of 3/32" tie wire at nominal spacing of 6 in. Do not allow the use of simple spiraling (looping without locking) of the wire.

For welded-wire mesh baskets, the Contractor must construct the joint using alternating single and double half-hitches (locked loops) in every mesh opening along the joint. Ensure the lacing wire terminals are securely fastened.

(b) Spiral Binders

When using spiral binders with 7/32" wire or larger, ensure the Contractor rotates the spiral binders into position so that it passes through each mesh opening along the joint. Ensure both ends of the spiral binders are wrapped at least 2 times around the mesh to secure the spiral. The Contractor must place continuous, successive loops of spiral binders no greater than 3 in apart.

Do not allow the use of spiral binders after stones have been placed into the baskets.

(c) Interlocking Rings (Tiger Tites)

When using interlocking rings, the Contractor must use one interlocking ring in every mesh opening and lock the rings for gabions and revetment mattresses.

(d) Overlapping Rings (Spenax Fasteners)

The use of overlapping rings is allowed when a 1" lap can be consistently obtained. The Contractor must install one ring in each mesh opening. Ensure the Contractor maintains the minimum, manufacturer-recommended air pressure in the gun used to close the overlapping rings.

(e) Alternative Fasteners

The use of alternative fasteners may be allowed. Ensure the fasteners do not damage the basket wire's protective coating. The alternative fasteners must be spaced close enough to ensure no gaps exceed 2" between baskets. Alternative fasteners must have minimum strengths of at least:

- 1,400 lb/ft for galvanized gabions,
- 1,250 lb/ft for PVC gabions, and
- 800 lb/ft for revetment mattresses.

5. Assembly and Installation

Review with the Contractor the details of installation included in the Plans for the gabion/revetment mattress pay items required on the project. Ensure the location and layout of the baskets comply with the Plans or as authorized by the Resident Engineer.

Ensure an experienced technical representative from the basket manufacturer is present when construction of the gabion/revetment mattress installation begins.

The same mesh style for all panels (sides and diaphragms) of the baskets must be used consistently. Baskets must be assembled to ensure each panel meets the strength and flexibility requirements in accordance with Subsection 732.09, "Wire Baskets for Gabions and Revetment Mattresses." The Contractor must construct baskets with the height, width, and length within 5 percent of the dimensions shown on the Plans or as authorized by the Resident Engineer. Diaphragms must be installed that equally divide each gabion or revetment mattress into cells. Ensure the length of the diaphragm does not exceed one and one-half times the width of the gabion base or the horizontal width of the revetment mattress. Ensure diaphragms are secured to the base of the basket.

In accordance with Section 602.04.F of the Standard Specifications, the Contractor will follow the following steps to assemble and begin installation of the gabion/revetment mattress:

- Place the assembled empty baskets on the prepared surface.
- Place the front row of baskets first and continue placing successive rows of baskets toward the top of the slope.
- Ensure creases and bends are in the correct position, and the top of each side is level.
- Install the baskets and avoid gaps between baskets when completed.
- Connect adjoining baskets in the same row before filling with stone.
- Avoid moving baskets after filling with stone.
- Connect adjacent rows of baskets along all contacting edges.

(a) Installing Connections

Ensure the Contractor makes connections by joining selvage wire to selvage wire, selvage wire to edge wire, or selvage wire to mesh. Only use mesh-to-mesh connections if one of the previous connections is not possible.

The selvage (aka, selvedge) wires of the baskets are the thicker perimeter wires to which the mesh and edge wires are secured as shown in Figure 602:1.

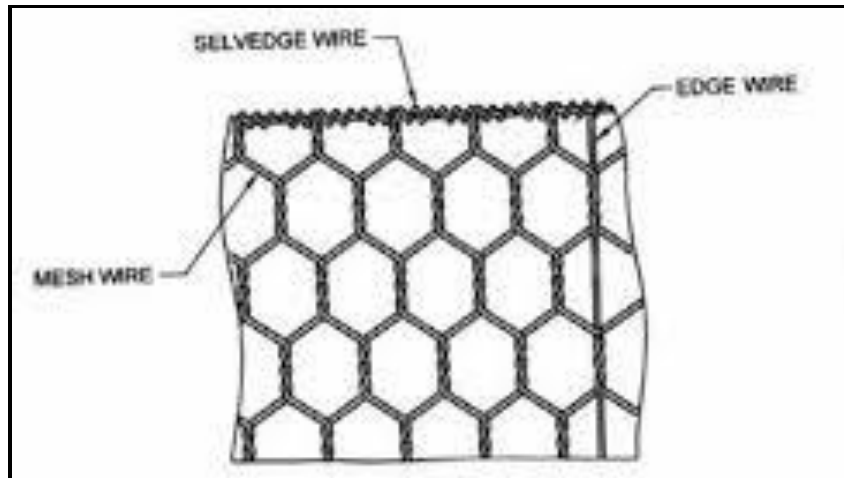


Figure 602:1. Gabion & Revetment Mattress Basket Wires

Avoid using alternative fasteners (spiral binders, interlocking rings, or overlapping rings) to close stone-filled basket lids unless approved by the Resident Engineer. (The Resident Engineer may grant approval if the alternative fasteners can be installed on a stone-filled basket without stretching the basket or damaging the protective coating.)

(b) Stone-Filling

The Contractor may fill the baskets with stone by hand or machine. When using machines, the stones should also be arranged by hand to minimize voids.

In accordance with Section 602.04.F(3) of the Standard Specifications, the Contractor will place the stone into the baskets of the gabion/revetment mattress in compliance with the following:

- Avoid damaging the wire coating.
- Maintain basket alignment throughout the filling process.
- Correct bulges in the mesh before continuing to fill the baskets.
- Fill with stone layers no greater than 1 ft at a time.

- Fill cells no higher than 1 ft above the stone elevations in adjacent cells.
- Use care in placing stones in baskets; drop stones into the baskets from no higher than 3 ft.
- Along exposed faces of the basket, arrange the stone by hand to ensure a neat and compact appearance.
- Uniformly overfill gabion/revetment mattress baskets by 1-1/2 in. Do not under fill gabion/revetment mattress baskets.
- Allow for the proper closing of the lid, and provide an even, uniform surface.

(c) Connecting Wires

Lacing or tie wires are used to assemble and join the baskets together and, when used properly, will reduce the basket walls from bulging. The Contractor must place two uniformly spaced internal connecting wires between each stone layer for gabion baskets higher than 2 ft and with exposed faces. Ensure the back and the front faces of each basket are connected. The connecting wires must be looped around two mesh openings or a single welded-wire joint on each basket face and the wire terminals must be securely twisted.

(d) Basket Lids

Each basket lid must be stretched over the stone fill until the lid meets the edges of the panels using a lid closing tool. The use of crowbars or other single-point leverage bars to close the lid should be avoided as it could result in damage to the basket. Ensure the lid is secured with lacing wire or wire fasteners along the edges, ends, and internal-cell diaphragms. Wire ends must be bent into the baskets.

(e) Partial Baskets

When site conditions require the use of partial baskets, the Contractor must cut, fold, and re-wire the partial baskets to meet the needs of the area. Ensure the Contractor folds the excess basket mesh back and wires it to the adjacent basket face. Assemble, install, fill, close the lid, and lace the reshaped partial basket in accordance with Subsections 602.04.F(1) through 602.04.F(5) of the Standard Specifications.

(f) PVC Coated Baskets

Do not allow the installation of PVC coated materials until the ambient air temperature and the temperature of the PVC materials are at least 15 °F above the brittleness temperature of the PVC materials.

6. Backfilling

The proper backfill of the gabion/revetment mattress is critical to its long-term performance. Inadequate backfill material or compaction and failure to properly install the filter fabric could result in premature settlement, erosion and shifting of the baskets. Ensure the Contractor performs the backfill operations behind the gabions in accordance with Subsection 202.04.B, “Embankments” of the Standard Specifications and as specified in the Plans.

7. Retaining Walls

Construct retaining walls on a 6 to 10 percent batter or as shown on the Plans. Overlap vertical joints and offset horizontal joints in each successive layer.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess excavation, etc. (Do not allow the Contractor to place surplus materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, bridge/abutment number, descriptive location, etc.) and pay item(s) being installed (gabions, revetment mattress, filter fabric).
- Dimensions of gabions, revetment mattress or filter fabric installed.
- Work being performed on the gabion items (excavating/preparing foundation, installing baskets, placing stone, etc.).
- Quantity of each pay item that is placed (cubic yards or square yards).
- Receipt of haul tickets of gabion/revetment mattress stone and quantity placed.
- Receipt of materials invoice and certifications (if needed).

- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

The final quantity for these pay items will be determined by the methods defined in Section 602.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 602.05, refer to Section 109.01 of the Standard Specifications for clarification.

(a) Cubic Yard Unit of Measure Pay Items

Measure the volume of the *Gabions* installed at locations shown in the Plans or approved by the Resident Engineer. The measurements for determining the volume will be using the neat line dimensions of the baskets shown on the plans, or as modified by the Resident Engineer to fit field conditions in accordance with Section 109.01 of the Standard Specifications.

The cost of providing the baskets, stone and filter sand is to be included in the contract unit price paid for the volume (CY) of gabion placed. Unless otherwise indicated in the Plans or Contract, the cost of backfill for the gabion is also included in the contract unit price for the gabions.

Documentation of the *Gabion* pay item paid by the Cubic Yard will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate *Gabion* pay item from the list of contract pay items.
2. In the appropriate field, enter the station extents or descriptive location for each item being installed.
3. In the Placed Quantity field, enter the quantities (CY) of the pay items completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, tally of tickets, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, select the 'New' button to create a new row for the selected pay item.

(b) Square Yard Unit of Measure Pay Items

Measure the area covered by the *Revetment Mattresses* and *Filter Fabric* installed at locations shown in the Plans or approved by the Resident Engineer.

Do not include overlaps between rows of filter fabric in any measurements in accordance with Section 109.01 of the Standard Specifications. The cost of providing the overlaps is to be included in the price paid for the area (SY) covered by the filter fabric. (NOTE: Section 109.01 states, in part, “For area calculations, unless otherwise required by the Contract, the Resident Engineer will make longitudinal measurements horizontally and will use the neat dimensions as shown on the plans, or as modified by the Resident Engineer, for transverse measurements.”)

The cost of providing the baskets, stone and filter sand is to be included in the contract unit price paid for the area (SY) of revetment mattress placed.

Documentation of the relevant revetment mattress or filter fabric pay items paid by the Square Yard will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate revetment mattress or filter fabric pay item from the list of contract pay items.
2. In the appropriate field, enter the station extents or a descriptive location for each item being installed.
3. In the Placed Quantity field, enter the calculated quantity (SY) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the ‘New’ button to create a new row for the selected pay item.

602.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously submitted and accepted sources of materials were used by the Contractor. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Division to confirm the status of source/product approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project’s Sampling and Testing Checklist generated by SiteManager for

the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

The cost of providing the baskets, stone and filter sand is to be included in the contract unit price paid for the volume (CY) of gabion and area (SY) of revetment mattress placed. Unless otherwise indicated in the Plans or Contract, the cost of backfill for the gabion is also included in the contract unit price for the gabions. The cost of providing the overlaps is to be included in the price paid for the area (SY) covered by the filter fabric.

C. Protection of the Work

Ensure the gabions, revetment mattresses and filter fabric is satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Ensure the Contractor complied with all conditions stated in the 404 Permit included in the Contract and environmental requirements stated in the Plans.

602 CHECKLIST – GABIONS AND REVETMENT MATTRESSES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant pay items been identified and reviewed (type of gabions, revetment mattresses, filter fabric)?					
Have the proposed sources of materials (baskets, stone, filter fabric, etc.) been submitted by the Contractor and reviewed for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Have the plan notes and details in the Plans for the installation of the gabions, revetment mattresses, and filter fabric been reviewed and discussed with the Contractor?					
Have the dimensions in the Plans for the gabions, revetment mattresses, and filter fabric been reviewed and discussed with the Contractor?					
Have the foundation preparation requirements to facilitate the placement of the gabion/revetment mattress to the required dimensions for the area required to be covered been discussed with the Contractor?					
Has the requirement for the placement of the filter sand beneath the gabion/revetment mattress been discussed with the Contractor?					
Has the requirement for the technical representative from the basket manufacturer required to be on-site when installation of baskets begin been discussed with the Contractor?					
Have weather limitations for the placement and protection of filter fabric been discussed with the Contractor?					

Has the requirement to install the overlying material (gabion/revetment mattress) on the filter fabric within 3 days of placement been discussed with the Contractor?					
Has the delivery and handling of the gabion/revetment mattress stone been discussed with the Contractor to ensure no damage occurs to the pavement?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Has the Residency verified that the previously submitted and accepted sources of materials (baskets, stone, filter fabric, etc.) are being used by the Contractor?					
Do the gabion/revetment mattress baskets meet the requirements of Sections 602.02.B and 732.09 of the Specifications?					
Did the Contractor complete the foundation preparation required to facilitate the placement of the gabion/revetment mattress for the area required to be covered in the Plans?					
Did the Contractor complete the placement of the filter sand beneath the gabion/revetment mattress?					
Did the Contractor arrange for the technical representative from the basket manufacturer to be on-site when installation of baskets begin?					
Are connections of the baskets being completed (type, layout, location, etc.) in accordance with the specifications?					
Are the diaphragms made of the same material as the baskets and installed in a manner to prevent bulging of the side panels of the baskets?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor connecting adjoining baskets in the same row before filling with stone in 1' increments in each basket?					
Is the Contractor uniformly overfilling gabion/revetment mattress baskets by 1-1/2 in?					
Is the filter fabric being placed on a slope that is uniform, smooth, and free of debris that may damage the filter fabric?					
Is the filter fabric being placed in accordance with Section 601.04.C (no stretching of fabric, adequate overlap of joints, securing fabric, etc.)?					
Are the weather limitations for the placement of filter fabric being met?					
Did the Contractor install the overlying material (gabion/revetment mattress) on the filter fabric within 3 days of placement?					
Is the delivery and handling of the gabion/revetment mattress stone being done in a manner to ensure no damage occurs to the pavement?					
Is the gabion/revetment mattress being placed to the dimensions and area specified on the Plans?					
Is the Contractor properly installing filter fabric and backfilling the gabions in a manner to ensure compaction?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Verify that the previously submitted and accepted sources of materials were used by the Contractor.					
Verify the sampling and testing of the components of the grout met requirements of the FAST Guide.					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Were connections and diaphragms completed in a manner to prevent bulging of the baskets?					
Did the Contractor install the overlying material (filter blanket, etc.) on the filter fabric within 3 days of placement without damage to the filter fabric?					
Was the gabion/revetment mattress placed to the dimensions and area specified on the Plans or authorized by the Resident Engineer?					
Was the filter fabric and backfill of the gabions completed in a manner to ensure compaction?					
Has the Contractor taken adequate precautions to protect the gabion/revetment mattress from damage?					

SECTION 603 – STEEL JETTY BANK PROTECTION

603.01 GENERAL

This work consists of placing steel jetty bank protection. This consists of a mainline jetty with or without back-up jetties as shown on the Plans. The jetties consist of steel jacks connected by steel cables or reinforcing bars to a deadman anchor.

The Department will establish the length of mainline and back up jetties and the distance between lines of jetties as shown on the Plans. The Resident Engineer may direct changes to the lengths and locations of jetties, if erosive conditions have altered the landscape and rendered the Plan design ineffective.

603.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various steel jack, steel cable and deadman pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (layout of jacks and deadmen, jack and cable dimensions, area to be covered, etc.).
- Review the US Army Corp of Engineers 404 Permit conditions when included in the Contract and any environmental notes in the Plans.
- Proposed sources of material and material requirements.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used, including the connections used for the jacks and cable.
- Type of deadman proposed for use by the Contractor (concrete or timber).
- If concrete deadmen are proposed for use by the Contractor, discuss the need for concrete mix designs and certified concrete batch plants.
- Confirmation of existing groundline changes from the planned conditions that might warrant adjustments to the lengths and locations of the jetties.
- Contractor's schedule/plan for the work.
- Staging areas for stockpiled steel components and steel cable.

B. Acceptance of Materials

Review the Plans and distinguish the various steel jack, steel cable and deadman pay items included in the contract. Review the material requirements in Section 603.02 of the Standard Specifications that pertain to the steel jack, steel cable and deadmen required in

the Plans. Review the Special Provisions and Plan Notes for applicable material requirements.

When the Contractor proposes to use concrete deadmen in lieu of timber, review the material requirements in Section 701, "Portland Cement Concrete" of the Standard Specifications that pertain to the ingredients to produce PC concrete (cement, aggregates, cement substitutes, admixtures, etc.).

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the steel jetty bank protection pay items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials, mix designs and plant locations. Resolve any questions or concerns with the submitted sources of materials, mix designs and plant locations with the Contractor in a timely manner. A written response accepting the proposed sources of materials, mix designs and plant locations must be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed PC concrete mix design submitted by the Contractor meets the requirements of Section 701 of the Standard Specifications. The information required on each PC concrete mix design may be found in Section 701.01.C of the Standard Specifications. Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed PC Concrete Batch Plants

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

Ideally, the Contractor will submit their proposed concrete batch plant locations in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete batch plants submitted by the Contractor have a current ODOT certification. The plants must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Acceptance of Materials

The Contractor should submit its proposed sources of materials and mix designs at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items. Section 603.02 of the Standard Specifications includes the material requirements that pertain to the steel jack, steel cable and deadmen required in the Plans. Review the Special Provisions and Plan Notes for applicable material requirements.

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.) submitted by the Contractor. Any revisions to the sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch plant.

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before steel jetty bank protection construction work begins.

1. Existing Groundline Confirmation

It is possible that from the time the plans were developed to the time that construction begins, the groundlines of the channel bank may have changed significantly due to continued erosion. Confirmation of existing groundline changes from the planned conditions that might warrant adjustments to the lengths and locations of the jetties. If the comparison to the existing groundlines to the planned groundlines indicates significant differences, the Resident Engineer should contact the Design Engineer for their review and recommendations.

2. Contractor Staging Area and 404 Permit Conditions

Steel jetty bank protection projects will typically be on regulated waters that will require a US Army Corp of Engineers Permit (404 Permit). Review with the Contractor the conditions listed in the 404 Permit included in the Contract by special provision and any environmental plan notes included in the Plans. Any staging area proposed by the Contractor must comply with any listed conditions and requirements in the Plans and Contract.

3. Contractor Proposed Mix Designs

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, "Admixtures".

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine).

Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT Materials Division Qualified Products List (QPL) or Approved Rock, Stone, & Sand Sources lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed PC Concrete Batch Plants

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

Ideally, the Contractor will submit their proposed concrete batch plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. The status of concrete batch plant certifications can be found on the ODOT Materials Division website ([Hydraulic Cement Concrete Plant List](#)). If the plant does not have a “current” certification, it is the responsibility of the residency to conduct a plant inspection as further detailed below.

(a) Concrete Plant Inspection

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant

inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste concrete or materials. (Do not allow the Contractor to place surplus concrete, grout or other materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

603.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 603.02 of the Standard Specifications that pertain to the steel jack, steel cable and deadmen required in the Plans. Review the Special Provisions and Plan Notes for applicable material requirements.

When the Contractor proposes to use concrete deadmen in lieu of timber, review the material requirements in Section 701, “Portland Cement Concrete” of the Standard Specifications that pertain to the ingredients to produce PC concrete (cement, aggregates, cement substitutes, admixtures, etc.).

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the steel jetty bank protection pay items.

The Resident Engineer must review for acceptance the Contractor’s proposed sources of materials, mix designs and plant locations. Resolve any questions or concerns with the submitted sources of materials, mix designs and plant locations with the Contractor in a timely manner. A written response accepting the proposed sources of materials, mix designs and plant locations must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Steel Jacks

In accordance with Section 603.02.A of the Standard Specifications, the Contractor must provide steel jacks consisting of the following:

- Three new structural steel angles, 4 in × 4 in × 1/4 in × 192 in;
- Six high strength bolts with hexagon heads and nuts, 1/2 in × 1 1/2 in; and
- No. 6 double-annealed smooth-wire lacing.

Review the Special Provisions and Plan Notes for additional material requirements for the steel jacks that would supersede these requirements from the specifications.

2. Steel Cable

In accordance with Section 603.02.B of the Standard Specifications, the Contractor must provide used-steel oil-field cable that has been, inspected, respooled, and oil-treated. Ensure the steel cable has a diameter of at least 7/8 in or provide reinforcing steel bars of at least 3/4 in in diameter and cable clamps for fastening.

Review the Special Provisions and Plan Notes for additional material requirements for the steel cable that would supersede these requirements from the specifications.

3. Deadman

In accordance with Section 603.02.C of the Standard Specifications, the Contractor must provide deadman of concrete or timber. Ensure the concrete deadmen are Class A Concrete with dimensions of at least 3 ft × 2 ft × 1-1/2 ft. Ensure the timber deadmen are new creosoted railroad ties at least 6 in × 8 in × 96 in, or creosoted timber pile cutoffs with a diameter of at least 7 in at the smallest end and a length of 8 ft.

Review the Special Provisions and Plan Notes for additional material requirements for the deadmen that would supersede these requirements from the specifications.

4. Contractor Proposed Mix Designs

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations.

Ensure the Contractor has submitted its proposed concrete mix designs in advance of any work beginning on the deadmen. The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 603.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

5. Contractor Proposed PC Concrete Batch Plants

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed sources of materials, mix designs and plant locations. Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the deadmen pay items.

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 603.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

6. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials and mix designs in advance of any work beginning on the steel jetty bank protection pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber, the Contractor will need to submit their proposed concrete. The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.). Any revisions to the sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete and other components used in the construction of the deadmen submitted by the Contractor is on the ODOT [Materials Division Qualified](#)

[Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber and when steel reinforcing steel is used in lieu of steel cable, the Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]

- Verify the Slag Cement (Grade 100 or Grade 120) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Slag Cement](#). [Document in Template AM5001]
- Verify the Silica Fume product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Silica Fume](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Verify the Curing Agents used on the PC concrete are listed on the [QPL-HC Concrete Curing Agents](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the steel jetty bank protection item is listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 603.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install steel jetty bank protection items. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment includes hand tools for fabricating and installing the steel jacks and steel cables, and excavation equipment for installing the deadmen. Do not allow the Contractor to proceed with the use of equipment or methods that result in the work violating any conditions listed in the 404 Permit included in the Contract or environmental requirements stated in the Plans.

Review the Special Provisions and Plan Notes for specific equipment requirements for the steel jetty bank protection construction.

C. Construction Operations

Review with the Contractor the plan notes and details of installation included in the Plans for the steel jetty bank protection pay items required on the project. After the Contractor performs the construction staking for the work, ensure the location and layout of the steel jetty bank protection features (steel jacks and deadmen) comply with the Plans.

It is possible that from the time the plans were developed to the time that construction begins, the groundlines of the channel bank may have changed significantly due to continued erosion. The Contractor should establish the construction staking for the planned locations of the jetties, including the steel jack alignment and locations of the deadmen to determine if modifications to the design should be considered. Confirmation of existing groundline changes from the planned conditions that might warrant adjustments to the lengths and locations of the jetties. If the comparison of the existing groundlines to the planned groundlines indicates significant differences, the Resident Engineer should contact the Design Engineer for their review and recommendations prior to beginning the installation of the steel jetty bank protection features.

Steel jetty bank protection projects will typically be on regulated waters that will require a US Army Corp of Engineers Permit (404 Permit). Ensure the Contractor complies with the conditions listed in the 404 Permit included in the Contract by special provision and any environmental plan notes included in the Plans. Any staging area proposed by the Contractor must also comply with any listed conditions and requirements in the Plans and Contract.

During the installation of the steel jetty bank protection, verify the Contractor meets the requirements of 603.04 of the Standard Specifications as follows:

1. Constructing Steel Jacks

Bolt three steel angles together so each angle is perpendicular to the other two angles. Construct the jacks to a height of at least 9 ft, and lace with at least four wire lines as follows:

- Tie the outside lacing line at each angle.
- Pass the second lacing line through the angles 2 ft from the ends.
- Pass the third lacing line through the angles 4 ft from the ends.
- Pass the inside lacing line through the angles 6 ft from the ends.

Review the Special Provisions and details in the Plans for additional specific requirements for the construction of the steel jacks that would supersede these requirements from the specifications.

2. Anchoring Steel Jacks

Use double runs of steel cable or reinforcing steel bars to anchor the jacks. The Contractor may use either of the following materials (along with steel cable clamps for fastening) for anchoring the steel jacks:

- Used steel oil-field cable that has a diameter of at least 7/8 in.
- Reinforcing steel bars with a diameter of at least 3/4 in.

Pass one cable or bar on each side of the jack and apply a cable clamp to hold the cables together and to keep the jack in place. For a mainline jetty, anchor the cables or bars at each end with a deadman. For backup jetties, fasten the cables or bars to the mainline at a steel jack and anchor to a deadman at the opposite end.

Minimize the use of splices and, if necessary, place splices only at a jack.

Make splices, construct end connections to timber deadmen, or connect backup jetties to a mainline jetty by wrapping each steel cable around the jack or deadman at least twice and fasten with double cable clamps. Connect concrete deadmen as shown on the Plans. Splice reinforcing bars with a double-flare v-groove weld of at least 3 in in accordance with the current edition of the AWS “Reinforcing Steel Welding Code.”

Review the Special Provisions and details in the Plans for additional specific requirements for the anchoring of the steel jacks that would supersede these requirements from the specifications.

3. Placing the Deadmen

The Contractor may use deadmen constructed of concrete or timber as follows:

- Class A Concrete at least 3 ft × 2 ft × 1½ ft.
- New creosoted railroad ties at least 6 in × 8 in × 96 in.
- Creosoted timber pile cutoffs with a diameter of at least 7 in at the smallest end and a length of 8 ft.

Place each deadman in a trench and ensure the pull is at right angles to the deadman. Ensure the deadman bears on undisturbed earth. Bury the deadmen at least 6 ft deep, measured to the bottom of the deadman. Backfill the trench and compact the soil to the density of adjacent in-situ soil.

Review the Special Provisions and details in the Plans for additional specific requirements for the construction of the deadmen that would supersede these requirements from the specifications.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and comply with environmental conditions. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste concrete or materials. (Do not allow the Contractor to place surplus concrete or other materials near or in streams or waterways.)
- Compliance with 404 Permit included in the Contract and environmental requirements stated in the Plans.

Discuss any issues that are not being adequately provided, including properly disposing of waste materials and compliance with environmental conditions.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being installed (steel jacks, steel cable or deadmen).
- Type of material used for steel cable (cable or reinforcing steel) and deadmen (concrete or timber).
- Work being performed on the jetty items (setting jacks, placing cable, excavating/setting deadmen, etc.).
- Quantity of each pay item that is placed (EA or LF).
- Receipt of materials invoice and certifications (if needed).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

The final quantity for these pay items will be determined by the methods defined in Section 603.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 603.05, refer to Section 109.01 of the Standard Specifications for clarification.

The *Steel Jack* and *Deadman* pay items will be measured by the Each for the number of jacks constructed, placed, and anchored.

For the mainline jetty, the Resident Engineer will measure the length of the *Steel Cable* pay item from the center of the steel jack to the center of the deadman. For backup jetties, the Resident Engineer will measure the length of *Steel Cable* from

the tie to the mainline jetty to the center of the deadman. The *Steel Cable* pay item may be constructed from cable or reinforcing steel.

(a) Each Unit of Measure Pay Items

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

Documentation of the *Steel Jack* and *Deadman* pay items will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the ‘New’ button to create a new row for the selected pay item.

(b) Linear Foot Unit of Measure Pay Items

Documentation of the *Steel Cable* pay item will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the ‘New’ button to create a new row for the selected pay item.

603.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

When the Contractor proposes to use Class A Concrete deadmen in lieu of timber and when steel reinforcing steel is used in lieu of steel cable, verify that the previously submitted and accepted sources of materials and mix designs were used by the Contractor. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Division to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Check that the steel jetty bank protection work is satisfactorily maintained until the project is completed and any corrective action has been successfully remedied to the satisfaction of the Resident Engineer.

Ensure the Contractor complied with all conditions stated in the 404 Permit included in the Contract and environmental requirements stated in the Plans.

603 CHECKLIST – STEEL JETTY BANK PROTECTION

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant jetty pay items been identified and reviewed (jacks, cable and deadman)?					
Has the 404 Permit conditions and environmental plan notes been discussed with the Contractor?					
Have the existing groundlines of the channel banks been compared to the planned groundlines that the jetty layout was designed to fit?					
Has the design engineer been contacted to provide recommendations for changes to the jetty alignment due to encountering different groundlines from those depicted in the plans?					
Have the proposed staging area for stockpiling materials been discussed with the Contractor?					
Have the requirements for the fabrication and installation of the jacks, cable and deadmen been discussed with the Contractor?					
Does the Contractor plan to install concrete deadmen?					
Is the Contractor planning to use reinforcing steel bars in lieu of steel cable?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the use of a portable batch plant or the plant not having a current certification?					

Have the proposed sources of materials (reinforcing steel, etc.) been submitted by the Contractor and reviewed for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials and concrete mix designs?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Were the existing groundlines of the channel banks significantly different than the planned groundlines that the jetty layout was designed to fit?					
Was the design engineer contacted to provide recommendations for the jetty alignment due to encountering different groundlines from those depicted in the plans?					
Is the Contractor complying with the requirements for the fabrication and installation of the jacks?					
Is the Contractor complying with the requirements for anchoring the jacks (layout of the cables, splices, clamps, etc.)?					
Is the Contractor complying with the requirements for installation of the deadmen (size, angle, depth, etc.)?					
Is the Contractor complying with the 404 Permit conditions and environmental plan notes?					
Is the Contractor installing concrete deadmen?					
Is the Contractor using reinforcing steel bars in lieu of steel cable for anchoring the jacks?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Have the proposed sources of materials (reinforcing steel, etc.) been submitted by the Contractor and reviewed for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials and concrete mix designs?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Is the Contractor using the mix design, concrete plant and sources of materials that has been accepted by the Resident Engineer?					
Have all of the FAST Guide requirements for sampling coarse/fine aggregates at the concrete plant and documenting products on the QPL in SiteManager been performed by the residency?					

Part 3:Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Were the steel jetty bank protection features installed to the layout and alignment shown on the Plans or authorized by the Resident Engineer?					
Were the jetties anchored in accordance with Section 603.04.B?					

Part 3:Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Were the deadmen installed in accordance with Section 603.04.C?					
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Have all of the FAST Guide requirements for sampling & testing the fresh concrete mix and documenting results in SiteManager been performed by the residency?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the Contractor comply with all conditions stated in the 404 Permit included in the Contract and environmental requirements stated in the Plans					
Has the Contractor taken adequate precautions to protect the steel jetties from damage until project acceptance?					

SECTION 609 – INTEGRAL CURB, COMBINED CURB AND GUTTER, BITUMINOUS CURB AND CONCRETE CURB

609.01 GENERAL

This work consists of constructing integral curb, combined curb and gutter, bituminous curb, and concrete curb.

609.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various curb pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (type and dimension of curb, planned locations, etc.).
- Proposed sources of material and material requirements.
- Proposed mix designs and certified plants for concrete and asphalt.
- Methods and equipment to be used.
- Weather limitations for construction.
- Grading, surface preparation and backfill requirements prior to and during construction.
- Contractor's schedule/plan for the work.
- Maintenance of traffic during construction.

B. Acceptance of Materials

Review the Plans and distinguish the PC concrete or bituminous curb pay items included in the contract. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the type of curb construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant PC concrete or bituminous curb pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete and Asphalt Plants

Ideally, the Contractor will submit their proposed concrete and asphalt plant locations in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete or asphalt plants submitted by the Contractor have a current ODOT certification. The plants must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and mix designs at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the products required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before curb construction work begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract and which types of PC concrete or bituminous curb are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the types of curbs that are required. [ODOT Standard Drawing CSCD-6](#) includes details regarding the curb used for PC concrete pavements. [ODOT Standard Drawing ASCD-6](#) includes details regarding the curb used for asphalt pavements.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Weather Limitations

Review the weather limitation requirements in the Plans and Standard Specifications for the concrete curb items and bituminous curb item as specified in the Plans.

The PC concrete curb items are required to be placed in accordance with Section 414.04 of the Standard Specifications. Ensure the Contractor is aware of the maximum surface temperature (must be less than 110 °F) required to proceed with the placement of the PC concrete. Additionally, the temperature of the mixed PC concrete must be between 50 °F to 90 °F during the mixing, deliver, and placement. The PC concrete must be protected through all weather conditions (cold, hot, rain, etc.) until it has hardened.

The bituminous curb item is required to be placed in accordance with Section 411.04 of the Standard Specifications. Ensure the Contractor is aware of the minimum surface temperature (must be at least 40 °F for HMA and 35 °F for WMA) required to proceed with the placement of the bituminous curb. Additionally, the temperature of the asphalt mix must be within ± 25 °F of the optimum temperature shown on the asphalt mix design.

3. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to place the concrete or bituminous curb materials in their submittals prior to beginning construction. Section 609.03 of the Standard Specifications requires the Contractor to provide a curb machine capable of extruding a uniformly textured material to the shape and density and established line and grade required in the Plans.

Other various pieces of equipment required for PC concrete curb may be found in Section 414.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Forms,
- Concrete Saw,
- Vibrators,
- Floats and straightedges,
- Spraying equipment, and
- Joint sealing equipment.

4. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,

- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

(b) Asphalt Mix Designs

The Residency will verify that the proposed asphalt mix designs submitted by the Contractor are on the Materials Division list of Asphalt Mix Designs Approved for Use. There are various reports that can be accessed on the Materials Division website that are grouped by [Producer](#), [Contract](#), [County](#) or [Mix ID](#). If a proposed asphalt mix design is not listed on these reports, contact Materials Division – Bituminous Branch for their input and recommendation. Resolve any questions or concerns with the submitted mix designs with the Contractor in a timely manner. A written response accepting the mix designs must be sent to the Contractor and kept in the project file.

5. Contractor Proposed Concrete and Asphalt Plants

Ideally, the Contractor will submit their proposed concrete and asphalt plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete and asphalt plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

(b) Asphalt Plant Inspection and Scale Certification

The ODOT Materials Division – Independent Assurance (IA) Branch is responsible for inspecting asphalt plants each year and verifying that plant scales are certified every six months. The Hot Mix Asphalt (HMA) Plant

List is maintained and posted on the Materials Division website that indicates the inspection status and scale certification status of all plants that may be used on ODOT construction projects.

The Residency will verify that the proposed asphalt plants submitted by the Contractor are on the Materials Division list of [Hot Mix Asphalt \(HMA\) Plant List](#) and that the inspection status and scale certification status are both listed as “current”. If a proposed asphalt plant is not listed on this report or the plant status is not “current”, contact Materials Division – Independent Assurance (IA) Branch for their input and recommendation. Resolve any questions or concerns with the submitted asphalt plants with the Contractor in a timely manner.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, asphalt emulsion, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

609.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the PC concrete or bituminous curb pay items included in the contract. Review the material requirements in the relevant surface (concrete and asphalt) construction sections or the sections of Chapter 700, “Materials” of the Standard Specifications that pertain to the type of curb construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant PC concrete or bituminous curb pay items.

The Resident Engineer must review for acceptance the Contractor’s proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Ensure the Contractor has submitted its proposed concrete or asphalt mix designs in advance of any work beginning on the PC concrete or bituminous curb pay items.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 609.02.C.4(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

(b) Asphalt Mix Designs

The Residency will verify that the proposed asphalt mix designs submitted by the Contractor are on the Materials Division list of Asphalt Mix Designs Approved for Use. There are various reports that can be accessed on the Materials Division website that are grouped by [Producer](#), [Contract](#), [County](#) or [Mix ID](#). If a proposed asphalt mix design is not listed on these reports, contact Materials Division – Bituminous Branch for their input and recommendation.

Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use. A written response accepting the mix designs must be sent to the Contractor and kept in the project file.

2. Contractor Proposed Concrete and Asphalt Plants

Ensure the Contractor has submitted its proposed concrete or asphalt batch plants in advance of any work beginning on the PC concrete or bituminous curb pay items.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 609.02.C.5(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

(b) Asphalt Plant Inspection and Scale Certification

The Residency will verify that the proposed asphalt plants submitted by the Contractor have a current ODOT certification as further described in Section 609.02.C.5(b) of this Manual. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, mix designs and plant locations in advance of any work beginning on the relevant PC concrete or bituminous curb pay items.

(a) PC Concrete Curb and Curb & Gutter

The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.). Any revisions to the sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch plant.

The sources of materials for other components used in the construction of the PC concrete curb items (reinforcement steel, curing compound, joint sealers, etc.) must also be submitted to the Resident Engineer for acceptance. Any revisions to these sources should be reviewed for acceptance by the Resident Engineer prior to use in the PC concrete curb construction.

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for

an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Verify the Curing Agents used on the PC concrete are listed on the [QPL-HC Concrete Curing Agents](#). [Document in Template AM5001]
 - Verify the product and source is listed on the Liquid Membrane Curing Compound list – only the Type 2 White-Pigmented curing compound is acceptable for use on PCC pavement
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:

- Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
- Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) Bituminous Curb

The sources of materials for asphalt (bituminous) mixes will be indicated on the approved Job Mix Formula (asphalt cement, aggregates, anti-stripping agents, etc.). Any revisions to the sources indicated on the approved Job Mix Formula should be reviewed and accepted by the Materials Division Bituminous Branch prior to use by the asphalt producer.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

In accordance with Section 609.02 of the Standard Specifications, the Contractor must provide Type S5 or Type S6 asphalt concrete for bituminous curb in accordance with Subsection 708.04, “Composition of Mixtures,” except the asphalt concrete mixture must have an asphalt content of 1.15 times the asphalt content required by the approved relevant job-mix formula.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project’s Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the asphalt cement binder used in the asphalt mix from the asphalt plant to submit to the ODOT Materials Division for acceptance. [Document in Template C91018]
 - Sample liquid asphalt materials in accordance with AASHTO R66. Use appropriate sample containers; plastic jugs for Emulsified Asphalt and tin cans for Asphaltic Cement Binders.
- Verify the asphalt mixture complies with the requirements of the approved Job Mix Formula and applicable tolerances:
 - Gradation; Mechanical Analysis of Extracted Aggregate - AASHTO T 30 [Document in Template T30]
 - Asphalt Binder Content by Ignition – OHD L-26 [Document in Template C93013]
(NOTE: asphalt content must be 1.15 times the asphalt content required by the approved relevant job-mix formula.)
- Verify the aggregate used in the asphalt mixture complies with the requirements of Table 707:1 of the Standard Specifications:
 - Sand Equivalent – AASHTO T 176 [Document in Template C93004]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Ensure the Contractor's equipment complies with the requirements of the Standard Specifications.

Section 609.03 of the Standard Specifications requires the Contractor to provide a curb machine capable of extruding a uniformly textured material to the shape and density and established line and grade required in the Plans. This requirement pertains to both the PC concrete and bituminous curb.

Additionally, various other pieces of equipment required for PC concrete curb may be found in Section 414.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Forms,
- Concrete Saw,
- Vibrators,
- Floats and straightedges,
- Spraying equipment, and
- Joint sealing equipment.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract and which types of PC concrete or bituminous curb are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the types of curbs that are required. [ODOT Standard Drawing CSCD-6](#) includes details regarding the curb used for PC concrete pavements. [ODOT Standard Drawing ASCD-6](#) includes details regarding the curb used for asphalt pavements.

Ensure the finished curb items are constructed in conformance to the dimensions shown on the Plans or ODOT Standard Drawings unless otherwise directed by the Resident Engineer. If the planned dimensions are not being achieved, stop the operation and correct the problems creating the incorrect dimensions before resuming the curb installation operation.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department. Tolerances for both PC concrete and bituminous curb must meet those specified in Sections 609.04.H and, by cross-reference, 401.04.A of the Standard Specifications. The surface elevations for new pavement construction must be within 1/2 in of the elevations shown on the Plans. Ensure the surface smoothness is within 1/8 inch in 10 ft. Test for surface smoothness by placing a straightedge between two contacts on the finished surface and measuring the distance from the surface to the straightedge. Ensure that all combined curb & gutter drains properly and doesn't pond water in the gutter.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department. The Resident Engineer may at their discretion accept out of specification work in accordance with Section 105.03 of the Standard Specifications at a reduced cost.

Verify the following complies with Section 609.04 of the Standard Specifications when constructing the PC concrete or bituminous curb:

1. Weather Limitations and Surface Preparation

Review the weather limitation requirements in the Plans and Standard Specifications for the concrete curb items and bituminous curb item as specified in the Plans.

The PC concrete curb items are required to be placed in accordance with Section 414.04 of the Standard Specifications. Ensure the Contractor is aware of the maximum surface temperature (must be less than 110 °F) required to proceed with the placement of the PC concrete. Additionally, the temperature of the mixed PC concrete must be between 50 °F to 90 °F during the mixing, deliver, and placement. The PC concrete must be protected through all weather conditions (cold, hot, rain, etc.) until it has hardened.

The bituminous curb item is required to be placed in accordance with Section 411.04 of the Standard Specifications. Ensure the Contractor is aware of the minimum surface temperature (must be at least 40 °F for HMA and 35 °F for WMA) required to proceed with the placement of the bituminous curb. Additionally, the temperature of the asphalt mix must be within ± 25 °F of the optimum temperature shown on the asphalt mix design.

When placing the PC concrete or bituminous curb on a pavement surface, ensure the pavement is clean and free of any debris that may adversely affect the bonding of the curb to the pavement surface. When placing the curb on a subgrade or base, ensure the Contractor excavates to the depth shown on the Plans, and compacts the base to a firm, even surface. Any soft or unsuitable material that is encountered must be removed and replaced with material approved by the Resident Engineer, and adequately compacted prior to placing the curb.

2. Using Forms for Placement of Curb

The Contractor may use forms for constructing the PC concrete or bituminous curb, unless otherwise specified in the Plans. Ensure the Contractor provides forms made of wood, metal, or other material that will not warp or misalign during placement of curb material. Ensure forms extend the entire depth of curb, or curb and gutter. During the placement of the concrete or asphalt, the Contractor must brace and secure the forms to prevent deflection from the alignment or grade shown on the Plans or directed by the Resident Engineer.

Do not allow shimming to the bottom of the forms to exceed 2" in built up thickness for any type of curb. The Resident Engineer must give prior approval to allow fastening the built up section to the form.

When placing the PC concrete curb, ensure the Contractor provides tight forms that prevent leaks. The Contractor must clean the forms and must oil or wet them prior to placing the PC concrete.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department.

3. Using the Extruded Method for Placement of PC Concrete Curbs

The Contractor may use the extruded (slip-form) method for constructing the PC concrete curb or combined curb & gutter, unless otherwise specified in the Plans. When using the extruded method, the Contractor must use an extrusion machine on a string or wire line, with the rails or forms set at a uniform depth below the finished top of curb grade.

PC concrete must be uniformly fed into the extrusion (curb) machine. Ensure that after extrusion, the concrete maintains the shape of the section without support. Ensure the finished curb or combined curb and gutter, is well compacted, with no voids or honeycombs and built to the shape, line, and grade shown on the Plans. The Contractor must perform any additional surface finishing immediately after extrusion. Ensure tolerances meet those specified in Sections 609.04.H and, by cross-reference, 401.04.A of the Standard Specifications. If the planned dimensions are not being achieved or if excessive honeycombs are found, stop the operation and correct the problems (low or high slump of concrete, incorrect shoe on curb machine, etc.) creating the incorrect dimension or excessive honeycombs before resuming the curb installation operation.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department. Ensure that all combined curb & gutter drains properly and doesn't pond water in the gutter.

4. Placing, Finishing and curing PC Concrete Curbs

When using forms for the placement of PC concrete curbs, the Contractor must verify the alignment and grad of the forms, then place, vibrate and finish the concrete in accordance with Section 414.04 of the Standard Specifications.

The Contractor must uniformly brush the surfaces as soon as the curb concrete can keep its shape without support. Edge formed concrete joints, including edges at expansion and contraction joints or weakened-plane joints, to the radius shown on the Plans.

Ensure the Contractor cures the PC concrete used for curb and combined curb & gutter in accordance with Section 414.04 of the Standard Specifications.

5. Joints for PC Concrete Curbs

Joints in PC concrete curbs are required similarly for formed and extruded methods of placement. In accordance with Section 609.04.E of the Standard Specifications, the Contractor is required to construct joints in PC concrete curbs as follows:

- Construct curb joints perpendicular to the subgrade and to the longitudinal axis of the curb.
- Construct expansion and contraction joints at locations of joints in the adjacent pavement structure and meeting the material requirements in accordance with Section 701.08 of the Standard Specifications.
- Use pre-molded expansion joint filler of the thickness and at the locations for expansion joints.
- For combined curb & gutter contraction joints used in conjunction with asphalt pavement, saw in accordance with Subsection 609.04.H, “Extruded Method,” and seal with the same material used for sealing expansion joints.

Additional requirements for constructing joints in PC concrete curbs can be found in [ODOT Standard Drawing CSCD-6](#) which includes details regarding the curb used for PC concrete pavements and [ODOT Standard Drawing ASCD-6](#) which includes details regarding the combined curb & gutter used for asphalt pavements.

Additional requirements for constructing joints in PC concrete curbs found in [ODOT Standard Drawing CSCD-6](#) includes:

- Curb & gutter shall be placed integral with the paving slab unless otherwise shown in the plans.
- Transverse joints shall match the pavement’s transverse joints.
- Transverse joints shall be placed at drainage structure inlets.
- Longitudinal joints shall be tied with #5 deformed tie bars that are 2’-6” long at 3’ centers.
- All joints shall be sealed as shown on [ODOT Standard Drawing LECS-5](#).
- Method of measurement and limits of curb measured for payment through drives.

Additional requirements for constructing joints in PC concrete combined curb & gutter found in [ODOT Standard Drawing ASCD-6](#) includes:

- Combined curb & gutter shall have 3/4" isolation joints at drainage structure inlets, street curb returns and at those location shown on the Plans.
- Butt or sawed joints shall be spaced at a maximum of 20’ centers.
- Joint fillers in the curbs shall extend to within 2” of the face and top of all curbs.
- All joints shall be sealed as shown on [ODOT Standard Drawing LECS-5](#).
- Method of measurement and limits of combined curb & gutter measured for payment through drives and street returns.

6. Curb Openings

When curb openings are required for drives and street returns, the Contractor will omit the curb portion of the combined curb & gutter. If leaving the gutter of combined curb & gutter, make the concrete higher at the back of the curb line than at the front to maintain the drainage across the curb opening and prevent ponding of the water in that area. This should also be done for the top of the pavement where curb is omitted, unless the curb opening is constructed to drain water from the pavement.

7. Bituminous Curb

The Resident Engineer may approve other methods to construct short sections or radii of bituminous curb. Ensure curb constructed by alternative methods produces the same result as the machine-produced curb.

The Contractor must construct bituminous curb with the same methods as placing asphalt pavements in accordance with Sections 411.04.A through Section 411.04.G of the Standard Specifications, except as follows:

- Establish one edge of the bituminous curb with a string or wire line.
- Place the bituminous curb at the lowest temperature that yields the best results for the mix placed and machine used.
- Ensure the placement temperature does not vary more than 20 °F.

8. Backfill of Curbs

Ensure the Contractor backfills the back side of the curbs with soil approved by the Resident Engineer and compacts it in layers no greater than 6 in deep. Ensure the curb remains in-place and undamaged while placing and compacting the backfill. The Contractor must repair any damage to the backfilled curb using methods approved by the Resident Engineer, at no additional cost to the Department.

The cost to backfill the curb is to be included in the contract unit price for the relevant curb pay item and is not measured separately for payment.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, asphalt emulsion, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location) and pay item(s) being installed (concrete curb, combined curb & gutter or bituminous curb).
- Work being performed on the curb items (forming, pouring/placing curb, sawing, backfilling, etc.).
- Quantity of each pay item that is placed (LF).
- Temperatures of the PC concrete or asphalt mixture taken throughout the day (recorded in the Concrete/Daily Laydown Report).
- Receipt of haul tickets (electronic tickets) of PC concrete or asphalt and quantity placed.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

The final quantity for these curb pay items will be determined by the methods defined in Section 609.05 of the Standard Specifications. The Resident Engineer will measure the length of *Concrete Curb*, *Combined Curb and Gutter*, and *Bituminous Curb* along the front face of the curb. The measurement will include the length through curb openings, as stated in the specifications and ODOT Standard Drawings.

Documentation of the curb pay items paid by the Linear Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the descriptive location or the station to station extents and location (i.e., direction, station extents, lane designation, etc.).
- c. In the Placed Quantity field, enter the measured quantity (LF) of the relevant curb pay item completed.
- d. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

609.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, Asphalt Mix Designs Approved for Use, etc.), contact Materials Division to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

Ensure the length of *Concrete Curb*, *Combined Curb and Gutter*, and *Bituminous Curb* was measured along the front face of the curb. The measurement will include the length through curb openings, as stated in the specifications and ODOT Standard Drawings. The cost to backfill the curb is to be included in the contract unit price for the relevant curb pay item and is not measured separately for payment.

C. Protection of the Work

Ensure the curb is not damaged during the backfilling operation and is satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

609 CHECKLIST – INTEGRAL CURB, COMBINED CURB AND GUTTER, BITUMINOUS CURB AND CONCRETE CURB

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant curb pay items been identified and reviewed (concrete curb, combined curb & gutter, bituminous curb)?					
Have the relevant ODOT Standard Drawings CSCD-6 and ASCD-6 been reviewed with the Contractor?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the proposed mix design for the asphalt been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the proposed asphalt plant for the production of the bituminous curb been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete or asphalt plants?					

Has the maximum surface temperature of 110 °F required to proceed with the placement of the PC concrete curb been discussed with the Contractor?					
Has the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement been discussed with the Contractor?					
Have the minimum surface temperature requirements of at least 40 °F for HMA and 35 °F for WMA for the placement of bituminous curb been discussed with the Contractor?					
Have the acceptable mix temperature ranges for the asphalt mix being within ± 25 °F of the optimum temperature shown on the asphalt mix design been discussed with the Contractor?					
Has the requirement for a curb machine capable of extruding a uniformly textured material to the shape and density and established line and grade required in the Plans been discussed with the Contractor?					
Does the Contractor have a plan for maintenance of traffic and protection of the curb items during its placement and opening to traffic?					
Has the proper disposal of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.) been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the proposed mix design for the asphalt been submitted by the Contractor and reviewed by the Resident Engineer and accepted?					
Does the proposed asphalt plant for the production of the bituminous curb have a current certification and has been accepted by the Resident Engineer?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete or asphalt plants?					
Is the Contractor using the mix designs that have been accepted/approved by the Resident Engineer?					
Is the maximum surface temperature of 110 °F required to proceed with the placement of the PC concrete curb being achieved?					
Is the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement being achieved?					
Are the minimum surface temperature requirements of at least 40 °F for HMA and 35 °F for WMA for the placement of bituminous curb being achieved?					
Are the acceptable mix temperature ranges for the asphalt mix being within ± 25 °F of the optimum temperature shown on the asphalt mix design being achieved?					
Is the Contractor placing the proper type of curb (concrete/bituminous curb or combined curb & gutter) at the locations shown on the Plans or as authorized by the Resident Engineer?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor using a curb machine capable of extruding a uniformly textured material to the shape and density and established line and grade required in the Plans?					
When using forms to construct the curb, are the forms cleaned & oiled, secured to prevent deflection and has shimming that does not exceed 2 inches?					
Is the curb being constructed to the dimensions required by the Plans or ODOT Standard Drawings?					
Does the curb have the proper surface finish and curing method required in the Standard Specifications?					
Are joints (isolation, construction, transverse, etc.) in the curb being installed as required in the Standard Specifications and ODOT Standard Drawings?					
Are curb openings across driveways and street returns being constructed in a manner to maintain water drainage in the gutter line across the curb opening?					
Have samples of the aggregates used in the PC concrete been taken and tested in accordance with the FAST Guide?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Have the required fresh concrete samples and test been performed in accordance with the FAST Guide?					
Have samples of the aggregate for the asphalt mix been taken and tested for sand equivalent results at the frequencies in accordance with the FAST Guide?					
Have samples of the asphalt mixture been taken and tested at the frequencies in accordance with the FAST Guide?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Have all of the test results and confirmation of sources/products on the QPL been documented in SiteManager by the residency?					
Has the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3:Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor place the proper type of curb (concrete/bituminous curb or combined curb & gutter) at the locations shown on the Plans or as authorized by the Resident Engineer?					
Was the curb constructed to the dimensions required by the Plans or ODOT Standard Drawings?					
Does the curb have the proper surface finish and curing method required in the Standard Specifications?					
Are joints (isolation, construction, transverse, etc.) in the curb installed as required in the Standard Specifications and ODOT Standard Drawings?					
Were curb openings across driveways and street returns constructed in a manner to maintain water drainage in the gutter line across the curb opening?					
Has the Contractor taken adequate precautions to protect the completed curb from damage?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					

Part 3:Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Have all of the FAST Guide requirements for sampling & testing and documenting results in SiteManager been performed by the residency?					
Did the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 610 – CONCRETE OR ASPHALT SIDEWALKS, DRIVEWAYS, DIVIDING STRIPS, AND TACTILE WARNING DEVICES

610.01 GENERAL

This work consists of constructing PC concrete or asphalt dividing strips, sidewalks and driveways, and tactile warning devices.

610.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various dividing strip, sidewalk and driveway pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (type and dimension of dividing strip, sidewalk and driveway; planned locations; etc.).
- Proposed sources of material and material requirements.
- Proposed mix designs and certified plants for concrete and asphalt.
- Methods and equipment to be used.
- Weather limitations for construction.
- Grading and foundation preparation and backfill requirements during construction.
- Contractor's schedule/plan for the work.
- Maintenance of traffic during construction.
- Discuss the importance of the sidewalk and curb ramps meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#).
- Discuss the Contractor's responsibility for ensuring compliance with the PROWAG accessibility guidelines as stated in Note 10 in [ODOT Standard Drawing WCR-4](#).

B. Acceptance of Materials

Review the Plans and distinguish the pay items included in the contract for PC concrete or asphalt dividing strip, sidewalks and drives that are listed. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the dividing strip, sidewalks and drives construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant

locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant dividing strip, sidewalk and driveway pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete and Asphalt Plants

Ideally, the Contractor will submit their proposed concrete and asphalt plant locations in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete or asphalt plants submitted by the Contractor have a current ODOT certification. The plants must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials (including tactile warning devices, when required) and mix designs at the Preconstruction Meeting. If the project includes the installation of tactile warning devices, ensure the proposed source and product name for the devices are also submitted. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the products required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#)

lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

When the project includes the installation of traffic items, the Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). If a proposed traffic item product is not on the APL, contact Traffic Engineering Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before construction begins on the sidewalk and driveways.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for PC concrete or asphalt dividing strip, sidewalks and drives that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the dividing strip, sidewalks and driveways that are required. The various ODOT Standard Drawings pertaining to this work include the following:

- [ODOT Standard Drawing CSCD-6](#) includes details regarding the dividing strip, sidewalks and drives used for PC concrete pavements.
- [ODOT Standard Drawing ASCD-6](#) includes details regarding the dividing strip, sidewalks and drives used for asphalt pavements.

- [ODOT Standard Drawing WCR-4](#) includes details regarding the construction of sidewalks and curb ramps.
- [ODOT Standard Drawing TWD-2](#) includes details regarding the installation of tactile warning devices (for new installation and retrofit) in wheelchair ramps.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

Discuss the importance of the sidewalk and ramps meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#). If the Plans indicate constructing an aspect that contradicts the requirements for an accessible pathway (such as a drainage structure placed in line with a wheelchair ramp or a driveway profile not providing an acceptable 2% pathway for the adjoining sidewalk), contact the Resident Engineer or ODOT ADA Manager for evaluation. It is ultimately the Contractor's responsibility for ensuring compliance with the PROWAG accessibility guidelines as stated in Note 10 in the [ODOT Standard Drawing WCR-4](#), which states:

10. ALL FEATURES OF CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, SIDEWALKS, CURB RAMPS AND CROSSWALK MARKINGS SHALL COMPLY WITH THE PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG). WHERE SPATIAL LIMITATIONS OR EXISTING FEATURES WITHIN THE LIMITS OF THE PROJECT PREVENT FULL COMPLIANCE WITH THE PROWAG, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERY OF SUCH FEATURE(S). THE CONTRACTOR SHALL NOT PROCEED WITH ANY ASPECT OF THE WORK WHICH IS NOT IN FULL COMPLIANCE WITH THE PROWAG WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER. ANY WORK WHICH IS NOT PERFORMED WITHIN THE GUIDELINES OF THE PROWAG, FOR WHICH THE CONTRACTOR DOES NOT HAVE WRITTEN APPROVAL, SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

2. Weather Limitations and Surface Preparation

Review the weather limitation requirements in the Plans and Standard Specifications for the dividing strip, sidewalk and driveway pay items as specified in the Plans.

The PC concrete items (dividing strip, sidewalks and driveways) are required to be placed in accordance with Section 414.04 of the Standard Specifications. Ensure the Contractor is aware of the maximum surface temperature (must be less than 110 °F) required to proceed with the placement of the PC concrete. Additionally, the temperature of the mixed PC concrete must be between 50 °F to 90 °F during the mixing, deliver, and placement. The PC concrete must be protected through all weather conditions (cold, hot, rain, etc.) until it has hardened.

The asphalt items (dividing strip, sidewalks and driveways) are required to be placed in accordance with Section 411.04 of the Standard Specifications. Ensure the Contractor is aware of the minimum surface temperature (must be at least 40 °F for HMA and 35 °F for WMA) required to proceed with the placement of the sidewalks and driveways. Additionally, the temperature of the asphalt mix must be within ± 25 °F of the optimum temperature shown on the asphalt mix design.

The Contractor must achieve adequate compaction of the subgrade material underneath all dividing strips, sidewalks and driveways. A hand operated or power compactor must be used to uniformly compact the subgrade material. The type and weight of the compactor must meet the Resident Engineer's approval. Hand-tamping of areas inaccessible to the compactor may be used by the Contractor in small and isolated areas.

3. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to place the PC concrete or asphalt dividing strip, sidewalk and driveway materials in their submittals prior to beginning construction.

The various pieces of equipment required for the PC concrete items may be found in Section 414.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Forms,
- Concrete Saw,
- Vibrators,
- Floats and straightedges,
- Spraying equipment, and
- Joint sealing equipment.

The various pieces of equipment required for the asphalt items may be found in Section 411.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Asphalt paver (when the area for the work is sufficient for use) or box blade/grader for areas inaccessible to the paver,
- Compactors (self-propelled steel wheel roller or hand-tamping compactor for areas inaccessible to the roller), and
- Hand tools (rakes, etc.).

4. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the

need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

(b) Asphalt Mix Designs

The Residency will verify that the proposed asphalt mix designs submitted by the Contractor are on the Materials Division list of Asphalt Mix Designs Approved for Use. There are various reports that can be accessed on the Materials Division website that are grouped by [Producer](#), [Contract](#), [County](#) or [Mix ID](#). If a proposed asphalt mix design is not listed on these reports, contact Materials Division – Bituminous Branch for their input and recommendation. Resolve any questions or concerns with the submitted mix designs with the Contractor in a timely manner. A written response accepting the mix designs must be sent to the Contractor and kept in the project file.

5. Contractor Proposed Concrete and Asphalt Plants

Ideally, the Contractor will submit their proposed concrete and asphalt plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete and asphalt plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

(b) Asphalt Plant Inspection and Scale Certification

The ODOT Materials Division – Independent Assurance (IA) Branch is responsible for inspecting asphalt plants each year and verifying that plant scales are certified every six months. The Hot Mix Asphalt (HMA) Plant List is maintained and posted on the Materials Division website that indicates the inspection status and scale certification status of all plants that may be used on ODOT construction projects.

The Residency will verify that the proposed asphalt plants submitted by the Contractor are on the Materials Division list of [Hot Mix Asphalt \(HMA\) Plant List](#) and that the inspection status and scale certification status are both listed as “current”. If a proposed asphalt plant is not listed on this report or the plant status is not “current”, contact Materials Division – Independent Assurance (IA) Branch for their input and recommendation. Resolve any questions or concerns with the submitted asphalt plants with the Contractor in a timely manner.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction including maintaining access to where it is safe and accessible during sidewalk construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, asphalt emulsion, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

610.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the PC concrete or asphalt dividing strip, sidewalk and driveway pay items included in the contract. Review the material requirements in the relevant surface (concrete and asphalt) construction sections or the sections of Chapter 700, “Materials” of the Standard Specifications that pertain to the type of dividing strip, sidewalk or driveway construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the project includes the installation of tactile warning devices, ensure the proposed source and product name for the devices are also submitted. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant PC concrete or asphalt dividing strip, sidewalk and driveway pay items.

The Resident Engineer must review for acceptance the Contractor’s proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Ensure the Contractor has submitted its proposed concrete or asphalt mix designs in advance of any work beginning on the PC concrete or asphalt dividing strip, sidewalk and driveway pay items.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List](#)

[\(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 610.02.C.4(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

(b) Asphalt Mix Designs

The Residency will verify that the proposed asphalt mix designs submitted by the Contractor are on the Materials Division list of Asphalt Mix Designs Approved for Use. There are various reports that can be accessed on the Materials Division website that are grouped by [Producer](#), [Contract](#), [County](#) or [Mix ID](#). If a proposed asphalt mix design is not listed on these reports, contact Materials Division – Bituminous Branch for their input and recommendation.

Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use. A written response accepting the mix designs must be sent to the Contractor and kept in the project file.

2. Contractor Proposed Concrete and Asphalt Plants

Ensure the Contractor has submitted its proposed concrete or asphalt batch plants in advance of any work beginning on the PC concrete or asphalt dividing strip, sidewalk and driveway pay items.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 610.02.C.5(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

(b) Asphalt Plant Inspection and Scale Certification

The Residency will verify that the proposed asphalt plants submitted by the Contractor have a current ODOT certification as further described in

Section 610.02.C.5(b) of this Manual. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, mix designs and plant locations in advance of any work beginning on the relevant PC concrete or asphalt dividing strip, sidewalk and driveway pay items. If the project includes the installation of tactile warning devices, ensure the proposed source and product name for the devices are also submitted.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

(a) PC Concrete Dividing Strips, Sidewalks and Driveways

The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.). Any revisions to the sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch plant.

The sources of materials for other components used in the construction of the PC concrete items (reinforcement steel, curing compound, joint sealers, etc.) must also be submitted to the Resident Engineer for acceptance. Any revisions to these sources should be reviewed for acceptance by the Resident Engineer prior to use in the PC concrete dividing strip, sidewalk and driveway construction.

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain

approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Verify the Curing Agents used on the PC concrete are listed on the [QPL-HC Concrete Curing Agents](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing

test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) Asphalt Dividing Strips, Sidewalks and Driveways

The sources of materials for asphalt (bituminous) mixes will be indicated on the approved Job Mix Formula (asphalt cement, aggregates, anti-stripping agents, etc.). Any revisions to the sources indicated on the approved Job Mix Formula should be reviewed and accepted by the Materials Division Bituminous Branch prior to use by the asphalt producer.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the asphalt cement binder used in the asphalt mix from the asphalt plant to submit to the ODOT Materials Division for acceptance. [Document in Template C91018]
 - Sample liquid asphalt materials in accordance with AASHTO R66. Use appropriate sample containers; plastic jugs for Emulsified Asphalt and tin cans for Asphaltic Cement Binders.
- Verify the asphalt mixture complies with the requirements of the approved Job Mix Formula and applicable tolerances:
 - Gradation; Mechanical Analysis of Extracted Aggregate - AASHTO T 30 [Document in Template T30]
 - Asphalt Binder Content by Ignition – OHD L-26 [Document in Template C93013]
- Verify the aggregate used in the asphalt mixture complies with the requirements of Table 707.1 of the Standard Specifications:
 - Sand Equivalent – AASHTO T 176 [Document in Template C93004]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing

test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(c) Tactile Warning Device

The Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). Ensure the product name and manufacturer is shown on the APL. If a proposed traffic item product is not on the APL, contact Traffic Engineering Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Traffic Engineering Division to confirm the status of the source/product approval.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

B. Equipment and Methods

Ensure the Contractor's equipment needed to place the PC concrete or asphalt dividing strip, sidewalk and driveway materials items complies with the requirements of the Standard Specifications.

The Contractor must achieve adequate compaction of the subgrade material underneath all dividing strips, sidewalks and driveways. A hand operated or power compactor must be used to uniformly compact the subgrade material. The type and weight of the compactor must meet the Resident Engineer's approval. Hand-tamping of areas inaccessible to the compactor may be used by the Contractor in small and isolated areas.

The various pieces of equipment required for the PC concrete items may be found in Section 414.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Forms,
- Concrete Saw,
- Vibrators,
- Floats and straightedges,
- Spraying equipment, and
- Joint sealing equipment.

The various pieces of equipment required for the asphalt items may be found in Section 411.03 of the Standard Specifications and include the following:

- Trucks and transport units,
- Asphalt paver (when the area for the work is sufficient for use) or box blade/grader for areas inaccessible to the paver,
- Compactors (self-propelled steel wheel roller or hand-tamping compactor for areas inaccessible to the roller), and
- Hand tools (rakes, etc.).

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for PC concrete or asphalt dividing strip, sidewalks and drives that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the dividing strip, sidewalks and driveways that are required. The various ODOT Standard Drawings pertaining to this work include the following:

- [ODOT Standard Drawing CSCD-6](#) includes details regarding the dividing strip, sidewalks and drives used for PC concrete pavements.
- [ODOT Standard Drawing ASCD-6](#) includes details regarding the dividing strip, sidewalks and drives used for asphalt pavements.
- [ODOT Standard Drawing WCR-4](#) includes details regarding the construction of sidewalks and wheelchair ramps.

- [ODOT Standard Drawing TWD-2](#) includes details regarding the installation of tactile warning devices (for new installation and retrofit) in wheelchair ramps.

Ensure the finished dividing strip, sidewalks and drives are constructed in conformance to the dimensions shown on the Plans or ODOT Standard Drawings unless otherwise directed by the Resident Engineer. If the planned dimensions are not being achieved, stop the operation and correct the problems creating the incorrect dimensions before resuming the construction operation.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department. As specified in Section 610.04 of the Standard Specifications, the concrete construction must meet the requirements of Section 414.04 and the asphalt construction must meet the requirements of Section 411.04. Each of those sections cross-reference Section 401.04.A of the Standard Specifications for the tolerance requirements for the work. The surface elevations for new pavement construction must be within 1/2 in of the elevations shown on the Plans. Ensure the surface smoothness is within 1/8 inch in 10 ft. Test for surface smoothness by placing a straightedge between two contacts on the finished surface and measuring the distance from the surface to the straightedge. Ensure that all combined curb & gutter drains properly and doesn't pond water in the gutter.

There are stringent requirements for the running slope, the cross-slope and other features for the construction of the sidewalk and ramps. Additionally, when sidewalks meet driveways, the continuation of the accessible pathway must be maintained across the driveways. Ensure daily that the sidewalk and ramps are meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#).

There are four chapters included in the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#) and a majority of the technical requirements for the accessible pathway will be found in Chapter 3. However, there are pertinent requirements found in all four of the chapters. A summary of the chapters and a small sample of their content is as follows:

- Chapter 1 – Application and Administration. Includes purpose & application of guidelines, deviations, definitions, etc.
- Chapter 2 – Scoping Requirements. Includes temporary pedestrian facilities, pedestrian signs, street furniture, on-street parking, etc.
- Chapter 3 – Technical Requirements. Includes pedestrian access routes, curb ramps, detectable warning surfaces, crosswalks, pedestrian push buttons, etc.
- Chapter 4 – Supplemental Technical Requirements. Includes protruding objects, vertical clearance, stairs, handrails, etc.

The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department. The Resident Engineer may at their discretion accept out of specification

work in accordance with Section 105.03 of the Standard Specifications at a reduced cost. Any sidewalk related items that are out of compliance (running slope, cross-slope, etc.) are only allowed to be accepted if deemed to be technically infeasible to construct. The details regarding the infeasibility to construct in accordance with the requirements must be explained and properly documented.

The acceptance of non-compliant work requires a formalized process and documentation to record the scenario. The document that will be required is an ODOT Form entitled “ADA Facility Technically Infeasible Determination Process”. A copy of this form is included in the [Appendix](#) to this chapter of the manual. An electronic fillable form and additional guidance for its use can be obtained from the ODOT ADA Manager.

Verify the following complies with Section 610.04 of the Standard Specifications and applicable ODOT Standard Drawings and policies when constructing the PC concrete or asphalt dividing strip, sidewalks and driveways:

1. Weather Limitations and Surface Preparation

Review the weather limitation requirements in the Plans and Standard Specifications for the PC concrete or asphalt dividing strip, sidewalk and driveway items as specified in the Plans.

The PC concrete items are required to be placed in accordance with Section 414.04 of the Standard Specifications. Ensure the Contractor is aware of the maximum surface temperature (must be less than 110 °F) required to proceed with the placement of the PC concrete. Additionally, the temperature of the mixed PC concrete must be between 50 °F to 90 °F during the mixing, deliver, and placement. The PC concrete must be protected through all weather conditions (cold, hot, rain, etc.) until it has hardened.

The asphalt items are required to be placed in accordance with Section 411.04 of the Standard Specifications. Ensure the Contractor is aware of the minimum surface temperature (must be at least 40 °F for HMA and 35 °F for WMA) required to proceed with the placement of the asphalt dividing strip, sidewalk or driveway items. Additionally, the temperature of the asphalt mix must be within ± 25 °F of the optimum temperature shown on the asphalt mix design.

The Contractor must achieve adequate compaction of the subgrade material underneath all dividing strips, sidewalks and driveways. Ensure the Contractor excavates to the depth shown on the Plans, and compacts the base to a firm, even surface. Any soft or unsuitable material that is encountered must be removed and replaced with material approved by the Resident Engineer, and adequately compacted prior to placing the subbase material or PC concrete or asphalt items. Verify the type of subbase material required in the Plans or typical sections. Usually, the sidewalk will require a fine aggregate (sand) or course aggregate (TBSC) base underneath it.

A hand operated or power compactor must be used to uniformly compact the subgrade material. The type and weight of the compactor must meet the Resident Engineer's approval. Hand-tamping of areas inaccessible to the compactor may be used by the Contractor in small and isolated areas.

2. PC Concrete Construction

As specified in Section 610.04.A of the Standard Specifications, the Contractor must form, place, and finish concrete in accordance with Subsection 414.04 with the exception of the type of surface finish that will be used. Ensure the Contractor uses a broom-finish or burlap-drag for the final surface of concrete dividing strips, sidewalks, and driveways, or as otherwise shown in the Plans or directed by the Resident Engineer. Review the details in the Plans regarding the surface finish for the sidewalks on the project and identify any specific texturing requirements. Some projects will require embedded patterns or colored concrete to identify a buffer area between the accessible pathway and the roadway traffic. Other projects may have a unique finish for aesthetic purposes, such as swirled finish, dummy joint layouts, etc.

Connections to the existing pavement or other concrete surfaces must be made with a sawed construction joint.

Ensure the Contractor uses a hand operated or power compactor to uniformly compact the subgrade material prior to forming and placing the concrete.

(a) Forming Driveways, Sidewalks and Ramps

There are stringent requirements for the running slope, the cross-slope and other features for the construction of the driveways, sidewalks and ramps. Additionally, when sidewalks meet driveways, the continuation of the accessible pathway must be maintained across the driveways. Check the forms being set up for concrete pours daily to ensure that the driveways, sidewalks and curb ramps are meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#).

Encourage the Contractor to set forms such that the sidewalks and curb ramps are well within the requirements for the maximum allowable running slope & cross-slope and minimum thickness of the sidewalk. For example, if the forms are set exactly at a 2% cross-slope there will likely be spots that will exceed the 2% maximum requirement due to the finishing operation resulting in undulations (high and low spots) in the final cured concrete surface. It is preferable to set the forms below the maximum running slope and cross-slope requirements in anticipation of the undulations in the final surface.

Review the additional details found below in Section 610.03.C.6 of this Manual for various requirements governing the construction of the accessible pathways.

Review the additional details found below in Section 610.03.C.8 of this Manual for various requirements governing the construction of the driveways.

(b) Joints

Review the Plans for details regarding the layout and project specific details regarding the joints required in the PC concrete dividing strips, driveways and sidewalks. When no project specific details are included, follow the requirements of the Standard Specifications and ODOT Standard Drawings.

In accordance with Section 610.04.A of the Standard Specifications, the Contractor must install the following joints in PC concrete dividing strips, driveways and sidewalks:

- Expansion Joints. Construct expansion joints to the dimensions required by the Contract and fill with the pre-molded filler as shown on the Plans.
- Dummy Joints. Use a jointing tool, or other method approved by the Resident Engineer, to divide the sidewalk into sections with dummy joints. Extend the dummy joints into the concrete at least one-third the concrete slab depth and to 1/8 in wide.
- Construction Joints. Form construction joints around appurtenances, extending the joints into the sidewalk, driveway, or dividing strip. Install pre-molded expansion joint filler to a thickness of 1/4 in, between the concrete and fixed structures.

In accordance with [ODOT Standard Drawing CSCD-6](#), the Contractor must install the joints in PC concrete dividing strips, driveways and sidewalks in the following manner:

- Concrete Dividing Strip
 - Sealed 3/4" longitudinal isolation joints are required between both sides of the dividing strip and the back of curbs.
 - Sealed 1/2" transverse expansion joints are required every 50'.
 - Sealed 1/4" transverse expansion joints are required at the 1/3 points between every 1/2" transverse expansion joints.
 - Filler material used in isolation and expansion joints are to be premolded material.
 - Joints in dividing strip should align with curb joints.
- Concrete Driveway

- A non-tied butt joint is required between the drive and the edge of the PCC pavement or combined curb & gutter.
- A 3/4" isolation joint is required in the curb (perpendicular to the face of the curb) at the non-tied butt joint.
- Filler material used in isolation and expansion joints are to be premolded material.
- Concrete Sidewalk
 - Sawed 1-1/2" deep contraction joints are required every 6'. These joints do not require sealing.
(Typically, these sawed joints are substituted with the dummy joints referenced in Section 610.04.A(2) of the Standard Specifications formed with a jointing tool that is 1/8" wide and extends into the concrete at least one-third its thickness.)
 - When sidewalk is placed adjacent to the curb on the pavement, premolded expansion material and joint sealant is required if the opposing edge of the sidewalk is constrained. If the opposing edge is unconstrained (backfilled with soil), no expansion filler or joint sealant is required.
 - NOTE: When sidewalk is placed adjacent to a building face, a joint will be required at that interface. New sidewalk standards will be including a general note requiring a joint made by hand tools and the use of premolded expansion material and joint sealant. Failure to install a joint between the new sidewalk and the building face will result in cracking of the sidewalk.

In accordance with [ODOT Standard Drawing WCR-4](#), the Contractor must install the joints in PC concrete dividing strips, driveways and sidewalks in the following manner:

- Sealed 1/2" expansion joints are required at all joints between wheelchair ramps and the adjoining sidewalk.
- Sealed 1/2" expansion joints are required at all joints between sidewalks and driveways, street pavement and retaining walls.
- Sealed 1/2" expansion joints are required at all joints between sidewalks and curbs when the opposing side of the sidewalk is constrained.

(c) Curing and Protection from Traffic

As specified in Section 610.04.A of the Standard Specifications, the Contractor must use moist burlap or cotton mats to cure the concrete for at least 72 hr in accordance with Section 414.04.J. Typically, the timely application of the impervious membrane curing compound is acceptable

just like it is for PCC pavements and curbs as allowed in Sections 414.04.J and 609.04.G. The use of the wet mats is generally only done during cold weather placement of the concrete.

The Contractor must use barricades to protect sidewalks, driveways, and dividing strips from traffic. During the 72 hr curing period, do not allow traffic (pedestrian or vehicular) to use the surface. Prevent vehicular traffic from using the surface for 7 days, unless otherwise directed by the Resident Engineer.

3. Asphalt Construction

The Contractor must perform excavation and build forms in accordance with Sections 609.04.A and 609.04.B of the Standard Specifications. Ensure the Contractor excavates to the depth shown on the Plans, and compacts the base to a firm, even surface. It is critical that the sidewalks and driveways are constructed on a uniform and compacted base to avoid variations on the asphalt surface resulting from the placement and compaction of the asphalt. Any soft or unsuitable material that is encountered while grading and compacting the base must be removed and replaced with material approved by the Resident Engineer, and adequately compacted prior to placing the sidewalks and driveways.

Asphalt construction must be performed in accordance with Section 411.04 of the Standard Specifications. The asphalt material must be placed on the compacted subgrade in one or more layers, and compacted to the thickness shown on the Plans.

Hand-operated or power rollers must be used to uniformly compact the material. The type and weight of the roller must meet the Resident Engineer's approval. Hand-tamping of areas inaccessible to the roller should be required.

Use barricades to protect sidewalks, driveways, and dividing strips from traffic. Protect asphalt for 1 day from use, unless otherwise directed by the Resident Engineer.

4. Backfill

Ensure the Contractor backfills all exposed sides of sidewalks and driveways immediately after form removal and honeycombed areas are filled and pointed. Delays in the backfill operation will leave the sides exposed to weather and potential undermining and loss of base material underneath the sidewalks and driveways. The backfill material to be used is subject to the approval of the Resident Engineer. The Contractor must thoroughly compact the backfill material in layers no deeper than 6 in compacted. Ensure the Contractor protects the concrete or asphalt material from damage during placement and compaction of the backfill. The Contractor must repair any damage to the backfilled sidewalks and driveways using methods approved by the Resident Engineer, at no additional cost to the Department.

Ensure the width of the backfill is at least 2 ft where the elevation of the adjacent surface is lower than the sidewalk or driveway.

5. Remove, Relay, or Extend Brick or Stone Sidewalks

Review the Plans for details regarding the layout and project specific details regarding the construction of brick or stone sidewalks. When no project specific details are included, follow the requirements of the Standard Specifications.

The use of brick, stone or any material that would result in an irregular surface as the pedestrian access route (the compliant portion of the sidewalk that connects to accessible parking, crosswalks, transit stops/shelters and building entrances) is not recommended. This texture difference is recommended for the buffer area/furniture zone and can provide directional cues due to the texture difference between the concrete and brick/stone. Example, a streetscape project should not have the crosswalks patterned as brick, the outer edges of the crosswalk could be brick patterned for accessibility and visual cues, while the main crosswalk path is a smooth, stable surface. If your project plans specify the use of the brick or stone within the pedestrian access pathway, the Resident Engineer may want to contact the ODOT ADA Manager to seek input or guidance on potential design changes to incorporate on the project.

In accordance with Section 610.04.A of the Standard Specifications, ensure the Contractor excavates and prepares the subgrade when relaying or extending brick or stone sidewalks. Once the subgrade has been prepared to the elevations and grades required in the Plans, the Contractor must provide a sand cushion 1-1/2 in deep with a uniform, flat surface at the required elevation. Before relaying sidewalk, ensure the Contractor cleans the old bricks that are to be used. The bricks or stones must be laid close together to match the existing walk, and tamped firmly into the sand cushion.

Ensure the surface of the walk is smooth and at the grade shown on the Plans. Once the work is verified by the project inspector, the Contractor must fill the joints around the bricks and stones with mortar grout composed of one part portland cement and two parts mortar sand by volume, by spreading an excess over the surface and sweeping into the joints. After grout has been placed, ensure the Contractor cleans the surface of the brick or stone. Ensure the Contractor backfills the sides of the walk in a timely manner as required for concrete or asphalt sidewalks.

6. Sidewalk and Curb Ramp Requirements

There are stringent requirements for the running slope, the cross-slope and other features for the construction of the driveways, sidewalks and curb ramps. Additionally, when sidewalks meet driveways, the continuation of the accessible pathway must be maintained across the driveways. Check the forms being set up for concrete pours daily to ensure that the driveways, sidewalks and curb ramps are

meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#). Ensure that subgrade for asphalt driveways, sidewalks and ramps are also prepared to meet the running slope, cross-slope and other requirements.

If the Plans indicate constructing an aspect that contradicts the requirements for an accessible pathway (such as a drainage structure placed in line with a curb ramp or a driveway profile not providing an acceptable 2% pathway for the adjoining sidewalk), contact the Resident Engineer or ODOT ADA Manager for evaluation. It is ultimately the Contractor's responsibility for ensuring compliance with the PROWAG accessibility guidelines as stated in Note 10 in the [ODOT Standard Drawing WCR-4](#), which states:

10. ALL FEATURES OF CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, SIDEWALKS, CURB RAMPS AND CROSSWALK MARKINGS SHALL COMPLY WITH THE PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG). WHERE SPATIAL LIMITATIONS OR EXISTING FEATURES WITHIN THE LIMITS OF THE PROJECT PREVENT FULL COMPLIANCE WITH THE PROWAG, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERY OF SUCH FEATURE(S). THE CONTRACTOR SHALL NOT PROCEED WITH ANY ASPECT OF THE WORK WHICH IS NOT IN FULL COMPLIANCE WITH THE PROWAG WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER. ANY WORK WHICH IS NOT PERFORMED WITHIN THE GUIDELINES OF THE PROWAG, FOR WHICH THE CONTRACTOR DOES NOT HAVE WRITTEN APPROVAL, SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

In accordance with [ODOT Standard Drawing WCR-4](#), the Contractor must install the driveways, sidewalks and curb ramps in the following manner:

- The maximum running slope of sidewalks and wheelchair ramps is 8.33%.
- The maximum cross-slopes of sidewalks and running slopes of sidewalk landing areas are 2.0%.
- Where sidewalks meet driveways, a 4' wide crossing shelf is required in the driveway profile to provide a maximum 2% cross-slope for the accessible pathway.
- When constructing a 4' wide sidewalk that is longer than 200', there must be 5' widened sections spaced no more than 200' apart to ensure wheelchair passage. (NOTE: new ODOT Standard Drawings are being developed to illustrate this detail.)
- Ramp dimension shown on the ODOT Standard Drawing are based on a curb height of 6". The dimensions must be adjusted or prorated for other curb heights.
- Draining structures shall not be placed in line with the wheelchair ramps.

7. Tactile Warning Device

The Contractor must install tactile warning device materials in accordance with the manufacturer's specifications and as shown on the Plans. Review the Plans for details regarding the layout and project specific details regarding the tactile warning devices. When no project specific details are included, follow the requirements of the manufacturer's specifications, Standard Specifications, ODOT Standard Drawings and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#).

The Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). Ensure the product name and manufacturer is shown on the APL. If a proposed traffic item product is not on the APL, contact Traffic Engineering Division to confirm the status of the source/product approval. Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Traffic Engineering Division to confirm the status of the source/product approval.

The same requirements of Contractor's responsibilities for the PROWAG compliance of sidewalks and wheelchair ramps applies to the tactile warning devices. It is ultimately the Contractor's responsibility for ensuring compliance with the PROWAG accessibility guidelines as stated in Note 2 in the [ODOT Standard Drawing TWD-2](#), which states:

2. ALL FEATURES OF TACTILE WARNING DEVICE DESIGN AND FINAL INSTALLATION SHALL COMPLY WITH THE PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG). WHERE SPATIAL LIMITATIONS OR EXISTING FEATURES WITHIN THE LIMITS OF THE PROJECT PREVENT FULL COMPLIANCE WITH THE PROWAG, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERY OF SUCH FEATURE(S). THE CONTRACTOR SHALL NOT PROCEED WITH ANY ASPECT OF THE WORK WHICH IS NOT IN FULL COMPLIANCE WITH THE PROWAG WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER. ANY WORK WHICH IS NOT PERFORMED WITHIN THE GUIDELINES OF THE PROWAG, FOR WHICH THE CONTRACTOR DOES NOT HAVE WRITTEN APPROVAL, SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

In accordance with [ODOT Standard Drawing TWD-2](#), the Contractor must install the tactile warning devices in the following manner:

- Details for installation of various types (surface bonded, inset mounted, etc.) of tactile warning devices are shown along with the orientation of their patterns in the sidewalk/ramp.
- Tactile warning device surface shall extend from edge to edge of walkway entering the crosswalk, at street level.
- Sidewalk, ramp and flare thickness shall be 4" minimum thickness after installation of tactile warning treatment.
- Truncated dome surface shall contrast visually (light-on-dark or dark-on-light) with the adjoining walking surface and the material used to provide the contrast shall be an integral part of the truncated dome surface.
- Surface bonded tactile systems may only be placed on newly poured concrete after an appropriate period of curing of the concrete in accordance with the manufacturer's specifications and as directed by the Resident Engineer.
- The same tactile dome pattern and color shall be used throughout any new or retrofit project.
- Tactile warning surfaces may not be stamped in wet concrete.

8. Driveway Requirements

There are ODOT guidelines regarding the construction of residential and commercial driveways. Review the Plans for details regarding the layout and project specific details regarding the construction of the driveways on the project.

[ODOT Standard Drawing CSCD-6](#) provides details regarding the following:

- Radius requirements for residential and commercial driveways.
- Type of joint required at tie-in to the pavement/curb & gutter.
- Method of measurement for the payment of the driveway/curb & gutter.
- Maximum grades/profiles for driveway and driveway connections to pavement/curb & gutter.

Additionally, ODOT projects are intended to adhere to the requirements of the "Policy on Driveway Regulations for Oklahoma Highways", 1996 Edition and the "ODOT Roadway Design Manual", 1992 Edition. Details regarding the design and construction of driveways from these references include the following:

- Width of a residential one-way drive is 10-24'.
- Width of a residential two-way drive is 24-30'.
- Width of a commercial one-way drive is 14-24'.
- Width of a commercial two-way drive is 22-35'.
- Grade of residential drive is 0-10% desirable, with a 15% maximum.
- Grade of commercial drive is 0-5% desirable, with a 15% maximum.
- Maximum change in grade at connection of drive to an arterial street is 8%.

- Maximum change in grade at connection of drive to a collector road is 9%.
- Maximum change in grade at connection of drive to a local road is 15%.

When the Contractor is preparing the subgrade for the construction of a concrete or asphalt driveway, check to ensure that the drive will comply with the requirements listed above. If the driveway appears to be too narrow or steep, contact the Resident Engineer for their evaluation prior to allowing the Contractor to install the drive.

When sidewalks meet driveways, the continuation of the accessible pathway must be maintained across the driveways. Check the forms being set up for concrete pours daily to ensure that the driveways, sidewalks and ramps are meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#). Ensure that subgrade for asphalt driveways, sidewalks and ramps are also prepared to meet the running slope, cross-slope and other requirements.

If the Plans indicate constructing an aspect that contradicts the requirements for an accessible pathway (such as a driveway profile not providing an acceptable 2% pathway for the adjoining sidewalk), contact the Resident Engineer or ODOT ADA Manager for evaluation. It is possible that arrangements will need to be made with a property owner to extend the length of the driveway to provide an acceptable driveway profile that will enable the accessible pathway to be constructed.

9. Acceptance of Non-Compliant Work

Ensure the finished dividing strip, sidewalks and drives are constructed in conformance to the dimensions shown on the Plans or ODOT Standard Drawings unless otherwise directed by the Resident Engineer. If the planned dimensions are not being achieved, stop the operation and correct the problems creating the incorrect dimensions before resuming the construction operation.

There are stringent requirements for the running slope, the cross-slope and other features for the construction of the sidewalk and ramps. Additionally, when sidewalks meet driveways, the continuation of the accessible pathway must be maintained across the driveways. Ensure daily that the sidewalk and ramps are meeting the running slope, cross-slope and other requirements found in [ODOT Standard Drawing WCR-4](#) and the [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#). The Contractor must correct material and dimension deficiencies that exceed specified tolerances using methods approved by the Resident Engineer, at no additional cost to the Department.

The acceptance of non-compliant work requires a formalized process and documentation to record the scenario. The document that will be required is an ODOT Form entitled “ADA Facility Technically Infeasible Determination Process”. A copy of this form is included in the [Appendix](#) to this chapter of the manual. An electronic fillable form and additional guidance for its use can be obtained from the ODOT ADA Manager.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction including maintaining access to where it is safe and accessible during sidewalk construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, asphalt emulsion, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location) and pay item(s) being installed (concrete or asphalt dividing strip, sidewalk and driveway items).
- Work being performed on the dividing strip, sidewalk or driveway items (forming, pouring/placing concrete or asphalt, sawing, backfilling, etc.).
- Quantity of each pay item that is placed (SY, SF, TON).
- Temperatures of the PC concrete or asphalt mixture taken throughout the day (recorded in the Concrete/Daily Laydown Report).
- Receipt of haul tickets (electronic tickets) of PC concrete or asphalt and quantity placed.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

Where specific methods of measurement are not defined in Section 610.05, refer to Section 109.01 of the Standard Specifications for clarification.

[ODOT Standard Drawing CSCD-6](#) and [ODOT Standard Drawing ASCD-6](#) provides details regarding the method of measurement for the payment of the driveways and associated pavement, curb or curb & gutter. Additionally, there are details regarding instances where rolled curb is required on concrete drives but is not measured separately for payment and is included in the cost of the drive.

Dividing strip, sidewalk and driveway pay items are typically measured and paid by the Square Yard (SY). The contract may define any of those items to be measured and paid by the Ton (TON) when using asphalt in lieu of concrete. The tactile warning device pay item is measured and paid by the Square Foot (SF).

(a) Square Yard Unit of Measure Pay Items

Documentation of the relevant dividing strip, sidewalk and driveway pay items paid by the Square Yard will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (SY) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Ton Unit of Measure Pay Items

Documentation of the relevant asphalt dividing strip, sidewalk and driveway pay items paid by the Ton will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both the descriptive location and the station to station extents.
3. In the Placed Quantity field enter the quantity (Tons) of asphalt dividing strip, sidewalk or driveway complete in place as determined from haul tickets.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, select the 'New' button to create a new row for the selected pay item.

(c) Square Foot Unit of Measure Pay Items

Documentation of the *Tactile Warning Device* pay item paid by the Square Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the *Tactile Warning Device* pay item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (SF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

610.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, APL, Approved Rock, Stone & Sand Sources, Asphalt Mix Designs Approved for Use, etc.), contact Materials and/or Traffic Engineering Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

C. Protection of the Work

Ensure the sidewalk and driveways are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

610 CHECKLIST – CONCRETE OR ASPHALT SIDEWALKS, DRIVEWAYS, DIVIDING STRIPS, AND TACTILE WARNING DEVICES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant curb pay items been identified and reviewed (dividing strip, sidewalk, driveway and tactile warning device)?					
Have the requirements for the relevant ODOT Standard Drawings CSCD-6, ASCD-6, WCR-4 and TWD-4 been reviewed with the Contractor?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the proposed mix design for the asphalt been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the proposed asphalt plant for the project been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete or asphalt plants?					

Has the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement been discussed with the Contractor?					
Have the minimum surface temperature requirements of at least 40 °F for HMA and 35 °F for WMA for the placement of bituminous curb been discussed with the Contractor?					
Have the acceptable mix temperature ranges for the asphalt mix being within ± 25 °F of the optimum temperature shown on the asphalt mix design been discussed with the Contractor?					
Is the tactile warning device product and source of material proposed for use by the Contractor listed on the Traffic Division APL?					
Has the adequate compaction of the subgrade material underneath all dividing strips, sidewalks and driveways been discussed with the Contractor?					
Have the requirements for running slope, cross-slope and other aspects of providing an accessible pathway as stated in ODOT Standard Drawing WCR-4 and the PROWAG accessibility guidelines been discussed with the Contractor?					
Has the Contractor's responsibility for ensuring compliance with the PROWAG accessibility guidelines as stated in Note 10 in ODOT Standard Drawing WCR-4 been discussed with the Contractor?					
Does the Contractor have a plan for maintenance of vehicular and pedestrian traffic and protection of the relevant items during their placement and opening to traffic?					
Has the proper disposal of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.) been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the proposed mix design for the asphalt been submitted by the Contractor and reviewed by the Resident Engineer and accepted?					
Does the proposed asphalt plant for the production of asphalt on the project have a current certification and have been accepted by the Resident Engineer?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete or asphalt plants?					
Is the Contractor using the sources of materials and mix designs that have been accepted/approved by the Resident Engineer?					
Is the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement being achieved?					
Are the minimum surface temperature requirements of at least 40 °F for HMA and 35 °F for WMA for the placement of bituminous curb being achieved?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Are the acceptable mix temperature ranges for the asphalt mix being within ± 25 °F of the optimum temperature shown on the asphalt mix design being achieved?					
Has the Contractor adequately compacted the subgrade material underneath all dividing strips, sidewalks and driveways?					
Is the Contractor placing the proper type of dividing strip, sidewalk, and driveways at the locations shown on the Plans or as authorized by the Resident Engineer?					
Are the dividing strip, sidewalk, and driveways being constructed to the dimensions required by the Plans or ODOT Standard Drawings?					
Is the Contractor complying with the requirements for running slope, cross-slope and other aspects of providing an accessible pathway as stated in ODOT Standard Drawing WCR-4 and the PROWAG accessibility guidelines?					
Where sidewalks tie to driveways, is an accessible pathway being maintained across the drive?					
Does the dividing strip, sidewalk, and driveways have the proper surface finish and curing method required in the Plans and Standard Specifications?					
Are joints (isolation, construction, transverse, etc.) in the dividing strip, sidewalk, and driveways being installed as required in the Standard Specifications and ODOT Standard Drawings?					
Is the tactile warning device product and source of material used by the Contractor listed on the Traffic Division APL?					
Is the tactile warning device being installed by the Contractor in accordance with the manufacturer's specifications and the ODOT Standard Drawing?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have samples of the aggregates used in the PC concrete been taken and tested in accordance with the FAST Guide?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Have the required fresh concrete samples and test been performed in accordance with the FAST Guide?					
Have samples of the aggregate for the asphalt mix been taken and tested for sand equivalent results at the frequencies in accordance with the FAST Guide?					
Have samples of the asphalt mixture been taken and tested at the frequencies in accordance with the FAST Guide?					
Have all of the test results and confirmation of sources/products on the QPL been documented in SiteManager by the residency?					
Is the Contractor backfilling the sidewalk and driveways in a timely manner?					
Is the Contractor backfilling the sidewalk and driveways without causing any damage to the work?					
Does the Contractor have a plan for maintenance of vehicular and pedestrian traffic and protection of the relevant items during their placement and opening to traffic?					
Is the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor place the proper type of dividing strip, sidewalk, and driveways at the locations shown on the Plans or as authorized by the Resident Engineer?					
Were the dividing strip, sidewalk, and driveways constructed to the dimensions required by the Plans or ODOT Standard Drawings?					
Does the dividing strip, sidewalk, and driveways have the proper surface finish and curing method required in the Standard Specifications?					
Are joints (isolation, construction, transverse, etc.) in the dividing strip, sidewalk, and driveways installed as required in the Standard Specifications and ODOT Standard Drawings?					
Were the sidewalk and driveways backfilled in a timely manner without causing any damage to the work?					
Has the Contractor taken adequate precautions to protect the completed dividing strip, sidewalk, and driveways from damage from vehicular and pedestrian traffic?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Have all of the FAST Guide requirements for sampling & testing and documenting results in SiteManager been performed by the residency?					
Did the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 611 – MANHOLES, DROP OR CURB INLETS, AND JUNCTION BOXES

611.01 GENERAL

This work consists of constructing manholes, drop or curb inlets, junction boxes, or similar structures using precast concrete units, brick masonry, or cast-in-place concrete.

611.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various manhole, inlet and junction box pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (type drainage structures, planned locations, etc.).
- Proposed sources of material and material requirements, including any precast structures.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Proposed mix designs and certified plants for concrete.
- Methods and equipment to be used.
- Weather limitations for construction.
- Structure foundation preparation and backfill requirements during construction.
- Contractor's schedule/plan for the work.
- Maintenance of traffic during construction.

B. Acceptance of Materials

Review the Plans and distinguish the pay items included in the contract for various manhole, inlet and junction box items that are listed. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the drainage structure construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant manhole, inlet and junction box pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix

designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

Mix designs must be reviewed for acceptance by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant locations in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have a current ODOT certification. The plants must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and mix designs at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the products required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

When the Contractor proposes the use of precast drainage structures (manhole, inlet or junction box), the Contractor's manufacturer must submit their shop drawings to Roadway Design Division for approval as specified in Section 105.02 of the Standard Specifications. The Resident Engineer will be notified when the shop drawings have been approved by Roadway Design Division. The Residency will verify that the proposed manufacturer shown on the approved shop drawings is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)),

by verifying the source is listed on the Precast Concrete Drainage Structure list. If the proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before construction work begins on drainage structure manholes, inlets and junction boxes

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the manholes, inlets and junction boxes that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various drainage structures that are required.

The “Summary of Drainage Structures” sheet in the Plans includes the following information necessary to construct the manholes, inlets and junction boxes:

- Structure number,
- Description of structure (type and size),
- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,

- flowline out of structure,
- top of grate,
- top of manhole

There are multiple various ODOT Standard Drawings pertaining to both cast-in-place and precast manholes, inlets and junction boxes. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the drainage structure items included on the project. The various ODOT Standard Drawings for the drainage structures are:

- [ODOT Standard Drawing PSMD-2](#) – Precast Standard Median Drain.
- [ODOT Standard Drawing SMD-4](#) – Cast-in-Place Standard Median Drains (18” to 36” Pipes).
- [ODOT Standard Drawing CDIB-2](#) – Cast-in-Place Concrete Drop Inlets for R.C. Boxes (3’ x 2’ to 6’ x 6’).
- [ODOT Standard Drawing CDIB30-2](#) – Cast-in-Place Concrete Drop Inlets for 30 Degree Skew R.C. Boxes (3’ x 2’ to 6’ x 6’).
- [ODOT Standard Drawing CDIP-2](#) – Cast-in-Place Concrete Drop Inlet for 18” to 72” R.C. Pipes.
- [ODOT Standard Drawing CDIP30-2](#) – Cast-in-Place Concrete Drop Inlet for 30 Degree Skew 18” to 72” R.C. Pipes.
- [ODOT Standard Drawing GPI-5](#) – Cast-in-Place Grated Pipe Drop Inlet (18” to 42” Pipes).
- [ODOT Standard Drawing SSCD-4](#) – Storm Sewer Construction Details.
- [ODOT Standard Drawing PCI-1](#) – Precast Curb Inlet (Designs 1, 2 and 3).
- [ODOT Standard Drawing PJB-0](#) – Precast Junction Box (Keyed with Precast Curb Inlets).
- [ODOT Standard Drawing PGPI-0](#) – Precast Grated Pipe Drop Inlet.
- [ODOT Standard Drawing CI-2](#) – Cast-in-Place Curb Inlets.
- [ODOT Standard Drawing SSIF-5](#) – Storm Sewer Inlet Frames (Curb Inlets).
- [ODOT Standard Drawing CIG-4](#) – Cast Iron Grates (Curb Inlets).
- [ODOT Standard Drawing MFC-5](#) – Manhole Frame and Cover.
- [ODOT Standard Drawing MJB-4](#) – Cast-in-Place Manholes and Junction Boxes.
- [ODOT Standard Drawing PRM-1](#) – Precast Round Manhole.
- [ODOT Standard Drawing PSM-1](#) – Precast Square Manhole.
- [ODOT Standard Drawing PMD-1](#) – Precast Manhole Details.
- [ODOT Standard Drawing PCDIB-0](#) – Precast Concrete Drop Inlets for R.C. Boxes (4’x2’ to 5’x5’).

- [ODOT Standard Drawing PCDIB30-0](#) – Precast Concrete Drop Inlets for 30 Degree Skew R.C. Boxes (4'x2' to 5'x5').
- [ODOT Standard Drawing PCDIP-0](#) – Precast Concrete Drop Inlets for 18" to 36" R.C. Pipes.
- [ODOT Standard Drawing PCDIP30-0](#) – Precast Concrete Drop Inlets for 30 Degree Skew 18" to 36" R.C. Pipes.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Shop (Working) Drawings for Precast Structures

When the Contractor proposes the use of precast drainage structures (manhole, inlet or junction box), the Contractor's manufacturer must submit their shop drawings to Roadway Design Division for approval. Section 105.02.A of the Standard Specifications includes "pre-cast structure drawings" on the list of items that require working drawings from the Contractor. And, Section 105.02.B requires working drawings being submitted to the appropriate Design Division. Approved manufacturers of the precast drainage structures on ODOT projects (as listed on the Materials Division [QPL-Drainage Conduits](#)) are aware of the process required for the approval of the working/shop drawings.

The Resident Engineer will be notified (copied on correspondence with Contractor) when the shop drawings have been approved by Roadway Design Division. The Residency will verify that the proposed manufacturer shown on the approved shop drawings is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the Precast Concrete Drainage Structure list. If the proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

The residency project inspector will verify that the units were manufactured by the approved source and that they were inspected on-site during fabrication by verifying the inspection stamp on units delivered to the project site ([markings](#)).

3. Contractor Proposed Methods and Equipment

Precast concrete units are typically allowed in lieu of brick masonry or cast-in-place concrete unless otherwise shown on the Plans. Brick masonry for the construction or rebuilding of sanitary sewer manholes is not allowed as stated in Section 611.02.A of the Standard Specifications and [ODOT Standard Drawing MJB-4](#).

Discuss the type of construction proposed by the Contractor for the various types of structures required on the project. When using precast concrete units, the Contractor must provide specialized equipment capable of off-loading, handling, and placing the largest single unit or subassemblies. Ensure lift devices and connection points are safe for handling above ground and in the inlet excavation.

4. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and

- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

5. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

611.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the pay items included in the contract for various manhole, inlet and junction box items that are listed. Review the material requirements in the relevant sections of Chapter 700, “Materials” of the Standard Specifications that pertain to the drainage structure construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant manhole, inlet and junction box pay items.

When the Contractor uses precast drainage structures (manhole, inlet or junction box), the Contractor’s manufacturer must submit their shop drawings to Roadway Design Division for approval as specified in Section 105.02 of the Standard Specifications. The Resident Engineer will be notified when the shop drawings have been approved by Roadway Design Division. The Residency will verify that the proposed manufacturer shown on the approved shop drawings is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the Precast Concrete Drainage Structure list.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Ensure the Contractor has submitted its proposed concrete designs in advance of any work beginning on the pay items utilizing PC concrete.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 611.02.C.4(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete plants in advance of any work beginning on the pay items utilizing PC concrete.

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 611.02.C.5(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials in advance of any work beginning on the relevant manhole, inlet or junction box pay items.

When the Contractor proposes the use of precast drainage structures (manhole, inlet or junction box), ensure the Contractor's manufacturer has submitted their shop drawings to Roadway Design Division for approval and the manufacturer of the precast units are on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)). If the project includes the installation of iron castings (frames & grates, manhole rings & covers, curb inlet openings, etc.), ensure the proposed source and product name for those items are also submitted.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

(a) PC Concrete and Reinforcing Steel for Manhole, Inlet or Junction Box Pay Items

Section 611.02 of the Standard Specifications requires Class A Concrete to be used for the construction of manhole, inlet or junction box items. The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.). Any revisions to the sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch plant.

The sources of materials for other components used in the construction of the PC concrete items (reinforcement steel, curing compound, joint sealers, etc.) must also be submitted to the Resident Engineer for acceptance. Any revisions to these sources should be reviewed for acceptance by the Resident Engineer prior to use in the PC concrete for manhole, inlet or junction box construction.

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the

product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Additionally, the ODOT Standard Drawings require the use of reinforcing steel in cast-in-place drainage structures.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]

- Verify the Curing Agents used on the PC concrete are listed on the [QPL-HC Concrete Curing Agents](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the cast-in-place drainage structures is listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) Precast Concrete Units

When the Contractor uses precast drainage structures (manhole, inlet or junction box), the Contractor's manufacturer must submit their shop drawings to Roadway Design Division for approval as specified in Section 105.02 of the Standard Specifications. The Resident Engineer will be notified when the shop drawings have been approved by Roadway Design Division. The Residency will verify that the proposed manufacturer shown on the approved shop drawings is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the Precast Concrete Drainage Structure list.

The residency project inspector will verify that the units were manufactured by the approved source and that they were inspected on-site during fabrication by verifying the inspection stamp on units delivered to the project site ([markings](#)).

(c) Portland Cement Mortar

When the Contractor uses brick masonry, the mortar must be composed of one part portland cement and two parts mortar sand by volume, mixed with water to form a plastic consistency. No more than 10 percent of the cement (by volume) may be substituted with hydrated lime. When used, the hydrated lime must be added to the cement first.

- Verify the Hydraulic Cements product and source used in the Portland Cement Mortar is listed on the [QPL-Hydraulic Cements](#).
- Verify the Mortar Sand product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#)).

(d) Iron Castings

When the project includes the installation of iron castings (frames & grates, manhole rings & covers, curb inlet openings, etc.), ensure the proposed source and product name for those items are on the Materials Division [QPL-Iron Castings](#). [Document in Template AM5004]

B. Equipment and Methods

Precast concrete units are typically allowed in lieu of brick masonry or cast-in-place concrete for the various types of structures required on the project, unless otherwise shown on the Plans.

In accordance with Section 611.03 of the Standard Specifications, when precast concrete units are being used on the project, the Contractor must provide specialized equipment capable of off-loading, handling, and placing the largest single unit or subassemblies. Ensure lift devices and connection points are safe for handling above ground and in the inlet excavation.

Section 611.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the various types of drainage structures. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment includes excavators and compactors for the excavation and compaction of the drainage structures and hand tools for construction of brick masonry or cast-in-place concrete units.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the manholes, inlets and junction boxes that are listed. Typically, the Contractor has the option of constructing these drainage structure items using precast units or cast-in-place with concrete or masonry brick (or a combination of the concrete and brick). Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various drainage structures that are required.

Ensure the Contractor installs the correct type of structure at the location shown in the Plans and verify the structure is placed to the elevations required in the Plans, unless otherwise directed by the Resident Engineer. The “Summary of Drainage Structures” sheet in the Plans includes the following information necessary to construct the manholes, inlets and junction boxes:

- Structure number,
- Description of structure (type and size),
- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,
 - flowline out of structure,
 - top of grate,
 - top of manhole

There are multiple various ODOT Standard Drawings pertaining to both cast-in-place and precast manholes, inlets and junction boxes. Ensure the Contractor complies with the applicable ODOT Standard Drawings for the drainage structure items included on the project. The various ODOT Standard Drawings for the drainage structures are:

- [ODOT Standard Drawing PSMD-2](#) – Precast Standard Median Drain.
- [ODOT Standard Drawing SMD-4](#) – Cast-in-Place Standard Median Drains (18” to 36” Pipes).
- [ODOT Standard Drawing CDIB-2](#) – Cast-in-Place Concrete Drop Inlets for R.C. Boxes (3’ x 2’ to 6’ x 6’).
- [ODOT Standard Drawing CDIB30-2](#) – Cast-in-Place Concrete Drop Inlets for 30 Degree Skew R.C. Boxes (3’ x 2’ to 6’ x 6’).
- [ODOT Standard Drawing CDIP-2](#) – Cast-in-Place Concrete Drop Inlet for 18” to 72” R.C. Pipes.
- [ODOT Standard Drawing CDIP30-2](#) – Cast-in-Place Concrete Drop Inlet for 30 Degree Skew 18” to 72” R.C. Pipes.
- [ODOT Standard Drawing GPI-5](#) – Cast-in-Place Grated Pipe Drop Inlet (18” to 42” Pipes).
- [ODOT Standard Drawing SSCD-4](#) – Storm Sewer Construction Details.
- [ODOT Standard Drawing PCI-1](#) – Precast Curb Inlet (Designs 1, 2 and 3).
- [ODOT Standard Drawing PJB-0](#) – Precast Junction Box (Keyed with Precast Curb Inlets).
- [ODOT Standard Drawing PGPI-0](#) – Precast Grated Pipe Drop Inlet.
- [ODOT Standard Drawing CI-2](#) – Cast-in-Place Curb Inlets.

- [ODOT Standard Drawing SSIF-5](#) – Storm Sewer Inlet Frames (Curb Inlets).
- [ODOT Standard Drawing CIG-4](#) – Cast Iron Grates (Curb Inlets).
- [ODOT Standard Drawing MFC-5](#) – Manhole Frame and Cover.
- [ODOT Standard Drawing MJB-4](#) – Cast-in-Place Manholes and Junction Boxes.
- [ODOT Standard Drawing PRM-1](#) – Precast Round Manhole.
- [ODOT Standard Drawing PSM-1](#) – Precast Square Manhole.
- [ODOT Standard Drawing PMD-1](#) – Precast Manhole Details.
- [ODOT Standard Drawing PCDIB-0](#) – Precast Concrete Drop Inlets for R.C. Boxes (4'x2' to 5'x5').
- [ODOT Standard Drawing PCDIB30-0](#) – Precast Concrete Drop Inlets for 30 Degree Skew R.C. Boxes (4'x2' to 5'x5').
- [ODOT Standard Drawing PCDIP-0](#) – Precast Concrete Drop Inlets for 18" to 36" R.C. Pipes.
- [ODOT Standard Drawing PCDIP30-0](#) – Precast Concrete Drop Inlets for 30 Degree Skew 18" to 36" R.C. Pipes.

Verify the following complies with Section 611.04 of the Standard Specifications and applicable ODOT Standard Drawings when constructing the manholes, inlets and junction boxes:

1. Concrete

Class A Concrete meeting the requirements of Section 701.01 of the Standard Specification is required when concrete is used for the construction of the manhole, inlet or junction box items. When constructing concrete bottoms for manholes, inlets and junction boxes, ensure the Contractor places the concrete to the dimensions and shape indicated in the applicable ODOT Standard Drawings. The surface must be trowelled to obtain a uniform, smooth, and impervious hard-fanned finish.

Ensure exposed concrete edges have at least a 1/2 in chamfer, or a rounded edge. Exposed concrete surfaces must be finished in accordance with Section 509.04.G of the Standard Specifications.

The temperature of the mixed PC concrete must be between 50 °F to 90 °F during the mixing, deliver, and placement. The PC concrete must be protected through all weather conditions (cold, hot, rain, etc.) until it has hardened.

(a) Manholes and Junction Boxes

In accordance with Note 3 on [ODOT Standard Drawing MJB-4](#), cast-in-place concrete walls with the same dimensions shown on the standard may be used in lieu of the brick masonry. When the cast-in-place wall exceeds

5 ft in height, the Contractor must use No. 4 reinforcing steel spaced at 30" vertically and 12" horizontally.

Additionally, [ODOT Standard Drawing MJB-4](#) requires the inside faces of sanitary sewer manhole walls to be sealed with a coating of material required by the governing municipality, which is typically not a mortar coating.

2. Clay Brick or Concrete Brick

In accordance with [ODOT Standard Drawing MJB-4](#), all sanitary sewer manholes shall be constructed only of Class A Concrete or precast concrete units. The typical brick masonry may be used for storm sewer manholes, curb inlets and junction boxes.

In accordance with Section 611.04.B of the Standard Specifications, when brick masonry is being used on the project, the Contractor must install stretchers every fifth course and headers for the remainder for brick masonry used in circular or curved walls with radii less than 2 ft. Ensure the thickness of the joints does not exceed 1/4 in vertical on inside faces or 3/8 in on horizontal faces. For brick masonry used in both straight and curved walls with radii at least 2 ft, headers must be installed every fifth course and stretchers for the remainder. Ensure the thickness of the joints does not exceed 3/8 in. Vertical joints must be constructed in subsequent courses half the length or width of the brick.

Ensure the Contractor lays the brick in a full bed of mortar and constructs shoved joints. The Department will not allow buttered joints.

Other requirements for the construction of brick masonry required in Section 611.04.B are as follows:

- For joints on the inside or exposed face of the masonry, rub the joints fully and cut as the brickwork is built up to ensure a smooth surface on the inside of the manhole, inlet or junction box.
- Build up the masonry in level courses true to the lines, grades, and dimensions shown on the Plans.
- Use bats to close joints around irregular openings as directed by the Resident Engineer.
- Thoroughly wet the brick immediately before placing.
- Clean and wet old brick masonry before joining new masonry to it.
- If the Contract requires a mortar coating, apply to the minimum thickness shown on the Plans. (NOTE: [ODOT Standard Drawing MJB-4](#), requires a 1/2" thick mortar coating be applied to exposed outside surface of manholes.)
- Apply the mortar coat while the brick masonry is clean and damp, then trowel to a uniform, smooth, impervious surface.

3. Pipe Connections

Verify the Contractor uses inlet and outlet pipe of the size shown on the Plans or as directed by the Resident Engineer. The lip of the female end of the pipe must be removed at the connection to a manhole, inlet or junction box. Ensure the end of the pipe (male or female end) is flush with the inside of the wall. The Contractor must tightly seal by trowelling the mortar flush for the entire circumference of the pipe in the wall.

4. Special Curb

Ensure the Contractor uses the same type of concrete as the regular curb if building curbs adjacent to sewer inlets or uses Class A concrete where no adjacent regular curb is being built. Verify the Contractor accurately shapes the forms for the curb opening to the dimensions and at the locations shown on the Plans. Ensure the forms remain in place for at least 3 days to cure the concrete, or longer as directed by the Resident Engineer.

5. Reinforcing Steel

When reinforcing steel is being used in the construction of the manholes, inlets or junction boxes, ensure it is being placed in accordance with Section 511 of the Standard Specifications and the Plans.

The ODOT Standard Drawings provide details regarding the placement of reinforcing steel in footings, lids and walls for manholes, inlets and junction boxes, including the following:

- In accordance with Note 3 on [ODOT Standard Drawing MJB-4](#), cast-in-place concrete manhole floors shall have No. 4 reinforcing steel placed at 6" maximum spacing in both directions.
- In accordance with Note 3 on [ODOT Standard Drawing MJB-4](#), cast-in-place concrete junction box floors and lids shall have No. 4 reinforcing steel placed at 6.5" and 18" maximum spacing the directions shown on the standard drawing. Junction boxes outside of the pavement and with no riser will have the reinforcing steel placed in the lid at 9" spacing in both directions.
- In accordance with Note 3 on [ODOT Standard Drawing MJB-4](#), cast-in-place concrete walls with the same dimensions shown on the standard may be used in lieu of the brick masonry. When the cast-in-place wall exceeds 5 ft in height, the Contractor must use No. 4 reinforcing steel spaced at 30" vertically and 12" horizontally.
- In accordance with Note 7 on [ODOT Standard Drawing CI-2](#), cast-in-place concrete inlet floors shall have No. 4 reinforcing steel placed at 16" maximum spacing in both directions.
- In accordance with Note 7 on [ODOT Standard Drawing CI-2](#), cast-in-place concrete walls with the same dimensions shown on the standard may be used

in lieu of the brick masonry. When the cast-in-place wall exceeds 5 ft in height, the Contractor must use No. 4 reinforcing steel spaced at 30" vertically and 12" horizontally.

6. Castings, Grate, and Drop Inlet Grates and Special Frames

Ensure the Contractor assembles and places castings, grates, special frames, and supports as shown on the Plans and ODOT Standard Drawings. The frames of manholes and covers, and inlets and grates must be embedded in a layer of mortar with a full bearing and set to the grade shown on the Summary of Drainage Structures (and verified with the P&P sheets) in the Plans.

Ensure the top of the casting is installed flush with the surrounding surface unless otherwise indicated in the Plans.

The exposed surfaces of special structural steel frames and supports must be finished in accordance with Section 506 of the Standard Specifications and as depicted in the approved shop drawings.

The [ODOT Standard Drawings](#) provide details regarding the castings, grates, special frames, and supports for manholes, inlets and junction boxes. Refer to the relevant Standard Drawings to find various details regarding the dimensions, configuration, fittings, placement, installation, etc.

7. Excavation and Backfill

In preparation for the installation of manholes, inlets and junction boxes, ensure the Contractor excavates to the depth shown on the Plans and compacts the base to a firm, even surface. Unsuitable material should be removed and replaced with suitable material and compacted as directed by the Resident Engineer.

Review any additional foundation requirements in the Plans and ODOT Standard Drawings. [ODOT Standard Drawing PCI-1](#) for precast curb inlets includes a note that states, "Foundation shall be moderately firm to hard in-situ soil or compacted fill material." Additionally, Note 11 on PCI-1 states in part that a 3" minimum thick leveling course material be placed under the precast units that extends 6" beyond the base area in all directions. The leveling course material shall be constructed with Aggregate Base Type A and the cost of the material is included in the price of the structure.

8. Precast Units

When using precast concrete units for manholes, inlets and junction boxes, the Contractor must provide specialized equipment capable of off-loading, handling, and placing the largest single unit or subassemblies. Ensure lift devices and connection points are safe for handling above ground and lowering in the excavated area for its final placement.

The Contractor must bed precast concrete units on a solid foundation at least 2” thick (minimum of 3” thick for curb inlets according to [ODOT Standard Drawing PCI-1](#)) that consists of clean, uniformly graded material capable of being mechanically leveled, leveled by flooding, or floated on a lean grout.

Do not allow the presence of clay balls or cement clumps in the foundation material. If using sand flooding or grout pouring for bedding, backfilling, or both, securely anchor each unit to prevent lateral or vertical movement. Immediately after placement, ensure the Contractor proceeds with backfilling the inlet excavation and compacts the backfill material using incremental layers or sand flooding.

Verify the Contractor places the entrance and exit conduits (round, oval, elliptical, arch pipe or concrete box) at the flowline elevations as shown on the Plans and approved shop drawings. Do not allow alterations of the elevation or angle to facilitate ease of installation.

When the precast units are installed within the limits of the pavement, ensure the Contractor sets precast concrete inlet units flush with, or slightly below, the top of the subgrade to prevent interference with the movement of the paving equipment. If precast concrete inlet assemblies are set at subgrade elevation, the Contractor must use a bedded brick (fired clay or concrete) leveling course to bring the inlet assembly to the final grade shown on the Plans. The Department will allow a formed and poured concrete collar to raise the inlet up to the necessary elevation. When a concrete collar is used, ensure the Contractor pins the collar to the inlet box and additional opening boxes as approved by the Resident Engineer.

Ensure precast concrete units provide a soil-tight connection between subassemblies and at each entrance or exit conduit blockout. If a unit is delivered with a blockout placed in error, or if a Plan revision renders a blockout unnecessary, the Contractor must clean the hole and fill with a concrete patch. For blockouts, the Department will allow a patch from a previous blockout hole securely grouted in place or poured, or placed using a dry-mix high-strength concrete.

The Contractor must use gasket material between subassemblies (individual units that are pieced together to form the full structure) and between the inlet unit and entrance/exit conduits. In accordance with Section 611.04.H of the Standard Specifications, the gasket/adhesive material used by the Contractor must be listed on the Materials Division’s Approved Products List for adhesive materials. If there is no APL/QPL for adhesive materials (which at the time of publication of this Manual, there is not), then the gasket material must be supplied by the manufacturer of the precast units and must conform to the requirements of Section 726.01.B of the Standard Specifications or as otherwise recommended by the manufacturer. Verify the manufacturer of the precast units is listed on the Materials Division [QPL-Drainage Conduits](#). Additionally, [ODOT Standard Drawing MJB-4](#) requires the inside faces of sanitary sewer manhole walls to be sealed with a coating of material required by the governing municipality, which is typically not a mortar coating.

The joints of precast units must be sealed in accordance with Section 613.04.H of the Standard Specifications to prevent water passage, including the following:

- Ensure the ends are fully inserted and the inner surfaces are flush when joining pipe conduit sections.
- Construct joints with mortar, cold applied mastic-rubber gaskets, or plastic joint material as shown on the Plans.
- Ensure the joints are concentric and reasonably watertight. Keep the inside of the pipe free of joint material.
- In accordance with Section 611.04.H, make joints with a single natural rubber or neoprene gasket or O-ring in accordance with the manufacturer's recommendations.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, structure number) and pay item(s) being installed (manhole, inlet and junction box items).
- Work being performed on the drainage structure items (excavating, brick masonry, pouring/placing concrete, placing precast units, installing grates, backfilling, etc.).
- Quantity of each pay item that is placed (EA, VF, CF).
- Temperatures of the PC concrete taken throughout the day (recorded in the Concrete Report).
- Receipt of haul tickets (electronic tickets) of PC concrete and quantity placed.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

Where specific methods of measurement are not defined in Section 611.05, refer to Section 109.01 of the Standard Specifications for clarification.

In accordance with Sections 611.06 of the Standard Specifications, there are several pay items for the various types of manhole, inlet and junction box pay items that might be used. Typically, the Residency will measure and pay for the items as follows:

- The various manhole and inlet pay items (including replacements of existing frames, covers, grates, cast iron hoods, etc.) are measured and paid by the Each (EA) for the number provided for each type and design. The contract will include pay items necessary for each type/size of manhole, inlet or frame/grate/cover required on the project; such as:
 - Inlet CI Design 2(B-D),
 - Precast Inlet (SMD-Type 1),
 - Manhole (4' Diameter),
 - Replacement of Inlet Grate,
 - Replacement of Manhole Frame and Cover,
 - etc.
- Manhole depth of wall in excess of 6' will be measured and paid as Additional Depth in Manhole by the Vertical Foot (VF). (Note: Section 611.05.B of the Standard Specifications define manhole depth of wall in excess of 5' will be measured and paid as Additional Depth in Manhole by the VF; however, the relevant ODOT Standard Drawings establishes 6' as the standard depth. And, in accordance with Section 105.04 of the Standard Specifications, the Standard Drawings take precedent over the Standard Specifications.)
- Inlet depth in excess of the minimum depth shown in the relevant ODOT Standard Drawings for the type of inlet constructed, will be measured and paid as Additional Depth in Inlet by the Vertical Foot (VF).
- *Junction Boxes* and *Special Manhole* pay items will be measured and paid by the Cubic Foot (CF). Measure the volume of 8" thick wall constructed and make deductions for openings (openings of 18" or less will not be deducted for the junction boxes). The residency will measure and pay for the concrete bottom for each structure (and lids when required for junction boxes) as *Class A Concrete, Small Structures* in accordance with Section 509.05 of the Standard Specifications as stated in Section 611.05 and [ODOT Standard Drawing MJB-4](#).

Document the completed items as follows:

(a) Each Unit of Measure Pay Items

Documentation of the relevant manhole, inlet and junction box pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations, select the 'New' button to create a new row for the selected pay item.

(b) Vertical Foot Unit of Measure Pay Items

Documentation of the relevant *Additional Depth of Manhole* or *Additional Depth of Inlet* pay item paid by the Vertical Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the measured quantity (VF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(c) Cubic Foot Unit of Measure Pay Items

Documentation of the *Junction Boxes* and *Special Manhole* pay items paid by the Cubic Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the measured quantity (CF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

611.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials, precast manufacturers and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Verify that manhole depth of wall in excess of 6' is measured and paid as *Additional Depth in Manhole* by the Vertical Foot (VF). (Note: Section 611.05.B of the Standard Specifications define manhole depth of wall in excess of 5' will be measured and paid as

Additional Depth in Manhole by the VF; however, the relevant ODOT Standard Drawings establishes 6' as the standard depth. And, in accordance with Section 105.04 of the Standard Specifications, the Standard Drawings take precedent over the Standard Specifications.)

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the manhole, inlet and junction box items are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Ensure the Contractor maintains temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments.

611 CHECKLIST – MANHOLES, DROP OR CURB INLETS, AND JUNCTION BOXES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant drainage structure pay items been identified and reviewed (manhole, inlet, junction box, replacement of frames/grates/covers, etc.)?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the proposed manufacturer submitted shop drawings to ODOT Roadway Design Division for any precast structures being used on the project?					
Is the proposed manufacturer of the precast structures and iron castings listed on the QPL?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete plants?					

Has the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement been discussed with the Contractor?					
Has the adequate compaction and leveling of the in situ soil material underneath all manholes, inlets and junction boxes been discussed with the Contractor?					
Has the aggregate base material used as a leveling course underneath all precast manholes, inlets and junction boxes been discussed with the Contractor?					
Have the requirements for type, location and elevations shown in the Summary of Drainage Structures in the Plans been discussed with the Contractor?					
Does the Contractor have a plan for installation and maintenance of temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Has the proper disposal of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.) been discussed with the Contractor?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete plants?					
Is the Contractor using the sources of materials and mix designs that have been accepted/approved by the Resident Engineer?					
Is the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement being achieved?					
Have samples of the aggregates used in the PC concrete been taken and tested in accordance with the FAST Guide?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Have the required fresh concrete samples and test been performed in accordance with the FAST Guide?					
Have all of the test results and confirmation of sources/products on the QPL been documented in SiteManager by the residency?					
Have the precast structure manufacturer's shop drawings been approved by ODOT Roadway Design Division for precast structures being used on the project?					
Is the proposed manufacturer of the precast structures and iron castings listed on the QPL?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Do the precast units delivered to the project site have a stamp verifying that they were inspected by the ODOT Materials Division?					
Has the Contractor adequately compacted and levelled the in situ soil material underneath all manholes, inlets and junction boxes?					
Has the Contractor placed 3" of aggregate base material used as a leveling course underneath all precast manholes, inlets and junction boxes?					
Is the Contractor placing the proper type of manholes, inlets and junction boxes at the locations shown on the Plans or as authorized by the Resident Engineer?					
Are the manholes, inlets and junction boxes being constructed to the elevations required by the Summary of Drainage Structures and P&P sheets in the Plans?					
Does the Contractor have lifting equipment capable of off-loading, handling, and placing the largest precast units without causing damage to them?					
When cast-in-place concrete is used in lieu of precast or masonry brick inlets and manholes, is reinforcing steel being used for walls exceeding 5' as required by the ODOT Standard Drawings?					
Is reinforcing steel being placed at the required spacing for concrete floors and lids on manholes, inlets and junction boxes?					
Are joints between precast units, pipes stubbed into inlet or manholes, etc., being sealed with adhesive gasket material and grout as required in the Standard Specifications and ODOT Standard Drawings?					
Are castings, grates, frames, fittings and supports being installed in accordance with the ODOT Standard Drawings for all manholes, inlets and junction boxes?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Is the Contractor adequately backfilling the manholes, inlets and junction boxes in a timely manner without causing damage to the structures?					
Is additional depth in manholes measured and paid for manhole walls exceeding 6' as required by the ODOT Standard Drawings?					
Does the Contractor have a plan for protection of the manhole, inlet and junction box items during construction equipment operations?					
Has the Contractor installed and maintained temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Is the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor place the proper type of manholes, inlets and junction boxes at the locations shown on the Plans or as authorized by the Resident Engineer?					
Were the manholes, inlets and junction boxes constructed to the dimensions and elevations required by the Summary of Drainage Structures and P&P sheets in the Plans?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Were joints between precast units, pipes stubbed into inlet or manholes, etc., sealed with adhesive gasket material and grout as required in the Standard Specifications and ODOT Standard Drawings?					
Were the manholes, inlets and junction boxes backfilled in a timely manner without causing any damage to the work?					
Was additional depth in manholes measured and paid for manhole walls exceeding 6' as required by the ODOT Standard Drawings?					
Has the Contractor taken adequate precautions to protect the completed manholes, inlets and junction boxes from damage from construction of the pavement?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Have all of the FAST Guide requirements for sampling & testing and documenting results in SiteManager been performed by the residency?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the Contractor install and maintain temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Did the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 612 – ADJUSTMENT OF EXISTING STRUCTURES

612.01 GENERAL

This work consists of adjusting, altering, relocating, resetting, and realigning existing structures, equipment, or appurtenances. This applies to public structures shown on the Plans to remain.

612.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of adjustments (rebuild, reset, adjust to grade, etc.) of the various types of existing structures (manhole, inlet, waterline, valve box, meter box, fire hydrant, etc.) pay items included in the Contract.
- Review plan notes and details of adjustments included in the Plans for the relevant pay items (type of adjustments, type of structures, planned locations, etc.).
- Proposed sources of material and material requirements, including any precast structures.
- Proposed mix designs and certified plants for concrete.
- Methods and equipment to be used.
- Structure foundation preparation and backfill requirements during construction.
- Contractor's schedule/plan for the work.
- Coordination with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances.
- Traffic control and maintenance of traffic during construction.

B. Acceptance of Materials

The Contractor must provide materials of an equivalent grade to the existing structure that is being adjusted, as shown on the Plans, or materials required by the Contract for similar work. Review the material requirements for the relevant sections of the Standard Specifications and any special provisions included in the contract or plan notes that pertain to the adjusting of existing structures pay items required in the Plans.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the adjusting of existing structures pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current

ODOT certification. The Residency will verify that the proposed sources of materials submitted by the Contractor for the products required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

C. Preparatory Work and Contractor Work Plans

Consider the following before adjusting, altering, relocating, resetting, or realigning existing structures or appurtenances construction work begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the various adjustments of existing structures that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various adjusting of existing structures pay items that are required.

The “Summary of Drainage Structures” sheet in the Plans includes the following information necessary to construct/adjust the manholes and inlets:

- Structure number,
- Description of structure (type and size),
- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,
 - flowline out of structure,
 - top of grate,
 - top of manhole

There are multiple various ODOT Standard Drawings pertaining to both cast-in-place and precast manholes and inlets. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the drainage structure items included on the project.

Other structures that require adjustments (waterline, sanitary sewer line, valve box, meter box, fire hydrant, etc.) should be detailed in the Plans for information related to the various adjusting of existing structures pay items that are required.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. Ensure the Contractor's proposed equipment complies with the requirements for adjusting of existing structures operations as specified in relevant sections of the Standard Specifications or required in the Plans.

2. Contractor Proposed Methods and Equipment

Section 612.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the various types of drainage conduits and end treatments. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Brick masonry or cast-in-place concrete is acceptable for the adjustments to manholes and inlets unless otherwise shown on the Plans. Brick masonry for the construction or rebuilding of sanitary sewer manholes is not allowed in accordance with Section 611.02.A of the Standard Specifications.

Discuss the type of construction methods proposed by the Contractor for the various types of structures required on the project. When removing and resetting units, the Contractor must provide specialized equipment capable of removing, handling, and placing the unit without causing any damage.

Discuss the need for coordination with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

612.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Ensure the Contractor provides materials of an equivalent grade to the existing structure that is being adjusted, as shown on the Plans, or materials required by the Contract for

similar work. Review the material requirements for the relevant sections of the Standard Specifications and any special provisions included in the contract or plan notes that pertain to the adjusting of existing structures pay items required in the Plans.

The Contractor should submit its proposed mix designs and sources of materials at the Preconstruction Meeting. If the mix designs and sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the adjusting of existing structures pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. The Residency will verify that the proposed sources of materials submitted by the Contractor for the products required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

During construction, verify that the previously submitted and accepted mix designs and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product approval.

B. Equipment and Methods

Section 612.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to adjust existing structures. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Brick masonry or cast-in-place concrete is acceptable for the adjustments to manholes and inlets unless otherwise shown on the Plans. Brick masonry for the construction or rebuilding of sanitary sewer manholes is not allowed in accordance with Section 611.02.A of the Standard Specifications.

Other structures that require adjustments (waterline, sanitary sewer line, valve box, meter box, fire hydrant, etc.) should be detailed in the Plans for information related to the various adjusting of existing structures pay items that are required.

Discuss the type of construction methods proposed by the Contractor for the various types of structures required on the project. When removing and resetting structures, ensure the Contractor provides specialized equipment capable of removing, handling, and placing the structure without causing any damage.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the various adjustments of existing structures that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various adjusting of existing structures pay items that are required.

The “Summary of Drainage Structures” sheet in the Plans includes the following information necessary to construct/adjust the manholes and inlets:

- Structure number,
- Description of structure (type and size),
- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,
 - flowline out of structure,
 - top of grate,
 - top of manhole

There are multiple various ODOT Standard Drawings pertaining to both cast-in-place and precast manholes and inlets. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the drainage structure items included on the project.

Other structures that require adjustments (waterline, sanitary sewer line, valve box, meter box, fire hydrant, etc.) should be detailed in the Plans for information related to the various adjusting of existing structures pay items that are required. Ensure the Contractor coordinates with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. Ensure the Contractor’s proposed equipment complies with the requirements for adjusting of existing structures operations as specified in relevant sections of the Standard Specifications or required in the Plans.

Verify the following complies with Section 612.04 of the Standard Specifications when adjusting existing structures required in the Plans:

1. General

When a project includes Department-provided electrical equipment, the Contractor must refurbish, reset and deliver the equipment to the project as specified in the Plans.

Existing structures must be adjusted, reset or rebuilt to the final grade shown on the “Summary of Drainage Structures” sheet in the Plans, or as approved by the Resident Engineer. When adjustments to existing structures in pavement is required in the Plans, those adjustments must be made after placing the final surface course.

Ensure the Contractor protects the altered, removed, or reset structure or appurtenance during transport and adjustment. The Contractor is required to repair or replace unprotected items damaged during transport or adjustment at no additional cost to the Department.

When required in the Plans, the Contractor must transport items from a storage site and reset the structure or appurtenance at no additional cost to the Department. All structures and appurtenances must be modified, cleaned, or repaired before resetting as shown on the Plans.

2. Adjustments to Existing Manholes

If the Contract requires the tops of the manholes to be lowered to a new grade, ensure the Contractor removes the walls and rebuilds the manholes in a manner that the maximum batter of the walls does not exceed 4” per foot.

When the Plans require an existing manhole to be raised 1 ft or less to the new grade, the walls of the manhole may be constructed vertically from the top of the battered section of the existing manhole.

When the Plans require an existing manhole to be raised more than 1 ft to the new grade, the walls of the manhole must be removed to the bottom of the batter section, or to an elevation at which the inside diameter of the manhole is at least 3 ft. Once the walls are removed down to that location, the Contractor will rebuild the walls in accordance with Section 611 of the Standard Specifications and [ODOT Standard Drawing MJB-4](#).

In accordance with Section 611.02 and [ODOT Standard Drawing MJB-4](#), all sanitary sewer manholes shall be constructed only of Class A Concrete or precast concrete units and brick masonry is not allowed.

3. Adjustments to Existing Inlets and Manholes

Existing inlets, manholes and similar structures must be adjusted, reset or rebuilt to the final grade shown on the “Summary of Drainage Structures” sheet in the Plans, or as approved by the Resident Engineer. Rebuilding of the inlets and manholes must be done in accordance with Section 611 of the Standard Specifications and the relevant ODOT Standard Drawings, such as [ODOT Standard Drawing MJB-4](#) and [ODOT Standard Drawing CI-2](#).

4. Adjustments to Existing Valve Boxes and Meter Boxes

When the Plans require adjustments to existing valve or meter boxes, the Contractor must reset and/or remove valve boxes and meter boxes to the grade shown on the Plans without causing any damage to the valve, meter or box. Damaged items must be replaced by the Contractor at no additional cost to the Department.

Ensure the Contractor coordinates with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances. Verify the adjusted box allows proper access to the valve or meter after it has been reset.

5. Adjustments to Existing Fire Hydrants, Valves, Water Meters, Waterlines, Manholes, Etc.

When the Plans require adjustments to existing fire hydrants, water valves, water meters, waterlines, sanitary sewer manholes, etc., the Contractor is required to coordinate the work with the owner (typically a municipality) of those facilities. Structures that require adjustments (waterline, sanitary sewer line, valve box, meter box, fire hydrant, etc.) should be detailed in the Plans for information related to the various adjusting of existing structures pay items that are required.

Ensure the public utility owner is involved prior to beginning any adjustment of the existing structures to relocate waterlines and reset water valves, meters, manholes, and fire hydrants. Ensure the Contractor performs the work on these items in accordance with the requirements of the owner and Section 616 of the Standard Specifications.

In accordance with [ODOT Standard Drawing MJB-4](#), the inside faces of sanitary sewer manhole walls are to be sealed with a coating of material required by the governing municipality which is typically not a mortar coating.

6. Adjustments to Existing Pipe Sewers

When the Plans require adjustments to existing sanitary sewer pipelines, the Contractor is required to coordinate the work with the public utility owner (typically a municipality) of the sanitary sewer facility. The sanitary sewer that

requires adjustment should be detailed in the Plans for information related to the required adjustment.

Ensure the Contractor coordinates with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances.

The Contractor must remove and relay pipe sewers and appurtenances in accordance with Section 615 of the Standard Specifications, which states in part that reference be made to the Oklahoma Department of Environmental Quality (ODEQ) Regulations, the manufacturers' recommendations, ASTM, ANSI, AWWA, and the Public Utility Owner for whom the work is to be performed for additional specifications. The Special Provisions, Plans, Public Utility Specifications, Supplemental, or Standard Specification will govern over the ODEQ minimum regulations.

Section 615 of the Standard Specifications includes details regarding the following:

- General construction methods (begin at the low point of the line and work up, complete the main line prior to lateral lines, etc.)
- Setting grade lines
- Excavation, bedding and backfilling
- Placing and joining pipe
- Field testing and inspection

7. Adjustments to Existing Waterlines

When the Plans require adjustments to existing waterlines, the Contractor is required to coordinate the work with the public utility owner (typically a municipality) of the waterline facility. The waterline that requires adjustment should be detailed in the Plans for information related to the required adjustment.

Ensure the Contractor coordinates with the public utility owner regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances.

The Contractor must remove and relay or lower waterlines and appurtenances in accordance with Section 616 of the Standard Specifications, which states in part to perform pipe and fitting work in accordance with the more stringent specifications or regulations from the public utility owner or the Oklahoma Department of Environmental Quality (ODEQ) Regulations.

Section 616 of the Standard Specifications includes details regarding the following:

- Material requirements for the pipe, jointing material and fittings
- Supplemental (Shop) Drawings for the pipe and fittings

- General construction methods (minimum separation between water and sewer lines, concrete blocking for various locations, etc.)
- Excavation, bedding and backfilling
- Placing and joining pipe
- Setting valves, hydrants, dead ends, etc.
- Connecting to existing lines and removal of abandoned lines
- Field testing and inspection

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, structure number) and pay item(s) being adjusted (manhole, inlet, valve, meter, hydrant, waterline, etc.).
- Work being performed on the existing structure adjustment items (excavating, brick masonry, pouring/placing concrete, installing grates, water or sanitary sewer line installation, backfilling, etc.).
- Quantity of each pay item that is placed (EA, LF).
- Any communications with the public utility owner.
- Temperatures of the PC concrete taken throughout the day (recorded in the Concrete Report).
- Receipt of haul tickets (electronic tickets) of PC concrete and quantity placed.
- Receipt of materials certifications.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

Where specific methods of measurement are not defined in Section 612.05, refer to Section 109.01 of the Standard Specifications for clarification.

In accordance with Sections 612.06 of the Standard Specifications, there are several pay items for the various types adjustment to existing structure pay items that might be used. Typically, the Residency will measure and pay for the items as follows:

- The various adjustment pay items (including adjust to grade, rebuilt, reset, remove & reset, relocation, etc.) are measured and paid by the Each (EA) for the number provided for each type of existing structure (manhole, inlet, valve, meter, valve box, meter box, fire hydrant, grate, frame & cover, etc.). The contract will include pay items necessary for each type of adjustment for each type of existing structure required on the project.
- The various adjustment of water and sanitary sewer line pay items (including lowered, removed & relaid, etc.) are measured and paid by the Linear Foot (LF) for each type and size of existing structures (diameter of waterlines and pipe sewers). The contract will include pay items necessary for each type of adjustment for the types and diameters of existing structures required on the project.

Document the completed items as follows:

(a) Each Unit of Measure Pay Items

Documentation of the relevant adjustment of existing structure pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations, select the 'New' button to create a new row for the selected pay item.

(b) Linear Foot Unit of Measure Pay Items

Documentation of the relevant adjustment of existing waterline or pipe sewer structure pay items paid by the Linear Foot will be performed within

the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the measured quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

612.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the adjusted existing structures are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Ensure the Contractor maintains temporary erosion control devices around drainage structures to protect them from collecting stormwater runoff sediments.

612 CHECKLIST – ADJUSTMENT OF EXISTING STRUCTURES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant adjustment of existing structure pay items been identified and reviewed (manhole, inlet, waterline, valve, meter, etc. required to rebuild, reset, adjust to grade, etc.)?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the adjustments to the existing structures been reviewed with the Contractor?					
Have the requirements for type, location and elevations shown in the Summary of Drainage Structures in the Plans been discussed with the Contractor?					
Has the public utility owner been contacted regarding any adjustments necessary for waterlines or sanitary sewer lines and their appurtenances?					
Has the method for rebuilding inlets and manholes (brick masonry or cast-in-place concrete) been discussed with the Contractor?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					

Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete plants?					
Has the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement been discussed with the Contractor?					
Has the adequate compaction and leveling of the in situ soil material underneath all manholes, inlets and water or sanitary sewer lines been discussed with the Contractor?					
Does the Contractor have a plan for installation and maintenance of temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Has the proper disposal of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.) been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant adjustment of existing structure pay items been identified and reviewed (manhole, inlet, waterline, valve, meter, etc. required to rebuild, reset, adjust to grade, etc.)?					
Is the Contractor complying with the requirements of the relevant ODOT Standard Drawings?					
Is the Contractor complying with the plan notes and details regarding the adjustments to the existing structures?					
Is the Contractor complying with the requirements for type, location and elevations shown in the Summary of Drainage Structures in the Plans?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor coordinating with the public utility owner for the adjustments necessary for waterlines or sanitary sewer lines and their appurtenances?					
Is the Contractor following the method for rebuilding inlets and manholes (brick masonry or cast-in-place concrete) as had been previously discussed?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs and PC concrete plants?					
Is the Contractor using the sources of materials and mix designs that have been accepted/approved by the Resident Engineer?					
Is the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement being achieved?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have all of the test results and confirmation of sources/products on the QPL been documented in SiteManager by the residency?					
Has the Contractor adequately compacted and levelled the in situ soil material underneath all manholes, inlets and water or sanitary sewer lines?					
Is the Contractor placing the proper type of manholes, inlets and junction boxes at the locations shown on the Plans or as authorized by the Resident Engineer?					
Are the manholes, inlets and junction boxes being adjusted to the elevations required by the Summary of Drainage Structures and P&P sheets in the Plans?					
Is reinforcing steel being placed at the required spacing for concrete floors on manholes and inlets?					
Are castings, grates, frames, fittings and supports being installed in accordance with the ODOT Standard Drawings for all manholes and inlets?					
Is the Contractor adequately backfilling the manholes, inlets and water/sewer lines in a timely manner without causing damage to the structures?					
Does the Contractor have a plan for protection of the manhole and inlet items during construction equipment operations?					
Has the Contractor installed and maintained temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Is the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor adjust the proper type of manholes, inlets and water/sewer lines at the locations shown on the Plans or as authorized by the Resident Engineer?					
Were the manholes, inlets and water/sewer lines adjusted to the dimensions and elevations required by the Summary of Drainage Structures and P&P sheets in the Plans?					
Were joints between precast units, pipes stubbed into inlet or manholes, etc., sealed with adhesive gasket material and grout as required in the Standard Specifications and ODOT Standard Drawings?					
Were the manholes, inlets and water/sewer lines backfilled in a timely manner without causing any damage to the work?					
Has the Contractor taken adequate precautions to protect the completed manholes, inlets and water/sewer lines from damage from construction of the pavement?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Did the Contractor install and maintain temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Did the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 613 – DRAINAGE CONDUITS

613.01 GENERAL

This work consists of installing new or removing and reinstalling existing pipe conduits, including the excavation and bedding or boring and jacking necessary for the following:

- Pipe underdrains and edge drains with inside diameter of at least 4 in; and
- Other pipe with inside diameter of at least 12 in, used in storm drains and culverts, or drainage conduits not defined as bridges.

613.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of drainage conduit, bedding materials and end treatment pay items included in the Contract.
- Review plan notes and details of installation included in the Plans for the relevant pay items (type drainage structures, planned locations, etc.).
- Review pay item notes included in the Plans for the relevant pay items (payment based on plan quantity, pay item includes cost of trench excavation & bedding material, etc.).
- Proposed sources of material and material requirements, including any precast structures.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Proposed mix designs and certified plants for concrete.
- Methods and equipment to be used.
- Weather limitations for construction.
- Pipe conduit foundation preparation and backfill requirements during construction.
- Contractor's schedule/plan for the work, including timely connection of outlet laterals for underdrain/edge drain and the timely backfill of pipe conduits.
- Traffic control and maintenance of traffic during construction.

B. Acceptance of Materials

Review the Plans and distinguish the pay items included in the contract for various types of drainage conduit (RCP, CGSP and PP), bedding materials (Class A, B, C and underdrain cover material) and end treatment (CET, PCES, SCES, etc.) items that are listed. Review the material requirements in the relevant sections of Chapter 700, "Materials" of the Standard Specifications that pertain to the drainage conduit and end treatment construction

performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant drainage conduit and end treatment pay items.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file

The Residency will verify that the proposed manufacturer/supplier of the drainage conduits shown on the Contractor's proposed source of materials is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the relevant product list. If the proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval. There are approved sources on the [QPL-Drainage Conduits](#) sorted and listed by each of the following products:

- Corrugated Metal Pipe (CMP) {this is for the Corrugated Galvanized Steel Pipe (CGSP) pay items},
- Corrugated Polyethylene/Polypropylene Pipe (PP), and
- Reinforced Concrete Pipe (RCP).

The residency project inspector will verify that the reinforced concrete pipe units that are delivered to the project site were manufactured by the approved source and that they were inspected by an ODOT representative on-site during fabrication by verifying the inspection stamp on each unit delivered to the project site ([markings](#)).

The Residency will verify that the proposed sources of materials submitted by the Contractor for the relevant class of bedding material required on the project are on the ODOT Materials Division [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed bedding material source is not on the approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

When the project includes *Culvert End Treatment* (CET) or *Sloped Concrete End Section* (SCES) or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. The Class A Concrete mix design must be reviewed for approval by the Resident Engineer as described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below. The proposed concrete plants must be reviewed for acceptance by the Resident Engineer as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

When the project includes edge drain pay items, the Contractor will need to provide separator fabric as specified in the ODOT Standard Drawing. The Residency will verify that the proposed manufacturer and product submitted by the Contractor for the separator fabric is listed on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)) on the Separator Fabric for Bases list in accordance with Section 712.05 of the Standard Specifications.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or the approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before drainage conduit construction work begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the various types of drainage conduits (RCP, CGSP and PP), bedding materials (Class A, B, C and underdrain cover material) and end treatment (CET, PCES, SCES, etc.) that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various drainage conduits, bedding materials and end treatments that are required.

The “Summary of Drainage Structures” sheet in the Plans includes the following information necessary to construct the drainage conduits and end treatments:

- Structure number,
- Description of structure (type, length and size),
- Type of end treatment,

- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,
 - flowline out of structure,

There are multiple various ODOT Standard Drawings pertaining to the various types of drainage conduits and end treatments. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the drainage conduit items included on the project. The various ODOT Standard Drawings for the drainage structures are:

- [ODOT Standard Drawing PED-4](#) – Pavement Edge Drain.
- [ODOT Standard Drawing PUD-4](#) – Pipe Underdrain Installation.
- [ODOT Standard Drawing CET3S-1](#) – Culvert End Treatment Single Pipe Installation 1 to 3 Safety Slope.
- [ODOT Standard Drawing CET4S-4](#) – Culvert End Treatment Single Pipe Installation 1 to 4 Safety Slope.
- [ODOT Standard Drawing CET6S-4](#) – Culvert End Treatment Single Pipe Installation 1 to 6 Safety Slope.
- [ODOT Standard Drawing CET3D-1](#) – Culvert End Treatment Double Pipe Installation 1 to 3 Safety Slope.
- [ODOT Standard Drawing CET4D-4](#) – Culvert End Treatment Double Pipe Installation 1 to 4 Safety Slope.
- [ODOT Standard Drawing CET6D-4](#) – Culvert End Treatment Double Pipe Installation 1 to 6 Safety Slope.
- [ODOT Standard Drawing PCES-5](#) – Prefabricated Culvert End Sections.
- [ODOT Standard Drawing SCES-4](#) – Sloped Concrete End Sections.
- [ODOT Standard Drawing CCI-1](#) – Concrete Culvert Installation (1 of 2 sheets).
- [ODOT Standard Drawing CCI-2](#) – Concrete Culvert Installation (2 of 2 sheets).
- [ODOT Standard Drawing MCI-1](#) – Metal Culvert Installation (1 of 3 sheets).
- [ODOT Standard Drawing MCI-2](#) – Metal Culvert Installation (2 of 3 sheets).
- [ODOT Standard Drawing MCI-3](#) – Metal Culvert Installation (3 of 3 sheets).
- [ODOT Standard Drawing TCI-1](#) – Thermoplastic Culvert Installation.
- [ODOT Standard Drawing PBB-1](#) – Pipe Bedding and Backfill.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Contractor Proposed Methods and Equipment

Discuss the type of construction methods proposed by the Contractor for the installation of the various types of drainage conduits required on the project. Section 613.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the various types of drainage conduits and end treatments. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The Contractor must provide equipment capable of off-loading, handling, and placing the conduit. Ensure the trench excavation is performed to the elevations and grades required for each specific structure as shown in the Plans. Ensure the Contractor has excavators capable of performing the trench excavation to the required dimensions (width, depth and grade) and the equipment needed to meet the compaction requirements for the bedding and backfill material required for each specific structure as shown in the Plans.

3. Contractor Proposed Mix Designs

When the project includes *Culvert End Treatment (CET)* or *Sloped Concrete End Section (SCES)* or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,

- Water source and test reports required by Section 701.04, “Water,”
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed Concrete Plants

When the project includes *Culvert End Treatment* (CET) or *Sloped Concrete End Section* (SCES) or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

613.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the Plans and distinguish the pay items included in the contract for the various types of drainage conduits (RCP, CGSP and PP), bedding materials (Class A, B, C and underdrain cover material) and end treatments (CET, PCES, SCES, etc.) that are listed. Review the material requirements in the relevant sections of Chapter 700, “Materials” of the Standard Specifications that pertain to the drainage conduit and end treatment construction performed. Review the Standard Specifications, Special Provisions and Plan Notes for applicable material requirements.

The Contractor should submit its proposed sources of materials, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant drainage conduit and end treatment pay items.

The Resident Engineer must review for acceptance the Contractor’s proposed mix designs, plants and sources of materials. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and plants must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

1. Contractor Proposed Mix Designs

When the project includes *Culvert End Treatment* (CET) or *Sloped Concrete End Section* (SCES) or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. Ensure the Contractor has submitted its proposed concrete designs in advance of any work beginning on the pay items utilizing PC concrete.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved

aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 613.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

When the project includes *Culvert End Treatment (CET)* or *Sloped Concrete End Section (SCES)* or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. Ensure the Contractor has submitted its proposed concrete plants in advance of any work beginning on the pay items utilizing PC concrete.

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 613.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials in advance of any work beginning on the relevant drainage conduit and end treatment pay items. The Residency will verify that the proposed manufacturer/supplier of the drainage conduits shown on the Contractor's proposed source of materials is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the relevant product list.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate

items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

(a) Drainage Conduit Pay Items

The Residency will verify that the proposed manufacturer/supplier of the drainage conduits shown on the Contractor's proposed source of materials is listed on the Materials Division Qualified Products List ([QPL-Drainage Conduits](#)), by verifying the source is listed on the relevant product list. If the proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval. There are approved sources on the [QPL-Drainage Conduits](#) sorted and listed by each of the following products:

- Corrugated Metal Pipe (CMP) {this is for the Corrugated Galvanized Steel Pipe (CGSP) pay items},
- Corrugated Polyethylene/Polypropylene Pipe (PP), and
- Reinforced Concrete Pipe (RCP).

The residency project inspector will verify that the reinforced concrete pipe units that are delivered to the project site were manufactured by the approved source and that they were inspected by an ODOT representative on-site during fabrication by verifying the inspection stamp on each unit delivered to the project site ([markings](#)).

- Verify the Reinforced Concrete Pipe (RCP) product and source delivered to the project is listed on the [QPL-Drainage Conduits](#). [Document in Template AM5002]
- Verify the Corrugated Metal Pipe (CMP) product and source delivered to the project is listed on the [QPL-Drainage Conduits](#). [Document in Template AM5001]
- Verify the Corrugated Polyethylene/Polypropylene Pipe (PP) product and source delivered to the project is listed on the [QPL-Drainage Conduits](#). [Document in Template AM5001]

(b) PC Concrete for End Treatment Pay Items

When the project includes *Culvert End Treatment* (CET) or *Sloped Concrete End Section* (SCES) or *Outlet Lateral Headwall* pay items, the Contractor will need to provide Class A Concrete as specified in the ODOT Standard Drawings. The sources of materials for the ingredients to produce PC concrete will be listed on the PC concrete mix designs (cement, aggregates, cement substitutes, admixtures, etc.). Any revisions to the

sources indicated on the PC concrete mix design should be reviewed for acceptance by the Resident Engineer prior to use by the concrete batch plant.

The sources of materials for other components used in the construction of the PC concrete items (reinforcement steel, curing compound, joint sealers, etc.) must also be submitted to the Resident Engineer for acceptance. Any revisions to these sources should be reviewed for acceptance by the Resident Engineer prior to use in the PC concrete for drainage conduit and end treatment construction.

The Residency will verify that the proposed source of materials for the ingredients to produce PC concrete submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

The Residency must perform and document the following acceptance tests/procedures as applicable:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Verify the Curing Agents used on the PC concrete are listed on the [QPL-HC Concrete Curing Agents](#). [Document in Template AM5001]

- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(c) Bedding Material

The Residency will verify that the proposed sources of materials submitted by the Contractor for the relevant class of bedding material required on the project are on the ODOT Materials Division [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed bedding material source is not on the approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

- Obtain a sample of the Class C Standard Bedding Material and verify the gradations comply with the applicable Section of the Standard Specifications (703.06 or 703.08). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Pipe Underdrain, Filter Sand and verify the gradations comply with the applicable Section 703.06 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Obtain a sample of the Pipe Underdrain Aggregate, Coarse and verify the gradations comply with the applicable Section 703.06 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))

(d) Separator Fabric for Edge Drain Pay Items

When the project includes edge drain pay items, the Contractor will need to provide separator fabric as specified in [ODOT Standard Drawing PED-4](#). The Residency will verify that the proposed manufacturer and product submitted by the Contractor for the separator fabric is listed on the Materials Division Qualified Products List ([QPL-Construction Fabrics](#)) on the Separator Fabric for Bases list in accordance with Section 712.05 of the Standard Specifications.

B. Equipment and Methods

Section 613.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the various types of drainage conduits and end treatments. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The Contractor must provide equipment capable of off-loading, handling, and placing the conduit. Ensure the trench excavation is performed to the elevations and grades required for each specific structure as shown in the Plans. Ensure the Contractor has excavators capable of performing the trench excavation to the required dimensions (width, depth and grade) and the equipment needed to meet the compaction requirements for the bedding and backfill material required for each specific structure as shown in the Plans.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the various types of drainage conduits (RCP, CGSP and PP) and end treatments (CET, PCES, SCES, etc.) that are listed. Review the Standard Specifications, Special Provisions and Plan Notes and determine additional details for the various drainage conduits and end treatments that are required.

Ensure the Contractor installs the correct type of structure at the location shown in the Plans and verify the structure is placed to the elevations required in the Plans, unless otherwise directed by the Resident Engineer. The "Summary of Drainage Structures" sheet in the Plans includes the following information necessary to construct the drainage conduits and end treatments:

- Structure number,
- Description of structure (type, length and size),
- Type of end treatment,
- Location of the structure,
- Pay items and quantities associated with the structure,
- Various relevant elevations,
 - flowline into structure,

- flowline out of structure,

There are multiple various ODOT Standard Drawings pertaining to the various types of drainage conduits and end treatments. Ensure the Contractor complies with the applicable ODOT Standard Drawings for the drainage structure items included on the project. The various ODOT Standard Drawings for the drainage conduits and end treatments are:

- [ODOT Standard Drawing PED-4](#) – Pavement Edge Drain.
- [ODOT Standard Drawing PUD-4](#) – Pipe Underdrain Installation.
- [ODOT Standard Drawing CET3S-1](#) – Culvert End Treatment Single Pipe Installation 1 to 3 Safety Slope.
- [ODOT Standard Drawing CET4S-4](#) – Culvert End Treatment Single Pipe Installation 1 to 4 Safety Slope.
- [ODOT Standard Drawing CET6S-4](#) – Culvert End Treatment Single Pipe Installation 1 to 6 Safety Slope.
- [ODOT Standard Drawing CET3D-1](#) – Culvert End Treatment Double Pipe Installation 1 to 3 Safety Slope.
- [ODOT Standard Drawing CET4D-4](#) – Culvert End Treatment Double Pipe Installation 1 to 4 Safety Slope.
- [ODOT Standard Drawing CET6D-4](#) – Culvert End Treatment Double Pipe Installation 1 to 6 Safety Slope.
- [ODOT Standard Drawing PCES-5](#) – Prefabricated Culvert End Sections.
- [ODOT Standard Drawing SCES-4](#) – Sloped Concrete End Sections.
- [ODOT Standard Drawing CCI-1](#) – Concrete Culvert Installation (1 of 2 sheets).
- [ODOT Standard Drawing CCI-2](#) – Concrete Culvert Installation (2 of 2 sheets).
- [ODOT Standard Drawing MCI-1](#) – Metal Culvert Installation (1 of 3 sheets).
- [ODOT Standard Drawing MCI-2](#) – Metal Culvert Installation (2 of 3 sheets).
- [ODOT Standard Drawing MCI-3](#) – Metal Culvert Installation (3 of 3 sheets).
- [ODOT Standard Drawing TCI-1](#) – Thermoplastic Culvert Installation.
- [ODOT Standard Drawing PBB-1](#) – Pipe Bedding and Backfill.

Verify the following complies with Section 613.04 of the Standard Specifications and applicable ODOT Standard Drawings when constructing the drainage conduits and end treatments items required in the Plans:

1. Type of Culvert Pipe and Bedding

Ensure the Contractor provides the types of drainage conduit pipe and bedding material specified in the Plans for each drainage structure. The drainage conduit pipe must meet the applicable requirements in Section 726 of the Standard

Specifications. The “Summary of Drainage Structures” sheet in the Plans includes the information necessary to construct the drainage conduits and end treatments.

In accordance with Section 613.02 of the Standard Specifications, when reinforced concrete pipe (RCP) pay items are included in the project, the RCP must be Class III unless otherwise required in the Plans. In accordance with Note 8 on [ODOT Standard Drawing CCI-2](#), Class I and Class II round RCP may be used in trenches outside the roadbed and street limits. And, in accordance with Note 15 on [ODOT Standard Drawing CCI-2](#), Class V round RCP must be used for all pipe used for jacking operations.

In accordance with Section 613.02 of the Standard Specifications and [ODOT Standard Drawing TCI-1](#), when polyethylene or polypropylene pipe conduit (PP) is used on the project, PP pipes with diameters greater than 60 inches will not be allowed.

If the type of pipe (RCP, CGSP and PP) required for the drainage conduit is not shown on the Plans, the type is optional. The Contractor must provide the same type of pipe for each application, unless the Resident Engineer approves an alternative in writing.

When the type of bedding material (Class A, Class B, etc.) is not specified in the “Summary of Drainage Structures” sheet in the Plans for each specific drainage structure, the type of bedding must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#). The four different types of bedding material shown on PBB-1 are as follows:

- Class A Bedding – CLSM or Class C Concrete around the pipe with a coarse aggregate base option for use under the pipe.
- Class B Bedding – Coarse aggregate around the pipe. Material options include Coarse Cover Aggregate (703.06), Coarse Aggregate Size 8 (701.06) or Aggregate Base Type A (703.01).
- Class C Bedding – Fine aggregate around the pipe. Material options include Filter Sand (703.06) or Class C Bedding Material (703.08).
- Class D Bedding – Native soil.

The following table from [ODOT Standard Drawing PBB-1](#) specifies the appropriate type of bedding for each type of drainage conduit pipe installed in various locations. Follow the requirements of the table, unless a higher class of bedding is specified in the “Summary of Drainage Structures” sheet in the Plans.

PIPE BEDDING CLASS/DESIGN TABLE							
TYPE OF PIPE	■ UNDER PAVING				OUTSIDE PAVING		
	CROSS DRAIN (NHS OR ADT > 6000 VPD)	CROSS DRAIN (OTHER)	STORM SEWER (NHS OR ADT > 6000 VPD)	STORM SEWER (OTHER)	CROSS DRAIN	SIDE DRAIN	STORM SEWER
REINFORCED CONCRETE PIPE	B	C	B	C	C	D	C
CORRUGATED GALV. STEEL PIPE (CGSP)	NA	B	NA	B	C	D	C
MILL (POLYMER) PRECOATED CGSP	NA	B	NA	B	C	D	C
CORRUGATED GALV. STRUCT. PLATE	NA	B	NA	B	C	D	C
ALUMINIZED (ALUMINUM COATED) TYPE II CSP	NA	B	NA	B	C	D	C
CORRUGATED HIGH DENSITY POLYETHYLENE / PVC	NA	A	NA	A	B	B	B
POLYVINYL CHLORIDE (SC 40/80 PVC)	NA	NA	NA	NA	NA	NA	NA
CORRUGATED POLYPROPYLENE PIPE (PP) ▲	B	B	B	B	C	D	C

■ WHEN THERE IS ANY POSSIBILITY OF THE PAVEMENT BEING WIDENED DURING THE LIFE OF THE DRAINAGE STRUCTURE, THE BEDDING SHALL MEET THE 'UNDER PAVING SECTION' CRITERIA FOR THE FULL EXTENT OF ANY ANTICIPATED EXPANSION TO THE FACILITY.

▲ BACKFILL WITH A MINIMUM OF TWO (2) FEET OF APPROVED BACKFILL MATERIAL.

Figure 613:1. Pipe Bedding Class/Design Table from ODOT Std. PBB-1

2. General Drainage Conduit Installation Requirements

Ensure the Contractor installs the correct type of structure at the location and alignment shown in the Plans and verify the structure is placed to the elevations and grades (percent slope of flowline) required in the Plans, unless otherwise directed by the Resident Engineer.

The Contractor must begin installing pipe conduits starting at the outlet or the lowest point of the line. If installing a main or submain drainage conduit with at least one lateral or tributary, ensure the Contractor constructs the tributary lines after completing the main or submain drainage conduit to ensure drainage during construction.

Ensure the Contractor maintains adequate drainage of the project site during construction operations. This is especially important when ponding water can stand on the roadway and impact the vehicles or when water can backup onto properties adjacent to the project. It is also helpful to the Contractor to maintain drainage and allow quicker drying time on embankments or subgrade that is being constructed.

The Contractor is responsible to protect the work, including drainage structures, from damage during construction. Cracked or deformed conduits must be replaced by the Contractor before final acceptance at no additional cost to the Department.

When installing drainage conduits, ensure the Contractor completes the work in accordance with the following requirements from Section 613.04.A:

- Join new and existing storm drain appurtenances as shown on the Plans or as approved by the Resident Engineer.
- Ensure storm drain conduits do not project beyond the inside wall of other sewers or sewer appurtenances.
- Install the invert or flow line of the drainage conduit to the grade line shown on the Plans, unless otherwise directed by the Resident Engineer.
- Establish the center and grade lines in the trench at intervals no greater than 25 ft.
 - The Department will allow an interval increase to 50 ft if using a laser device to establish the center and grade lines, except when establishing the center and grade lines of manholes or appurtenances, set the first interval at 25 ft.
- Seal drainage conduit dead ends, wyes, and tees by cementing stoppers in place.
- When temporarily stopping storm drain work, prevent trash or debris from entering conduits using a non-watertight stopper to close the end of conduits with diameters 24 in or less.

(a) Edge Drains

In accordance with Section 613.04.A of the Standard Specifications and [ODOT Standard Drawing PED-4](#), the edge drain conduit must be placed in an excavated trench lined with separator fabric. The pavement surfacing will be placed above the trench backfill as shown on the typical sections in the Plans. Splices required in the edge drain conduit and in the separator fabric must be completed in accordance with the manufacturer's recommendations. Elbow outlet fittings of high-impact polyethylene or equivalent material must be used to transition between the edge drain conduit and the edge drain outlet laterals.

The edge drain outlet laterals and headwalls must be placed on a smooth grade. The trenches may be backfilled and compacted with native soil material or as otherwise shown on the plans.

To minimize the risk of damage to the edge drain system, ensure the Contractor installs the outlet laterals and connections to the edge drain within 48 hr of placing the edge drain.

Damaged edge drain conduit must be repaired by the Contractor by splicing with an undamaged section of conduit at no additional cost to the Department. The Contractor must also protect existing pavement from damage during excavation and placement of pavement edge drain. Any damages must be repaired to the satisfaction of the Resident Engineer at no additional cost to the Department.

Before acceptance by the Resident Engineer, the Contractor must backfill the lateral outlet headwalls and clear the outlets of debris.

3. Excavation

The Contractor may only excavate as much trench for drainage pipe conduit as can be laid within 2 calendar days, unless otherwise directed by the Resident Engineer. And, the Contractor may only excavate as much trench for pavement edge drain conduit as can be set and backfilled in 1 calendar day.

After completing the embankment to the height required by the Contract (or at a minimum completed above the flow line elevation of the drainage conduit), the Contractor may begin to excavate trenches to place conduits in embankment fill.

Trenches must be excavated to the width shown on the Plans, from the bottom of the trench to at least 2 ft above the top of the conduit. The required trench width for each type and size of pipe conduit may be found on the applicable ODOT Roadway Standard (CCI-1, TCI-1, MCI-1, and MCI-3).

The Contractor must provide additional excavation to accommodate the bells at every joint of pipe conduit (primarily for joints of RCP). Ensure the size and depth of the additional excavation relieves any load on the bell and provides firm bedding under the conduit and adequate space to construct the joint.

Where a concrete cradle or refill is shown on the Plans, it shall be constructed as detailed in the Plans or as directed by the Resident Engineer.

The full length and width of the trench bottom must be compacted prior to placing the pipe conduit in the trench. Soft or unsuitable material encountered in the bottom of the trench must be removed and replaced with suitable material as directed by the Resident Engineer. For cross drains, the Contractor must excavate to a grade line with a longitudinal camber of the magnitude as shown on the Plans.

For projects that require borrow to complete the required embankments on the project, all suitable excavated material must be used in the backfill of the drainage conduit or planned embankment. Excess excavated soil material not used on the project as embankment or backfill becomes the property of the Contractor for removal and disposal in a manner approved by the Resident Engineer. The disposal of excess material will not be measured and paid for separately.

4. Bedding

When the type of bedding material (Class A, Class B, etc.) is not specified in the “Summary of Drainage Structures” sheet in the Plans for each specific drainage structure, the type of bedding must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications. The four different types of bedding material shown on PBB-1 and Section 703.08 are as follows:

- Class A Bedding – CLSM (701.19) or Class C Concrete (701.01) around the pipe with a coarse aggregate base option for use under the pipe.
- Class B Bedding – Coarse aggregate around the pipe. Material options include Coarse Cover Aggregate (703.06), Coarse Aggregate Size 8 (701.06) or Aggregate Base Type A (703.01).
- Class C Bedding – Fine aggregate around the pipe. Material options include Filter Sand (703.06) or Class C Bedding Material (703.08).
- Class D Bedding – Native soil with no particles larger than 3 in, no frozen lumps, and no excess moisture.

Underdrain bedding material must comply with the requirements shown on [ODOT Standard Drawing PUD-4](#) and Section 703.06 of the Standard Specifications. The two different types of bedding material shown on PUD-4 and Section 703.06 are as follows:

- Coarse Cover Aggregate – gradation meeting the requirements of Table 703:8 in Section 703.06.B(1) of the Standard Specifications.
- Filter Sand – gradation meeting the requirements of Table 703:9 in Section 703.06.B(2) of the Standard Specifications.

Edge drain bedding material must comply with the requirements shown on [ODOT Standard Drawing PED-4](#) and Section 703.06 of the Standard Specifications. The requirement of bedding material shown on PED-4 and Section 703.06 are as follows:

- Edge Drain Cover Aggregate – gradation meeting the requirements of coarse aggregate - size number 57 in Section 701.06 of the Standard Specifications.

5. Separator Fabric

When the project includes edge drain pay items, the Contractor will need to provide separator fabric as specified in [ODOT Standard Drawing PED-4](#). The Contractor must install the separator fabric in accordance with Section 325 of the Standard Specifications. Review Section 325 of this Construction Manual for details regarding the critical aspects of its installation. A few of those critical aspects include:

- Geotextiles are delivered in rolls covered with a protective wrapping. Make sure that the Contractor maintains the protective wrapping during shipment and storage, and elevates the geotextile off of the ground during storage to protect from the weather and ultraviolet light.
- Ensure that the location, elevation, and width of the edge drain trench are correct and the surfaces (bottom and sides) are free of soft spots or ruts and it is smooth and free of obstructions.
- Ensure the Contractor overlaps each transverse and longitudinal joint of the fabric at least 17 in. Ensure the fabric is placed so that the preceding roll overlaps the following roll in the direction the cover aggregate material is being spread.

6. Outlet Lateral Headwalls

When the project includes underdrain or edge drain pay items, the Contractor will need to provide outlet lateral headwalls as specified in [ODOT Standard Drawing PED-4](#). Note 10 on [ODOT Standard Drawing PUD-4](#) states that details for the outlet lateral headwall are found on the PED-4 Standard Drawing. The Contractor must construct the outlet lateral headwall at the locations shown in the Plans or as directed by the Resident Engineer. The outlet lateral headwall must be constructed with Class A Concrete meeting the requirements Section 509 of the Standard Specifications.

Additionally, in accordance with Section 613.04.G of the Standard Specifications the Contractor must provide and set marker posts at underdrain/edge drain pipe outlets as shown on the Plans. Details regarding the marker posts should be shown in the PED and PUD standard drawings. However, if there are no details shown in the Plans or standard drawings, then the type of marker would be optional. Historically, a 6 ft long, 7 in diameter wooden post was required that was painted yellow with reflective tape wrapped around the top. The post was embedded into the ground 40 in. But if there are no details shown, the Contractor could use a Code 3 Delineator or some other marker approved by the Engineer.

7. Rodent Screens

When the project includes underdrain or edge drain pay items, the Contractor will need to provide rodent screens as specified in [ODOT Standard Drawing PUD-4](#) and [ODOT Standard Drawing PED-4](#). Ensure the Contractor installs rodent screens in each underdrain outlet lateral line and fastens to the outlet end of the edge drain lateral pipe.

8. Placing Pipe

When placing reinforced concrete pipe (RCP) or any other type of pipe conduit that the ends of the joints of pipe are inserted one into the other, ensure the Contractor lays the joints with the bell end of the joint facing upstream.

Ensure the Contractor installs the correct type of structure at the location and alignment shown in the Plans and verify the structure is placed to the elevations and grades (percent slope of flowline) required in the Plans, unless otherwise directed by the Resident Engineer.

The pipe conduit must be placed on a compacted foundation of bedding material as required in the Plans or as otherwise approved by the Resident Engineer. When the type of bedding material (Class A, Class B, etc.) is not specified in the “Summary of Drainage Structures” sheet in the Plans for each specific drainage structure, the type of bedding must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#). Ensure the pipe conduit is properly installed to the center of the alignment, elevation and grade lines shown on the Plans. Ensure the conduit remains in its required location during its continued installation upstream and backfilling operation.

As the Contractor is placing the various types of pipe conduit, ensure they comply with the following requirements specified in Section 613.04.G of the Standard Specifications:

- Start laying the pipe at the outlet or the lowest point of the line and progress with the installation going upstream.
- Lower the pipe into the trench without dropping. Use hoisting equipment to place the pipe.
- Clean the inside of the barrel before lowering the pipes into the trench.
- Avoid damaging the pipe or trench. Replace damaged pipe or repair damaged trench at no additional cost to the Department.
- Ensure the bottom of the pipe contacts the shaped bedding along the entire length.
- Lay paved or partially lined pipe so the longitudinal centerline of the paved segment conforms to the flow line.
- When placing elliptical and elliptically reinforced pipes, ensure the major axis is within 5° of a horizontal plane through the longitudinal axis of the pipe.
- Do not fill or ram material under pipe to raise the pipe to grade.

When placing corrugated polyethylene/polypropylene pipe (PP), it is critical that the Contractor installs a non-flammable end section as required in the Plans. If a detail regarding the use of the non-flammable is not included in the Plans, ensure the Contractor complies with the requirements of Section 613.04.G which requires 1 ft of non-flammable end section (metal or RCP) for every 6 in of PP pipe diameter, not including any tapered section of the PP pipe.

(a) Underdrain and Edge Drain Installation

As the Contractor is placing the pipe underdrain or edge drains, ensure they comply with the following requirements specified in Section 613.04.G of the Standard Specifications:

- Embed underdrain/edge drain pipe in the bedding material and located at the center of the alignment, elevation and grade lines shown on the Plans.
- Lay perforated pipe with the perforations facing down.
- Place underdrain/edge drain pipe with a top of pipe identification marker facing up.
- Fasten metal rodent screens to the outlet end of the underdrain/edge drain pipe. Provide mesh screens with 1/2 in openings, fabricated of steel wire with diameters of 0.04 in, or 0.08 in after galvanization. Ensure the wire mesh meets the requirements of ASTM A 740 (2014).
- Permanently seal the dead end of the underdrain/edge drain pipe with end caps.

Ensure the Contractor provides outlet lateral headwalls as required in the Plans and as specified in [ODOT Standard Drawing PED-4](#). Note 10 on [ODOT Standard Drawing PUD-4](#) states that details for the outlet lateral headwall are found on the PED-4 Standard Drawing. The Contractor must construct the outlet lateral headwall at the locations shown in the Plans or as directed by the Resident Engineer.

Additionally, in accordance with Section 613.04.G of the Standard Specifications the Contractor must provide and set marker posts at underdrain/edge drain pipe outlets as shown on the Plans. Details regarding the marker posts should be shown in the PED and PUD standard drawings. However, if there are no details shown in the Plans or standard drawings, then the type of marker would be optional. Historically, a 6 ft long, 7 in diameter wooden post was required that was painted yellow with reflective tape wrapped around the top. The post was embedded into the ground 40 in. But if there are no details shown, the Contractor could use a Code 3 Delineator, or some other marker approved by the Engineer.

9. Joining Pipe Conduit

Ensure the ends are fully inserted and the inner surfaces are flush when joining pipe conduit sections.

Ensure the Contractor constructs joints of the pipe conduit with mortar, cold applied mastic-rubber gaskets, or plastic joint material as shown on the Plans or ODOT Standard Drawings. Ensure the joints are concentric and reasonably watertight. Keep the inside of the pipe free of joint material. Flexible pipe conduit must be

joined with an external or internal coupling device, or with a twist lock coupling system integrated into the wall of the conduit. Ensure the Contractor fastens the coupling system to the conduit and ensure the system does not release during installation, handling, and backfilling operations. The Resident Engineer will accept coupling systems based on the field conditions and will not accept systems that repeatedly release.

The Resident Engineer can approve or reject the coupling system, regardless of it being on the Material's Division Qualified Products List (QPL) based on the performance of the system.

When connecting PP pipe to non-flammable end sections (metal or RCP), ensure the Contractor installs the joint so that the connection forms a continuous line free from irregularities in the flow line of the structure. Ensure the resulting connection is both soil and water tight.

10. Backfilling Conduit

The Contractor must allow access to the trench for inspection of the conduit by the residency project inspector before backfilling the trench.

Ensure the pipe conduit section ends are fully inserted and has smooth inside joints and clean barrels. Before backfilling, the Contractor must replace misaligned, settled, or damaged pipes as directed by the residency project inspector. After inspection and approval by the Resident Engineer, the Contractor may proceed with placement of the backfill in the pipe trench with material as shown on the Plans.

When the type of bedding material (Class A, Class B, etc.) is not specified in the "Summary of Drainage Structures" sheet in the Plans for each specific drainage structure, the type of bedding must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications. Underdrain bedding material must comply with the requirements shown on [ODOT Standard Drawing PUD-4](#) and Section 703.06 of the Standard Specifications. Edge drain bedding material must comply with the requirements shown on [ODOT Standard Drawing PED-4](#) and Section 703.06 of the Standard Specifications.

Ensure the Contractor complies with the requirements for placing and compacting the bedding material as specified in Note 10 in the [ODOT Standard Drawing PBB-1](#), which states:

10. BEDDING MATERIAL CLASSES B, C, AND D SHALL BE PLACED IN 6" LAYERS. CLASSES C AND D BEDDING SHALL BE COMPACTED TO 95% MAXIMUM DENSITY AND CLASS B SHALL BE COMPACTED TO 98% STANDARD DENSITY. ALL COMPACTION OF BEDDING MATERIAL SHALL BE DONE USING HANDOPERATED EQUIPMENT ONLY.

Ensure the Contractor's method and equipment prevents displacement of or damage to the pipe conduit during the backfilling operation. Place standard bedding

material over pipes to the depth shown on the Plans or ODOT Standard Drawings. Place and compact backfill in accordance with the embankment requirements found in Section 202.04.B of the Standard Specifications.

Backfill corrugated polyethylene/polypropylene pipe (PP) with a minimum of 2 ft of approved backfill material in accordance with the latest ODOT Standard Drawing for standard pipe bedding ([ODOT Standard Drawing PBB-1](#)) and fill height tables for thermoplastic pipe installation ([ODOT Standard Drawing TCI-1](#)).

11. Jacking Pipe Conduit

When required in the Plans, the Contractor must install pipe conduit by jacking, boring, or pushing. Ensure the Contractor installs the correct type of structure at the location and alignment shown in the Plans and verify the structure is placed to the elevations and grades (percent slope of flowline) required in the Plans, unless otherwise directed by the Resident Engineer. The methods and equipment used by the Contractor for jacking and boring pipe conduit must be approved by the Resident Engineer. Prevent operations from interfering with existing underground utilities.

The Contractor will need to excavate pits for the jacking equipment if the grade of the pipe conduit at the jacking end is below the ground surface. Ensure the Contractor continuously dewater the pits until backfilling is complete. Ensure the disturbed area for the excavation of the bore pit is kept to a minimum.

Jacked, bored, or pushed pipe conduits must be installed at least 18 in below the ground line or subgrade. The Contractor must cut an “X” in the curb or surface above both sides of the pipe conduit crossings as approved by the Resident Engineer.

The use of a circulation medium (water or other fluids) in boring or jacking operations may only be done with the prior written approval of the Resident Engineer. Ensure the Contractor uses minimum pressure when applying the circulation medium. The circulation medium must be kept in the casing throughout jacking and boring operations.

The installation of pipe conduit by jacking under railroad embankments, highways, streets, or other facilities must be accomplished without interfering with operation of the railroad, highway, street, or other facility, and without damaging the embankment or structure.

Ensure the Contractor installs pipe conduit using jacking in accordance with the size, type, and class shown on the Plans. If the strength of the pipe conduit is not rated for the additional pressure of jacking operations, the Contractor must reinforce the pipe conduit to withstand jacking pressure at no additional cost to the Department.

As the Contractor is installing various types of pipe conduit by jacking, boring, or pushing, ensure they comply with the following requirements specified in Section 613.04.J of the Standard Specifications:

- If jacking or pushing pipe conduit with an inside diameter greater than 2 in under railroads, highways, streets, or other facilities, bore or remove the soil during the jacking or pushing operation.
- If jacking or pushing pipe conduit with an inside diameter of 36 in or less under railroads, highways, streets, or other facilities, install the pipe conduit using a combination of boring and jacking.
- Use a boring auger or bit with a diameter smaller than that of the pipe conduit.
- Jack the pipe conduit as the boring auger drills out the material.
- Bore no more than 1 ft ahead of the pipe conduit.

As the Contractor is jacking the pipe conduit, ensure they comply with the following equipment and methods requirements specified in Section 613.04.J of the Standard Specifications:

- Provide heavy duty jacks for installing the pipe conduit in the embankment.
- Apply even pressure to the jacks.
- Provide a jacking head, and bracing between the jacks and the jacking head to ensure the pipe conduit receives uniform pressure.
- Provide a jacking frame or backstop.
- Set the pipe conduit on guides braced together to support the sections of pipe conduit, and to direct it to the center and grade lines shown on the Plans.
- If pipe conduit sections are less than 6 ft long, place two sections in the guide frame at the same time. Lubricate the joints to minimize breakage.
- Place the jacking assembly in line with the grade of the pipe conduit.
- Push the pipe conduit through the embankment with jacks and excavate earth material ahead of the pipe conduit removing the material through the pipe conduit.

The excavation for the underside of the conduit, for at least one-third the circumference of the pipe conduit, shall conform to the contour and grade of the conduit. Ensure the excavated area conforms to the shape and grade of the conduit. Unless otherwise specified, create a clearance of 2 in or less for the upper half of the pipe conduit. The clearance is to be tapered down to zero at the point where the excavation conforms to the pipe conduit's shape.

The Department will allow a steel cutting edge around the head and for at least the upper two-thirds of the conduit and extending a short distance beyond the end of the conduit. Ensure the steel cutting edge is constructed and mounted and results in a clearance between the outside of the conduit and the undisturbed earth not exceeding 1/2 in. When excavating inside the pipe, the Contractor must not exceed

the outside diameter of the conduit or extend more than 12 in beyond the lead edge of the cutting head; this will provide for final trimming by the cutting edge and eliminates any void space except that clearance allowed above regarding the steel cutting head.

The jacking operations must be performed on each structure without interruption to prevent the pipe conduit from becoming firmly set in the embankment.

The Contractor must stop jacking operations at the first signs of caving and make corrections and install measures to prevent future caving before restarting, as approved by the Resident Engineer.

Grout must be used to fill cavities or voids created by jacking operations, as approved by the Resident Engineer. The Contractor must remove conduit damaged by jacking operations and replace at no additional cost to the Department.

12. Re-laying Culvert Pipe

When the Plans include the Re-laying Culvert Pipe pay items, the Contractor is responsible to clean the previously removed culvert pipe before re-laying. The installation of the pipe conduit must be done in accordance with Section 613.04.G of the Standard Specifications.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, structure number) and pay item(s) being installed (RCP, CGSP, PP, underdrain, edge drain, bedding material, end sections, outlet lateral headwall, etc.).

- Work being performed on the drainage structure items (excavating, placing pipe conduit, backfilling, boring & jacking pipe conduit, pouring concrete for outlet lateral headwall or end section installation, etc.).
- Quantity of each pay item that is placed (LF, EA, CY).
- Temperatures of the PC concrete taken throughout the day (recorded in the Concrete Report).
- Receipt of haul tickets (electronic tickets) of PC concrete and quantity placed.
- Receipt of materials certifications.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Sections 613.05 and 613.06 of the Standard Specifications, there are several pay items for the various types pipe conduit, end sections, types of bedding material and installation pay items that might be used. Review the pay item notes in the Plans for any items designated to include the cost of trench excavation or standard bedding materials or for the quantity to be based on the planned quantity. Separator fabric used in the installation of the edge drain will be measured and paid for in accordance with Section 325 of the Standard Specifications, as stated in Section 613.06.

Typically, the Residency will measure and pay for the items as follows:

- The residency will pay for different sizes, shapes and types of pipe conduit as separate pay items which are measured and paid by the Linear Foot (LF) for each size, shape and type of pipe conduit installed. The contract will include pay items necessary for each size, shape and type of pipe conduit required on the project, such as:
 - Various diameters or dimensions of pipe conduit (18", 22"x13", 14"x23", etc.),
 - Various shapes of pipe conduit (round, arch, elliptical, etc.),
 - Various types of pipe conduit (RCP, CGSP, PP, PVC, cast iron, etc.),
 - Various sizes and types of underdrain (6", perforated, non-perforated, etc.),
 - Various sizes and types of edge drain (6", perforated, non-perforated, etc.),
 - Various sizes of jacked conduit (2", 18", 36", etc.),
 - Various sizes and types of re-laying culvert pipe (18", 22"x13", 14"x23", etc.).

The residency project inspector will measure the length of drainage conduit, edge drain conduit, and edge drain outlet laterals along the centerline of the pipe conduit. Deductions in the measured length will be made for conduit

runs through manholes, inlets or special structures with diameter/dimension larger than 12 in. Wye branches in the pipe conduit and any structures with diameter/dimension less than 12 in will not be deducted from the field measured length of pipe conduit.

- The residency will pay for different sizes and types of pipe end sections as separate pay items which are measured and paid by the Each (EA) for each size and type of pipe end section installed. The contract will include pay items necessary for each size and type of pipe end section required on the project, such as:
 - Various shapes and dimensions of *Prefabricated Culvert End Section* (18" round, 22"x13" arch, 14"x23" elliptical, etc.),
 - Various types (dimensions and configurations) of *Culvert End Treatment* (Type A3, Type AA3, Type AAA3, Type B3, etc.),
 - Various shapes and dimensions of *Sloped Concrete End Section* (Type A3, Type AA3, Type B3, Type BB3, etc.),
 - Various shapes and dimensions of *Special End Section* of RCP (18" round, 22"x13" arch, 14"x23" elliptical, etc.),
 - Various shapes and dimensions of *Galvanized Steel Culvert End Section* (18" round, 21"x15" arch, 14"x23" elliptical, etc.),
 - *Outlet Lateral Headwall* for underdrain and edge drain conduit outlets.
- The residency will pay for the different classes of pipe standard bedding material as separate pay items which are measured and paid by the Cubic Yard (CY) for each class of bedding material installed. The contract will include pay items necessary for each class of bedding material required on the project, including:
 - *Standard Bedding Material, Class A* – CLSM or Class C Concrete around the pipe with a coarse aggregate base option for use under the pipe.
 - *Standard Bedding Material, Class B* – Coarse aggregate around the pipe. Material options include Coarse Cover Aggregate (703.06), Coarse Aggregate Size 8 (701.06) or Aggregate Base Type A (703.01).
 - *Standard Bedding Material, Class C* – Fine aggregate around the pipe. Material options include Filter Sand (703.06) or Class C Bedding Material (703.08).
 - *Standard Bedding Material, Class D* – Native soil, which does not have a pay item and is not measured for payment.
 - *Pipe Underdrain Cover Material* – includes both the coarse cover aggregate and the filter sand.
 - Aggregate Cover Material used for backfill of Edge Drain is included in the unit price for the edge drain and is not measured separately for payment, as stated on note 9 on ODOT Standard Drawing PED-4.

The residency project inspector will calculate the volume of standard bedding material Class A, Class B, and Class C using the theoretical cross-sectional area using the width of the trench and the height of the bedding material as shown on the Plans or Standard Drawings. The theoretical cross-sectional area of the embedded portion of the pipe using the outside diameter as shown on the Plans or Standard Drawings will be deducted from the total theoretical cross-sectional area of the bedding material. Then multiply the remaining cross-sectional area by the length of the pipe conduit completed in place. (NOTE: the deduction of the volume of the underdrain pipe is not required and that cross-sectional area of the underdrain pipe becomes measured as pipe underdrain cover material.)

- The residency will pay for the trench excavation pay item which is measured and paid by the Cubic Yard (CY) for each pipe conduit installed.
 - *Trench Excavation.* (NOTE: Trench excavation required for installation of Edge Drain is included in the unit price for the edge drain and is not measured separately for payment, as stated in the typical section notes on ODOT Standard Drawing PED-4.

The residency project inspector will calculate the volume of trench excavation by multiplying the width of the trench shown on the Plans, the length of the drainage conduit completed in place, and the trench depth determined as follows:

- Cut areas – the average depth from the lower excavation line to the finished subgrade shown on the Plans.
- Fill areas – the depth from the lower excavation line shown on the Plans to 2 ft above the drainage conduit.

In adjacent excavation and embankment areas, the residency project inspector will establish an equitable measurement elevation. The residency project inspector will establish the lower excavation line (used in determining the depth of trench excavation) by subtracting the thickness of the drainage conduit wall (as indicated in the relevant ODOT Standard Drawings) and the depth of bedding material below the outside surface of the drainage conduit shown on the Plans from the flow line elevation shown on the Plans. (NOTE: additional details may be found in the relevant ODOT Standard Drawings.)

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the relevant size, shape and type of pipe conduit pay items paid by the Linear Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item (underdrain, edge drain, RCP, CGSP, PP, round, arch, elliptical, jacked conduit, etc.) from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the measured quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

Documentation of the relevant size and type of pipe end sections pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item (CET, SCES, prefabricated end section, round, arch, elliptical, outlet lateral headwall, etc.) from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional structures or additional locations, select the 'New' button to create a new row for the selected pay item.

(c) Cubic Yard Unit of Measure Pay Items

Documentation of the relevant trench excavation or class of pipe standard bedding material pay items paid by the Cubic Yard will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate trench excavation or class of bedding material (Class A, B or C or pipe underdrain cover material) pay item from the list of contract pay items.
2. In the appropriate field, enter the station for each item, a descriptive location or the structure number(s) for each item being installed.
3. In the Placed Quantity field, enter the calculated quantity (CY) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

613.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Ensure the pay item notes in the Plans for items designated to include the cost of trench excavation or standard bedding materials or for the quantity to be based on the planned quantity are addressed as specified by the residency for all relevant pay items.

Verify the separator fabric used in the installation of the edge drain was measured and paid for in accordance with Section 325 of the Standard Specifications, as stated in Section 613.06. Confirm the trench excavation and aggregate cover material used for the installation and backfill of edge drain was not measured separately for payment, due to both being included in the unit price for the edge drain and is as stated on [ODOT Standard Drawing PED-4](#).

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

C. Protection of the Work

Ensure the various pipe conduit and end section structures are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department. Ensure the Contractor sets marker posts at the outlets of the underdrain and edge drain conduits to reduce the risk of future damage during right-of-way mowing operations.

Ensure the Contractor maintains temporary erosion control devices around drainage structures to protect them from collecting stormwater runoff sediments.

613 CHECKLIST – DRAINAGE CONDUITS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant pipe conduit, bedding material and end sections pay items shown in the Plans been identified and reviewed?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the pipe conduit, bedding material and end sections pay items been reviewed with the Contractor (payment based on plan quantity, items that include the cost of trench excavation & bedding, etc.)?					
Have the requirements for type, location, elevations and profile grades shown in the Summary of Drainage Structures in the Plans been discussed with the Contractor?					
Have the types of bedding material (Class A, B, C and D) for each structure been discussed?					
Has the method for re-laying culvert pipe (removals without damaging, cleaning pipe prior to re-laying, etc.) been discussed with the Contractor?					
Have the sources of materials (pipe conduit supplier, bedding material, etc.) been submitted by the Contractor?					
Have the sources of materials been verified on the QPL and approved aggregates lists?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					

Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Has the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement been discussed with the Contractor?					
Has the adequate compaction and leveling of the bedding material underneath pipe conduit been discussed with the Contractor?					
Have the timeliness requirements for the installation of outlet laterals and connections to underdrain/edge drain been discussed?					
Have the requirements for installing rodent screens, outlet lateral headwalls and marker posts on underdrain/edge drain outlets been discussed with the Contractor?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor have a plan for installation and maintenance of temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Has the proper disposal of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.) been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant pipe conduit, bedding material and end sections pay items shown in the Plans been identified and reviewed ?					
Is the Contractor complying with the requirements of the relevant ODOT Standard Drawings?					
Is the Contractor complying with the plan notes and details regarding the pipe conduit, bedding material and end sections pay items?					
Is the Contractor complying with the requirements for type, location, elevations and profile grades shown in the Summary of Drainage Structures in the Plans?					
Is the Contractor using the required types of bedding material (Class A, B, C and D) for each structure?					
Is the Contractor following the method for re-laying culvert pipe (removals without damaging, cleaning pipe prior to re-laying, etc.) as had been previously discussed?					
Have the sources of materials (pipe conduit supplier, bedding material, etc.) been submitted by the Contractor?					
Have the sources of materials been verified on the QPL and approved aggregates lists?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Is the Contractor using the sources of materials and mix designs that have been accepted/approved by the Resident Engineer?					
Is the required temperature of the mixed PC concrete being between 50 °F to 90 °F during the mixing, deliver, and placement being achieved?					
Have samples of the aggregates used in the PC concrete been taken and tested in accordance with the FAST Guide?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Have the required fresh concrete samples and test been performed in accordance with the FAST Guide?					
Have all of the test results and confirmation of sources/products on the QPL been documented in SiteManager by the residency?					
Do the precast units (RCP, etc.) delivered to the project site have a stamp verifying that they were inspected by the ODOT Materials Division?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor excavating the trench for the pipe conduit to the width and depth required on the Plans and ODOT Standard Drawings?					
Has the Contractor adequately compacted and levelled the bedding material underneath all pipe conduits?					
Is the Contractor placing the proper type of pipe conduit, bedding material and end sections at the locations shown on the Plans or as authorized by the Resident Engineer?					
Is the Contractor starting at the outlet or lowest point of the pipe conduit and laying the pipe going upstream?					
Are the pipe conduits being installed to the elevations and profile grades required by the Summary of Drainage Structures and P&P sheets in the Plans?					
Are joints in the pipe conduit being fully inserted and sealed with adhesive gasket material or coupling systems as required in the Standard Specifications and ODOT Standard Drawings?					
Is the Contractor installing a non-flammable end section to all PP conduit?					
Is the perforated underdrain/edge drain pipe being installed with the perforations facing down?					
Is the Contractor installing the separator fabric in the edge drain trench in accordance with the ODOT Standard Drawing?					
Is the boring and jacking equipment and methods resulting in acceptable installation that meets the requirements of 613.04.J including not causing any damage to the pipe conduit?					
Are end sections being installed in accordance with the ODOT Standard Drawings?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor adequately backfilling the pipe conduit in a timely manner without causing damage or misaligning the joints in the conduit?					
Is the Contractor complying with the timeliness requirements for the installation of outlet laterals and connections to underdrain/edge drain?					
Did the Contractor install the rodent screens and outlet lateral headwalls to the underdrain/edge drain outlets?					
Did the Contractor install marker posts at the underdrain/edge drain outlets?					
Does the Contractor have a plan for protection of the pipe conduit and end sections during construction equipment operations?					
Has the Contractor installed and maintained temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Is the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor install the proper type, shape and size of pipe conduit at the locations shown on the Plans or as authorized by the Resident Engineer?					
Did the Contractor install the proper bedding material for each structure at the locations shown on the Plans or as authorized by the Resident Engineer?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor install the proper type, shape and size of end sections at the locations shown on the Plans or as authorized by the Resident Engineer?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Was the pipe conduit installed to the elevations and profile grades required by the Summary of Drainage Structures and P&P sheets in the Plans?					
Were joints in the pipe conduit sealed with adhesive gasket material or coupling system as required in the Standard Specifications and ODOT Standard Drawings?					
Were the pipe conduit lines backfilled in a timely manner without causing any damage to the work or misaligning the joints in the conduit?					
Has the Contractor taken adequate precautions to protect the completed pipe conduit lines and end sections from damage from construction of the pavement?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Did the Contractor install and maintain temporary erosion control devices around the drainage structures to protect them from collecting stormwater runoff sediments?					
Did the Contractor properly disposed of waste materials (concrete truck washout, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 614 – WICK DRAINS AND STRIP DRAINS

614.01 GENERAL

This work consists of installing prefabricated wick drains and strip drains.

Wick drains are placed vertically in an embankment to provide a ground improvement technique used to accelerate the consolidation of soft and yielding compressible soils by providing vertical drainage pathways. This technique may be used in lieu of or in conjunction with overbuilding an embankment with a soil surcharge and waiting months for the underlying compressible soil to consolidate over time.

Strip drains are placed horizontally along the edges of the embankment to collect water and channel it away from the pavement to minimize water saturation of the subgrade, similar to an underdrain/edge drain system. Some systems attach the strip drain to the wick drains to facilitate the performance of the wick drain system.

614.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Proposed sources of material and material requirements.
- Material certification (Type A and Type B material certifications) requirements.
- Review applicable special provisions included in the Contract and plan notes and details of installation included in the Plans for the relevant pay items (wick drains or strip drains).
- Installation and equipment requirements.
- Minimum experience requirement for installation of wick drains.
- Methods and equipment to be used.
- Splicing and backfill requirements.
- Review instrumentation monitoring devices required in conjunction with the installation of the wick drains.
- Contractor's schedule/plan for the work.
- Protection and maintenance of drains and instrumentation equipment during construction.

B. Acceptance of Materials

Review the material requirements for wick drains found in Section 614.02.A of the Standard Specifications and any special provisions included in the contract or plan notes that pertain to the wick drains required in the Plans. Review the material requirements for strip drains found in Section 614.02.B of the Standard Specifications and any special

provisions included in the contract or plan notes that pertain to the strip drains required in the Plans.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the wick drain and strip drain pay items.

The Resident Engineer must review for acceptance the Contractor's proposed products and sources of materials and products to ensure compliance with Section 614.02 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant wick drain and strip drain pay items included in the Plans. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

Unless otherwise required in the Plans or Contract, ensure the Contractor's proposed sources of materials and products comply with Section 614.02 of the Standard Specifications as follows:

1. Wick Drains

The Residency will verify that the proposed product and source of materials for the strip drain product submitted by the Contractor meet the requirements of Section 614.02.A of the Standard Specifications. Acceptable prefabricated wick drain products that are listed in Section 614.02.A include:

- Alidrain,
- Ameridrain (Type 407), or
- Mebra-Drain.

When using any of these products, the Contractor must submit a Type B Material Certification in accordance with Sections 106.04 and 614.02 of the Standard Specifications. The Type B Material Certification is a certification prepared by the manufacturer showing the limits of test values as determined by a Department approved manufacturer's laboratory, a qualified commercial laboratory, or another approved laboratory.

If the Contractor proposes an alternate product/source that is not listed in Section 614.02.A, they must submit samples and specification data sheets for evaluation at least one month prior to beginning work. The Resident Engineer may contact Materials Division to confirm the source/product as an approved equivalent product.

2. Strip Drains

The Residency will verify that the proposed product and source of materials for the strip drain product submitted by the Contractor meets the requirements of Section 614.02.B of the Standard Specifications.

The Contractor must provide a Type A Materials Certification for strip drains in accordance with Sections 106.04 and 614.02 of the Standard Specifications for tests, except for composite in-plane flow and compressive strength. For strip drain in-place flow and compressive strength, the Contractor must provide a Type B Materials Certification in accordance with Sections 106.04 and 614.02 of the Standard Specifications. Obtain a 9 ft sample of the strip drain from each lot or shipment and provide the samples to the ODOT Materials Division for inspection and testing.

The Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment. The Type B Material Certification is a certification prepared by the manufacturer showing the limits of test values as determined by a Department approved manufacturer's laboratory, a qualified commercial laboratory, or another approved laboratory.

C. Preparatory Work and Contractor Work Plans

Consider the following before wick drain or strip drain installation operation begin.

1. Contract Plans and Specifications

Review the Standard Specifications, Special Provisions and Plan Notes and determine any specific requirements that pertain to the wick drain and strip drain pay items on your project. Ensure the details regarding the installation and layout are reviewed with the Contractor prior to work commencing. Determine whether there are any instrumentation monitoring devices required in conjunction with the installation of the wick drains.

Discuss the minimum experience requirements for the installation of the wick drains that are specified in Section 614.04.A of the Standard Specifications. The minimum experience requirement consists of successfully completing three wick drain installation projects. Identify the three projects by project name, location, description, size, completion date, and contract manager.

Review the requirements of the pay items and materials being used and the related acceptance criteria. Ensure the Contractor's proposed equipment complies with the requirements for the installation of the wick drains and strip drains.

2. Handling and Storage of Materials

Review the requirements in the Plans and Standard Specifications regarding the packaging, storage and handling of the wick drain and strip drain materials. Ensure the Contractor is aware of all requirements and has a method to adequately store and handle the wick drains and strip drains.

3. Contractor Proposed Equipment and Methods

The Contractor may include the equipment needed to install the wick drains and strip drains in their submittals prior to beginning construction. In accordance with Section 614.03 of the Standard Specifications, the primary requirements for the equipment used to install the wick drains includes:

- Using equipment that will cause the least amount of subsoil disturbance during the installation operation.
- Using a sleeve or mandrel that intrudes into the soil.
- Provide a sleeve with a cross sectional area no greater than 12 in².
- Ensure the sleeve has an “anchor” rod or plate at the bottom to prevent the soil from entering the bottom of the sleeve during installation and to anchor the bottom of the drain when the sleeve is removed.
- To minimize disturbance to the subsoil, the sleeve may be intruded into the subsoil using static or vibratory methods; the Department will not allow impact methods.

The Contractor is required to submit the details of the sequence and method of installation to the Resident Engineer at least two weeks before installing the drainage wicks.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess excavation, litter, etc. (Do not allow the Contractor to place surplus materials near or in streams or waterways.)

614.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements for wick drains found in Section 614.02.A of the Standard Specifications and any special provisions included in the contract or plan notes that pertain to the wick drains required in the Plans. Review the material requirements for

strip drains found in Section 614.02.B of the Standard Specifications and any special provisions included in the contract or plan notes that pertain to the strip drains required in the Plans.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the wick drain and strip drain pay items.

The Resident Engineer must review for acceptance the Contractor's proposed products and sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

The Contractor must provide a Type A or B Material Certification for wick/strip drains in accordance with Sections 106.04 and 614.02 of the Standard Specifications. As stated in Section 106.04 of the Standard Specifications, the Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment. Type B Material Certification is a certification prepared by the manufacturer showing the limits of test values as determined by a Department approved manufacturer's laboratory, a qualified commercial laboratory, or another approved laboratory. Certifications must include:

- the project number,
- name of the Contractor,
- identification markings on shipment (when applicable), and
- for Type A Material Certifications required by the FAST Guide, the quantity of material being certified.

Type A and B Material Certifications must be approved by the ODOT Materials Division for compliance with the contract requirements. ODOT Materials Division will provide approved certifications to the Resident Engineer.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product approval.

If any materials used do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing materials will be handled (i.e., resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, etc.).

Unless otherwise required in the Plans or Contract, ensure the Contractor's proposed sources of materials and products comply with Section 614.02 of the Standard Specifications as follows:

1. Wick Drains

The Residency will verify that the proposed product and source of materials for the strip drain product submitted by the Contractor meet the requirements of Section 614.02.A of the Standard Specifications. Acceptable prefabricated wick drain products that are listed in Section 614.02.A include:

- Alidrain,
- Ameridrain (Type 407), or
- Mebra-Drain.

When using any of these products, the Contractor must submit a Type B Material Certification in accordance with Section 106.04 of the Standard Specifications.

If the Contractor proposes an alternate product/source that is not listed in Section 614.02.A, they must submit samples and specification data sheets for evaluation at least one month prior to beginning work. The Resident Engineer may contact Materials Division to confirm the source/product as an approved equivalent product.

2. Strip Drains

The Residency will verify that the proposed product and source of materials for the strip drain product submitted by the Contractor meets the requirements of Section 614.02.B of the Standard Specifications.

The Contractor must provide a Type A Materials Certification for strip drains in accordance with Section 106.04 of the Standard Specifications for tests, except for composite in-plane flow and compressive strength. For strip drain in-place flow and compressive strength, the Contractor must provide a Type B Materials Certification in accordance with Section 106.04 of the Standard Specifications. Obtain a 9 ft sample of the strip drain from each lot or shipment and provide the samples to the ODOT Materials Division for inspection and testing.

B. Equipment and Methods

Ensure the Contractor's equipment complies with the requirements of the Standard Specifications and all plan notes and details in the Plans. Section 614.03 of the Standard Specifications contains requirements for equipment that will be used to install the wick drains.

Ensure the Contractor's proposed equipment complies with the requirements for installation of the wick drains.

Verify the Contractor's equipment meets the requirements of Section 614.03 of the Standard Specifications as follows.

1. Equipment for Wick Drain Installation

In accordance with Section 614.03 of the Standard Specifications, the primary requirements for the equipment used to install the wick drains includes:

- Using equipment that will cause the least amount of subsoil disturbance during the installation operation.
- Using a sleeve or mandrel that intrudes into the soil.
- Provide a sleeve with a cross sectional area no greater than 12 in².
- Ensure the sleeve has an "anchor" rod or plate at the bottom to prevent the soil from entering the bottom of the sleeve during installation and to anchor the bottom of the drain when the sleeve is removed.
- To minimize disturbance to the subsoil, the sleeve may be intruded into the subsoil using static or vibratory methods; the Department will not allow impact methods.

The Contractor is required to submit the details of the sequence and method of installation to the Resident Engineer at least two weeks before installing the drainage wicks.

2. Miscellaneous Equipment for Strip Drain Installation

Section 614.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the strip drains. The Contractor will typically place the horizontal strip drains by hand or with light equipment to cover the areas shown on the Plans. Ensure the Contractor's method does not result in damage to the strip drains.

Provide the following miscellaneous equipment for the proper placement of the wick drains and strip drains:

- Auger or other method to loosen stiff upper surface soils before installing the wick drain.
- Excavation equipment to provide a level working platform for the installation of the wick drains and strip drains.
- Hand tools and kits provided with the wick drains and strip drains to splice units together.

C. Construction Operations

Wick drains are placed vertically in an embankment to provide a ground improvement technique used to accelerate the consolidation of soft and yielding compressible soils by providing vertical drainage pathways. This technique may be used in lieu of or in

conjunction with overbuilding an embankment with a soil surcharge and waiting months for the underlying compressible soil to consolidate over time.

Strip drains are placed horizontally along the edges of the embankment to collect water and channel it away from the pavement to minimize water saturation of the subgrade, similar to an underdrain/edge drain system. Some systems attach the strip drain to the wick drains to facilitate the performance of the wick drain system.

When the project includes instrumentation devices to monitor the settlement of the embankment, it is the Contractor's responsibility to protect the monitoring devices. The monitoring devices should be protected and marked to deter construction equipment from encountering them. The Contractor must replace damaged instrumentation devices at no additional cost to the Department.

Verify the following complies with Section 614.04 of the Standard Specifications when constructing the wick drains or strip drains required in the Plans:

1. Previous Qualifying Experience Installing Wick Drains

The Contractor must illustrate to the Resident Engineer that they meet the minimum experience requirement stated in Section 614.04.A of the Standard Specifications prior to beginning the installation of wick drains on the project. The minimum experience requirement consists of successfully completing three wick drain installation projects. The Contractor must provide information regarding the three projects including the project name, location, description, size, completion date, and Resident Engineer/contract manager.

2. Surface Preparation

The Contractor must construct a work platform to properly install the wick drains and strip drains. For the wick drains, the work platform must be stable and level enough to ensure that the drainage wicks are plum (does not deviate more than 4% from vertical) when intruded into the soil. For the strip drains, the work platform must be stable and level enough to ensure that the strip drains lay flat and straight with minimal slack.

The Contractor will keep the work platform in place and allow it to become part of the embankment.

3. Wick Drains

The Contractor's details for the sequence and method of installation must be submitted to the Resident Engineer at least two weeks before installing the wick drains. The Contractor must demonstrate that the equipment, method, and materials produce an installation that complies with the Contract before installing drainage wicks. Drainage wicks must be installed with equipment that will cause the least amount of subsoil disturbance during the installation operation. Trial wicks must

be installed at locations directed by the Resident Engineer for evaluation and approval prior to beginning the installation of the planned locations.

The Resident Engineer's approval of the method and equipment to install the trial wicks does not constitute acceptance of the method for the remainder of the Project. If the Resident Engineer decides the method of installation produces unsatisfactory wick, the Contractor must alter the method, equipment, or both.

The Contractor must install the drainage wick using a sleeve or mandrel that intrudes into the soil. Ensure the sleeve protects the wick material from tears, cuts, and abrasions during installation. The sleeve being used must have a cross sectional area no greater than 12 in². To minimize disturbance to the subsoil, the Contractor must intrude the sleeve into the subsoil using static or vibratory methods; impact methods are not allowed due to causing subsurface damage to the wick drain.

Ensure the sleeve has an "anchor" rod or plate at the bottom to prevent the soil from entering the bottom of the sleeve during installation and to anchor the bottom of the drain when the sleeve is removed.

Prior to beginning the installation of the wick drains, the Contractor must locate, number, and mark drainage wicks for quantity determination and the project records. Precautions must be taken to preserve the markings. Ensure drainage wick locations do not vary by more than 6 in from the locations shown on the Plans or directed by the Resident Engineer.

The Contractor must install drainage wicks from the working surface to the depth shown on the Plans or to a depth where the soil resists an effort at further penetration using equipment that meets the minimum requirements. The Resident Engineer may revise the Plan limits and vary the depths, spacing, or the number of wicks.

Prior to installing wick drains at each location, check the equipment for plumb before advancing each wick, and ensure it does not deviate by more than 4 percent from vertical.

To loosen stiff upper surface soils before installing the drainage wicks, the Contractor may use an auger or other methods, provided that the auger does not extend more than 2 ft into the soils.

The Resident Engineer will reject wicks that are visibly damaged or are out of place by more than 6 in. Damaged or out of place wick drains will need to be replaced to the satisfaction of the Resident Engineer at no additional cost to the project.

The Contractor must provide the residency project inspector with a means to determine the linear quantity of wick material at each wick location. During installation of the wick, provide a means of determining the depth of the drainage wick using the numbers and marking previously discussed. The project residency inspector should reach an agreement on the length of each wick drain location installed upon its completion.

Splices or connections of the drainage wick material must be made in a manner that ensures wick material continuity. Ensure a length of wick drain protrudes above the surface at each wick installation to secure the wick drain to the strip drain. The wick material must be neatly cut at the upper edge upon completion of each location.

Notify the Resident Engineer where obstructions are encountered below the working surface that cannot be penetrated using equipment meeting the minimum requirements. The Contractor must complete the drain from the elevation of the obstruction to the working surface. If it is determined that the length of the obstructed wick drain is insufficient, the Contractor will need to install a new wick drain located 18 in from the obstructed drain as directed by the Resident Engineer.

When the project includes instrumentation devices to monitor the settlement of the embankment, it is the Contractor's responsibility to protect the monitoring devices. The monitoring devices should be protected and marked to deter construction equipment from encountering them.

4. Strip Drains

Strip drains must be laid flat and straight with minimal slack. The Contractor must place strip drain products with a hard back and protrusions so the core back lies next to the ground with the studs pointing up. Ensure splices are neat and made in accordance with the manufacturer's recommendations using kits provided by the manufacturer. Ensure the Contractor secures the wick drains and strip drains and ensure the drains remain connected and in place throughout the construction process.

When proceeding with the embankment construction, the Contractor should use end dumping for the first layer of embankment to avoid damage to the drains from equipment traffic. The initial 2 ft of embankment should be placed as a "bridge lift" over the horizontal drains using low ground pressure equipment and light compaction to avoid damage to the underlying strip drain system.

When the project includes instrumentation devices to monitor the settlement of the embankment, it is the Contractor's responsibility to protect the monitoring devices. The monitoring devices should be protected and marked to deter construction equipment from encountering them. The Contractor must replace damaged instrumentation devices at no additional cost to the Department.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and

- Properly disposing of waste materials, excess excavation, litter, etc. (Do not allow the Contractor to place surplus materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, offset distance from centerline, descriptive location, etc.) and pay item(s) being installed (wick drain or strip drain).
- Work being performed on the wick drain or strip drain items (excavating work platform, installing drains, backfilling, etc.).
- Quantity of wick drain or strip drain installed (LF).
- Receipt of material shipping reports, invoices or certifications.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

Where specific methods of measurement are not defined in Section 614.05, refer to Section 109.01 of the Standard Specifications for clarification. In accordance with Section 614.05 of the Standard Specifications, the Resident Engineer will measure the length of prefabricated strip and wick drains along the centerline of the drain installed. Trial wick drains that were installed in an acceptable manner will be measured for payment.

Documentation of the prefabricated wick drain and strip drain pay items paid by the Linear Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the descriptive location or the station to station extents and location (i.e., direction, station extents, lane designation, etc.).
- c. In the Placed Quantity field, enter the measured quantity (LF) of the relevant prefabricated strip and wick drain pay items completed.
- d. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

614.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials which were submitted by the Contractor were utilized on the project. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and the products used do not appear to be in compliance with the requirements of Section 614.02 of the Standard Specifications, contact Materials Division to confirm the status of source/product approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the Contractor provides Type A or B Material Certification for wick/strip drains in accordance with Sections 106.04 and 614.02 of the Standard Specifications. Type A and B Material Certifications must be approved by the ODOT Materials Division for compliance with the contract requirements. ODOT Materials Division will provide approved certifications to the Resident Engineer.

B. Audit Requirements

Ensure the measured length of prefabricated strip and wick drains along the centerline of the drain installed for each location is documented by the residency project inspector. Trial wick drains that were installed in an acceptable manner will be measured for payment.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

C. Protection of the Work

Check that the wick drains and strip drains are satisfactorily maintained while embankment is placed. The Contractor must repair damage to or displaced drainage wicks caused by construction equipment traffic or improper installation, at no additional cost to the Department in a manner approved by the Resident Engineer.

When the project includes instrumentation devices to monitor the settlement of the embankment, it is the Contractor's responsibility to protect the monitoring devices. Ensure the monitoring devices are marked and protected to deter construction equipment from encountering them. The Contractor must replace damaged instrumentation devices at no additional cost to the Department.

614 CHECKLIST – WICK DRAINS AND STRIP DRAINS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed sources for wick drain and strip drain materials been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Is the Contractor proposing to use one of the acceptable wick drain product options listed in Section 614.02.A?					
Has the Type A Certification for the wick drain product been submitted by the Contractor and approved by the ODOT Materials Division for acceptance?					
Have the Type A and B Certifications for the strip drain product been submitted by the Contractor and approved by the ODOT Materials Division for acceptance?					
Has the Resident Engineer sent a response to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Has the minimum experience for wick drain installation been discussed with the Contractor?					
Does the project include instrumentation monitoring devices in conjunction with the installation of the wick/strip drains?					
Has the Contractor's schedule/plan for the work including the installation of trial wick drains been discussed?					
Have the equipment requirements for the installation of the wick drains been discussed with the Contractor?					
Have the splicing requirements for the wick drain and strip drain been discussed with the Contractor?					
Does the Contractor have a plan for protection and maintenance of drains and instrumentation equipment during embankment construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed sources for wick drain and strip drain materials been submitted by the Contractor and reviewed by the Resident Engineer and accepted?					
Has the Type A Certification for the wick drain product been approved by the ODOT Materials Division for acceptance and provided to the Resident Engineer?					
Have the Type A and B Certifications for the strip drain product been approved by the ODOT Materials Division for acceptance and provided to the Resident Engineer?					
Has the Resident Engineer sent a response to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Did the Contractor meet the minimum experience for wick drain installation specified in Section 614.04A?					
Does the project include instrumentation monitoring devices in conjunction with the installation of the wick/strip drains?					
Did the Contractor successfully install trial wick drains as required?					
Is the Contractor using equipment and methods (use of auger <2', anchor plate, static or vibratory methods, etc.) that meets the requirements for the installation of the wick drains?					
Is the Contractor using the sources of wick drains and strip drains that have been accepted by the Resident Engineer?					
Has the Contractor numbered, measured and marked the wick drains to be installed to enable quantity measurements and documentation of the wick drain once installed?					
Did the Contractor construct a level working platform to properly install the wick/strip drains?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Do the Contractor's splices for the wick drain and strip drain meet the requirements of the specifications and manufacturer's recommendations?					
Is the Contractor and residency project inspector verifying the quantity (LF) of each wick drain location installed?					
Is the Contractor placing the wick drains within 6" of the locations specified on the Plans and within 4% of vertical?					
Is the Contractor placing the strip drains at the locations and elevations specified on the Plans?					
Are the strip drains being placed flat and straight with minimal slack?					
Have the strip drains been adequately connected to the wick drains as shown on the Plans?					
Did the Contractor place an initial 2' thick "bridge lift" of embankment over the strip drains to avoid damage to the drains?					
Is the Contractor sufficiently maintaining the wick/strip drains during the placement of the embankment?					
Is the Contractor maintaining and protecting instrumentation equipment during embankment construction?					
Has the Contractor properly disposed of waste materials, drainage wick cutoff, etc.?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the sources of materials for the wick drains and strip drains that were accepted by the Resident Engineer?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Verify the receipt of the Type A and B Certifications approved by Materials Division for the wick/strip drains?					
Did the Contractor place the wick drains within 6" of the locations specified on the Plans and within 4% of vertical?					
Were the strip drains placed at the locations and elevations specified on the Plans?					
Were the strip drains placed flat and straight with minimal slack?					
Did the Contractor take adequate precautions to protect the wick/strip drains and instrumentation equipment during the embankment construction?					
Did the Contractor place an initial 2' thick "bridge lift" of embankment over the strip drains to avoid damage to the drains?					
Were any conditions requiring corrective action or maintenance (damaged wick/strip drain, damaged instrumentation equipment, etc.) addressed sufficiently by the Contractor?					
Did the Contractor and residency project inspector verify the quantity (LF) of each wick drain location installed?					
Did the Contractor properly dispose of waste materials, cutoffs, etc.?					

SECTION 615 – SANITARY SEWER PIPE CONDUITS

615.01 GENERAL

This work consists of constructing sanitary sewer pipelines. For additional specifications not covered in Plans, Special Provisions or Section 615 of the Standard Specifications, refer to the following:

- Oklahoma Department of Environmental Quality (ODEQ) Regulations,
- the manufacturers' recommendations,
- ASTM,
- American National Standards Institute (ANSI),
- American Water Works Association (AWWA), and
- the Public Utility Owner for whom the work is to be performed for additional specifications.

The Special Provisions, Plans, Public Utility Specifications, or Standard Specification will take precedence over the ODEQ minimum regulations.

615.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of sanitary sewer pay items (PVC pipe, service line, service connection, sewer leakage test, deflection test, etc.) included in the Contract.
- Review plan notes and details included in the Plans and special provisions in the Contract for the requirements (details of installation, material requirements, sequencing of work, etc.) of the relevant sanitary sewer pay items included in the Plans.
- Proposed sources of material and material requirements.
- Methods and equipment to be used.
- Contractor's method to provide connectivity in the sanitary sewer system and to collect and dispose of sewage that is discharged during construction.
- Excavation, bedding and backfill requirements during sanitary sewer installation.
- Elevation and grade control methods to be used.
- Inspection and field testing requirements.
- Contractor's schedule/plan for the work.
- Coordination with the public utility owner regarding installations, cut-offs and connections necessary for sanitary sewer lines.
- Traffic control and maintenance of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 615.02 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant sanitary sewer pay items included in the Plans.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant sanitary sewer pay items included in the Plans.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and products to ensure compliance with Section 615.02 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant sanitary sewer pay items included in the Plans. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

Unless otherwise required in the Plans or Contract, ensure the Contractor's proposed sources of materials and products comply with Section 615.02 of the Standard Specifications as follows:

1. Polyvinyl Chloride (PVC) Pipe and Fittings

In accordance with Section 615.02 of the Standard Specifications, the Contractor must provide the following:

- Polyvinyl Chloride (PVC) pipe bearing the seal of the National Sanitation Foundation (NSF) with a Standard Dimension Ratio (SDR) no greater than 35.
- Polyvinyl Chloride (PVC) pipe, fittings, and in-line tees that dimensionally conform to ASTM D 3034, with an SDR of 35.

In addition to the material requirements in Section 615.02 of the Standard Specifications, review any relevant plan notes and details included in the Plans and special provisions in the Contract for additional requirements that pertain to the materials required for the sanitary sewer pay items included in the Plans.

Ideally, the Contractor will submit their proposed sources of materials in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

C. Preparatory Work and Contractor Work Plans

Consider the following before sanitary sewer construction work begins.

1. Contract Plans and Specifications

Review the requirements in Section 615 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant sanitary sewer pay items included in the Plans.

2. Inspection, Field Testing and Acceptance

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the sanitary sewer construction.

Ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work and during all field testing.

3. Elevation and Grade Control for Sanitary Sewer Line Installation

Review the requirements in Section 615.04.A of the Standard Specifications regarding the methods and equipment required for setting the grade lines for the sanitary sewer lines.

Sanitary sewer lines are typically designed to function by gravity flow and improper installation will adversely affect the performance. Ensure the Contractor has a method to adequately establish the elevations and grade lines prior to beginning the sanitary sewer construction.

4. Contractor Proposed Methods and Equipment

Discuss the type of construction methods proposed by the Contractor for the installation of the sanitary sewer lines required on the project. Section 615.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the installation of the sanitary sewer lines. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The Contractor must provide equipment capable of off-loading, handling, and placing the conduit. Ensure the Contractor uses the surveying equipment necessary to perform the trench excavation to the elevations and grades required for each specific sanitary sewer line as shown in the Plans. Ensure the Contractor has excavators capable of performing the trench excavation to the required dimensions (width, depth and grade) and the equipment needed to meet the compaction requirements for the bedding and backfill material required for the sanitary sewer lines.

D. Safety and Environmental Issues

It is the Contractor's responsibility to make adequate provision for the sewerage of the system during construction. Ensure the Contractor has a method to adequately provide connectivity in the sanitary sewer system and to collect and dispose of sewage that is discharged during construction.

There are stringent ODEQ regulations regarding the required separation distance of sanitary sewer lines from water lines. The Plans should adequately address the separation distance requirements for all known water lines in place. When an unknown water line is encountered during the sanitary sewer installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and sanitary sewer design engineer when any condition is encountered where the minimum separation requirements are in doubt.

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, sanitary sewage, etc. (Do not allow the Contractor to place sanitary sewage or other materials near or in storm sewer structures, streams or waterways.)

615.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Ensure the Contractor complies with the material requirements found in Section 615.02 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the sanitary sewer pay items included in the Plans.

The Contractor should submit its proposed sources of materials at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant sanitary sewer pay items.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner and prior to installing any sanitary sewer. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

Unless otherwise required in the Plans or Contract, ensure the Contractor's proposed sources of materials and products comply with Section 615.02 of the Standard Specifications as follows:

1. Polyvinyl Chloride (PVC) Pipe and Fittings

In accordance with Section 615.02 of the Standard Specifications, the Contractor must provide the following:

- Polyvinyl Chloride (PVC) pipe bearing the seal of the National Sanitation Foundation (NSF) with a Standard Dimension Ratio (SDR) no greater than 35.
- Polyvinyl Chloride (PVC) pipe, fittings, and in-line tees that dimensionally conform to ASTM D 3034, with an SDR of 35.

Ensure the Contractor complies with any additional material requirements stated in plan notes and details included in the Plans and special provisions in the Contract for the sanitary sewer pay items included in the Plans.

B. Equipment and Methods

Section 615.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the sanitary sewer items. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the sanitary sewer construction includes:

- equipment capable of off-loading, handling, and placing the sanitary sewer lines,
- surveying equipment necessary to perform the trench excavation to the elevations and grades required for each specific sanitary sewer line as shown in the Plans,
- excavators capable of performing the trench excavation to the dimensions (width, depth and grade) required in the Plans, and
- equipment needed to meet the compaction requirements for the bedding and backfill material required for the sanitary sewer lines.

C. Construction Operations

Review the requirements in Section 615 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant sanitary sewer pay items included in the Plans.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the sanitary sewer construction.

Ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work and during all field testing.

Review all aspects of Section 615.04 of the Standard Specifications prior to beginning the sanitary sewer installation and ensure the Contractor complies with the requirements, including the following:

1. General Installation

The Contractor must begin construction of sanitary sewer pipe conduits at the outlet or low point of the line. If the construction involves the building of a main or submain pipe conduit with one or more laterals or tributaries, start construction of tributary lines after completing the main or submain pipe conduit to the point at which the tributary or laterals discharge into it.

It is the Contractor's responsibility to make adequate provision for the sewerage of the system during construction. Ensure the Contractor has a method to adequately provide connectivity in the sanitary sewer system and to collect and dispose of sewage that is discharged during construction. Ensure the Contractor makes all connections of sanitary sewers or sewer appurtenances to other sanitary sewers or to sewer appurtenances (manholes, special structures, etc.) as shown on the Plans, or approved by the Resident Engineer. Do not allow sewer pipe to project beyond the inside wall line of other sewers or sewer appurtenances.

Ensure the Contractor seals the dead ends of sewers, wyes, and tees by cementing stoppers in place when constructing ends. Ensure tight-fitting watertight stoppers or bulkheads are securely placed in or across the end of sanitary sewer lines.

2. Elevation and Grade Control

When setting the grade lines, ensure the Contractor uses the grade line shown on the Plans, Supplemental Drawings, or established by the Resident Engineer as the elevation of the invert (flowline) of the sewer pipe. It is critical to install the sanitary sewer pipe to the designed grades to ensure the gravity fed line functions as designed.

The grade line and alignment should be established using batterboards and a top line. When placing sanitary sewer pipe, ensure a top line (sighting cord) is maintained over a span of three-grade stakes. As each batterboard is erected, the top line must be verified to ensure the accuracy of the grade stakes and the batterboard setting. The residency project inspector must be kept informed by the Contractor of errors, discrepancies, or displacement of grade stakes.

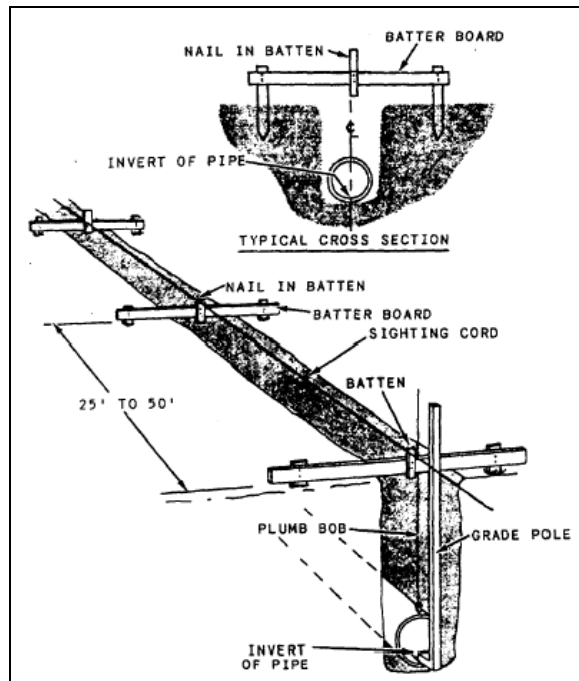


Figure 615:1. Batterboards and Top Line

Ensure the Contractor establishes the batterboards at intervals of no more than 25 ft. If a laser device establishes line and grade, the batterboard interval may be increased to 50 ft. Ensure the first batterboard is always set at 25 ft when laying out a manhole or appurtenance.

Any variation to these layout and survey requirements that are proposed by the Contractor must be approved by the Resident Engineer. The Contractor must demonstrate the accuracy and uniformity of any alternate methods.

3. Accommodating Waterline Mains and Minimum Separation

There are stringent ODEQ regulations regarding the required separation distance of sanitary sewer lines from water lines. The Plans should adequately address the separation distance requirements for all known water lines in place. When an unknown water line is encountered during the sanitary sewer installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and sanitary sewer design engineer when any condition is encountered where the minimum separation requirements are in doubt.

A summary of the ODEQ separation requirements are as follows:

- Horizontally place the sewer at least 10 ft from existing or proposed water mains and 50 ft from potable water wells.

- Where sewers cross water mains (either above or below), provide a vertical clearance of at least 2 ft.
- If a water main crosses under a sewer provide structural support to the sewer. Install sewer pipe joints at least 10 ft from water lines, unless otherwise approved by the Resident Engineer.
- When it is impossible to meet these horizontal and vertical separation requirements, construct and pressure test the sewer line to ensure it is watertight before backfilling.

4. Excavation and Bedding

In accordance with Sections 615.04.B and 615.04.C of the Standard Specifications, the excavation must be performed in accordance with Section 613.04.B and the bedding must be performed in accordance with Section 613.04.C of the Standard Specifications. The measurement and payment of the trench excavation and the bedding material will also be done in accordance with Section 613.05 and 613.06 of the Standard Specifications, unless otherwise noted in the Plans (such as the cost of those items to be included in the linear foot cost of the sanitary sewer pipe).

The Contractor may only excavate as much trench for sanitary sewer pipe as can be laid within 2 calendar days, unless otherwise directed by the Resident Engineer.

After completing the embankment to the height required by the Contract (or at a minimum completed above the flow line elevation of the sanitary sewer pipe), the Contractor may begin to excavate trenches to place pipe in embankment fill.

Trenches must be excavated to the width shown on the Plans, from the bottom of the trench to at least 2 ft above the top of the conduit. The required trench width for each type and size of sanitary sewer pipe may be found in the Plans.

The full length and width of the trench bottom must be compacted prior to placing the sanitary sewer pipe in the trench. Soft or unsuitable material encountered in the bottom of the trench must be removed and replaced with suitable material as directed by the Resident Engineer.

For projects that require borrow to complete the required embankments on the project, all suitable excavated material must be used in the backfill of the sanitary sewer pipe (when allowed) or planned embankment. Excess excavated soil material not used on the project as embankment or backfill becomes the property of the Contractor for removal and disposal in a manner approved by the Resident Engineer. The disposal of excess material will not be measured and paid for separately.

The type of bedding material required for the sanitary sewer pipe should be specified in the details shown in the Plans. The details may specify that the type of bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be

a unique embedment material specification. The four different types of bedding material shown on PBB-1 and Section 703.08 are as follows:

- Class A Bedding – CLSM (701.19) or Class C Concrete (701.01) around the pipe with a coarse aggregate base option for use under the pipe.
- Class B Bedding – Coarse aggregate around the pipe. Material options include Coarse Cover Aggregate (703.06), Coarse Aggregate Size 8 (701.06) or Aggregate Base Type A (703.01).
- Class C Bedding – Fine aggregate around the pipe. Material options include Filter Sand (703.06) or Class C Bedding Material (703.08).
- Class D Bedding – Native soil with no particles larger than 3 in, no frozen lumps, and no excess moisture.

5. Placing Pipe

Ensure the Contractor coordinates their sanitary sewer construction operation with the public utility owner regarding installations, cut-offs and connections necessary for sanitary sewer lines. Additionally, ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work while it is underway.

It is the Contractor's responsibility to make adequate provision for the sewerage of the system during construction. Ensure the Contractor maintains connectivity in the sanitary sewer system and collects and disposes of sewage that is discharged during construction.

In accordance with Section 615.04.D of the Standard Specifications, the placement of the sanitary sewer pipe must be performed in accordance with Section 613.04.G of the Standard Specifications.

Ensure the Contractor installs the correct type of sanitary sewer pipe at the location and alignment shown in the Plans and verify the pipe conduit is placed to the elevations and grades (percent slope of flowline) required in the Plans, unless otherwise directed by the Resident Engineer.

When placing a type of sanitary sewer pipe that the ends of the joints of pipe are inserted one into the other, ensure the Contractor lays the joints with the bell end of the joint facing upstream.

In accordance with Section 615.04.E of the Standard Specifications, the Contractor shall construct joints in accordance with the manufacturer's recommendations. Before joining pipes, ensure the Contractor cleans and dries the surfaces of the joint surface of the pipe. Trenches must be kept free of water until the joints become water tight. Realignment the pipe after completing the joint must be avoided unless the pipe is removed and a new joint is constructed.

The sanitary sewer pipe must be placed on a compacted foundation of bedding material as required in the details shown in the Plans or as otherwise approved by the Resident Engineer. The details may specify that the type of bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be a unique embedment material specification. Ensure the sanitary sewer pipe is properly installed to the center of the alignment, elevation and grade lines shown on the Plans. Ensure the sanitary sewer pipe remains in its required location during its continued installation upstream and backfilling operation.

As the Contractor is placing the sanitary sewer pipe, ensure they comply with the following requirements specified in Section 613.04.G of the Standard Specifications:

- Start laying the pipe at the outlet or the lowest point of the line and progress with the installation going upstream.
- Lower the pipe into the trench without dropping. Use hoisting equipment to place the pipe.
- Clean the inside of the barrel before lowering the pipes into the trench.
- Avoid damaging the pipe or trench. Replace damaged pipe or repair damaged trench at no additional cost to the Department.
- Ensure the bottom of the pipe contacts the shaped bedding along the entire length.
- Do not fill or ram material under pipe to raise the pipe to grade.

6. Backfilling

In accordance with Section 615.04.F of the Standard Specifications, the backfill of the sanitary sewer pipe must be performed in accordance with Section 613.04.I of the Standard Specifications. The measurement and payment of the backfill (bedding) material will also be done in accordance with Section 613.05 and 613.06 of the Standard Specifications, unless otherwise noted in the Plans (such as the cost of the bedding material item to be included in the linear foot cost of the sanitary sewer pipe).

The Contractor must allow access to the trench for inspection of the conduit by the residency project inspector before backfilling the trench.

Ensure the pipe conduit section ends are fully inserted and has smooth inside joints and clean barrels. Before backfilling, the Contractor must replace misaligned, settled, or damaged pipes as directed by the residency project inspector. After inspection and approval by the Resident Engineer, the Contractor may proceed with placement of the backfill in the pipe trench with material as shown on the Plans.

The type of bedding material required for the sanitary sewer pipe should be specified in the details shown in the Plans. The details may specify that the type of

bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be a unique embedment material specification.

When the type of bedding material required for the sanitary sewer pipe is a standard type specified in the [ODOT Standard Drawing PBB-1](#), ensure the Contractor complies with the requirements for placing and compacting the bedding material as specified in Note 10 in the [ODOT Standard Drawing PBB-1](#), which states:

10. BEDDING MATERIAL CLASSES B, C, AND D SHALL BE PLACED IN 6" LAYERS. CLASSES C AND D BEDDING SHALL BE COMPACTED TO 95% MAXIMUM DENSITY AND CLASS B SHALL BE COMPACTED TO 98% STANDARD DENSITY. ALL COMPACTION OF BEDDING MATERIAL SHALL BE DONE USING HANDOPERATED EQUIPMENT ONLY.

Ensure the Contractor's method and equipment prevents displacement of or damage to the pipe conduit during the backfilling operation. Place standard bedding material over pipes to the depth shown on the Plans or ODOT Standard Drawings. Place and compact backfill in accordance with the embankment requirements found in Section 202.04.B of the Standard Specifications.

7. Inspection and Field Testing

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the sanitary sewer construction. Ensure advanced notification and proper coordination is provided to the public utility owner for all field testing.

The public utility will assign a representative to the Project to coordinate compliance with the utility specifications. The utilities' representative should work in conjunction with the residency project inspector and the Resident Engineer. All negotiations, decisions, instructions, interpretations, and matters influencing the work should be between the Contractor and the project residency inspector or Resident Engineer.

The Contractor must provide written notification to the Resident Engineer at least 24 hours before performing any field acceptance testing.

Leakage tests may include water or low pressure air testing. Ensure outward or inward leakage, exfiltration or infiltration, does not exceed 200 gal per 1 in of pipe diameter per mile per day. Perform an exfiltration or infiltration test with a positive head of at least 2 ft.

Deflection tests must wait to be conducted on flexible pipes at least 30 days after placing the final backfill. Ensure the pipe deflection does not exceed 5 percent. The deflection test must be made with a rigid ball or mandrel with a diameter equal

to 95 percent of the inside diameter of the pipe. Do not allow the use of mechanical pulling devices, unless otherwise approved by the Resident Engineer.

Lamping tests must be performed in the presence of the Inspector. As required by OSHA regulations, explosion proof devices must be used to provide a mechanical method of exchanging the air within the sewer line. Ensure the Contractor corrects the pipe alignment as directed by the Resident Engineer at no additional cost to the Department. Ensure three-quarters of the pipe barrel is visible from manhole to manhole or any other appurtenance or special structure.

D. Safety and Environmental Considerations

It is the Contractor's responsibility to make adequate provision for the sewerage of the system during construction. Ensure the Contractor maintains connectivity in the sanitary sewer system and collects and disposes of sewage that is discharged during construction.

Ensure the location of the sanitary sewer lines meet the minimum separation requirements from water lines in accordance with ODEQ regulations. The Plans should adequately address the separation distance requirements for all known water lines in place. When an unknown water line is encountered during the sanitary sewer installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and sanitary sewer design engineer when any condition is encountered where the minimum separation requirements are in doubt.

A summary of the ODEQ separation requirements are as follows:

- Horizontally place the sewer at least 10 ft from existing or proposed water mains and 50 ft from potable water wells.
- Where sewers cross water mains (either above or below), provide a vertical clearance of at least 2 ft.
- If a water main crosses under a sewer provide structural support to the sewer. Install sewer pipe joints at least 10 ft from water lines, unless otherwise approved by the Resident Engineer.
- When it is impossible to meet these horizontal and vertical separation requirements, construct and pressure test the sewer line to ensure it is watertight before backfilling.

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, sanitary sewage, etc. (Do not allow the Contractor to place sanitary sewage or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being installed (PVC pipe, sanitary sewer service connection, sanitary sewer line, etc.).
- Work being performed on the sanitary sewer items (excavating, placing pipe, backfilling, connecting sanitary sewer line, installing and connection service lines, performing field tests, etc.).
- Quantity of each pay item that is placed (LF, EA).
- Name of public utility owner representative on-site to inspect the work or testing.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Sections 615.05 and 615.06 of the Standard Specifications, there are multiple pay items for the sanitary sewer pay items (PVC pipe, sanitary sewer service connection, sanitary sewer line, etc.) that might be used on the project.

The final quantity for the sanitary sewer pay items will be determined by the methods defined in Section 615.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 615.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length (LF) of *Polyvinyl Chloride (PVC) Pipe* and *Sanitary Sewer Service Line* along the pipe center and grade lines. The residency project inspector will include the length of the riser pipe in the measurement for *Sanitary Sewer Service Line*. Deductions in the measured length will be made for the length of line within manholes and special structures and the length of vertical pipe or fittings required for drop manholes.

In accordance with Section 615.06 of the Standard Specifications, the following components of the items of sanitary sewer work are to be included in the contract unit prices for the relevant pay items:

- The cost of the line within manholes and special structures, the vertical pipe or fittings required for drop manholes, earth backfill, sheeting, shoring, and

concrete cradles to be included in the contract unit price for the relevant pay item.

- The cost of installing an in-line tee and bracing for riser pipe to be included in the contract unit price for *Sanitary Sewer Service Connection*.
- The cost of all fittings and adaptors to connect service to the existing line to be included in the contract unit price for *Sanitary Sewer Service Line*.
- The cost of field testing to be included in the contract unit price for the relevant pay item.

Trench excavation and the bedding materials used in the installation of the sanitary sewer items will be measured and paid for in accordance with Section 613 of the Standard Specifications or as specified in the Plans. Review the pay item notes in the Plans to see if the sanitary sewer pay items include the cost of trench excavation or bedding materials or whether those items are to be measure and paid for separately. Also, review the pay item notes in the Plans for any items designated for the quantity to be based on the planned quantity in lieu of field measured.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the *Polyvinyl Chloride (PVC) Pipe* and *Sanitary Sewer Service Line* pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the *Sanitary Sewer Service Connection* pay item will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

615.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials and products which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and the products used do not appear to be in compliance with the requirements of Section 615.02 of the Standard Specifications, contact Materials Divisions to confirm the status of source/product approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

B. Audit Requirements

Ensure the pay item notes in the Plans for items designated to include the cost of trench excavation or bedding materials or for the quantity to be based on the planned quantity are addressed as specified by the residency for all relevant pay items.

Confirm the trench excavation and bedding materials used for the installation and backfill of sanitary sewer items were measured and paid for in accordance with Section 613 of the Standard Specifications or as specified in the Plans. Review the pay item notes in the Plans to see if the sanitary sewer pay items include the cost of trench excavation or bedding materials or whether those items are to be measure and paid for separately. Also, review the pay item notes in the Plans for any items designated for the quantity to be based on the planned quantity in lieu of field measured.

Confirm the completed sanitary sewer items met the minimum requirements for the field testing (leakage, deflection, lamping, etc.) that was specified.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

C. Protection of the Work

Ensure the sanitary sewer items are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department. Ensure the Contractor collected and disposed of sewage that was discharged during construction.

Ensure the Contractor makes any corrections of deficiencies identified by the field testing.

615 CHECKLIST – SANITARY SEWER PIPE CONDUITS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant sanitary sewer pay items shown in the Plans been identified and reviewed?					
Have the plan notes and details regarding the sanitary sewer conduit, service line and service connection pay items been reviewed with the Contractor (bedding material, payment based on plan quantity, items that include the cost of trench excavation & bedding, etc.)?					
Have the requirements for sanitary sewer lines, location, elevations and profile grades shown in the Plans been discussed with the Contractor?					
Have the material requirements for the PVC pipe and fittings been discussed with the Contractor?					
Has the type of bedding material and details for its installation (width, depth, etc.) for the sanitary sewer lines been discussed?					
Has the Contractor ensuring the coordination of the public utility owner for installation, connections, inspection and field testing of the sanitary sewer construction been discussed?					
Has the method for elevation and grade control that will be used been discussed with the Contractor?					
Has the required compaction and leveling of the bedding material underneath sanitary sewer lines been discussed with the Contractor?					
Has the method for maintaining connectivity in the sanitary sewer system and collecting/disposing of sewage that is discharged during construction been discussed with the Contractor?					
Have the timeliness requirements for the installation of sanitary sewer pipe (only excavate as much as can be laid within 2 days) been discussed?					

Have the ODEQ minimum separation requirements of the sanitary sewer line to any existing waterlines been discussed with the Contractor?					
Have the types of field testing (leakage, deflection, lamping, etc.) on the sanitary sewer line been identified and discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant sanitary sewer pay items shown in the Plans been identified and reviewed?					
Is the Contractor complying with plan notes and details regarding the sanitary sewer conduit, service line and service connection pay items (bedding material, payment based on plan quantity, items that include the cost of trench excavation & bedding, etc.)?					
Is the Contractor complying with the requirements for sanitary sewer lines, location, elevations and profile grades shown in the Plans?					
Does the Contractor's PVC pipe and fittings meet the material requirements stated in Section 615.02?					
Is the Contractor excavating the trench for the sanitary sewer line to the width and depth required on the Plans?					
Is the Contractor using the type of bedding material and following the details for its installation (width, depth, etc.) for the sanitary sewer lines?					
Has the Contractor adequately compacted and levelled the bedding material underneath all sanitary sewer lines?					
Is the Contractor coordinating with the public utility owner for installation, connections, inspection and field testing of the sanitary sewer construction?					
Is the Contractor starting at the outlet or lowest point of the sanitary sewer lines and laying the pipe going upstream?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor using the surveying equipment and methods specified in Section 615.04.A to ensure sanitary sewer lines are installed to the elevations and profile grades required in the Plans?					
Are the sanitary sewer lines being installed to the elevations and profile grades required in the Plans?					
Are joints in the pipe conduit being fully inserted and sealed in accordance with the manufacturer's recommendations?					
Is the Contractor maintaining connectivity in the sanitary sewer system and collecting/disposing of sewage that is discharged during construction?					
Is the Contractor complying with the timeliness requirements for the installation of sanitary sewer pipe (only excavate as much as can be laid within 2 days)?					
Are any existing waterlines encountered that need to be evaluated for the ODEQ regulations for minimum separation requirements?					
Is the Contractor using the specified type of bedding material and compacting the backfill as required in the specifications and ODOT Standard Drawings?					
Is the Contractor adequately backfilling the sanitary sewer pipe in a timely manner without causing damage or misaligning the joints in the pipe?					
Have the types of field testing (leakage, deflection, lamping, etc.) on the sanitary sewer line been identified and performed by the Contractor in coordination with the public utility owner?					
Does the Contractor have a plan for protection of the sanitary sewer pipe during construction equipment operations?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Is the project residency inspector documenting the quantities of the relevant sanitary sewer pay items and the trench excavation/bedding material (paid for in accordance with Section 613)?					
Is the Contractor properly disposing of waste materials (excess trench excavation, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor install the proper sanitary sewer lines, service lines and connections at the locations shown on the Plans or as authorized by the Resident Engineer?					
Did the Contractor coordinate with the public utility owner during the installation, connections, inspection and field testing of the sanitary sewer construction?					
Did the Contractor install the proper bedding material for each sanitary sewer line at the locations shown on the Plans or as authorized by the Resident Engineer?					
Did the Contractor install the proper sanitary sewer service lines at the locations shown on the Plans or as authorized by the Resident Engineer?					
Were the sanitary sewer lines installed to the elevations and profile grades required by the Plans?					
Did the Contractor maintain connectivity of the sanitary sewer system and collect/dispose of sewage that was discharged during construction?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Were the pipe conduit lines backfilled in a timely manner without causing any damage to the work or misaligning the joints in the sanitary sewer lines?					
Did the Contractor adequately compact the bedding material for the sanitary sewer lines?					
Has the Contractor taken adequate precautions to protect the completed sanitary sewer lines and service lines from damage from construction of the project?					
Were the types of field testing (leakage, deflection, lamping, etc.) on the sanitary sewer line that were required performed by the Contractor in coordination with the public utility owner?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Did the Contractor properly disposed of waste materials (excess trench excavation, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 616 – WATER PIPE AND FITTINGS

616.01 GENERAL

This work consists of constructing waterlines and service lines. For additional specifications and material requirements not covered in Plans, Special Provisions or Section 616 of the Standard Specifications, refer to the following:

- Oklahoma Department of Environmental Quality (ODEQ) Regulations,
- the manufacturers' recommendations,
- ASTM,
- American National Standards Institute (ANSI),
- American Water Works Association (AWWA), and
- the Public Utility Owner for whom the work is to be performed for additional specifications.

The Special Provisions, Plans, Public Utility Specifications, or Standard Specification will take precedence over the ODEQ minimum regulations.

616.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various waterline pay items (PVC pipe, ductile iron pipe, copper water service pipe, fittings, valves, meters, hydrants, corporation stops, hydrostatic pressure testing & disinfecting, supplemental drawings, etc.) included in the Contract.
- Review plan notes and details included in the Plans and special provisions in the Contract for the requirements (details of installation, material requirements, sequencing of work, etc.) of the relevant waterline pay items included in the Plans.
- Proposed sources of material and material requirements.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used.
- Excavation, bedding and backfill requirements during waterline installation.
- Elevation and grade control methods to be used.
- Inspection and field testing requirements.
- Contractor's schedule/plan for the work.
- Coordination with the public utility owner regarding installations, cut-offs and connections necessary for waterline and appurtenance construction.
- Traffic control and maintenance of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Sections 616.02 and 733 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant waterline pay items included in the Plans.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and products to ensure compliance with Sections 616.02 and 733 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

Unless otherwise required in the Plans or Contract, ensure the Contractor's proposed sources of materials and products comply with Sections 616.02 and 733 of the Standard Specifications as follows:

1. Pipe

In accordance with Section 616.02.A of the Standard Specifications, the Contractor must provide waterline pipe that comply with the following:

- Pipe as shown on the Plans with AASHTO, ASTM, ANSI or AWWA specifications numbers for quality control and installation.
- Pipe and fittings with a pressure rating of at least 200 psi.
- Plastic pipe bearing the seal of the National Sanitation Foundation (NSF), with a Standard Dimension Ratio (SDR) not exceeding 14 and an Outside Diameter (OD) equal to the OD of the equivalent size ductile iron pipe.
- Cast or ductile iron pipe with the following minimum thickness class:
 - 4 in to 8 in diameter – Class 51, and

- 10 in and larger diameter – Class 50.
- Cast and ductile iron pipe wrapped with a loose-fitting, slip-on polyethylene film that covers the entire pipe and fittings.

In accordance with Section 733.01.B(1) of the Standard Specifications, the Contractor must provide cast iron water pipe that comply with the following:

- Provide 18 ft or 20 ft long joints of cast iron pipes.
- Provide cast iron pipes with a Class 22 thickness for diameters from 3 in to 12 in, and a Class 24 thickness for diameters greater than 12 in in accordance with ASTM A716.
- Ensure the pipes have an 18/40 iron strength

In accordance with Section 733.01.B(2) of the Standard Specifications, the Contractor must provide ductile iron water pipe that comply with the following:

- Provide ductile iron in accordance with AWWA C 151/A21.51-09.

In addition to the material requirements in Sections 616.02 and 733 of the Standard Specifications, review any relevant plan notes and details included in the Plans and special provisions in the Contract for additional requirements that pertain to the materials required for the waterline pipe pay items included in the Plans.

2. Joints

In accordance with Section 616.02.B of the Standard Specifications, the Contractor must provide cast iron waterline joints that comply with the following:

- Packing and jointing materials for pipe joints and fittings meeting the requirements of AWWA and the public utility owner.

In accordance with Section 733.01.G of the Standard Specifications, the Contractor must provide cast iron waterline joints that comply with the following:

- Provide joint cast iron pipe and fittings with any of the following end types:
 - Test push-on joints,
 - Mechanical joints,
 - Bell-and-spigot joints, or
 - Flange joints.
- Use flange joint ends only if shown on the Plans, except, always provide flanged joints at valve connection ends of tapping sleeves.
- Provide push-on joints and mechanical joints in accordance with AWWA C 111. Provide bell-and-spigot joints with square, braided, sterilized hemp and 99.73 percent pure lead caulking. Provide flange joints in accordance with ASME B 16.1.

In addition to the material requirements in Sections 616.02 and 733 of the Standard Specifications, review any relevant plan notes and details included in the Plans and special provisions in the Contract for additional requirements that pertain to the materials required for the waterline joints included in the Plans.

3. Fittings

In accordance with Section 616.02.C of the Standard Specifications, the Contractor must provide cast iron waterline fittings that comply with the following:

- Provide copper fittings for copper waterlines and cast or ductile fittings for other waterlines.
- Provide bronze service clamps for standard water service connections.
- Provide couplings with factory-installed brass bushings in accordance with ASTM B 62 and AWWA C 800 for Standard Corporation stop threads.

In accordance with Section 733.01.C of the Standard Specifications, the Contractor must provide cast iron waterline joints that comply with the following:

- Provide and test cast iron fittings in accordance with AWWA C 110/A21.10-12 standards for 2 in through 48 in pipe with a pressure rating of 250 psi.

In addition to the material requirements in Sections 616.02 and 733 of the Standard Specifications, review any relevant plan notes and details included in the Plans and special provisions in the Contract for additional requirements that pertain to the materials required for the waterline joints included in the Plans.

4. Valves

In accordance with Section 733.01.D of the Standard Specifications, the Contractor must provide cast iron waterline valves that comply with the following:

(a) Gate Valves

Provide gate valves in accordance with AWWA C 500. Provide gate valves with the following characteristics:

- Double disc parallel seats,
- Non-rising stem,
- Vertical mounting,
- O-ring stem seal,
- Counterclockwise opening, and
- Push-on mechanical, bell and spigot, or flanged ends to fit the pipe or fittings.

Unless otherwise required in the Plans, provide gate valves manufactured by Crane, Darling, Ludlow-Rensselaer, M & H, Mueller, A.P. Smith, or an equivalent gate valve approved by the Engineer.

(b) Ball Valves

Provide ball valves with the following characteristics:

- Double-seated natural or synthetic rubber,
- Bronze, or monel metal seats,
- Designated for 150 psi working pressure,
- Flanged ends, and
- O-ring rotor bearing seals of high-tensile strength cast iron with the following:
 - Enclosed manual operators,
 - An open-close indicator, and
 - Hand wheel with standard size square wrench nut for one-man operation at 150 psi unbalance across the valve

Test valves with a hydrostatic pressure of 250 psi on the valve body, with the rotor open, and 150 psi on each side of the valve; open the opposite side of the valve. Submit four copies of the test results and manufacturer's drawings for approval by the Engineer before valve delivery.

Unless otherwise required in the Plans, provide ball valves manufactured by Allis-Chalmers, Henry Pratt, Williamette Iron & Steel, or an equivalent ball valve approved by the Engineer.

(c) Air Relief Valves

Provide 2 in air relief valves with heavy-duty combination air release and vacuum tested to 300 psi water working pressure. Provide a cast iron body, cover, and baffle with high-quality stainless steel or bronze internal parts. Ensure the inside of the valve is coated with rust inhibitor.

Unless otherwise required in the Plans, provide air relief valves manufactured by Apco No. 145C, Darling, Rensselaer, or an equivalent air relief valve approved by the Engineer.

(d) Check Valves

Provide swing type check valves with the following characteristics:

- Single disc,
- Horizontal mounting,

- Diameter passage that minimizes pressure loss,
- Non-slamming for the installation of outside lever and weight,
- Bronze disc faces and seat rings, and
- Push-on mechanical, bell and spigot, or flanged ends to fit the pipe or fittings.

Unless otherwise required in the Plans, provide check valves manufactured by Crane, Darling, Ludlow-Rensselaer, M & H, Mueller, A.P. Smith, or an equivalent check valve approved by the Engineer.

5. Valve Boxes

Unless otherwise required in the Plans, the Contractor must provide screw, adjustable valve boxes with a drop cover for cast iron waterline valve boxes in accordance with Section 733.01.E of the Standard Specifications.

6. Fire Hydrants

Unless otherwise required in the Plans, the Contractor must provide and test fire hydrants in accordance with AWWA C 502 for cast iron waterline fire hydrants in accordance with Section 733.01.F of the Standard Specifications. The hydrants provided must comply with the following characteristics:

- Breakable connection features with a lower breaking point than the rest of the unit
- Breakable coupling on the stem immediately above the bury line with a lower breaking point than the rest of the unit;
- Compression main valve - 4-1/2 in;
- Inlet connection - 6 in;
- Bell, flange, or mechanical joint inlet;
- Bury length - 4-1/2 ft;
- Two hose nozzles - 2-1/2 in (with National Standard threads);
- One pumper nozzle - 4 in;
- O-ring seal;
- Drain valve;
- Counterclockwise opening;
- Yellow finish paint above ground line; and
- National Standard pentagon operating nut that can accommodate the installed fire hydrant.

Unless otherwise required in the Plans, provide fire hydrants manufactured by Darling, Mueller Improved, M& H, or an equivalent fire hydrant approved by the Engineer.

7. Lining of Cast Iron Pipe and Fittings

If required by the Contract, line cast iron pipe and fittings in accordance with AWWA C 104/A21.4-16 or as otherwise specified in the Plans

8. Copper Water Service Pipe and Fittings

In accordance with Section 733.02 of the Standard Specifications, the Contractor must provide copper water service pipe and fittings for construction of water service lines in accordance with the Plans and the local municipalities' requirements. When no municipality requirements are applicable and no requirements are included in the Plans, ensure the Contractor complies with the following requirements stated in Section 733.02:

- Provide Type K soft annealed seamless copper tubing service pipe cold drawn to size in accordance with ASTM B88.
- Provide sound, clean, and defect free, cast brass or bronze fittings, including corporation and curb stops. Permanently cast the name or trademark of the manufacturer in each fitting.

9. Galvanized Steel Water Pipes and Fittings

In accordance with Section 733.03 of the Standard Specifications, the Contractor must provide galvanized steel pipe for water service lines and fittings in accordance with the local municipalities' requirements. When no municipality requirements are applicable and no requirements are included in the Plans, ensure the Contractor complies with the following requirements stated in Section 733.03:

- Provide galvanized steel pipe in accordance with ASTM A53/A53M. Ensure the pipes are first class galvanized welded and seamless steel pipe of standard mass and dimensions, new stock, smoothly finished, and defect free.
- Provide wrought iron or steel galvanized fittings. Provide standard, right-hand screw threads for connections.

10. Nonmetallic Waterline Pipe and Fittings

In accordance with Section 733.04 of the Standard Specifications, the Contractor must provide nonmetallic pressure waterline pipe and fittings in accordance with the local municipalities' requirements. When no municipality requirements are applicable and no requirements are included in the Plans, ensure the Contractor provides nonmetallic pressure waterline pipe and fittings in accordance with the following ASTM specifications as stated in Section 733.03:

- Provide polyvinyl chloride (PVC) pipe in accordance with ASTM D1785.
- Provide acrylonitrile butadiene styrene (ABS) pipe in accordance with ASTM D1527.

- Provide polyethylene (PE) pipe in accordance with ASTM D2104.
- Provide polybutylene (PB) pipe in accordance with ASTM D2662.

C. Preparatory Work and Contractor Work Plans

Consider the following before waterline construction work begins.

1. Contract Plans and Specifications

Review the requirements in Section 616 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans.

2. Supplemental (Shop) Drawings

Section 616.04.A of the Standard Specifications requires the Contractor to provide supplemental pipe and fitting installation drawings which provide greater details for the construction of the waterline and appurtenances. The specification states that the Resident Engineer is responsible for the review and approval of the supplemental (shop) drawings. However, the review and approval of the public utility owner should be obtained to ensure proper coordination and communication regarding the construction of their system. The drawings should satisfy the more stringent specifications/regulations from the public utility owner and ODEQ.

Ensure the installation drawings are identified by station number and lateral positioning and, as a minimum, include the following:

- Profiles with a horizontal scale no greater than 100 ft to 1 in and a vertical scale no greater than 10 ft to 1 in. Ensure both scales are clearly shown.
- The brand name and model number of materials.
- Installation instructions.
- Thrust block sizes and locations.
- Fitting locations.
- Disinfection methods.
- Methods and materials for making connections to the existing lines.

3. Inspection, Field Testing and Acceptance

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the waterline construction. Ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work and during all field testing.

4. Waterline Appurtenances

Review the requirements in the Plans, Supplemental Drawings and Section 615.04 of the Standard Specifications regarding the requirements for all waterline appurtenances required on the Project. The various types of appurtenances may include:

- Valves and valve boxes,
- Fittings,
- Service lines, and
- Fire hydrants.

Ensure the Contractor places the appurtenances at the locations shown in the Plans and Supplemental Drawings or as otherwise directed by the Resident Engineer. The Resident Engineer should solicit input from the public utility owner prior to making any adjustments to the construction of the waterline and the appurtenances.

5. Contractor Proposed Methods and Equipment

Discuss the type of construction methods proposed by the Contractor for the installation of the waterlines required on the project. Section 616.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the installation of the waterlines. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The Contractor must provide equipment capable of off-loading, handling, and placing the waterline pipe and appurtenances. Ensure the Contractor has excavators capable of performing the trench excavation to the required dimensions (width, depth and grade) and the equipment needed to meet the compaction requirements for the bedding and backfill material required for the waterlines as shown in the Plans.

D. Safety and Environmental Issues

There are stringent ODEQ regulations regarding the required separation distance of sanitary sewer lines from water lines. The Plans should adequately address the separation distance requirements for all known water lines in place. When an unknown water line is encountered during the sanitary sewer installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and sanitary sewer design engineer when any condition is encountered where the minimum separation requirements are in doubt.

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,

- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess excavation, litter, etc. (Do not allow the Contractor to place waste materials or other materials near or in storm sewer structures, streams or waterways.)

616.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Ensure the Contractor complies with the material requirements found in Sections 616.02 and 733 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant waterline pay items included in the Plans.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and products to ensure compliance with Sections 616.02 and 733 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted sources of materials and products are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

Refer to the details provided above in Section 616.02.B of this manual for additional details regarding the material requirements for the following items to construct the waterline and appurtenances:

- Pipe,

- Joints,
- Fittings,
- Valves,
 - Gate valves
 - Ball valves
 - Air relief valves
 - Check valves
- Valve boxes,
- Fire hydrants,
- Lining of cast iron pipe & fittings,
- Copper service line & fittings,
- Galvanized steel water pipe & fittings, and
- Nonmetallic waterline pipe & fittings.

B. Equipment and Methods

Section 616.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the waterline items. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the waterline construction includes:

- equipment capable of off-loading, handling, and placing the waterline pipe and appurtenances,
- surveying equipment necessary to perform the trench excavation to the required elevations and grades as shown in the Plans,
- excavators capable of performing the trench excavation to the dimensions (width, depth and grade) required in the Plans, and
- equipment needed to meet the compaction requirements for the bedding and backfill material required for the waterlines.

C. Construction Operations

Review the requirements in Section 616 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant waterline pay items included in the Plans.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the sanitary sewer construction. Ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work and during all field testing.

Review all aspects of Section 616.04 of the Standard Specifications prior to beginning the waterline installation and ensure the Contractor complies with the requirements, including the following:

1. Supplemental Drawings

Section 616.04.A of the Standard Specifications requires the Contractor to provide supplemental pipe and fitting installation drawings which provide greater details for the construction of the waterline and appurtenances.

The specification states that the Resident Engineer is responsible for the review and approval of the supplemental (shop) drawings. However, the review and approval of the public utility owner should be obtained to ensure proper coordination and communication regarding the construction of their system. The drawings should satisfy the more stringent specifications/regulations from the public utility owner and ODEQ.

Ensure the Contractor submits supplemental drawings in advance of any work beginning on the waterline construction and, as a minimum, includes the following:

- Installation drawings are identified by station number and lateral positioning.
- Profiles with a horizontal scale no greater than 100 ft to 1 in and a vertical scale no greater than 10 ft to 1 in. Ensure both scales are clearly shown.
- The brand name and model number of materials.
- Installation instructions.
- Thrust block sizes and locations.
- Fitting locations.
- Disinfection methods.
- Methods and materials for making connections to the existing lines.

2. General Installation

Ensure the Contractor excavates the trench for the placement of the waterline pipe to the depth shown in the Plans but no less than 30 in below the surface of the natural ground or established subgrade.

Ensure the Contractor maintains drainage of the trench during waterline construction. Suspend pipe laying operations during rain or when the trench cannot be kept free of water. The Contractor must place a watertight plug in the open end of the main when stopping waterline installation operations.

Verify all intersecting sewer lines, house sewer lines, and sewers located within 10 ft of the water line before excavating the waterline trench. Ensure the Contractor prevents any sanitary sewer waste discharge into the trench.

Any disturbed or damaged sanitary or storm sewers must be immediately restored and repaired to a tight operating condition at no additional cost to the Department.

Ensure the Contractor installs a concrete block at bends, tees, crosses, outlet assemblies, valves, and plugs, except where the fittings have flanged, welded or harnessed joints. The concrete blocking must be placed so the joints are accessible for repairs. Check the details in the Plans and supplemental drawings for additional information.

3. Accommodating Waterline Mains and Minimum Separation

There are stringent ODEQ regulations regarding the required separation distance of sanitary sewer lines from waterlines. The Plans should adequately address the separation distance requirements for all known sanitary sewer lines in place. When an unknown sanitary sewer is encountered during the waterline installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and waterline design engineer when any condition is encountered where the minimum separation requirements are in doubt.

A summary of the ODEQ separation requirements are as follows:

- Place water mains at least 10 ft horizontally from existing or new sanitary sewer lines.
- Where water mains cross sanitary sewers (either above or below), provide a vertical clearance of at least 24 in.
- Where a water main crosses under a sewer, provide structural support for the sewer. Install sewer pipe joints at least 10 ft from water lines, unless otherwise approved by the Resident Engineer.
- When impossible to meet these horizontal and vertical separation requirements, construct and pressure test the sewer line to ensure it is watertight before backfilling.

4. Excavation and Bedding

In accordance with Sections 616.04.C and 615.04.D of the Standard Specifications, the excavation must be performed in accordance with Section 613.04.B and the bedding must be performed in accordance with Section 613.04.C of the Standard Specifications. In accordance with Section 616.06 of the Standard Specifications, the cost of the trench excavation and the bedding material are to be included in the linear foot cost of the relevant waterline pipe pay item.

The Contractor may only excavate as much trench for waterline pipe as can be laid within 2 calendar days, unless otherwise directed by the Resident Engineer. Ensure the Contractor excavates the trench for the placement of the waterline pipe to the depth shown in the Plans but no less than 30 in below the surface of the natural ground or established subgrade.

After completing the embankment to the height required by the Contract (or at a minimum completed above the flow line elevation of the waterline pipe), the Contractor may begin to excavate trenches to place pipe in embankment fill.

Trenches must be excavated to the width shown on the Plans, from the bottom of the trench to at least 2 ft above the top of the conduit. The required trench width for each type and size of waterline pipe may be found in the Plans.

The full length and width of the trench bottom must be compacted prior to placing the waterline pipe in the trench. Soft or unsuitable material encountered in the bottom of the trench must be removed and replaced with suitable material as directed by the Resident Engineer.

For projects that require borrow to complete the required embankments on the project, all suitable excavated material must be used in the backfill of the waterline pipe (when allowed) or planned embankment. Excess excavated soil material not used on the project as embankment or backfill becomes the property of the Contractor for removal and disposal in a manner approved by the Resident Engineer. The disposal of excess material will not be measured and paid for separately.

The type of bedding material required for the waterline pipe should be specified in the details shown in the Plans. The details may specify that the type of bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be a unique embedment material specification. The four different types of bedding material shown on PBB-1 and Section 703.08 are as follows:

- Class A Bedding – CLSM (701.19) or Class C Concrete (701.01) around the pipe with a coarse aggregate base option for use under the pipe.
- Class B Bedding – Coarse aggregate around the pipe. Material options include Coarse Cover Aggregate (703.06), Coarse Aggregate Size 8 (701.06) or Aggregate Base Type A (703.01).
- Class C Bedding – Fine aggregate around the pipe. Material options include Filter Sand (703.06) or Class C Bedding Material (703.08).
- Class D Bedding – Native soil with no particles larger than 3 in, no frozen lumps, and no excess moisture.

5. Placing Pipe

Ensure the Contractor coordinates their waterline construction operation with the public utility owner regarding installations, cut-offs and connections necessary for waterlines. Additionally, ensure proper coordination with the public utility owner during the work to enable their ability to inspect the work while it is underway.

In accordance with Section 616.04.E of the Standard Specifications, the placement of the waterline pipe must be performed in accordance with Section 613.04.G of the Standard Specifications.

Ensure the Contractor installs the correct type of waterline pipe at the location and alignment shown in the Plans and verify the pipe conduit is placed to the elevations and grades required in the Plans, unless otherwise directed by the Resident Engineer. Refer to the supplemental drawings for additional information.

When placing a type of waterline pipe that the ends of the joints of pipe are inserted one into the other, ensure the Contractor lays the joints with the bell end of the joint facing upstream.

In accordance with Section 616.04.F of the Standard Specifications, the Contractor shall construct joints in accordance with the manufacturer's recommendations and AWWA requirements. Before joining pipes, ensure the Contractor cleans and dries the surfaces of the joint surface of the pipe. Trenches must be kept free of water until the joints become water tight. Realigning the pipe after completing the joint must be avoided unless the pipe is removed and a new joint is constructed.

The waterline pipe must be placed on a compacted foundation of bedding material as required in the details shown in the Plans or as otherwise approved by the Resident Engineer. The details may specify that the type of bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be a unique embedment material specification. Ensure the waterline pipe is properly installed to the center of the alignment, elevation and grade lines shown on the Plans. Ensure the waterline pipe remains in its required location during its continued installation and during the backfilling operation.

As the Contractor is placing the waterline pipe, ensure they comply with the following requirements specified in Section 613.04.G of the Standard Specifications:

- Start laying the pipe at the outlet or the lowest point of the line and progress with the installation going upstream.
- Lower the pipe into the trench without dropping. Use hoisting equipment to place the pipe.
- Clean the inside of the barrel before lowering the pipes into the trench.
- Avoid damaging the pipe or trench. Replace damaged pipe or repair damaged trench at no additional cost to the Department.
- Ensure the bottom of the pipe contacts the shaped bedding along the entire length.
- Do not fill or ram material under pipe to raise the pipe to grade.

6. Connecting to Existing Waterlines

Ensure the Contractor makes connections to existing waterlines as indicated in the Plans, supplemental drawings or as directed by the Resident Engineer. Ensure proper coordination with the public utility owner during the work to enable their ability to inspect the connections while they are being installed.

7. Removal of Existing Waterlines

Existing waterlines that are no longer used will be abandoned or removed. If the Plans require removal of existing waterlines, the Contractor must remove the abandoned waterline at no additional cost to the Department unless otherwise stated in the Plans (such as cost included in other pay items).

8. Setting Valves

Ensure the Contractor installs the correct type of valve (gate, ball, air relief or check) at the locations shown in the Plans, unless otherwise directed by the Resident Engineer. Unless otherwise required by the Contract, set valves with the stem up and caulk the joints as required. Ensure the valve parts are cleaned of any foreign material. Refer to the supplemental drawings for additional information.

9. Setting Fire Hydrants

Ensure the Contractor installs the fire hydrants at the locations shown in the Plans, unless otherwise directed by the Resident Engineer. Before placing a hydrant, ensure any foreign material is removed from within the body. The Contractor must tighten the stuffing boxes, and open and close the hydrant valve to ensure the parts are fully functioning. Ensure the hydrant leads are cast or ductile iron pipe.

Ensure the Contractor installs a concrete block at bends, tees, crosses, outlet assemblies, valves, and plugs, except where the fittings have flanged, welded or harnessed joints. The concrete blocking must be placed so the joints are accessible for repairs. Check the details in the Plans and supplemental drawings for additional information.

Ensure the Contractor installs a concrete block on the back side of the hydrant opposite the pipe, between the hydrant and the vertical face of the trench end to keep the hydrant from moving. Each hydrant must be installed on a stone or concrete slab at least 4 in thick and 16 in square. Around the drain of the hydrant, ensure the Contractor places at least 7 cubic feet of broken stone, gravel, or brick bats. The Contractor must compact soil backfill to the elevation of the surrounding ground surface, at least 5 ft from the hydrant, in accordance with Section 613.04.I of the Standard Specifications.

10. Dead Ends

Dead ends must be closed with caps or plugs for spigot and bell ends. Ensure the Contractor caulks caps and plugs, and braces them with a concrete block. The installation of a 2 in blowoff on pipes up to 4 in in diameter is required, unless otherwise specified in the Plans. Check the details in the Plans and supplemental drawings for additional information.

11. Backfilling

In accordance with Section 616.04.L of the Standard Specifications, the backfill of the waterline pipe must be performed in accordance with Section 613.04.I of the Standard Specifications. In accordance with Section 616.06 of the Standard Specifications, the cost of the backfill material is to be included in the linear foot cost of the relevant waterline pipe pay item.

The Contractor must allow access to the trench for inspection of the conduit by the residency project inspector before backfilling the trench.

Ensure the waterline pipe section ends are fully inserted and has smooth inside joints and clean barrels. Before backfilling, the Contractor must replace misaligned, settled, or damaged pipes as directed by the residency project inspector. After inspection and approval by the Resident Engineer, the Contractor may proceed with placement of the backfill in the pipe trench with material as shown on the Plans.

The type of bedding material required for the waterline pipe should be specified in the details shown in the Plans. The details may specify that the type of bedding material must comply with the requirements shown on [ODOT Standard Drawing PBB-1](#) and Section 703.08 of the Standard Specifications or there may be a unique embedment material specification.

When the type of bedding material required for the waterline pipe is a standard type specified in the [ODOT Standard Drawing PBB-1](#), ensure the Contractor complies with the requirements for placing and compacting the bedding material as specified in Note 10 in the [ODOT Standard Drawing PBB-1](#), which states:

10. BEDDING MATERIAL CLASSES B, C, AND D SHALL BE PLACED IN 6" LAYERS. CLASSES C AND D BEDDING SHALL BE COMPACTED TO 95% MAXIMUM DENSITY AND CLASS B SHALL BE COMPACTED TO 98% STANDARD DENSITY. ALL COMPACTION OF BEDDING MATERIAL SHALL BE DONE USING HANDOPERATED EQUIPMENT ONLY.

Ensure the Contractor's method and equipment prevents displacement of or damage to the waterline pipe during the backfilling operation. Place standard bedding material over pipes to the depth shown on the Plans or ODOT Standard Drawings. Place and compact backfill in accordance with the embankment requirements found in Section 202.04.B of the Standard Specifications.

12. Inspection, Disinfection and Field Testing

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria. There are stringent field testing and inspection requirements for the acceptance of the sanitary sewer construction. Ensure advanced notification and proper coordination is provided to the public utility owner for all field testing.

The public utility will assign a representative to the Project to coordinate compliance with the utility specifications. The utilities' representative should work in conjunction with the residency project inspector and the Resident Engineer. All negotiations, decisions, instructions, interpretations, and matters influencing the work should be between the Contractor and the project residency inspector or Resident Engineer.

The Contractor must provide written notification to the Resident Engineer at least 24 hours before performing any field acceptance testing.

Pressure and leakage testing must be performed by the Contractor on the installed waterline pipe in accordance with AWWA Standard C 600. Ensure the working pressure of the pipe does not exceed two-thirds of the rated pressure of the pipe. Ensure leakage does not exceed 10 gal/in of pipe diameter per mile per 24 hr at 150 psi testing pressure.

Disinfection of all new, cleaned, or repaired water mains must be performed by the Contractor in accordance with Rules and Regulations Governing Operation of Public Water Supply Systems. The Contractor must allow water with 50 ppm to 100 ppm of chlorine to stand 24 hr and develop a residual of at least 10 ppm in the waterline pipe. The spent solution (overly chlorinated water used for disinfection) must be drained and replaced (flushed) with potable water before using the line. Alternatively, methods listed in the latest AWWA Specifications may be used by the Contractor. Obtain safe bacteriological samples on two consecutive days before using new, cleaned, or repaired water mains.

Check the details in the Plans and supplemental drawings for additional information regarding the testing and disinfecting requirements for the Project.

D. Safety and Environmental Considerations

Ensure the location of the sanitary sewer lines meet the minimum separation requirements from water lines in accordance with ODEQ regulations. The Plans should adequately address the separation distance requirements for all known sanitary sewer lines in place. When an unknown sanitary sewer is encountered during the waterline installation, ensure the sanitary sewers and water mains are separated vertically and horizontally in accordance with the ODEQ regulations. The Resident Engineer should notify the public utility owner and waterline design engineer when any condition is encountered where the minimum separation requirements are in doubt.

A summary of the ODEQ separation requirements are as follows:

- Place water mains at least 10 ft horizontally from existing or new sanitary sewer lines.
- Where water mains cross sanitary sewers (either above or below), provide a vertical clearance of at least 24 in.
- Where a water main crosses under a sewer, provide structural support for the sewer. Install sewer pipe joints at least 10 ft from water lines, unless otherwise approved by the Resident Engineer.
- When impossible to meet these horizontal and vertical separation requirements, construct and pressure test the sewer line to ensure it is watertight before backfilling.

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) workers, and
- Properly disposing of waste materials, excess excavation, litter, etc. (Do not allow the Contractor to place sanitary sewage or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being installed (PVC pipe, ductile iron pipe, copper water service pipe, fittings, valves, meters, hydrants, corporation stops, hydrostatic pressure testing & disinfecting, supplemental drawings, etc.).
- Work being performed on the waterline items (excavating, placing pipe or appurtenances, connecting waterline, installing and connection service lines, backfilling, performing field tests, etc.).
- Quantity of each pay item that is placed (LF, EA, LS).
- Name of public utility owner representative on-site to inspect the work or testing.
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Sections 616.05 and 616.06 of the Standard Specifications, there are multiple pay items for the waterline pay items (PVC pipe, ductile iron pipe, copper water service pipe, fittings, valves, meters, hydrants, corporation stops, hydrostatic pressure testing & disinfecting, supplemental drawings, etc.) that might be used on the project.

The final quantity for the sanitary sewer pay items will be determined by the methods defined in Section 616.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 616.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length (LF) of *Ductile Pipe*, *Polyvinyl Chloride (PVC) Pipe* and *Copper Water Service Line* along the pipe centerline including crosses, tees, sleeves, outlet assemblies, and plugs. No deductions in the measured length will be made for the space occupied by fittings, valves, and other materials.

The residency project inspector will measure each valve size and all appurtenances (valves, meters, hydrants, corporation stops, etc.) by the Each as separate pay items established in the Plans and Contract. The payment for the *Supplemental Drawings* will be made by the Lump Sum when included in the Plans and Contract. If a pay item for *Supplemental Drawings* does not exist, the Department will consider the work incidental to the waterline construction in accordance with Section 105.02 of the Standard Specifications.

In accordance with Section 616.06 of the Standard Specifications, the following components for the waterline construction are to be included in the contract unit prices for the following relevant pay items:

- Waterline pipe pay items.
 - Installation of bends, tees, crosses, sleeves, outlet assemblies, plugs, and other fittings,
 - Connections to existing lines,
 - Removal of abandoned lines,
 - Excavation,
 - Bedding material,
 - Blocking, and
 - Testing and disinfecting.
- Fire Hydrants.
 - Drainage stone,
 - Blocking, and
 - Fire hydrant extensions.

- Corporation Stops.
 - Tapping,
 - Service clamp, and
 - Coupling.
- Meter Installation.
 - Meter can,
 - Meter setter with ground key angle stop,
 - Crushed stone, and
 - Fittings for a complete installation.

Check the details in the Plans and supplemental drawings for additional information regarding the material/product requirements for the components of the waterline construction on the Project. Also, review the pay item notes in the Plans for any items designated for the quantity to be based on the planned quantity in lieu of field measured.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the *Ductile Pipe*, *Polyvinyl Chloride (PVC) Pipe* and *Copper Water Service Line* pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the *Valves, Corporation Stops, Meter Installation* and *Fire Hydrant* pay items will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

(c) Lump Sum Unit of Measure Pay Items

A partial payment of a "Lump Sum" pay item is not acceptable. Any partial payment for a "Lump Sum" pay item must be made by change order.

Documentation of the *Supplemental Drawings* Lump Sum item will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of Contract pay items.
2. In the appropriate field, enter either a descriptive location or the station-to-station extents, preferably both.
3. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantity to date does not exceed 1.00 Lump Sum.
4. In the Remarks bubble, document the method used for estimating the percentage of the lump sum item by providing sufficient information, calculations and/or references to specific sections of the standard specification.

616.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports

as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and products which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and the products used do not appear to be in compliance with the requirements of Sections 616.02 and 733 of the Standard Specifications, contact Materials Divisions to confirm the status of source/product approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” or “Lump Sum” pay item is not acceptable. Any partial payment for an “Each” or “Lump Sum” pay item must be made by change order.

C. Protection of the Work

Ensure the waterline items are not damaged during the backfilling operation and are satisfactorily maintained until the project is completed and any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Ensure the Contractor makes any corrections of deficiencies identified by the field testing.

616 CHECKLIST – WATER PIPE AND FITTINGS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant waterline and appurtenances pay items shown in the Plans been identified and reviewed?					
Have the plan notes and details regarding the waterline pipe, service lines and appurtenances pay items been reviewed with the Contractor (bedding material, supplemental drawings, disinfection and testing, payment based on plan quantity, etc.)?					
Have the requirements for waterline supplemental drawings been discussed with the Contractor?					
Have the material requirements for the waterline pipe, fittings, service lines and appurtenances been discussed with the Contractor?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Has the type of bedding material and details for its installation (width, depth, etc.) for the waterlines been discussed?					
Has the Contractor ensuring the coordination of the public utility owner for installation, connections, inspection and field testing of the waterline construction been discussed?					
Has the adequate compaction and leveling of the bedding material underneath waterlines and appurtenances been discussed with the Contractor?					
Have the timeliness requirements for the installation of waterline pipe (only excavate as much as can be laid within 2 days) been discussed?					
Have the ODEQ minimum separation requirements of the waterlines to any existing sanitary sewer lines been discussed with the Contractor?					

Have the types of field testing (leakage, pressure, etc.) and requirement for disinfection on the waterline been identified and discussed with the Contractor?					
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Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant waterline and appurtenances pay items shown in the Plans been identified and reviewed?					
Is the Contractor complying with plan notes and details regarding the waterline and appurtenances pay items (bedding material, supplemental drawings, disinfection and testing, payment based on plan quantity, etc.)?					
Has the Contractor met the requirements for waterline supplemental drawings?					
Have the supplemental drawings been sent to the public utility owner for their review and input?					
Is the Contractor complying with the requirements for waterline pipe, fittings, service lines and appurtenances shown in the Plans?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor's PVC pipe and appurtenances meet the material requirements stated in Sections 616.02 and 733?					
Is the Contractor excavating the trench for the waterline to the width and depth required on the Plans?					
Is the Contractor using the type of bedding material and following the details for its installation (width, depth, etc.) for the waterlines?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor adequately compacted and levelled the bedding material underneath all waterlines and appurtenances?					
Is the Contractor coordinating with the public utility owner for installation, connections, inspection and field testing of the waterlines and appurtenances construction?					
Is the Contractor starting at the outlet or lowest point of the waterlines and laying the pipe going upstream?					
Are the waterlines and appurtenances being installed to the elevations and locations required in the Plans?					
Is the Contractor installing watertight plugs in the open end of the waterline pipe when suspending installation operations (overnight, for the weekend, etc.)?					
Are joints in the waterline pipe conduit being fully inserted and sealed in accordance with the manufacturer's recommendations?					
Is the Contractor complying with the timeliness requirements for the installation of waterline pipe (only excavate as much as can be laid within 2 days)?					
Are any existing sanitary sewer lines encountered that need to be evaluated for the ODEQ regulations for minimum separation requirements?					
Is the Contractor using the specified type of bedding material and compacting the backfill as required in the specifications and ODOT Standard Drawings?					
Is the Contractor adequately backfilling the waterline pipe in a timely manner without causing damage or misaligning the joints in the pipe?					
Are valves being set with the stem pointed upward and the joints caulked at the locations shown on the Plans or supplemental drawings?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Are the fire hydrants being installed on a stone or concrete slab with a concrete block on the back side of the hydrant at the locations shown on the Plans or supplemental drawings?					
Have the types of field testing (leakage, pressure, etc.) on the waterline been identified and performed by the Contractor in coordination with the public utility owner?					
Is the Contractor performing the disinfecting of the waterlines as specified in 616.04.M or as otherwise required in the Plans or supplemental drawings in coordination with the public utility owner?					
Does the Contractor have a plan for protection of the waterline and appurtenances during construction equipment operations?					
Is the project residency inspector documenting the quantities of the relevant waterline and appurtenance pay items?					
Is the Contractor properly disposed of waste materials (excess trench excavation, protection from discharges near storm sewer structures or waterways, etc.)?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Did the Contractor install the proper type and size of waterline pipe conduit, service lines and appurtenances at the locations shown on the Plans, supplemental drawings or as authorized by the Resident Engineer?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the Contractor install the proper bedding material at the locations shown on the Plans or as authorized by the Resident Engineer?					
Were the pipe conduit lines backfilled in a timely manner without causing any damage to the work or misaligning the joints in the conduit?					
Has the Contractor taken adequate precautions to protect the completed pipe conduit lines and appurtenances from damage from construction of the pavement?					
Were the types of field testing (leakage, pressure, etc.) on the waterline performed by the Contractor in coordination with the public utility owner?					
Did the Contractor perform the disinfecting of the waterlines as specified in 616.04.M or as otherwise required in the Plans or supplemental drawings in coordination with the public utility owner?					
Were any conditions requiring corrective action or maintenance addressed sufficiently by the Contractor?					
Did the Contractor properly disposed of waste materials (excess trench excavation, protection from discharges near storm sewer structures or waterways, etc.)?					

SECTION 619 – REMOVAL OF BUILDINGS, STRUCTURES, AND OBSTRUCTIONS

619.01 GENERAL

This work consists of the following:

- Removing and disposing of specified obstructions;
- Salvaging designated materials;
- Backfilling the resulting trenches, holes, and pits;
- Removing abandoned items;
- Restoring the site to match the surrounding conditions; and
- Removing and recycling or disposing of production equipment for oil fields.

The Contractor must comply with current local, state, and federal regulations pertaining to the removal and disposal of facilities, referred to as buildings and structures.

619.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of removal pay items (removal of structures and obstructions, removal of specified items, sawing pavement, NESHAP pre-demolition inspection and notification, oil field equipment removal, etc.) included in the Contract.
- Review plan notes and details included in the Plans and special provisions in the Contract for the requirements (details of installation, material requirements, sequencing of work, etc.) of the relevant removal pay items included in the Plans.
- Requirements for any designated salvaged materials specified in the Plans.
- Relevant laws, ordinances and regulations governing the removal and disposal of structures/materials.
- Ownership of the excess materials from removals and their proper disposal.
- Disposal of excess materials within the project right-of-way must have prior written approval from the Resident Engineer.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work.
- Backfilling of resulting trenches, holes or pits resulting from the removal operations.
- Maintenance and protection of traffic during construction.
- Traffic control during construction and impacts from haul trucks entering/exiting the work zone.

- Clean up and opening to traffic considerations.

B. Acceptance of Materials

None required.

C. Preparatory Work and Contractor Work Plans

Consider the following before the removal operations begin.

1. Contract Plans and Specifications

Review the Plans, Standard Specifications, Special Provisions and Plan Notes for requirements for the removal operations. Ensure the Contractor is aware of local, state and federal laws, ordinances and regulations governing the removal and disposal of structures and materials.

Some projects include plan notes that require some material to be salvaged during the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

2. Contractor Proposed Equipment

The Contractor may include the equipment needed to perform the removal operations in their submittals prior to beginning construction. Section 619.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the removal operations. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the removal operations includes:

- Demolition equipment (jack hammers, etc.);
- Concrete saws,
- Excavators and loaders,
- Trucks, and
- Broom and other equipment necessary for clean-up.

3. Disposal of Materials

Discuss the Contractor's plan to remove salvageable material required by the Contract without damaging sections that are readily transportable. Check the Plans for the specified locations to store the salvaged material. Emphasize the Contractor's responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

Abandoned and excess material will become the property of the Contractor. It is the Contractor's responsibility to remove and dispose of excess material in accordance with local, state and federal laws, ordinances and regulations governing the removal and disposal of structures and materials. Any disposal of material adjacent to the project limits can only be done by written permission of the property owner. The Contractor must submit copies of property owner agreements to the Resident Engineer for the project file. Address hazardous materials in accordance with Section 107.15 of the Standard Specifications and provide documentation to the Resident Engineer after disposal.

D. Safety and Environmental Issues

It is the Contractor's responsibility to collect and dispose of materials generated from the removal operations in accordance with the Plans and applicable laws, rules, and regulations. Discuss the Contractor's proposed method to dispose of excess materials.

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, surplus debris, etc. (Do not allow the Contractor to place surplus debris, excavation or other materials near or in storm sewer structures, streams or waterways.)

619.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

None required.

B. Equipment and Methods

Section 619.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the removal operations. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the removal operations include:

- Demolition equipment (jack hammers, etc.);
- Concrete saws,
- Excavators and loaders,
- Trucks, and
- Broom and other equipment necessary for clean-up.

C. Construction Operations

Review the requirements in Section 619 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant removal pay items included in the Plans. Ensure the Contractor is aware of local, state and federal laws, ordinances and regulations governing the removal and disposal of structures and materials.

Review the relevant aspects of Section 619.04 of the Standard Specifications that pertain to the removals required on your project prior to beginning the removal operations and ensure the Contractor complies with the requirements, including the following:

1. General Removal and Disposal Requirements

Typically, when a project requires the demolition and removal of a building, ODOT will arrange for an inspection of the facility for asbestos containing material. In those instances, ODOT will address and abate the asbestos containing material and provide the Contractor with the National Emissions Standards for Hazardous Air Pollutants (NESHAP) inspection report(s) to support the Contractor's notification to ODEQ.

When the NESHAP inspection is the responsibility of the Contractor, the pay item *NESHAP Pre-demolition Inspection and Notification* will be included in the Contract. In those instances, ensure an Oklahoma Department of Labor (ODOL) licensed inspector performs NESHAP inspections for buildings and structures required by the Contract for demolition. A copy of the NESHAP pre-demolition inspection report must be submitted to the Resident Engineer. The relevant information from the NESHAP inspection report will be used by the Contractor to complete the pre-demolition notification form which must be submitted to the ODEQ and the Resident Engineer before beginning demolition.

The Contractor must inform the Resident Engineer of their proposed methods of removing buildings, structures, or obstructions prior to beginning the removals.

The Contractor must raze, remove, and dispose of buildings, foundations, and other obstructions that are on the right-of-way as required in the Plans. Check the Plans for any designation for the removal or disposal of utilities and structures by others. There may be agreements reached with utility owners or property owners that may have already compensated them for the removal of their facilities.

Check the Plans for any designation for the removal of portions of buildings or structures with the intention of leaving the other portion in place for continued use. Ensure the Contractor removes the portions of a system or configuration as required by the Plans and ensure the remaining parts continue to function as intended.

Check the Plans for any designation for the Contractor to salvage materials, structures or buildings that are to become property of ODOT. Ensure the Contractor's methods for removing salvageable material required by the Plans

result in no damage to the salvaged material. Check the Plans for the specified locations to store the salvaged material. Emphasize the Contractor's responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

It is the Contractor's responsibility to destroy or dispose of unusable and perishable material (organic material that will decompose over time, such as wood) in a manner that complies with local, state and federal laws, ordinances and regulations governing the removal and disposal of structures and materials.

It is the Contractor's responsibility to dispose of nonperishable material (such as aggregate or concrete rubble) in a manner that complies with local, state and federal laws, ordinances and regulations governing the removal and disposal of structures and materials.

Any disposal of materials proposed within the project right-of-way (burning, burying, etc.) must be done in a manner approved in writing by the Resident Engineer. There are limitations for disposal of materials within the right-of-way stated in Sections 104, 201 and 202 of the Standard Specifications.

Any disposal of material adjacent to the project limits can only be done by written permission of the property owner. The Contractor must submit copies of property owner agreements to the Resident Engineer for the project file.

Any disposal of hazardous materials must be done in accordance with Section 107.15 of the Standard Specifications and documentation must be provided to the Resident Engineer after disposal.

Building, structures, and other obstructions must be removed to at least 1 ft below the surrounding ground elevation or as specified in the Plans. Any basement floors encountered must be removed to the extent necessary to provide drainage from the basement as approved by the Resident Engineer.

The Contractor is responsible to fill any voids, basements or cavities left by structure removal to the level of the surrounding ground. If the fill is being placed within the prism of construction (limits of grading, embankments, ditch line, etc.), the Contractor must compact those areas in accordance with Sections 202.04.B and 202.04.D of the Standard Specifications.

Any items within the project limits that were not designated for removal that are damaged due to the Contractor's negligence must be repaired or replaced as approved by the Resident Engineer, at no additional cost to the Department.

2. Removal of Bridges, Culverts and other Existing Structures

Before beginning any operations for the removal of bridges or culverts, ensure the Contractor makes arrangements to accommodate traffic that might be impacted during (or after) the removal operations.

In accordance with Section 104.09 of the Standard Specifications, unless otherwise required in the Plans, all material generated from the removals shall become the property of the Contractor. Ownership of materials implies the responsibility to dispose of the material in accordance with all applicable local, state, and federal rules and regulations. The Department will not allow the Contractor to bury or otherwise dispose of material within the Project or on any publicly owned property without the Resident Engineer's prior written approval.

Ensure the Contractor complies with the following regarding the removal of bridges, culverts and other existing structures:

(a) Removal of Bridge Substructure

Piers, abutments, and piling must be cut a minimum of 1 ft below the ground line and covered with native soil. For areas with channel changes required in the Plans, the piers, abutments, and piling must be cut to the elevation of the channel excavation as required in the Plans. Substructures of existing bridge structures must be removed to the bottom of the channel. Any portion of the bridge substructure outside of the channel must be removed to a minimum of 1 ft below natural ground surface. To accommodate new structures, ensure the Contractor removes the existing substructure within the new structure limits.

Rubblized concrete and similar materials may be broken and placed in the embankment in accordance with Section 202.04.A(5)(b)1) of the Standard Specifications or disposed of as approved by the Resident Engineer. Section 202.04.A(5)(b)1) provides the requirements for placing a rock fill including maximum size of the rock, permissible locations in fill for larger rock, compaction requirements, etc.

Do not allow the Contractor to leave material in the channel.

All blasting or other removal operations that may damage new construction, must be performed before starting new construction in the area.

(b) Structures to Remain Property of Department

When structures being removed are designated in the Plans to remain the property of the Department, the Contractor must use an approved method of removal that minimizes the potential for any damage to the structure or the components of the structure that are specified to be salvaged. Ensure the Contractor's methods for removing salvageable material required by the Plans result in no damage to the salvaged material. Check the Plans for any specified locations to store the salvaged material. Emphasize the Contractor's responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

When salvaging bridges or components of bridges, ensure the Contractor's method for dismantling steel superstructure and wood bridges results in no damage to the salvaged material. Salvaged lumber and similar material must be neatly stacked on the right-of-way outside the limits of construction. Before dismantling a structural steel bridge, the Contractor must paint the steel members with match marks using steel stencils in a manner approved by the ODOT Bridge Division. The Contractor must dismantle steel members at the original field splices and support on falsework during dismantling operations, or dismantle as approved by the Resident Engineer.

(c) Structures to Become Property of the Contractor

When structures or material are not designated in the Plans to become the property of the Department, ensure the Contractor removes and disposes of the material in accordance with Sections 104.09 and 104.10 of the Standard Specifications.

Rubblized concrete and similar materials may be broken and placed in the embankment in accordance with Section 202.04.A(5)(b)1) of the Standard Specifications or disposed of as approved by the Resident Engineer. Section 202.04.A(5)(b)1) provides the requirements for placing a rock fill including maximum size of the rock, permissible locations in fill for larger rock, compaction requirements, etc.

3. Removal of Pavement, Sidewalks, Curbs, Etc.

In accordance with Section 104.09 of the Standard Specifications, unless otherwise required in the Plans, all material generated from the removals shall become the property of the Contractor. Ownership of the materials implies the responsibility to dispose of the material in accordance with all applicable local, state, and federal rules and regulations. The Department will not allow the Contractor to bury or otherwise dispose of material within the Project or on any publicly owned property without the Resident Engineer's prior written approval. When approved by the Resident Engineer, rubblized concrete and similar materials may be broken and placed in the embankment in accordance with Section 202.04.A(5)(b)1) of the Standard Specifications. Section 202.04.A(5)(b)1) provides the requirements for placing a rock fill including maximum size of the rock, permissible locations in fill for larger rock, compaction requirements, etc.

When materials generated from removals are designated in the Plans to become the property of the Department, ensure the Contractor stockpiles the salvaged materials at locations shown on the Plans. Rubblized concrete pavement, sidewalks, curbs, and other similar materials designated to become the property of the Department must be broken into pieces no heavier than 150 lb or as otherwise required in the Plans.

If the Plans require the removal of asphalt concrete or P.C. concrete pavement, sawing the pavement might be necessary to provide a clean, straight joint to tie the new pavement to. The Contractor must provide conventional wet cut type concrete saws capable of sawing joints to the line and depth necessary to prevent under-breakage or shatter of adjacent areas. Portable handheld saws are not allowed to be used for joints being used to connect new pavement to existing pavement.

4. Structures Abandoned

Ensure the Contractor removes abandoned structures to at least 6 in below the foundation grade of the new structure. Each end of abandoned sewer lines or other similar structures must be tightly plugged with concrete or as otherwise required in the Plans.

Ensure the Contractor removes abandoned manholes and similar structures to the depth shown on the Plans, fill the voids, and compact in accordance with Section 202.04 of the Standard Specifications. Areas for pavement or other construction over abandoned structures must be prepared by the Contractor by backfilling and compacting in uniform layers not exceeding 6 in deep in accordance with Section 202.04 of the Standard Specifications. The Contractor must consolidate (flushing sandy material with water) or compact backfill material in other areas over abandoned structures.

5. General Site Clearance Requirements

In accordance with Section 619.04.G of the Standard Specifications, ensure the Contractor complies with all applicable local, state, and federal ordinances, laws, rules and regulations along with the following:

- Clear obstructions and maintain surface drainage, drainage structures, and appurtenances.
- Contact the utility owner and provide for repairs at no additional cost to the Department if live utility lines are damaged.
- Ensure a licensed inspector performs NESHAP inspections for buildings and structures required by the Contract for demolition, and submit a copy of the NESHAP pre-demolition inspection and notification to the Resident Engineer before demolition.
- Notify the Resident Engineer in writing if anticipated, regulated friable or non-friable asbestos containing material is encountered.
 - The Department will require up to 60 days for the abatement disposal of the asbestos containing material. The Department will arrange for the removal of asbestos containing material. Proceed with the building removal as directed by the Resident Engineer.
 - The Contractor may abate the asbestos containing material, at no additional cost to the Department, subject to approval from the

Engineer, and oversight by the Department's Environmental Programs Division.

- Use a licensed well-driller to plug abandoned water wells in accordance with Oklahoma Water Resources Board (OWRB) Chapter 35, Subchapter 11. Provide written notification to the Resident Engineer of wells, ground water, or monitoring not shown on the Plans.
- Provide written notification to the Resident Engineer of oil wells, gas wells, injection wells, and all associated gathering/distribution lines not shown on the Plans. The Oklahoma Corporation Commission has regulatory oversight for Oil and Gas Conservation (OAC 165:10).
- Remove and dispose of septic tank contents by a licensed hauler and in accordance with all local, state, and federal rules and regulations. Address any hazardous materials encountered in accordance with Subsection 107.15, "Hazardous Materials," and provide documentation to the Resident Engineer after disposal.
- Plug or cap abandoned sewer lines, water lines, and similar structures in accordance with local ordinances.
- Remove refuse in accordance with ODEQ, Solid Waste Management regulations, OAC 252:515. Submit copies of the dump receipts to the Resident Engineer for every load removed from the Project.
- Notify the Resident Engineer of underground storage tanks not shown on the Plans, including petroleum or butane tanks.
 - The Department will coordinate the removal of underground tanks.

When any items listed above are encountered on the Project but were not addressed in the Plans, the Contractor may be entitled to additional compensation as provided for in Sections 104.03 and 104.06 of the Standard Specifications. The Resident Engineer may contact the ODOT Construction Division for input if the Contractor requests additional compensation.

D. Safety and Environmental Considerations

It is the Contractor's responsibility to collect and dispose of materials generated from the removal operations in accordance with the Plans and applicable laws, rules, and regulations. Discuss the Contractor's proposed method to dispose of excess materials.

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, surplus debris, etc. (Do not allow the Contractor to place surplus debris, excavation or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being performed (removal of specific item(s), sawing pavement, NESHAP inspection, etc.).
- Work being performed on the removal items (excavating, demolition of specific item(s), removals, removal of specific item(s), hauling material, burning/burying material, stockpiling salvaged material, backfilling voids/cavities, sawing pavement, etc.).
- Quantity of each pay item that is performed (LS, LF, EA, SY, CY).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Sections 619.05 and 619.06 of the Standard Specifications, there are multiple pay items for the removal pay items (lump sum item for removal of structures & obstructions, removal of specific item(s), sawing pavement, etc.) that might be used on the project.

The final quantity for the removal pay items will be determined by the methods defined in Section 619.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 619.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length of removed pipe conduit either by multiplying the number of sections of pipe by the commercially fabricated length or by measuring the pipe in place before removal.

In accordance with Section 619.06 of the Standard Specifications, the following components of the removal pay items are to be included in the contract unit prices for the relevant pay items:

- the cost of removing, preserving, storing, and disposing of salvageable material to be included in the contract unit price for the relevant pay items.
- the cost of excavating, removing, disposing of, backfilling, and compacting cavities created by removed buildings, structures, and obstructions to be included in the contract unit price for the relevant pay items.

- If pay items for removal of buildings, structures, and obstructions do not exist, the Department will consider the cost associated with each to be included in the contract unit price for other relevant items of work.

Document the completed items as follows:

(a) Lump Sum Unit of Measure Pay Items

A partial payment of a “Lump Sum” pay item is not acceptable. Any partial payment for a “Lump Sum” pay item must be made by change order.

Documentation of the *Removal of Structures & Obstructions*, *Removal of Existing Bridge Structure* and *Oil Field Equipment Removal* Lump Sum items will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of Contract pay items.
2. In the appropriate fields, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter an estimated percentage of the lump sum item completed, ensuring that the total quantity to date does not exceed 1.00 Lump Sum.
4. In the Remarks bubble, document the method used for estimating the percentage of the lump sum item by providing sufficient information, calculations and/or references to specific sections of the standard specification.

(b) Linear Foot Unit of Measure Pay Items

Documentation of the *Sawing Pavement* and the relevant removal pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.

5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(c) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the *NESHAP Pre-demolition Inspection and Notification* and the relevant removal pay items paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

(d) Square Yard Unit of Measure Pay Items

Documentation of the relevant removal pay items paid by the Square Yard (SY) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate removal pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (SY) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.

5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(e) Cubic Yard Unit of Measure Pay Items

Documentation of the relevant removal pay items paid by the Cubic Yard (CY) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate removal pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the calculated quantity (CY) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

619.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

None required.

B. Audit Requirements

Any disposal of material adjacent to the project limits can only be done by written permission of the property owner. The Contractor must submit copies of property owner agreements to the Resident Engineer for the project file. Ensure the copies of the property owner agreements are in the project files.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” or “Lump Sum” pay item is not acceptable. Any partial payment for an “Each” or “Lump Sum” pay item must be made by change order.

C. Protection of the Work

Check if the project includes plan notes that require some material to be salvaged during the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor complies with any specified requirements of the ownership and handling of the salvaged material and that any damaged items due to negligence were repaired or replaced as approved by the Resident Engineer, at no additional cost to the Department.

Ensure the Contractor filled the voids and cavities resulting from the removed structures. Areas for pavement or other construction over removed structures must be prepared by the Contractor by backfilling and compacting in uniform layers not exceeding 6 in deep in accordance with Section 202.04 of the Standard Specifications. The Contractor must consolidate (flushing sandy material with water) or compact backfill material in other areas over removed structures.

If the Plans require the removal of asphalt concrete or P.C. concrete pavement, ensure the Contractor saws the pavement to provide a clean, straight joint to tie the new pavement to that is free of under-breakage or damage to adjacent areas.

619 CHECKLIST – REMOVAL OF BUILDINGS, STRUCTURES, AND OBSTRUCTIONS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant removal pay items shown in the Plans been identified and reviewed?					
Have the requirements for the NESHAP Pre-demolition Inspection and Notification pay item included in the Contract been discussed with the Contractor?					
Have the plan notes regarding the salvaging of materials generated by the removals to become property of the Department been reviewed with the Contractor (bridge components, culverts, rubblized concrete, etc.)?					
Have the limits of the removals (area, depth, etc.) for the various removal pay items been discussed with the Contractor?					
Have the proper backfill requirements of holes and voids within the limits of the removals (backfill material, compaction, etc.) for the various removal pay items been discussed with the Contractor?					
Is the Contractor aware of the notifications necessary if septic tanks, underground storage tanks (fuel, etc.), or utility lines are encountered during the removal operations?					
Have the requirements for proper disposal of excess material generated by the removals been discussed with the Contractor?					
Have the requirements for proper disposal of excess material generated by the removals on the project right-of-way been discussed with the Contractor?					
Have the requirements for proper disposal of excess material generated by the removals on adjacent properties to the project been discussed with the Contractor?					

When disposing of excess material on adjacent property, has the Contractor provided copies of the written agreements with the property owner?					
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Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant removal pay items shown in the Plans been identified and reviewed?					
Has the Contractor complied with the requirements for the NESHP Pre-demolition Inspection and Notification pay item included in the Contract?					
Is the Contractor salvaging materials generated by the removals that are designated to become property of the Department (bridge components, culverts, rubblized concrete, etc.)?					
Is the Contractor removing structures and obstructions (area, depth, etc.) for the various removal pay items in accordance with the requirements?					
Is the Contractor meeting the backfill requirements of holes and voids within the limits of the removals (backfill material, compaction, etc.) for the various removal pay items?					
Has the Contractor provided notifications of septic tanks, underground storage tanks (fuel, etc.), or utility lines that were encountered during the removal operations?					
Has the Contractor complied with the requirements for proper disposal of excess material generated by the removals?					
Has the Resident Engineer given written approval for the disposal of excess material generated by the removals on the project right-of-way?					
Has the Contractor complied with the requirements for proper disposal of excess material generated by the removals on the project right-of-way?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Has the Contractor complied with the requirements for proper disposal of excess material generated by the removals on adjacent properties to the project?					
Has the Contractor provided copies of the written agreements with the property owner for disposing excess material on adjacent property,?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Were all the relevant removal pay items shown in the Plans completed as planned or as directed by the Resident Engineer?					
Were the salvaged materials that were designated to become property of the Department (bridge components, culverts, rubblized concrete, etc.) free of damage and stockpiled as required?					
Did the Contractor remove the structures and obstructions (area, depth, etc.) for the various removal pay items in accordance with the requirements?					
Did the Contractor meet the backfill requirements for holes and voids within the limits of the removals (backfill material, compaction, etc.) for the various removal pay items?					
Has the Contractor provided copies of the written agreements with the property owner for disposing excess material on adjacent property,?					

SECTION 620 – REMOVAL OF UNDERGROUND STORAGE TANKS

620.01 GENERAL

This work consists of removing and disposing underground storage tanks (primarily fuel or petroleum product storage). It is the Contractor's responsibility to comply with all current local, state and federal ordinances, laws and regulations including the following:

- Oklahoma Corporation Commission (OCC) rules, regulations, codes, and guidance documents,
- OCC "UST Removal Guidebook",
- Oklahoma Department of Environmental Quality (ODEQ) rules, regulations, codes, and guidance documents,
- American Petroleum Institute Bulletin 1604 for Recommended Practices for Removal of Underground Storage Tanks,

The Plans, Special Provisions and Standard Specification will take precedence over the ODEQ and OCC minimum regulations.

NOTE: The use of Section 620 of the Standard Specifications and the pay items for this section have been extremely limited since the adoption of the 2019 Edition of the Standard Specifications and even dating back to the adoption of the 2009 Edition. ODOT implemented new policies and procedures during that time that rendered this Section obsolete. ODOT Environmental Programs Division manages the removal of underground storage tanks and contaminated soil on highway projects, and typically the municipality will manage the operations on local government projects during preconstruction activities.

If you have a project that includes Section 620 pay items, you are encouraged to contact Environmental Programs Division for input and guidance.

620.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Review plan notes and details included in the Plans and special provisions in the Contract for the requirements (details and limits of tank removals, disposal of tank, removal of contaminated soil, etc.) of the removal of underground storage tank pay item included in the Plans.
- Location of the existing tanks that require removal in the Plans.
- Coordination with regulatory agency (OCC, ODEQ, etc.) to provide opportunity for their inspector to be on-site during removal operations.
- Methods and equipment to be used.

- ODEQ approved laboratory to be used for any required soil sampling and testing.
- Excavation and disposal of contaminated soil requirements during tank removal operations.
- Soil sampling/testing requirements.
- Reporting and notification requirements (scheduled date of tank removal, soil test results, certificate of tank destruction, tank closure report, etc.).
- Contractor's schedule/plan for the work.
- Coordination with the public utility owner regarding installations, cut-offs and connections necessary for waterline and appurtenance construction.
- Traffic control and maintenance of traffic during construction.
- Cleanup and backfill of void created from tank removal.

B. Acceptance of Materials

None required.

C. Preparatory Work and Contractor Work Plans

Consider the following before removal of underground storage tank operations begin.

1. Contract Plans and Specifications

Review the Standard Specifications, Special Provisions and Plan Notes and determine any specific requirements that pertain to the underground storage tank removal pay item on your project. Review the plan details for the locations of tank removals required for the project.

Ensure the Contractor is aware of the various regulations and requirements of the Oklahoma Corporation Commission (OCC) and the Oklahoma Department of Environmental Quality (ODEQ) regarding the tank removal and contaminated soil removal and disposal, including testing and reporting requirements.

2. Contractor Proposed Equipment

The Contractor may include the equipment needed to perform the underground tank removal operations in their submittals prior to beginning construction. Section 620.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the tank removal operations. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the tank removal operations include:

- Excavators and loaders,
- Trucks,
- Vacuum tankers, pumps and drums for fluids removal, and

- Other equipment necessary for clean-up.

3. Disposal of Materials

There are stringent ODOT specifications and environmental regulations (OCC, ODEQ, etc.) regarding the disposal of the removed tank and contaminated soil. Discuss the Contractor's plan to comply with the requirements and regulations during the tank/soil removal and disposal operations and emphasize the Contractor's responsibility for compliance.

Review the Standard Specifications, Special Provisions and Plan Notes and determine any specific requirements that pertain to the disposal of the removed tank and contaminated soil on your project. Some projects may specify that the sampling, testing, removal and disposal of the contaminated soil will be accomplished by a third party Contractor arranged by the ODOT Environmental Programs Division. In those instances, ensure coordination is provided by the construction project contractor and the ODOT Environmental Programs Division.

D. Safety and Environmental Issues

There are stringent ODOT specifications and environmental regulations (OCC, ODEQ, etc.) regarding the sampling and testing of the soil and the disposal of the removed tank and contaminated soil. Discuss the Contractor's plan to comply with the requirements and regulations during the tank/soil removal and disposal operations and emphasize the Contractor's responsibility for compliance, including testing and reporting requirements.

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing a copy of the Contractor's OKIE locate notification,
- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, surplus debris, etc. (Do not allow the Contractor to place surplus debris, excavation or other materials near or in storm sewer structures, streams or waterways.)

620.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

None required.

B. Equipment and Methods

Section 620.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the tank removal operations. The choice of

equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment for the tank removal operations include:

- Excavators and loaders,
- Trucks,
- Vacuum tankers, pumps and drums for fluids removal, and
- Other equipment necessary for clean-up.

C. Construction Operations

NOTE: The use of Section 620 of the Standard Specifications and the pay items for this section have been extremely limited since the adoption of the 2019 Edition of the Standard Specifications and even dating back to the adoption of the 2009 Edition. ODOT implemented new policies and procedures during that time that rendered this Section obsolete. ODOT Environmental Programs Division manages the removal of underground storage tanks and contaminated soil on highway projects, and typically the municipality will manage the operations on local government projects during preconstruction activities.

If you have a project that includes Section 620 pay items, you are encouraged to contact Environmental Programs Division for input and guidance.

Review the requirements in Section 620 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the underground petroleum storage tank removal pay items included in the Plans. Ensure the Contractor is aware of local, state and federal laws, ordinances, laws and regulations governing the tank removal and contaminated soil removal and disposal, including testing and reporting requirements.

Review the relevant aspects of Section 620.04 of the Standard Specifications that pertain to the tank removals required on your project prior to beginning the removal operations and ensure the Contractor complies with the requirements, including the following:

1. General Coordination, Sampling & Testing and Reporting Requirements

It is required to provide coordination with the appropriate regulatory agency (OCC, ODEQ, etc.) to provide an opportunity for their inspector to be on-site during removal operations. The following coordination requirements are listed in Section 620.04.A of the Standard Specifications:

- The Contractor must schedule the date for the removal of underground storage tanks with the Resident Engineer.
- The Resident Engineer must report this date to the ODOT Environmental Programs Division.

- This date is reported to the appropriate regulatory entity (OCC, ODEQ, etc.) to enable the regulatory inspector to be on site during the removal operation.
 - Typically, the scheduled date would be reported to the regulatory entity by the ODOT Environmental Programs Division. Check the plan notes included in the Plans and special provisions in the Contract to confirm who is responsible for that notification (Contractor, Resident Engineer or Environmental Programs Division).
 - Confirm with Environmental Programs Division who will be responsible for providing notification to the regulatory entity.

The Contractor must perform tank removal and sampling activities using appropriately qualified and licensed professionals, as required by law (ex. OCC Remover, OCC Environmental Consultant, etc.). The laboratory used for the sampling and testing of the soil to determine the limits of soil contamination must be pre-approved by the ODEQ.

The Contractor must prepare a Tank Closure Report in accordance with applicable local, state and federal rules and regulations, and in consultation with the ODOT Environmental Programs Division (EPD). Prior to submittal to the applicable regulatory agency, the Contractor must submit the analytical results and tank closure report(s) to the Resident Engineer. The Resident Engineer shall provide this documentation to the EPD; after EPD reviews the submittals, EPD will advise the Resident Engineer of the readiness for regulatory submittal. Upon receipt of that advisory notification from EPD, the Resident Engineer must notify the Contractor that the analytical results and tank closure report(s) must be submitted to the applicable regulatory agency.

2. Removal of Tanks

The tanks become the property of the Contractor upon removal from the ground. The Contractor must remove the tanks from the job site within 72 hours of removal, as per the OCC “UST Removal Guidebook”.

A Certificate of Destruction must be provided by the Contractor to the Resident Engineer for each removed tank. The Resident Engineer shall provide this documentation to the ODOT Environmental Programs Division.

3. Removal of Contaminated Soil

Ensure the Contractor return all loose soils to the pit to minimize open excavation safety hazards. Additional soil will likely be required to fill the cavity created from the removed tank. If evidence of contamination is observed, the excavation may be left open for further assessment at the discretion of the Resident Engineer and the ODOT Environmental Programs Division.

Some projects may specify that the sampling, testing, removal and disposal (or some combination of those activities) of the contaminated soil will be accomplished by a third party Contractor arranged by the ODOT Environmental Programs Division. In those instances, ensure coordination is provided by the construction project contractor and the ODOT Environmental Programs Division. When specified, the management of contaminated soil shall be coordinated with the ODOT Environmental Programs Division. As required, payment for additional excavation by the construction contractor for removal of contaminated soil in accordance with Subsection 620.06 of the Standard Specifications.

D. Safety and Environmental Considerations

It is the Contractor's responsibility to comply with ODOT specifications and environmental regulations (OCC, ODEQ, etc.) regarding the sampling and testing of the soil and the disposal of the removed tank and contaminated soil. Ensure the Contractor complies with the requirements and regulations during the tank/soil removal and disposal operations, including testing and reporting requirements. Contact the ODOT Environmental Programs Division for any questions, clarifications or concerns.

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing a copy of the Contractor's OKIE locate notification,
- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, surplus debris, etc. (Do not allow the Contractor to place surplus debris, excavation or other materials near or in storm sewer structures, streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being performed (removal of underground storage tank, removal of contaminated soil, etc.).
- Work being performed on the tank removal items (excavating, removal of tank, sampling soil, hauling tank from project site, hauling contaminated soil from project site, backfilling voids/cavities, etc.).
- Quantity of each pay item that is performed (EA, CY).

- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

Where specific methods of measurement for the removal pay items are not defined in Section 620.05, refer to Section 109.01 of the Standard Specifications for clarification.

In accordance with Section 620.06 of the Standard Specifications, the cost of the laboratory soil analysis is to be included in the contract unit price for the *Removal of Underground Storage Tank* pay item.

Document the completed items as follows:

(a) Each Unit of Measure Pay Items

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

Documentation of the *Removal of Underground Storage Tank* pay item paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the ‘New’ button to create a new row for the selected pay item.

(b) Cubic Yard Unit of Measure Pay Items

Documentation of the *Removal of Contaminated Soil* pay item paid by the Cubic Yard (CY) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate removal pay item from the list of contract pay items.

2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the calculated quantity (CY) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

620.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

None required.

B. Audit Requirements

Ensure the Contractor has submitted the relevant required forms and documentation as required by ODOT specifications and environmental regulations (OCC, ODEQ, etc.) regarding the disposal of the removed tank and contaminated soil, including the following:

- Certificate of Destruction (for the removed tank),
- Analytical Soil Test Results (from an ODEQ approved lab), and
- Tank Closure Report.

Verify that the above listed documentation has been submitted to the ODOT Environmental Programs Division.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated, unless gaps are intentionally omitted in accordance with the method of measurement.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor returned all loose soils to the void/cavity from the tank removal to minimize open excavation safety hazards. Additional soil will likely be required to fill the cavity created from the removed tank. If evidence of soil contamination is observed, the excavation may be left open for further sampling/testing, as approved by the Resident Engineer.

620 CHECKLIST – REMOVAL OF UNDERGROUND STORAGE TANKS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the locations of the underground storage tanks required to be removed in the Plans been discussed with the Contractor?					
Have the responsibilities (contractor or third party) for removal and disposal of the tanks and contaminated soil been discussed with the Contractor?					
Is the Contractor experience and knowledgeable of the local, state and federal regulations regarding the removal and disposal of the tank and contaminated soil?					
Has the proposed ODEQ pre-approved soil sampling & testing lab been submitted by the Contractor?					
Has the requirement for scheduling the tank removal date for Environmental Programs Division and OCC notification been discussed with the Contractor?					
Have the reporting requirements (soil test results, certificate of destruction, tank closure report, etc.) for the tank removal been discussed with the Contractor?					
Have the backfill requirements of the void/cavity from the tank removal been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor performing their responsibilities for removal and disposal of the tanks in accordance with the specifications and regulations?					
Is the Contractor performing their responsibilities for removal and disposal of the contaminated soil in accordance with the specifications and regulations?					

Part 2: During Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor provide advance notice on the scheduled tank removal date to the Resident Engineer?					
Was advance notice on the scheduled tank removal date provided to Environmental Programs Division by the Resident Engineer?					
Is the Contractor using an ODEQ pre-approved soil sampling & testing lab?					
Has the Contractor provided the soil test results as required to the Resident Engineer?					
Has the Contractor provided the certificate of destruction as required to the Resident Engineer?					
Has the Contractor provided the tank closure report as required to the Resident Engineer?					
Has the Resident Engineer provided all the documentation (soil test results, certificate of destruction, tank closure report, etc.) to Environmental Programs Division?					
Has the Contractor properly backfilled the void/cavity from the tank removal?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor provided all the documentation (soil test results, certificate of destruction, tank closure report, etc.) to the Resident Engineer?					
Did the Resident Engineer provided all the documentation (soil test results, certificate of destruction, tank closure report, etc.) to Environmental Programs Division?					
Did the Contractor properly backfilled the void/cavity from the tank removal?					

SECTION 622 – PIPE RAILING AND MISCELLANEOUS PIPE WORK

622.01 GENERAL

This work consists of providing and erecting pipe railing with steel and concrete posts, and miscellaneous pipe work.

622.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various pipe railing pay items (pipe railing, miscellaneous pipe work, etc.) included in the Contract.
- Review plan notes and details included in the Plans and special provisions in the Contract for the requirements (details of fabrication, mounting details, installation, material & coating requirements, etc.) of the relevant pipe railing pay items included in the Plans.
- Confirmation of planned locations and dimensions.
- Proposed sources of material and material requirements.
- Shop drawings for pipe railing for Resident Engineer approval.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work.
- Maintenance of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 622.02 and other referenced sections of the Standard Specifications regarding the pipe railing. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant pipe railing pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following for use in the pipe railing as specified in Sections 622.02 of the Standard Specifications:

- pipe railing materials in accordance with Section 732.04 of the Standard Specifications.
- two coats of aluminum paint (finish field coat) in accordance with Section 730.02 of the Standard Specifications for standard black steel pipe. (**NOTE:** *Aluminum paint specifications were eliminated from Section 730 beginning in the 1996 Edition of the Standard Specifications. The recommended replacement language from Materials*

*Division which will be added to the next edition of the specifications is, “**Provide two coats of 93% pure zinc paint and overcoat with a polyurethane-based paint for outdoor use.**” This will allow the work to be done in the field without having to send it to a coater and allow the choice of colors if the designers wish to specify a certain color coat.)*

- concrete posts in accordance with Section 504 of the Standard Specifications.
- reinforcement steel in accordance with Subsection 723.01 of the Standard Specifications.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources are not provided at that meeting, ensure that they are submitted in advance of any work (including fabrication) beginning on the relevant pipe railing pay items included in the Plans.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor’s proposed sources of materials and products to ensure compliance with Section 622.02 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant pipe railing pay items included in the Plans. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials must be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before pipe railing fabrication and installation begins:

1. Contract Plans and Specifications

Review the requirements in Section 622 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant pipe railing pay items included in the Plans. Various aspects for the fabrication and installation of the pipe railing that are typically shown in the details found in the Plans, include:

- details of fabrication (dimensions, connections, etc.),
- material & coating requirements,
- locations to be placed, and

- installation & mounting details.

If the pipe railing is being installed for protection of sidewalks, ramps and accessible pathways, discuss the importance of compliance with all [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#) requirements. If the Plans indicate constructing an aspect that appears to contradict the requirements for an accessible pathway (such as proximity of the pipe rail to the ramp, etc.), contact the Resident Engineer or ODOT ADA Manager for evaluation.

2. Supplemental (Shop) Drawings

Section 622.04.A of the Standard Specifications requires the Contractor to provide shop drawings which provide greater details for the fabrication of the pipe railing. The specification states that the Resident Engineer is responsible for the review and approval of the shop drawings. However, if the project is within the limits of a municipality that will maintain the completed pipe railing, the review and approval of the municipality should be obtained to ensure proper coordination and communication regarding the construction of their facility.

Ensure the shop drawings include sufficient information to satisfy the requirements of the details included in the Plans. Various aspects for the fabrication and installation of the pipe railing that are typically shown in the Plans and further detailed in the shop drawings, include:

- fabrication requirements:
 - diameter of pipe,
 - dimensions (height, length, spacing of pipe/posts),
 - type of connections,
- material requirements,
- coating requirements,
- locations to be placed, and
- installation & mounting details.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

622.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 622.02 and other referenced sections of the Standard Specifications regarding the pipe railing. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant pipe railing pay items included in the Plans. Ensure the Contractor's sources and products meet the relevant material requirements for the pipe railing.

The Contractor's fabricator of the pipe railing must provide shop drawings to illustrate greater details for the fabrication of the pipe railing for the review and approval of Resident Engineer. Ensure the pipe railing delivered to the project complies with the requirements shown in the approved shop drawings and complies with the details included in the Plans.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Unless otherwise required in the Plans, the Contractor must provide the following for use in the pipe railing as specified in Sections 622.02 of the Standard Specifications:

- pipe railing materials in accordance with Section 732.04 of the Standard Specifications.
- two coats of aluminum paint (finish field coat) in accordance with Section 730.02 of the Standard Specifications for standard black steel pipe. (**NOTE:** *Aluminum paint specifications were eliminated from Section 730 beginning in the 1996 Edition of the Standard Specifications. The recommended replacement language from Materials Division which will be added to the next edition of the specifications is, “**Provide two coats of 93% pure zinc paint and overcoat with a polyurethane-based paint for outdoor use.**” This will allow the work to be done in the field without having to send it to a coater and allow the choice of colors if the designers wish to specify a certain color coat.*)
- concrete posts in accordance with Section 504 of the Standard Specifications.
- reinforcement steel in accordance with Subsection 723.01 of the Standard Specifications.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources of materials and products are not provided at that

meeting, ensure that they are submitted in advance of any work beginning on the fabrication and installation of the pipe railing.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and products. Resolve any questions or concerns with the submitted sources of materials and products with the Contractor in a timely manner. A written response accepting the proposed sources of materials and products must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted sources of materials and products are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

B. Equipment and Methods

Section 622.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to place the pipe railing. The choice of equipment and methods for this work is usually left to the Contractor's discretion. Typical equipment includes lifting equipment for unloading/handling and hand tools for mounting/installing the pipe railing.

Discuss the type of installation/mounting methods proposed by the Contractor for the various locations of pipe railing required on the project. Ensure the methods for installation/mounting the pipe railing complies with the requirements shown in the approved shop drawings and complies with the details included in the Plans.

C. Construction Operations

The Contractor must meet the requirements in Section 622 of the Standard Specifications, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant pipe railing pay items included in the Plans. Additionally, The Contractor's fabricator of the pipe railing must provide shop drawings to illustrate greater details for the fabrication of the pipe railing. Ensure the pipe railing delivered to the project complies with the requirements shown in the approved shop drawings and complies with the details included in the Plans.

If the pipe railing is being installed for protection of sidewalks, ramps and accessible pathways, ensure compliance with all [Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#) requirements. If the Plans indicate constructing an aspect that appears to contradict the requirements for an accessible pathway (such as proximity of the pipe rail to the ramp, etc.), contact the Resident Engineer or ODOT ADA Manager for evaluation and input.

Various aspects for the fabrication and installation of the pipe railing that are typically shown in the Plans and further detailed in the shop drawings, include:

- fabrication requirements:

- diameter of pipe,
- dimensions (height, length, spacing of pipe/posts),
- type of connections,
- material requirements,
- coating requirements,
- locations to be placed, and
- installation & mounting details.

In accordance with Section 622.04 of the Standard Specifications, unless otherwise shown in the Plans or approved shop drawings, ensure the Contractor complies with the following:

- Make splices using male and female connections with dimensions no greater than the outside dimension of the pipe railing.
- Weld railing in accordance with Section 724.03 of the Standard Specification.
- Secure railing posts with fittings as shown on the Plans.
- Install miscellaneous pipe for conduit and drains in concrete curbs, sidewalks, or retaining walls as shown on the Plans, or as directed by the Resident Engineer. Ensure the pipes are completely embedded in the concrete

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the pipe railing items (preparation work for mounting, installation, applying field coating, etc.).
- Quantity of each pay item that is placed (LF).

- Any communications with the municipality (person, topic, etc.).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

The final quantity for the pipe railing pay items will be determined by the methods defined in Section 622.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 622.05, refer to Section 109.01 of the Standard Specifications for clarification.

The Resident Engineer will measure the length of *Pipe Railing* from center to center of the end posts. The measurement will not include the length of steel and concrete posts. In accordance with Section 622.06 of the Standard Specifications, unless otherwise stated in the Plans, the cost of steel and concrete posts are to be included in the contract unit price for *Pipe Railing* pay item.

Documentation of the pipe railing pay items paid by the Linear Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the descriptive location or the station to station extents and location (i.e., direction, station extents, lane designation, etc.).
- c. In the Placed Quantity field, enter the measured quantity (LF) of the relevant pipe railing pay item completed.
- d. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

622.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and products which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials which were submitted by the Contractor were not utilized on the project and the

products used do not appear to be in compliance with the requirements of Sections 622.02 and 732.04 of the Standard Specifications, contact Materials Divisions to confirm the status of source/product approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantities paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

C. Protection of the Work

Ensure the pipe railing items are not damaged during the construction of the project and are satisfactorily maintained until the project is completed. Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

622 CHECKLIST – PIPE RAILING AND MISCELLANEOUS PIPE WORK

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant pipe railing pay items shown in the Plans been identified and reviewed?					
Have the plan notes and details regarding the pipe railing pay items been reviewed with the Contractor (locations for installation, details of fabrication, mounting details, etc.)?					
Have the material and coating requirements for the pipe railing been discussed with the Contractor?					
Have the requirements for pipe railing shop drawings (details for fabrication, material, coating, mounting, etc.) been discussed with the Contractor?					
Have the requirements for pipe railing and other aspects of providing an accessible pathway as stated in the PROWAG accessibility guidelines been discussed with the Contractor?					
Has the Resident Engineer contacted the municipality to coordinate the review of shop drawings and fabrication/construction of the pipe railing?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant pipe railing pay items shown in the Plans been identified and reviewed?					
Has the Contractor submitted pipe railing shop drawings for Resident Engineer approval that contain details that meet the requirements of the Plans?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Resident Engineer sent the shop drawings to the municipality for their review and input?					
Has the Resident Engineer sent a written approval of the shop drawings to the Contractor?					
Did the Contractor comply with plan notes, details and shop drawings regarding the fabrication (type of material/coating, dimensions, splices, connections, etc.) of the pipe railing delivered to the project?					
Is the Contractor complying with plan notes, details and shop drawings regarding the installation locations for the pipe railing pay items?					
Is the Contractor complying with plan notes, details and shop drawings regarding the mounting method for the pipe railing pay items?					
Does the pipe railing design and location of installation meet the requirements of the PROWAG accessibility guidelines?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Has the Resident Engineer coordinated with the municipality for installation of the pipe railing?					
Does the Contractor have a plan for protection of the pipe railing during remaining construction operations?					
Is the project residency inspector documenting the quantities of the relevant pipe railing pay items?					
Is the Contractor properly disposed of waste materials (excess material from coating, mounting, etc.)?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials reviewed/accepted by the Resident Engineer?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Has the Contractor taken adequate precautions to protect the completed pipe railing from damage?					
Were any conditions or requiring corrective action or maintenance of pipe railing addressed sufficiently by the Contractor?					
Did the Contractor properly dispose of waste materials (excess material from coating, mounting, etc.)?					

SECTION 623 – GUARDRAIL AND END TREATMENTS

623.01 GENERAL

This work consists of constructing guardrail, end treatments, posts, blockouts, and other appurtenances. ODOT utilizes the following types of guardrail:

- Beam Guardrail Steel W-Beam Single,
- Beam Guardrail Steel W Beam Double,
- Beam Guardrail Steel Thrie Beam Single,
- Beam Guardrail Steel Thrie Beam Double,
- Beam Guardrail Steel Transition Section,
- Guardrail Anchor Unit, and
- Guardrail End Treatments (GET).

Unless otherwise specified in the Plans or Special Provisions in the Contract, the Contractor must use GETs that comply with the following:

- are designed as W-Beam guardrail terminals,
- provided with anchors capable of supporting the rail tensile strength developed during a downstream impact and remaining crashworthy for end-on impacts, and
- satisfy the National Cooperative Highway Research Program (NCHRP) Report 350 for a test level 3 (TL-3) terminal and are approved for use on the National Highway System.

623.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of guardrail pay items (types of guardrail, types of anchor units, guardrail end treatments, etc.) included in the Contract.
- Review special provisions, plan notes and ODOT Standard Drawings included in the Contract for the requirements (details of installation, material requirements, sequencing of work, etc.) of the relevant guardrail pay items included in the Plans.
- Confirmation of planned locations and lengths.
- Proposed sources of materials, products and material requirements. Type A Material Certification required for guardrail and GETs.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used.

- Contractor's schedule/plan for the work to minimize the time between the removal of the existing guardrail and its replacement.
- Requirements for any designated salvaged materials specified in the Plans.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 623.02 and other referenced sections of the Standard Specifications regarding the guardrail and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant guardrail pay items included in the Plans.

Ensure the GETs are manufactured with new material and assembled in accordance with the manufacturer's standards. GETs must be capable of flattening and bending the guardrail away from the impacting vehicle.

Ensure the guardrail elements are continuous 12 gauge sections; either one 26 ft long section, or two 13 ft long sections.

Unless otherwise required in the Plans, the Contractor must provide the following guardrail components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 623.02:

- PC Concrete, Class A meeting Section 701
- Epoxy Resin Adhesive meeting Section 701.13
- Reinforcing Steel meeting Section 723
- Requirements for Paint Systems meeting Section 730.02
- Guardrail Posts meeting Section 732.01
- Spacer Blocks (Blockouts) meeting Section 732.01
- Beam Guardrail Elements meeting Section 732.01
- Fittings (Steel Hardware) meeting Section 732.01
- Reflective Sheeting for Guide Posts meeting Section 733.05
- Non-Shrink Grout meeting Section 733.07

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant guardrail pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and

subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Guardrail anchor units require the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

PC concrete mix designs must be reviewed for approval by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant location in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plant submitted by the Contractor has a current ODOT certification. The plant must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following guardrail materials should be verified on the QPL or approved aggregate source list:

- Guardrail, beams and posts
- Components of the PC concrete listed on the mix design
- Reinforcing steel (used in anchor units)

The Contractor must submit a Type A Material Certification for the guardrail materials and GET's in accordance with the [FAST Guide](#). As stated in Section 106.04.C of the Standard Specifications, the Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

When the project includes the installation of traffic items, the Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). If a proposed traffic item product is not on the APL, contact Traffic Engineering Division to confirm the status of the source/product approval. The following guardrail materials should be verified on the APL:

- Guardrail end treatments
- Guardrail blockouts
- Note: Other components for guardrail may be added to the APL once approved for use.

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before guardrail installation begins:

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the guardrail pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant guardrail pay items included in the Plans.

Some projects include plan notes that require some material to be salvaged during the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

The “Summary of Guardrail” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the guardrail work:

- Station extents and location to be installed,
- Pay items to be installed (type of guardrail, GET, bridge connection, anchor unit, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the guardrail items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the guardrail items included on the project. The various ODOT Standard Drawings pertaining to the guardrail work include the following:

- [ODOT Standard Drawing THRI-1](#) includes details regarding the three beam guardrail bridge connections (31” guardrail height).
- [ODOT Standard Drawing SKT-1](#) includes details regarding the guardrail end treatments (31” guardrail height).
- [ODOT Standard Drawing GA31-1](#) includes details regarding the guardrail anchor units (31” guardrail height).
- [ODOT Standard Drawing GHW1-1](#) includes details regarding the guardrail and hardware (31” guardrail height). (1 of 2 sheets)
- [ODOT Standard Drawing GHW2-1](#) includes details regarding the guardrail and hardware (31” guardrail height). (2 of 2 sheets)

- [ODOT Standard Drawing DBF1-1](#) includes details regarding the guardrail bridge connections with adding rub rail to existing D-BF bridge connections (27-3/4" guardrail height).
- [ODOT Standard Drawing DBF2-1](#) includes details regarding the guardrail bridge connections with rub rail to new D-BF bridge connections (27-3/4" guardrail height).

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to install the guardrail in their submittals prior to beginning construction. Section 623.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install guardrail items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Guardrail posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the guardrail items.

For projects that include the removal of existing guardrail items for their replacement with new units, ensure the Contractor has an acceptable plan to schedule the operations to minimize the time between the removal of the existing guardrail and its replacement. Ensure the Contractor has a plan to protect areas vacated by the removed guardrail as shown in the Plans or as approved by the Resident Engineer.

3. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, "Admixtures".

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine).

Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and guardrail items from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed guardrail as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

623.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 623.02 and other referenced sections of the Standard Specifications regarding the guardrail and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant guardrail pay items included in the Plans.

Ensure the GETs are manufactured with new material and assembled in accordance with the manufacturer's standards. GETs must be capable of flattening and bending the guardrail away from the impacting vehicle.

Ensure the guardrail elements are continuous 12 gauge sections; either one 26 ft long section, or two 13 ft long sections.

Unless otherwise required in the Plans, the Contractor must provide the following guardrail components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 623.02:

- PC Concrete, Class A meeting Section 701
- Epoxy Resin Adhesive meeting Section 701.13
- Reinforcing Steel meeting Section 723
- Requirements for Paint Systems meeting Section 730.02
- Guardrail Posts meeting Section 732.01
- Spacer Blocks (Blockouts) meeting Section 732.01
- Beam Guardrail Elements meeting Section 732.01
- Fittings (Steel Hardware) meeting Section 732.01
- Reflective Sheeting for Guide Posts meeting Section 733.05
- Non-Shrink Grout meeting Section 733.07

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and

plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant guardrail pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Guardrail anchor units require the use of Class A Concrete. Ensure the Contractor has submitted its proposed concrete designs in advance of any work beginning on the PC concrete for the guardrail anchor units pay items.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 623.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the PC concrete for the guardrail anchor units pay items.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 623.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, products and mix designs in advance of any work beginning on the relevant guardrail pay items.

The Contractor must submit a Type A Material Certification for the guardrail materials and GET's in accordance with the [FAST Guide](#). As stated in Section 106.04 of the Standard Specifications, the Type A Material Certification is a certification prepared by the manufacturer consisting of a certified report detailing tests conducted by a laboratory approved by the Department on samples obtained from the lot(s) of material in the shipment. Type A and B Material Certifications must be approved by the ODOT Materials Division for compliance with the contract requirements. Certifications must include:

- the project number,
- name of the Contractor,
- identification markings on shipment (when applicable), and
- for Type A Material Certifications required by the FAST Guide, the quantity of material being certified.

The Residency will verify that the proposed source of materials and products submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various

products can be found on the Materials Division website ([Material Source Qualification](#)).

The Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). Ensure the product name and manufacturer is shown on the APL. If a proposed traffic item product is not on the APL, contact Traffic Engineering Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

(a) PC Concrete and Reinforcing Steel for Guardrail Anchor Units

Guardrail anchor units require the use of Class A Concrete and Reinforcing Steel. The Residency must perform and document the following acceptance tests/procedures on the PC concrete and reinforcing steel for the guardrail anchor unit pay items:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard

Specifications for the appropriate size number (57, 67, etc.).
[Document in Template T27]

- Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the guardrail anchor unit is listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) Guardrail Materials and GETs

The Residency will verify that the proposed source and product name submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Traffic Engineering Division Approved Products](#)

[List \(APL\)](#), whichever is applicable. The Residency must document the following acceptance procedures for the guardrail and GET items:

- Verify the proposed source and product for the guardrail materials (beams and posts) is listed on the [QPL-Guardrail Materials](#).
 - Ensure the Contractor provides a Type A Material Certification that is approved by ODOT Materials Division for the guardrail materials. [Document in Template AM5006]
- Verify the proposed source and product for the guardrail spacer block (blockout) is listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). [Document in Template AM5006]
- Verify the proposed source and product for the guardrail end sections (GETs) is listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#).
 - Ensure the Contractor provides a Type A Material Certification that is approved by ODOT Materials Division for the guardrail materials. [Document in Template AM5006]

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division and/or Traffic Engineering Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 623.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install guardrail items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Guardrail posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the guardrail items.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the guardrail pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant guardrail pay items included in the Plans.

For projects that include the removal of existing guardrail items for their replacement with new units, ensure the Contractor schedules the operations to minimize the time between the removal of the existing guardrail and its replacement. Review the plan notes and pay

item notes in the Plans for any limitations for the removal/replacement of the existing guardrail. Ensure the Contractor protects the area vacated by the removed guardrail as shown in the Plans or as approved by the Resident Engineer.

Check the Plans for any designation for the Contractor to salvage materials, structures or buildings that are to become property of ODOT. Ensure the Contractor's methods for removing salvageable material required by the Plans result in no damage to the salvaged material. Check the Plans for the specified locations to store the salvaged material. Emphasize the Contractor's responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

The design of the guardrail is specific to the location it is being installed and the length of need required at that location. Do not make any changes to the design (location or length) without confirming any modifications being considered with the Design Engineer. The "Summary of Guardrail" schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the guardrail work:

- Station extents and location to be installed,
- Pay items to be installed (type of guardrail, GET, bridge connection, anchor unit, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the guardrail items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the guardrail items included on the project. The various ODOT Standard Drawings pertaining to the guardrail work include the following:

- [ODOT Standard Drawing THRI-1](#) includes details regarding the three beam guardrail bridge connections (31" guardrail height).
- [ODOT Standard Drawing SKT-1](#) includes details regarding the guardrail end treatments (31" guardrail height).
- [ODOT Standard Drawing GA31-1](#) includes details regarding the guardrail anchor units (31" guardrail height).
- [ODOT Standard Drawing GHW1-1](#) includes details regarding the guardrail and hardware (31" guardrail height). (1 of 2 sheets)
- [ODOT Standard Drawing GHW2-1](#) includes details regarding the guardrail and hardware (31" guardrail height). (2 of 2 sheets)
- [ODOT Standard Drawing DBF1-1](#) includes details regarding the guardrail bridge connections with adding rub rail to existing D-BF bridge connections (27-3/4" guardrail height).
- [ODOT Standard Drawing DBF2-1](#) includes details regarding the guardrail bridge connections with rub rail to new D-BF bridge connections (27-3/4" guardrail height).

Verify the following complies with Section 623.04 of the Standard Specifications when performing guardrail installation operations:

1. Setting Posts for Guardrail or Barrier Posts

Ensure the Contractor sets the posts for guardrail as shown on the Plans. Verify the posts are set as shown on the Plans and set plumb with the front faces in a straight line. For curves, ensure the posts are set a uniform distance from the edge of the pavement. Set the tops of the posts to the elevations shown on the Plans or as approved by the Resident Engineer. For additional details regarding spacing and dimensions for the post installation, refer to the relevant ODOT Standard Drawing for the type of guardrail being placed.

Machine driven guardrail post is typically the installation method used by the Contractor. Ensure the Contractor fills all surface depressions resulting from driving the posts. Use material similar to the in situ material (usually asphalt guardrail widening) and compacts the material in a manner approved by the Resident Engineer.

When the Contractor chooses to dig post holes in compacted soil for the installation method, ensure the bottoms of the holes are cleared of loose material to ensure a stable post foundation. Once the post is placed, the holes must be backfilled with material approved by the Resident Engineer. Ensure the Contractor compacts each layer of material to a depth no greater than 6 in. Ensure compaction operations do not change the alignment of the post.

2. Guardrail Elements and Hardware

Ensure the Contractor installs the guardrail and its hardware in accordance with Section 623.04.B of the Standard Specifications, the relevant ODOT Standard Drawings and any details included in the Plans.

(a) Requirements of Section 623.04.B of the Standard Specifications

Ensure the Contractor complies with the requirements of the Standard Specifications, as follows:

- Erect rail elements in a smooth, continuous installation.
- Tighten all bolts except adjustment bolts.
- Provide bolts with lengths that extend beyond the nuts.

When field painting rail elements is required due to damage to the shop coat of paint, the Contractor must first apply a rust inhibitive primer. All field painting of surfaces must be completed before erecting any rail elements that may be inaccessible to painting after erection and installation. Ensure the Contractor uniformly applies the number of coats of paint required in

the Contract, or as approved by the Resident Engineer, by brush or pressure spray.

Additionally, the Contractor must field paint the following elements with two coats of zinc rich paint for their protection:

- Abraded galvanized surfaces with exposed base metal,
- The threads of fittings, and
- Fasteners and cut ends of bolts.

When double faced guardrail is required on the Project, ensure the Contractor installs the guardrail elements in accordance with the details as shown on the Plans.

Do not allow the Contractor to modify anchor-bolt holes or slots in the guardrail or its elements to accommodate connections in the field. Obtain Resident Engineer approval for modifications to standard guardrail design. Ensure modifications pass ODOT inspection before installation.

(b) Requirements of ODOT Standard Drawings

There are details included in the relevant ODOT Standard Drawings for the guardrail items required in the Plans that must be followed to ensure the guardrail performs in the manner it was designed. Ensure the Contractor complies with all relevant ODOT Standard Drawings.

For example, some requirements specified in [ODOT Standard Drawing GHW1-1](#) and details to confirm during installation include:

- Overlap the rail sections in the direction of traffic so the end of the previous plate rail covers the start of the succeeding plate rail to prevent end snagging from the nearest traffic.
- Post type and size (steel and wood options) and their spacing of 6'3" for Standard W-Beam Guardrail installation.
- Configuration of bolt, nut and washers for various connections.
- Spacer block (blockout) dimensions, details and options.
- Details and configuration of guardrail delineators which are required for all installations (Type 2, Code 1 for two-lane roadway installations and Type 1, Code 1 for all other roadway installations).
- Typical guardrail widening and location/offset of location to install the guardrail.

3. Placing Metal Plate Rails and Fittings

Ensure the Contractor fastens metal plate rails to the posts as shown on the Plans and relevant ODOT Standard Drawings. Overlap the rail sections at least 6 in (or

as specified in the ODOT Standard Drawings) in the direction of traffic so the end of the previous plate rail covers the start of the succeeding plate rail.

Only one type of metal plate guardrail may be used on the Project, unless otherwise shown on the Plans. Verify the proposed source and product for the guardrail materials (beams and posts) is listed on the [QPL-Guardrail Materials](#).

4. Guardrail Anchor Units

Ensure the Contractor constructs guardrail anchor units as shown on the Plans and relevant ODOT Standard Drawings. It is critical to the structural integrity of the anchor unit that the concrete footing is constructed to the dimensions and with the correct reinforcing steel and anchor bolts as designed.

[ODOT Standard Drawing GA31-1](#) includes details regarding the guardrail anchor units. Some requirements specified in [ODOT Standard Drawing GA31-1](#) and details to confirm during installation include:

- Various types of anchor units and connections.
- Post spacing for various types of installation.
- Configuration of bolt, nut and washers for various connections.
- Concrete footing, anchor bolt and reinforcing steel dimensions and details.

If rock is encountered during the excavation of the anchor unit footing, ensure the Resident Engineer is involved before making any modifications to the work. The Resident Engineer may contact the ODOT Materials Division if there is any concern with the hardness and durability of the rock that is encountered. When rock harder than medium sandstone (surface outcropping, massive boulders, and ledge rock under overburden) is encountered during construction of the concrete anchor, the Contractor must proceed as follows in accordance with Section 623.04.D of the Standard Specifications:

(a) For Surfacing Outcroppings

Drill four spaced and patterned holes with 2 in diameters. Fill half of each rock hole with pourable epoxy grout, insert full depth anchor bolts, and stabilize them. Fill the remainder of the hole with epoxy. Expel air bubbles and voids from the holes.

(b) For Rock with Soil Overburden 18 in Deep or Less

Use the following steps:

- Drill four spaced holes for the anchor bolts.
- Drill four additional holes with a diameter of 2-1/2 in, each 12 in from the center of the concrete anchor and spaced 90° apart.

- Fill half of each outer hole with pourable epoxy grout.
- Insert, plumb, and stabilize one number 9 reinforcing steel bar per hole, cut to the length needed for the anchor unit.
- Cut the reinforcing steel bar to a length that allows insertion of at least 12 in into the rock and a clearance of 2 in above the top of the concrete anchor.
- Fill the remainder of the hole with epoxy and expel the bubbles.
- Tie the 6 × 6-W1.5 × W1.5 wire mesh to the bars after the grout dries.
- Spread pourable epoxy grout on the surface between the rock and concrete for positive bond.
- Construct the upper portion of the anchor unit as shown on the Plans.

(c) For Rock Encountered Deeper Than 18 in

Construct the anchor in accordance with the procedure for soil with overburden 18 in deep or less, and omit the four additional anchors.

5. Guardrail End Treatments (GET)

Ensure experienced workers fabricate and install the GET as shown on the Plans and ensure the end treatment remains intact, redirects side vehicular impacts, and flattens the rail element to attenuate head-on vehicular impacts. [ODOT Standard Drawing SKT-1](#) includes details regarding the guardrail end treatments. The proper installation of the GET is critical to it performing as designed when impacted by a vehicle. Ensure all connections (bolt, nut, cable, etc.) and components are installed in accordance with the ODOT Standard Drawing or manufacturer's specifications for the GET unit.

Verify the GETs that are installed have been certified with appropriate crash-tested hardware. Ensure NCHRP 350 TL-3 certification for substituted hardware and that the product appears on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). Obtain the Resident Engineer's approval of substitution GET component hardware and ensure it passes Department inspection before installation.

6. Blockouts

Ensure that composite or synthetic blockouts used in safety end treatments attached to bridges or permanent concrete walls have been crash-tested and certified. Details and required dimensions of the blockouts can be found in [ODOT Standard Drawing GHW1-1](#).

Verify the proposed source and product for the guardrail spacer block (blockout) is listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#) or the proposed source for guardrail materials is listed on the [QPL-Guardrail Materials](#).

For proposed substitutions, the Contractor must provide a letter of certification and obtain the Resident Engineer's approval. The Contractor must use certified blockouts (spacer blocks) meeting the minimum requirements of NCHRP 350 TL-3. Contact ODOT Traffic Engineering Division for input and guidance on proposed products.

7. Guardrail Bridge Connection (GBC)

Ensure experienced workers fabricate and install the guardrail bridge connection (GBC) as shown on the Plans and ensure the bridge connection remains intact, redirects side vehicular impacts, and flattens the rail element to attenuate vehicular impacts at the approach ends of the bridge rail. The proper installation of the GBC is critical to it performing as designed when impacted by a vehicle. Ensure all connections (bolt, nut, cable, etc.), post spacing and components are installed in accordance with the applicable ODOT Standard Drawings.

There are multiple ODOT Standard Drawings pertaining to the installation of the various types of guardrail bridge connections. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the GBC items included on the project. The various ODOT Standard Drawings pertaining to the bridge connections include the following:

- [ODOT Standard Drawing THRI-1](#) includes details regarding the three beam guardrail bridge connections (31" guardrail height).
- [ODOT Standard Drawing DBF1-1](#) includes details regarding the guardrail bridge connections with adding rub rail to existing D-BF bridge connections (27-3/4" guardrail height).
- [ODOT Standard Drawing DBF2-1](#) includes details regarding the guardrail bridge connections with rub rail to new D-BF bridge connections (27-3/4" guardrail height).

Verify the GBCs that are installed have approved NCHRP 350 TL-3 designs, using only certified and crash-tested hardware. For proposed substitutions, the Contractor must provide a letter of certification and obtain the Resident Engineer's approval. Provide NCHRP 350 TL-3 certifications for substitute hardware, except for posts and blockouts, which may not be substituted without an actual crash test certification. Obtain the Resident Engineer's approval of substitution GBC component hardware and ensure it passes Department inspection before installation. Contact ODOT Traffic Engineering Division for input and guidance on proposed products.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and guardrail items from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed guardrail as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the guardrail items (setting/driving posts, guardrail installation, excavating or pouring anchor unit footing, installing guardrail bridge connection, etc.).
- Quantity of each pay item that is placed (LF, EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 623.06 of the Standard Specifications, there are multiple pay items for the various guardrail pay items (types of guardrail, bridge connections, anchor units, etc.) that might be used on the project.

The final quantity for the guardrail pay items will be determined by the methods defined in Section 623.05 of the Standard Specifications. Where specific methods of measurement are not defined in Section 623.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length of completed guardrail from center to center of the supporting posts.

In accordance with the various ODOT Standard Drawings, the following components of the guardrail pay items are to be included in the contract unit prices for the relevant pay items:

- The cost of all materials and labor to install the beam rail, blockouts, bolts, washer, nuts, concrete, reinforcing steel and all other appurtenances included in the ODOT Standard Drawing to be included in the contract unit price for the relevant pay items.
- Guardrail Curbing to be measured and paid for separately for the bridge connections when shown on the ODOT Standard Drawing.
- Guardrail Delineators to be measured and paid for separately for the guardrail when shown on the ODOT Standard Drawing.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the various types of guardrail pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the various types of guardrail pay items (anchor unit, bridge connection, end treatment, etc.) paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.

3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

623.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, APL, Approved Rock, Stone & Sand Sources, Asphalt Mix Designs Approved for Use, etc.), contact Materials and/or Traffic Engineering Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

Ensure the Contractor provides a Type A Material Certification for the guardrail beams and post and GETs as required in the [FAST Guide](#). Ensure the Contractor provides Type A Material Certifications in accordance with Section 106.04 of the Standard Specifications. Type A Material Certifications must be approved by the ODOT Materials Division for compliance with the contract requirements. ODOT Materials Division will provide approved certifications to the Resident Engineer.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor installed the guardrail and appurtenances, including guardrail delineators as required on Std. GHW-1. Ensure the guardrail items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed. Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

623 CHECKLIST – GUARDRAIL AND END TREATMENTS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant guardrail pay items shown in the Plans been identified and reviewed?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the guardrail pay items been reviewed with the Contractor (locations & lengths for installation, types of guardrail, etc.)?					
Have the proposed products and sources of materials (guardrail materials, GETs, PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed products and sources of materials (guardrail materials, GETs, PC concrete, reinforcing steel, etc.) been verified on the APL/QPL by the residency personnel?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					

Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Has a Type A Certification been submitted for the guardrail materials and GETs?					
Is there a plan note specifying that removed guardrail must be salvaged and delivered to a location to become property of ODOT?					
Has the method and schedule for installation of the guardrail been discussed with the Contractor to minimize/protect guardrail locations that are removed and replaced?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor have a plan for maintenance of traffic and protection of the guardrail operation during its construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (guardrail materials, GETs, PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Have all of the FAST Guide requirements for sampling, testing and documenting in SiteManager been performed by the residency?					
Have all of the FAST Guide requirements for documenting products on the APL/QPL in SiteManager been performed by the residency?					
Have the relevant Type A Certifications been approved by Materials Division for guardrail materials and GETs and documented in SiteManager?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Is the Contractor completing the guardrail item installation in compliance with the requirements for the relevant ODOT Standard Drawings?					
Is the Contractor complying with the plan notes and details regarding the guardrail pay items (locations & lengths for installation, types of guardrail, etc.)?					
Is the Contractor salvaging and delivering removed guardrail to the specified location to become property of ODOT?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor minimizing exposure time and protecting guardrail locations that are removed and replaced?					
Is the Contractor setting the guardrail posts to the dimensions shown on the relevant ODOT Standard Drawing?					
Is the Contractor lapping the guardrail beams as required on Std. GHW-1 (to prevent snagging from oncoming traffic)?					
Is the Contractor installing guardrail delineators as required on Std. GHW-1?					
Are all connections (bolt, nut, cable, etc.) and components installed in accordance with Std. SKT-1 or manufacturer's specifications for the GETs?					
Is the Contractor maintaining traffic and protecting the guardrail operation from traffic during its construction?					
Has the Resident Engineer identified any section of completed guardrail that will require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed guardrail items from damage?					
Has the residency personnel verified all completed guardrail items were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor use the products and sources of materials (guardrail materials, GETs, PC concrete, reinforcing steel, etc.) reviewed/accepted by the Resident Engineer for the guardrail items?					
Did the Contractor salvage and deliver the removed guardrail to the specified location to become property of ODOT?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the residency personnel perform all of the FAST Guide requirements for documenting products on the APL/QPL in SiteManager?					
Did the residency personnel verify the receipt of the Type A Certification approved by Materials Division for guardrail materials and GETs?					

SECTION 624 – FENCES

624.01 GENERAL

This work consists of constructing fence and gates. ODOT utilizes the following styles of fence:

- Fence, Style WWF (Woven Wire Fence),
- Fence, Style SWF (Strand Wire Fence),
- Fence, Style CLF (Chain Link Fence),
- Fence, Style GDF (Glare Deflector Fence), and
- Fence, Metal Panel.

624.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of fence pay items (types of fence, types of gates, etc.) included in the Contract.
- Review special provisions, plan notes and ODOT Standard Drawings included in the Contract for the requirements (details of installation, material requirements, etc.) of the relevant fence pay items included in the Plans.
- Confirmation of planned locations and lengths.
- Proposed sources of material and material requirements.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work including coordination with adjacent property owners to ensure protection/security of their property and livestock.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 624.02 and other referenced sections of the Standard Specifications regarding the fence materials and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant fence pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following fence components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 624.02:

- PC Concrete, Class A meeting Section 701
- Requirements for Paint Systems meeting Section 730.02
- Fence, Style WWF meeting Section 732.06
- Fence, Style SWF meeting Section 732.06
- Fence, Style CLF meeting Section 732.07
- Fence, Style GDF meeting Section 732.08

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant fence pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

The fence materials (wire, posts, chain link, top brace, tie wire, tension wire, etc.) are not listed on the ODOT Materials Division QPL. Sampling (by the residency) and acceptance testing (by the Materials Division) of those materials are required in accordance with the [FAST Guide](#). The sampling and testing must be performed in accordance with the frequency guidelines defined in the FAST Guide project's Sampling and Testing Checklist generated by SiteManager for the appropriate items.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Some fence and gate footings will require the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

PC concrete mix designs must be reviewed for approval by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant location in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plant submitted by the Contractor has a current ODOT certification. The plant must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following fence materials should be verified on the QPL or approved aggregate source list:

- Components of the PC concrete listed on the mix design

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

C. Preparatory Work and Contractor Work Plans

Review the Plans, Standard Specifications, ODOT Standard Drawings, Special Provisions and Plan Notes and determine any special requirements for the fence pay items that are required.

Consider the following before fence installation begins:

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the fence pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant fence pay items included in the Plans.

The “Summary of Fence” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station extents and location to be installed,
- Pay items to be installed (type of fence, height of fence, type of gate, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the fence items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the fence items included on the project. The various ODOT Standard Drawings pertaining to the fence work include the following:

- [ODOT Standard Drawing RWF1-3](#) includes details regarding the right-of-way Fence, Style WWF (woven wire fence).
- [ODOT Standard Drawing RWF2-3](#) includes details regarding the right-of-way Fence, Style SWF (strand wire fence).
- [ODOT Standard Drawing RWF3-3](#) includes details regarding the right-of-way Fence, Style CLF (chain link fence).

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Potential Changes to Fence Required in the Plans

Occasionally, a property owner will request modifications to the right-of-way fence scheduled to be installed on their property line or to add fence where it is not shown on the Plans. Before agreeing to any changes, check with the District Construction Engineer and obtain the Right-of-Way Agreement that was executed between the ODOT Right-of-Way Division and the property owner. There are instances where the property owner has received compensation for their fence or the type was clearly designated that would be installed. Do not proceed with changes to the planned fence without concurrence from the District Construction Engineer.

3. Existing Fence Removal

Review Sections 107.05 and 107.08 of the Standard Specifications regarding the Contractor’s responsibilities when right-of-way fence is required to be removed in

the Plans. It is critical for the Contractor to coordinate their schedule and plan for the work with adjacent property owners to ensure protection/security of their property and livestock. A summary of the responsibilities listed in the specifications include:

- Do not sever or remove existing fence or make alteration to fences required by the Contract until approved by the Resident Engineer.
- Temporary fences, when required to control livestock, shall be suitable for the purpose intended.
- Temporary fences used for the convenience of the Contractor will be provided at no additional cost to the Department.
- Preserve public and private property during the prosecution of the work.
- The Contractor is responsible for damage to public or private property resulting from negligence or misconduct in the Contractor's method of performing the work.
- The Contractor is responsible for restoring damaged property to a condition similar or equal to that existing before the damage occurred, at no additional cost to the Department.

If the Contractor does not comply with these requirements, the Resident Engineer may issue a Shut Down Order.

4. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to install the fence in their submittals prior to beginning construction. Section 624.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install fence items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Fence posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the wood or steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (wire stretcher/come along, wire cutter, etc.) for the fence items.

For projects that include the removal of existing fence items for their replacement, ensure the Contractor coordinates their schedule for the work with adjacent property owners has an acceptable plan to ensure protection/security of their property and livestock.

5. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the

need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

6. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and fence items from damage,
- Providing temporary fence or making necessary arrangements with adjacent property owners to ensure protection of livestock or other potential safety concerns.
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

624.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 624.02 and other referenced sections of the Standard Specifications regarding the fence materials and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant fence pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following fence components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 624.02:

- PC Concrete, Class A meeting Section 701
- Requirements for Paint Systems meeting Section 730.02
- Fence, Style WWF meeting Section 732.06
- Fence, Style SWF meeting Section 732.06
- Fence, Style CLF meeting Section 732.07

- Fence, Style GDF meeting Section 732.08

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant fence pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

The fence materials (wire, posts, chain link, top brace, tie wire, tension wire, etc.) are not listed on the ODOT Materials Division QPL. Sampling (by the residency) and acceptance testing (by the Materials Division) of those materials are required in accordance with the [FAST Guide](#). The sampling and testing must be performed in accordance with the frequency guidelines defined in the FAST Guide project's Sampling and Testing Checklist generated by SiteManager for the appropriate items.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed PC Concrete Mix Designs

Some fence and gate footings will require the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 624.02.C.5(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the PC concrete for the fence/gate post footings.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 624.02.C.6(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, products and mix designs in advance of any work beginning on the relevant fence pay items.

The Residency will verify that the proposed source of materials and products submitted by the Contractor on their PC concrete mix design is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to

be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate PC concrete items.

The fence materials (wire, posts, chain link, top brace, tie wire, tension wire, etc.) are not listed on the ODOT Materials Division QPL. Sampling (by the residency) and acceptance testing (by the Materials Division) of those materials are required in accordance with the [FAST Guide](#). The sampling and testing must be performed in accordance with the frequency guidelines defined in the FAST Guide project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. Sample sizes for each fence component may be found embedded in SiteManager on the Contract Sampling and Testing tab for each item located in SiteManager>Materials Management>Contract Materials.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

(a) PC Concrete for Fence/Gate Post Footings

Fence and gate post footings require the use of Class A Concrete. The Residency must perform and document the following acceptance tests/procedures on the PC concrete for the fence and gate post footings:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]

- Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.).
[Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) Fence Materials

The fence materials (wire, posts, chain link, top brace, tie wire, tension wire, etc.) are not listed on the ODOT Materials Division QPL. Sampling (by the residency) and acceptance testing (by the Materials Division) of those materials are required in accordance with the [FAST Guide](#). The sampling

and testing must be performed in accordance with the frequency guidelines defined in the FAST Guide project's Sampling and Testing Checklist generated by SiteManager for the appropriate items.

Sample sizes (length of sample, number of units, etc.) for each fence component may be found embedded in SiteManager on the Contract Sampling and Testing tab for each item located in SiteManager>Materials Management>Contract Materials.

Samples should be obtained as soon as they are delivered to the project site to enable the test results to become available as soon as possible.

The Residency must sample the fence items being used on the Project and document in SiteManager as follows:

- Obtain a sample of the Fence Wire, Wove, Zinc Coated used in WWF. [Document in Template C92013]
- Obtain a sample of the Fence Wire, Barbed used in SWF and WWF. [Document in Template C92010]
- Obtain a sample of the Fence Wire, Barbless, Zinc Coated used in WWF when specified. [Document in Template C92011]
- Obtain a sample of the Fence Posts, Steel used in SWF and WWF. [Document in Template C92012]
- Obtain a sample of the Fence Wire, Tie used in SWF and WWF. [Document in Template C92040]
- Obtain a sample of the Fence Wire, Chain Link Fabric used in CLF. [Document in Template C92015]
- Obtain a sample of the Fence Wire, Chain Link Tension used in CLF. [Document in Template C92014]
- Obtain a sample of the Fence Wire, Chain Link Tie used in CLF. [Document in Template C92048]
- Obtain a sample of the Fence Posts, Chain Link Support used in CLF. [Document in Template C92016]
- Obtain a sample of the Fence Posts, Chain Link Line used in CLF. [Document in Template C92017]
- Obtain a sample of the Fence Rail, Chain Link, Top or Brace used in CLF. [Document in Template C92018]
- Obtain a sample of the Fence Wire, Tension used in SWF and WWF. [Document in Template C92014]

During construction, verify that the previously sampled and tested materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

B. Equipment and Methods

Section 624.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install fence items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Fence posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the wood or steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (wire stretcher/come along, wire cutter, etc.) for the fence items.

For projects that include the removal of existing fence items for their replacement, ensure the Contractor coordinates their schedule for the work with adjacent property owners and has an acceptable plan to ensure protection/security of their property and livestock.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the fence pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant fence pay items included in the Plans.

The "Summary of Fence" schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station extents and location to be installed,
- Pay items to be installed (type of fence, height of fence, type of gate, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the fence items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the fence items included on the project. The various ODOT Standard Drawings pertaining to the fence work include the following:

- [ODOT Standard Drawing RWF1-3](#) includes details regarding the right-of-way Fence, Style WWF (woven wire fence).
- [ODOT Standard Drawing RWF2-3](#) includes details regarding the right-of-way Fence, Style SWF (strand wire fence).
- [ODOT Standard Drawing RWF3-3](#) includes details regarding the right-of-way Fence, Style CLF (chain link fence).

Verify the following complies with the relevant ODOT Standard Drawings and Section 624.04 of the Standard Specifications when constructing the fence on the project:

1. General Fence Installation Requirements

Upon receipt of the Notice to Proceed, existing fencing on the right-of-way becomes the responsibility of the Contractor. It is the Contractor's responsibility to maintain existing and newly installed fences and gates. For projects that include the removal of existing fence items for their replacement, ensure the Contractor coordinates their schedule for the work with adjacent property owners and has an acceptable plan to ensure protection/security of their property and livestock.

Ensure the Contractor performs any necessary clearing and grubbing to construct the new fence in accordance with Section 201 of the Standard Specifications.

Prior to beginning the fence installation, verify with the Contractor the style, type, and class of fence is being installed as shown on the Plans. Install fence gates at locations shown on the Plans or as directed by the Resident Engineer. Occasionally, a property owner will request modifications to the right-of-way fence scheduled to be installed on their property line or to add fence where it is not shown on the Plans. Before agreeing to any changes, check with the District Construction Engineer and obtain the Right-of-Way Agreement that was executed between the ODOT Right-of-Way Division and the property owner. There are instances where the property owner has received compensation for their fence or the type was clearly designated that would be installed. Do not proceed with changes to the planned fence without concurrence from the District Construction Engineer.

At intersections with existing fences or at locations with required fencing breaks, there may be a need to make post spacing adjustments. Ensure cross fencing connections include an end post placed perpendicular to the right-of-way fence or at the angle of the cross fence.

Verify that the installation of the fence complies with the relevant ODOT Standard Drawings in regard to the following:

- type of posts and footings,
- post spacing,
- locations/spacing of stretcher post,
- stretcher/corner/end post configurations,
- length of post embedment into the ground,
- spacing of fence wire materials,
- typical fan details for irregular terrain, and
- types and configurations of fence wire connections.

(a) Concrete Footings for Fence/Gate Posts

Fence posts may be set either from digging post holes or being machine driven. If the Contractor chooses to dig post holes and use a concrete

footings or when the Plans show embedding posts, braces, or anchors in concrete, temporary guys or braces must be installed to hold the posts in position until the concrete sets. Do not allow the Contractor to install materials (strand wire, woven wire, chain link, etc.) on posts, or strain guys and bracing, until 5 days after placement of the concrete, unless otherwise approved by the Resident Engineer.

Ensure the Contractor uses the concrete footings when specified in the relevant ODOT Standard Drawings. The WWF and CLF type fences require the concrete footings for all gates, corners, stretchers and end post locations. The SWF type fence does not mandate the use of concrete footings but is allowed to be used at the Contractor's option.

(b) Driving Option for Line Post Installation

As an option to setting fence posts in concrete footings or placing in tamped earthen holes, the Resident Engineer may approve driven line posts.

When using the driving option for wooden line posts, ensure the Contractor protects the tops of the posts and ensure the posts are sharpened by the supplier before treating with preservative. Do not allow the Contractor to field sharpen or taper dress the post tips. Wood posts with split or damaged tops must be replaced by the Contractor.

When using the driving option for metal line posts, ensure the Contractor uses a fitted impact head to minimize post deformation or damage to the galvanized or painted finish. After driving the metal posts, ensure the Contractor cleans damaged tops and paints with a zinc-rich paint. Metal posts with severely deformed or poorly painted tops must be replaced by the Contractor.

(c) Offset Control for Alignment of Right-of-Way Fence

The Contractor must perform adequate plumb and offset (alignment) control to ensure a smooth profile and alignment. There is a detail included in each fencing ODOT Standard Drawing for the proper installation along curves. Ensure the fence is installed entirely on the right-of-way and does not encroach across the adjacent property line.

In shallow depressions, use longer posts and barbed wire fans to maintain a smooth top of fence profile. If necessary, use strengthened fence construction and movable water gates for installations over deep ravines.

Do not allow the Contractor to fill swales or ravines to facilitate fence construction. The existing drainage must be maintained across the right-of-way line. There is a detail included in each fencing ODOT Standard Drawing for the proper installation of the fence across irregular terrains and

small drainage swales. Ensure the fence is installed in accordance with those details regarding the post and wire configurations.

(d) Post Installations in Rock

If rock is encountered during the excavation for post holes or driving of posts, ensure the Resident Engineer is involved before making any modifications to the work. The Resident Engineer may contact the ODOT Materials Division if there is any concern with the hardness and durability of the rock that is encountered.

For driven installations using mechanical or pneumatic equipment, the refusal for the driving operation is defined as 1 in or less entry per minute of driving with a 60 lb hammer delivering at least 60 blows per minute.

For installations in soil and in rock softer than medium sandstone, the Contractor must proceed as follows in accordance with Section 624.04.A(4) of the Standard Specifications:

- Ensure the driven posts reach the minimum embedment as shown on the Plans, or reach refusal.
- For refusal encountered at 24 in or deeper, keep the post in place and top cut to the profile control.
- For refusal encountered at depths less than 24 in, pull the post and install a concrete footing to the dimensions shown on the Plans for earth installations.
- Adhere to the following criteria for installations in surface-level, medium or harder sandstone:
- Drill a hole of the diameter and depth for footings in rock for the type of post shown on the Plans.
- Insert, plumb, and brace the post.
- Fill the hole with lean grout (thin hydraulic cement).
- For installations in medium to hard rock under a layer of earth, adhere to the following criteria:
- If rock is encountered at any depth less than the minimum driven embedment (as shown on the Plans), auger the earth.
- Consider as a regular concrete-embedded earth footing.
- Drill a hole of the diameter for footings in rock for the type of post shown on the Plans to a depth yielding the total minimum earth embedment, or the minimum rock embedment, whichever occurs first.
- Fill half of the rock hole with an approved type of lean grout and insert, plumb, and brace the post.
- Fill the remainder of the rock hole with lean grout.

- Place concrete for the earth footing above the grouted rock hole.

Where refusal of the driving operation occurs, the Contractor must provide driven posts in earth at least 24 in, or the minimum earth embedment as shown on the ODOT Standard Drawings. The minimum rock embedment is required, unless the total minimum earth embedment is reached first. Once these conditions are met, the Contractor is allowed to cut the tops of the posts to maintain the profile control.

(e) Aligning Posts

Ensure the tops of posts are set to the grade and alignment shown on the ODOT Standard Drawings.

The Contractor is only allowed to cut post tops in certain circumstances as defined in the specifications when encountering rock and only when approved by the Resident Engineer.

After cutting wood posts, ensure the Contractor paints the tops with a preservation solution. Do not allow the Contractor to flame-cut wooden posts. Ensure the Contractor cleans and paints cut areas on metal posts with a single coat of zinc-rich paint.

Upon the acceptable installation of the fence posts, the Contractor must install fence wire as follows:

- use wire or fencing materials of the required size and type to the posts and braces as shown on the Plans and ODOT Standard Drawings,
- install wire or fencing materials to the elevations and spacing dimensions shown on the ODOT Standard Drawings,
- stretch wire and fencing materials taut, and
- use configurations for connections as shown on the ODOT Standard Drawings.

2. Fence, Style WWF (Woven Wire Fence)

This style of fence consists of woven wire fabric (WWF) with smooth, barbles, or barbed wire strands on a steel post system, wood post system, or both. Verify the following complies with the relevant ODOT Standard Drawings and Section 624.04.B of the Standard Specifications when constructing the WWF on the project:

(a) Alignment

Ensure the Contractor installs WWF to the general alignment, angles, corners and attachment types at culverts as shown on the Plans. In general, the WWF fences will be installed on the permanent right-of-way line.

Ensure the fence is installed entirely on the right-of-way and does not encroach across the adjacent property line.

The Contractor must clear the work area of obstructions, level the ground, and remove minor irregularities prior to installing the right-of-way fence. The Contractor must perform adequate plumb and offset (alignment) control to ensure a smooth profile and alignment. There is a detail included in each fencing ODOT Standard Drawing for the proper installation along curves.

(b) Setting Posts

Ensure the Contractor provides posts (line, corner, end, stretcher and gate) of the size shown on [ODOT Standard Drawing RWF1-3](#) and installs them on the permanent right-of-way line as shown on the Plans. Verify that the installation of the posts complies with the WWF Standard Drawing in regard to the following:

- type of posts and footings,
- post spacing,
- locations/spacing of stretcher post (Note 5 on Std. RWF1-3 requires stretcher posts installed a maximum of 500' apart and at hill tops and valleys.),
- stretcher/corner/end post configurations,
- length of post embedment into the ground, and
- typical fan details for irregular terrain.

Additional posts must be set at abrupt changes in grade (top of a hill) and alignment (corners, curves, etc.) or at locations directed by the Resident Engineer.

Some fence posts may be set either from digging post holes or being machine driven. If the Contractor chooses to dig post holes to set line posts, ensure they are properly tamped, backfilled and firmly set.

Note 7 on [ODOT Standard Drawing RWF1-3](#) for WWF type fences requires concrete footings for all gate, corner, stretcher and end post locations. Temporary guys or braces must be installed to hold the posts in position until the concrete sets. Concrete for posts footings may be poured without forming if the excavation is stable and does not cave or slide. Forms will be required for footing excavations that are unstable, when directed by the Resident Engineer. Do not allow the Contractor to install materials (strand wire, woven wire, chain link, etc.) on posts, or strain guys and bracing, until 5 days after placement of the concrete, unless otherwise approved by the Resident Engineer.

Do not allow the Contractor to fill swales or ravines to facilitate fence construction. The existing drainage must be maintained across the right-of-way line. For small depressions, extra length posts (fan posts) must be provided, if not practical for the fence to closely follow the contour of the ground. At these locations, there is a detail included in [ODOT Standard Drawing RWF1-3](#) for the proper installation of the WWF fence across irregular terrains and small drainage swales. Ensure the Contractor stretches the wires taut and fastens to the posts to prevent vertical movement of the wires.

(c) Placing Fencing

Ensure the Contractor fastens barbed wire, barbless wire, or smooth wire to all fan, end, corner, gate or stretcher posts, and to line posts as shown on [ODOT Standard Drawing RWF1-3](#). Tension must be applied for stretching the fence wire with mechanical fence stretchers or single wire stretchers designed for the purpose. Stretch strands taut to a tensile force of 300 lb as shown on the Plans, or to a tensile force recommended by the manufacturer.

Verify that the installation of the fencing wire and materials comply with the WWF Standard Drawing in regard to the following:

- place fence wire/material on the outside of the posts away from the highway, except on curves or at corners (Note 3 on Std. RWF1-3),
- spacing of fence wire materials,
- typical fan details for irregular terrain,
- types and configurations of fence wire to post connections (Note 4 on Std. RWF1-3 specifies connections on end posts),
- WWF gate details, and
- attachment assembly details to culvert or bridge end walls.

Splicing of strand wire and wire fabric must be performed by the Contractor using a mechanical device of a type approved by the Resident Engineer or by making a wire splice by carrying the ends of wires 2 in past the splicing tools and wrap them around both wires backward from the tool for at least five turns.

In accordance with Std. RWF1-3, the wire must be attached to the private property side of the fence posts; on curves, place wire fabric on the side of the post that will maintain the wire in a taut condition. The woven wire fabric must be stretched uniformly tight with an approved mechanical tensioning device conforming to its location on the posts (spacing, height above the groundline, etc.) as shown on Std. RWF1-3. Ensure the Contractor places stays (wire spacers) parallel, straight, and uniformly spaced, as shown on Std. RWF1-3. Each woven fabric wire and strand wire must be stapled to wood posts or fastened with approved fittings to steel

posts. When possible, the Contractor should cut or splice woven wire at stretcher or wood posts to prevent buckling or undue stretching.

Ensure the Contractor builds fence attachment assemblies as shown on [ODOT Standard Drawing RWF1-3](#). For attachments to culvert or bridge end walls, the Contractor must drill the holes with a drill of the same size as the expansion device. Ensure the concrete does not break or chip during installation of the attachment assembly.

(d) Gates

Ensure the Contractor provides WWF gates as required in Std. RWF1-3 and Section 732.06B(2)(c) of the Standard Specifications. The WWF gate must be constructed from pipe or tubular framework covered with the same type of woven wire fabric as the adjoining fence. An acceptable option is a commercially available ranch-type metal panel gate. Additional details found in Std. RWF1-3 include:

- gate post configuration for single and double gates,
- Note 2 specifies that any gate greater than 18' requires a double gate which is paid for as two single gates,
- gate latch details, and
- length of gate is not included in the measured length of the WWF fence payment.

3. Fence, Style SWF (Strand Wire Fence)

The Strand Wire Fence (SWF) style of fence consists of smooth, barbless, or barbed wire strands on a steel post system, wood post system, or both. The SWF will be constructed in the same manner as WWF, in accordance with Subsection 624.04.B of the Standard Specifications. Review the specifications, [ODOT Standard Drawing RWF2-3](#) and the contents of Section 624.03.C.1 & 2 of this Manual for the information necessary to verify the SWF is constructed in accordance with the requirements.

Ensure the Contractor installs the SWF that has the type (barbed, smooth or barbless) and number of strands (4, 5 or 6) of wire as shown on the Plans. Differences between the SWF requirements and the WWF requirements include the following:

(a) Alignment

Ensure the Contractor installs SWF to the general alignment, angles, corners and attachment types at culverts as shown on the Plans.

In general, the alignment requirements for the SWF will be consistent with the requirements for WWF.

(b) Setting Posts

Ensure the Contractor provides posts (line, corner, end, stretcher and gate) of the size shown on [ODOT Standard Drawing RWF2-3](#) and installs them on the permanent right-of-way line as shown on the Plans. In general, the post setting requirements for the SWF will be consistent with the requirements for WWF.

The primary differences in the SWF and WWF post setting requirements are as follows:

- concrete footings are not required in Std. RWF2-3 for all gate, corner, stretcher and end post locations, like specified for WWF, and
- various options for use of metal line posts (tee-post, channel post and Y-bar post) are included in Std. RWF2-3.

(c) Placing Fencing

Ensure the Contractor fastens barbed wire, barbless wire, or smooth wire to all fan, end, corner, gate or stretcher posts, and to line posts as shown on [ODOT Standard Drawing RWF2-3](#). Ensure the SWF has the type and number of strands of wire as shown on the Plans. In general, the fence placing requirements for the SWF will be consistent with the requirements for WWF.

The primary difference in the SWF fence placing requirements is the inclusion of the connection options of the wire to the metal line posts that is included in Std. RWF2-3.

(d) Gates

Gate requirements for SWF (wire gate) are much different than the gates used for WWF (tube framework gate). Additionally, the gates are not measured and paid for separately for the SWF rather the length of the SWF gate is included in the linear foot measurement of the fence and included in the unit price of the fence pay item.

Ensure the Contractor provides SWF gates as required in [ODOT Standard Drawing RWF2-3](#), including the following:

- minimum width of gate opening is 16',
- gate post configuration for gates,
- Wire Gate Detail Note allows an acceptable option to the wire gate is a commercially available ranch-type metal panel gate or prefabricated pipe tubing style gate,
- gate latch details, and

- length of gate is included in the measured length of the SWF fence payment.

4. Fence, Style CLF (Chain Link Fence)

The Chain Link Fence (CLF) style of fence consists of chain link fabric fencing on a galvanized steel or aluminum alloy post system with or without barbed wire, smooth tension wire, or climb barrier systems. The CLF will be constructed in the same manner as WWF and in accordance with Subsection 624.04.D of the Standard Specifications. Review the specifications, [ODOT Standard Drawing RWF3-3](#) and the contents of Section 624.03.C.1 & 2 of this Manual for the information necessary to verify the SWF is constructed in accordance with the requirements.

Ensure the Contractor installs the CLF that has the class (A-without climb barrier or B-with climb barrier) and the height (4, 5, 6, 7 or 8 foot) of fence as shown on the Plans.

Differences between the CLF requirements and the WWF requirements include the following:

(a) Alignment

Ensure the Contractor installs CLF to the general alignment, angles, corners and attachment types at culverts as shown on the Plans. In general, the CLF fences will be installed on the permanent right-of-way line. Ensure the fence is installed entirely on the right-of-way and does not encroach across the adjacent property line.

In general, the alignment requirements for the CLF will be consistent with the requirements for WWF.

(b) Setting Posts

Ensure the Contractor provides posts (line, corner, end, stretcher and gate) of the size and types shown on [ODOT Standard Drawing RWF3-3](#) and installs them on the permanent right-of-way line as shown on the Plans. In general, the post setting requirements for the CLF will be consistent with the requirements for WWF, including the use of concrete footings on all posts other than line post and headwall connections (which may be embedded with soil backfill).

The primary differences in the CLF and WWF post setting requirements are as follows:

- various options for use of metal line posts and framework for the CLF are included in Std. RWF3-3,
- caps are required for pipe posts,

- post spacings are unique for the CLF posts, and
- embedment length into the ground and footing dimensions are listed in a schedule shown in Std. RWF3-3.

(c) Placing Fencing

Ensure the Contractor installs the CLF that has the class (A-without climb barrier or B-with climb barrier) and the height (4, 5, 6, 7 or 8 foot) of fence as shown on the Plans. Ensure the Contractor fastens chain link fabric fencing, barbed wire, barbless wire, or smooth wire to all fan, end, corner, gate or stretcher posts, and to line posts as shown on [ODOT Standard Drawing RWF3-3](#). In general, the fence placing requirements for the CLF will be consistent with the requirements for WWF.

The primary difference in the CLF fence placing requirements is the types of connections of the wire to the posts that is included in Std. RWF3-3.

Additionally, Section 624.04.D(2) of the Standard Specifications, the stretching and installation of the chain link fabric and wires must comply with the following:

- stretch the wire slightly above the tension recommended by the manufacturer to address the effects of seasonal temperatures,
- allow the wire to slack when the mechanical pullers are released.
- attach pullers to the full width of the wire and make ties in at least seven locations on each post before releasing the wire,
- may pull wire from both directions and joint by inserting one picket, and
- place smooth tension and barbed wire after placing the proper size of fabric.

(d) Concrete Wall for Fence

Across ravines, where it would not be practical to set posts and follow the ground line with the fence, posts should be set in a concrete wall as shown on the Plans and at locations directed by the Resident Engineer. If constructing a wall across a dry wash or periodically wet ravine, ensure the drainage is maintained and not blocked by the work. A partial wall on each bank with a water gate or fan in the center, or culverts through a solid wall is also allowed in the specifications.

(e) Gates

Ensure the Contractor provides CLF gates as required in [ODOT Standard Drawing RWF3-3](#) and Section 732.07 of the Standard Specifications. The CLF gate must be constructed from pipe or tubular framework covered with

the same type of chain link fabric as the adjoining fence. An acceptable option is a commercially available ranch-type metal panel gate. Additional details found in Std. RWF1-3 include:

- details for gate fabrication,
- gate post configuration for single and double gates,
- Gate Detail Note specifies that any gate greater than 18' requires a double gate which is paid for as two single gates,
- gate latch details,
- gates wider than 12' require 2 vertical braces at 1/3 points, and
- length of gate is not included in the measured length of the WWF fence payment.

5. Fence, Style GDF (Glare Deflector Fence)

This style of fence consists of a mesh fence on ground-embedded posts, guardrail posts, parapet wall, or concrete median barrier.

(a) Alignment

In general, Glare Deflector Fence (GDF) is constructed in the median, between opposing lanes of traffic, as shown on the Plans.

(b) Setting Posts and Placing Fencing

The various types of mounting installations include:

- When GDF is mounted on posts, the Contractor must set posts and place fencing in accordance with Section 624.04.D (2) of the Standard Specifications.
- For GDF mounted on guardrail, the Contractor must bolt the fence post to the guardrail post using bolts as shown on the Plans.
- For fence mounted on a parapet wall or median barrier, cast or drill holes in the wall and fit them with pipe sleeves as shown on the Plans. Threaded pipe flanges firmly attached to the top surface of the barrier wall is allowed as an alternate attachment method.

Terminal posts will be spaced at intervals no greater than 100 ft, or as shown on the Plans. Diagonal braces must be trussed from the brace end of the line post to the terminal post, and fastened with a brace band. On curves, the wire fabric must be placed on the side of the post that will maintain the wire in a taut condition. Glare deflector fence fabric must be installed as shown on the Plans, and fastened to the line posts with wire ties at 14 in intervals and to the top and bottom tension wire with wire ties or hog rings at intervals no greater than 12 in. Ensure the Contractor tightens the chain

link glare deflector fence to provide a smooth, uniform appearance. Stretcher bar-bands must be installed at intervals no greater than 11 in.

D. Safety and Environmental Considerations

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and fence items from damage,
- Providing temporary fence or making necessary arrangements with adjacent property owners to ensure protection of livestock or other potential safety concerns.
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Discussions with adjacent property owners (name and location) regarding fence removal/installation coordination.
- Work being performed on the fence items (setting/driving posts, excavating or pouring fence post footings, fence/gate installation, etc.).
- Quantity of each pay item that is placed (LF, EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 624.06 of the Standard Specifications, there are multiple pay items for the various fence and gate pay items (types/styles of fence, types/styles of gates, number of wire strands, height of fence, etc.) that might be used on the project.

The final quantity for the fence and gate pay items will be determined by the methods defined in Section 624.05 of the Standard Specifications. Where specific

methods of measurement are not defined in Section 624.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length of completed fence along the groundline (not Station to Station) from outside to outside of the end posts of the fence. Connections to cross fences will not be measured for payment and are considered incidental.

In accordance with [ODOT Standard Drawing RWF2-3](#), gates for Strand Wire Fence (SWF) are not measured and paid for separately. The length of the SWF gate is included in the linear foot measurement of the fence and included in the unit price of the SWF fence pay item.

In accordance with the various ODOT Standard Drawings, the following components of the fence and gate pay items are to be included in the contract unit prices for the relevant pay items:

- The cost of all materials and labor to install the fence wire, fence fabric, tie wire, posts, bolts, washer, nuts, concrete and all other appurtenances included in the ODOT Standard Drawing to be included in the contract unit price for the relevant fence and gate pay items.
- Connections to drainage structures and headwalls are considered incidental to the relevant fence pay item and will not be paid for separately.
- Fan details required at irregular terrain and drainage swales are considered incidental to the relevant fence pay item and will not be paid for separately.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the various types of fence pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.

5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the various types of gate pay items paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

624.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Division to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor installed the fence, gates and appurtenances, including fan details in irregular terrain. Ensure the fence items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed. Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

624 CHECKLIST – FENCES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant fence and gate pay items shown in the Plans been identified and reviewed?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the fence and gate pay items been reviewed with the Contractor (locations & lengths for installation, types of fence and gate, etc.)?					
Have the proposed products and sources of materials (fence/gate materials, PC concrete, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					

Has the method for establishing the alignment of the right-of-way fence been discussed with the Contractor?					
Have the use of concrete footings on all gate, corner, end and stretcher posts for the WWF and CLF as required on the relevant ODOT Standard Drawings been discussed with the Contractor?					
Has the method and schedule for installation of the fence/gates been discussed with the Contractor to minimize/protect adjacent property at locations that are removed and replaced?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor have a plan for maintenance of traffic and protection of the fencing operation during its construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (fence/gate materials, PC concrete, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Is the Contractor completing the fence/gate items installation in compliance with the requirements for the relevant ODOT Standard Drawings?					
Have any property owners questioned the type of fence to be installed on their property line?					
Has the Resident Engineer obtained any Right-of-Way Agreements that were executed between the ODOT Right-of-Way Division and the property owner from the District Construction Engineer?					
Is the Contractor complying with the plan notes and details regarding the fence/gate pay items (locations & lengths for installation, types of fence/gates, etc.)?					
Is the Contractor using an acceptable method for establishing the alignment of the right-of-way fence in the locations designated in the Plans?					
Have all of the FAST Guide requirements for sampling, testing and documenting in SiteManager been performed by the residency?					
Have all of the FAST Guide requirements for sampling, testing and documenting products on the QPL in SiteManager been performed by the residency?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Has the Contractor contacted property owners for coordinating their schedule prior to removing existing fence to ensure protection/security of their property and livestock?					
Is the Contractor minimizing exposure time for removed fence and protecting fence/gate locations that are removed and replaced?					
Is the Contractor setting the required fence/gate posts to the dimensions (length of post, depth of embedment, spacing, etc.) shown on the relevant ODOT Standard Drawings?					
Is the Contractor using concrete footings on all gate, corner, end and stretcher posts for the WWF and CLF as required on the relevant ODOT Standard Drawings?					
Is the Contractor installing with the type/style (SWF, WWF, CLF, height, number of strands, etc.) of fence that is shown on the Plans?					
Is the Contractor splicing and connecting the fence materials to the posts as required on the relevant ODOT Standard Drawings?					
Is the Contractor installing extra length posts (fan posts) for small depressions, if not practical for the fence to closely follow the contour of the ground as required on the relevant ODOT Standard Drawings?					
Is the Contractor installing the type and width of gates as required on the Plans and relevant ODOT Standard Drawings?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor installing the GDF in accordance with the locations and details shown in the Plans?					
Has the residency personnel collected samples of the fencing materials and posts in accordance with the FAST Guide?					
Is the Contractor maintaining traffic and protecting the fencing operation during its construction?					
Has the Resident Engineer identified any section of completed fence/gates that require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed fence/gate items from damage?					
Has the residency personnel verified all completed fence/gate items were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					
Did the Contractor use the products and sources of materials (fence materials, PC concrete, etc.) reviewed/accepted by the Resident Engineer for the fence/gate items?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the residency personnel perform all of the FAST Guide requirements for sampling, testing and documenting products on the QPL in SiteManager?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Did the Contractor maintain drainage swales that cross the right-of-way line and prevent causing any ponding of stormwater run-off?					

SECTION 625 – REMOVAL AND STORAGE OR RECONSTRUCTION OF FENCING AND GUARDRAIL

625.01 GENERAL

This work consists of removing and storing, or reconstructing, fencing and guardrail.

625.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of remove and store/reconstruct pay items (types of fence, types of gates, etc.) included in the Contract.
- Review special provisions, plan notes and ODOT Standard Drawings included in the Contract for the requirements (details of installation, material requirements, etc.) of the relevant remove and store/reconstruct pay items included in the Plans.
- Confirmation of planned locations and lengths.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work to minimize the time between the removal of the existing guardrail and its replacement.
- Contractor's schedule/plan for the work including coordination with adjacent property owners to ensure protection/security of their property and livestock.
- Requirements for any designated salvaged materials to be stored specified in the Plans.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Unless otherwise required in the Plans, the Contractor must provide the following for use in the reconstruction of fencing and guardrail as specified in Sections 625.02 of the Standard Specifications:

- Salvaged materials in good condition from the existing installations. Materials in poor condition must be replaced.
- aluminum paint (zinc-rich paint) for refurbishing salvaged materials in accordance with Section 730.02 of the Standard Specifications. *(NOTE: Aluminum paint specifications were eliminated from Section 730 beginning in the 1996 Edition of the Standard Specifications. The recommended replacement language from Materials Division which will be added to the next edition of the specifications is, "Provide two coats of 93% pure zinc paint and overcoat with a polyurethane-based paint for outdoor use." This will allow the work to be done in the field without having to send it to a coater and allow the choice of colors if the designers wish to specify a certain color coat.)*

C. Preparatory Work and Contractor Work Plans

Consider the following before the removing and storing or reconstructing fencing and guardrail operations begin.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the remove and store/reconstruct pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant remove and store/reconstruct pay items included in the Plans.

Some projects include plan notes that require some material to be salvaged and stored after completing the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

The “Summary of Guardrail” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the guardrail work:

- Station extents and location to be installed,
- Pay items to be installed (type of guardrail, GET, bridge connection, anchor unit, etc.) and
- Quantities for each pay item to be installed.

The “Summary of Fence” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station extents and location to be installed,
- Pay items to be installed (type of fence, height of fence, type of gate, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the fence items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the fence items included on the project.

2. Potential Changes to Fence Required in the Plans

Occasionally, a property owner will request modifications to the right-of-way fence scheduled to be installed on their property line or to add fence where it is not shown on the Plans. Before agreeing to any changes, check with the District Construction Engineer and obtain the Right-of-Way Agreement that was executed between the ODOT Right-of-Way Division and the property owner. There are instances where the property owner has received compensation for their fence or the type was

clearly designated that would be installed. Do not proceed with changes to the planned fence without concurrence from the District Construction Engineer.

3. Existing Fence Removal

Review Sections 107.05 and 107.08 of the Standard Specifications regarding the Contractor's responsibilities when right-of-way fence is required to be removed in the Plans. It is critical for the Contractor to coordinate their schedule and plan for the work with adjacent property owners to ensure protection/security of their property and livestock. A summary of the responsibilities listed in the specifications include:

- Do not sever or remove existing fence or make alteration to fences required by the Contract until approved by the Resident Engineer.
- Temporary fences, when required to control livestock, shall be suitable for the purpose intended.
- Temporary fences used for the convenience of the Contractor will be provided at no additional cost to the Department.
- Preserve public and private property during the prosecution of the work.
- The Contractor is responsible for damage to public or private property resulting from negligence or misconduct in the Contractor's method of performing the work.
- The Contractor is responsible for restoring damaged property to a condition similar or equal to that existing before the damage occurred, at no additional cost to the Department.

If the Contractor does not comply with these requirements, the Resident Engineer may issue a Shut Down Order.

4. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to remove and install the fence or guardrail in their submittals prior to beginning construction. Sections 623.03 and 624.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to remove and install fence or guardrail items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

(a) Remove and Reconstruct Fence

Fence posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the wood or steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (wire stretcher/come along, wire cutter, etc.) for the fence items.

For projects that include the removal of existing fence items for their replacement, ensure the Contractor coordinates their schedule for the work with adjacent property owners has an acceptable plan to ensure protection/security of their property and livestock.

(b) Remove and Reconstruct Guardrail

Guardrail posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the guardrail items.

For projects that include the removal of existing guardrail items for their replacement with new units, ensure the Contractor has an acceptable plan to schedule the operations to minimize the time between the removal of the existing guardrail and its replacement. Ensure the Contractor has a plan to protect areas vacated by the removed guardrail as shown in the Plans or as approved by the Resident Engineer.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and fence items from damage,
- Providing temporary fence or making necessary arrangements with adjacent property owners to ensure protection of livestock or other potential safety concerns.
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed guardrail as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

625.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Unless otherwise required in the Plans, the Contractor must provide the following for use in the reconstruction of fencing and guardrail as specified in Sections 625.02 of the Standard Specifications:

- Salvaged materials in good condition from the existing installations. Materials in poor condition must be replaced.

- aluminum paint (zinc-rich paint) for refurbishing salvaged materials in accordance with Section 730.02 of the Standard Specifications. (**NOTE:** *Aluminum paint specifications were eliminated from Section 730 beginning in the 1996 Edition of the Standard Specifications. The recommended replacement language from Materials Division which will be added to the next edition of the specifications is, “**Provide two coats of 93% pure zinc paint and overcoat with a polyurethane-based paint for outdoor use.**” This will allow the work to be done in the field without having to send it to a coater and allow the choice of colors if the designers wish to specify a certain color coat.*)

B. Equipment and Methods

Sections 623.03 (guardrail) and 624.03 (fence) of the Standard Specifications do not contain any specific requirements for the equipment that will be used to remove and install fence or guardrail items. The choice of equipment and methods for this work is usually left to the Contractor’s discretion.

Fence posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the wood or steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (wire stretcher/come along, wire cutter, etc.) for the fence items.

Guardrail posts may be set either from digging post holes or being machine driven. Ensure the post driver does not cause any damage to the steel posts during installation. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the guardrail items.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the remove and store/reconstruct pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant remove and store/reconstruct pay items included in the Plans.

The “Summary of Guardrail” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the guardrail work:

- Station extents and location to be installed,
- Pay items to be installed (type of guardrail, GET, bridge connection, anchor unit, etc.) and
- Quantities for each pay item to be installed.

The “Summary of Fence” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station extents and location to be installed,

- Pay items to be installed (type of fence, height of fence, type of gate, etc.) and
- Quantities for each pay item to be installed.

There are multiple various ODOT Standard Drawings pertaining to the installation of the fence items. Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the fence items included on the project.

Verify the following complies with Section 625.04 of the Standard Specifications when performing the removing and storing, or reconstructing, fencing and guardrail operation:

1. Removal of Fence or Guardrail

For projects that include the removal of existing fence items for their replacement, ensure the Contractor coordinates their schedule for the work with adjacent property owners has an acceptable plan to ensure protection/security of their property and livestock.

For projects that include the removal of existing guardrail items for their replacement with new units, ensure the Contractor has an acceptable plan to schedule the operations to minimize the time between the removal of the existing guardrail and its replacement. Ensure the Contractor has a plan to protect areas vacated by the removed guardrail as shown in the Plans or as approved by the Resident Engineer.

2. Storage of Salvaged Fence or Guardrail

Some projects include plan notes that require some material to be salvaged and stored after completing the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

When removing fence or guardrail material, verify the Contractor performs the removal operations in a manner that prevents damage to posts, cable, fence, plates, or fittings. Ensure the Contractor complies with the following actions required in Section 625.04.A of the Standard Specifications:

- Coil and tie cable or fence before storing.
- Box or tie fittings together in bundles.
- Stack metal plates and posts on blocks off the ground.

3. Reconstruction of Fence or Guardrail

When reconstructing fence or guardrail, ensure the Contractor removes and temporarily stores the salvaged material until the resetting operation begins. The Contractor is responsible to replace lost or damaged material at no additional cost to the Department.

Verify the Contractor performs the reconstruction of fence and guardrail in accordance with the relevant ODOT Standard Drawings and Sections 623 and 624 of the Standard Specifications as follows:

(a) Reconstruction of Fence

Ensure the Contractor reconstructs fence at the locations shown on the Plans and complies with Section 624 of the Standard Specifications and the relevant ODOT Standard Drawings when reconstructing the fence on the project. The various ODOT Standard Drawings pertaining to the fence work include the following:

- [ODOT Standard Drawing RWF1-3](#) includes details regarding the right-of-way Fence, Style WWF (woven wire fence).
- [ODOT Standard Drawing RWF2-3](#) includes details regarding the right-of-way Fence, Style SWF (strand wire fence).
- [ODOT Standard Drawing RWF3-3](#) includes details regarding the right-of-way Fence, Style CLF (chain link fence).

Refer to [Section 624.03.C of this Manual](#) for details regarding the inspection of the fence installation, including (but not limited to) the following:

- General fence installation requirements.
- Concrete footings for fence/gate posts. The WWF and CLF type fences require the concrete footings for all gates, corners, stretchers and end post locations.
- Driving option for line posts.
- Offset control for alignment (including profile of top of posts) of right-of-way fence.
- Post installations in rock.
- Maintaining existing drainage across the right-of-way line (fence fan details).
- Requirements specific to each style of fence and gates (WWF, SWF and CLF), including (but not limited to) the following:
 - type of posts and footings,
 - post spacing,
 - locations/spacing of stretcher post,
 - stretcher/corner/end post configurations,
 - length of post embedment into the ground,
 - spacing of fence wire materials,
 - typical fan details for irregular terrain, and
 - types and configurations of fence wire connections.

(b) Reconstruction of Guardrail

Section 625.04.B of the Standard Specifications requires the Contractor to coat newly cut holes with zinc rich paint, as follows:

- after erecting metal plate rail, clean abrasions of existing paint and apply one coat of aluminum paint to damaged and primed areas, and
- after the first coat dries, apply a second coat of aluminum paint to all plate rail and fittings in accordance with Section 623.04.B of the Standard Specifications.

Ensure the Contractor reconstructs guardrail at the locations shown on the Plans and complies with Section 623 of the Standard Specifications and the relevant ODOT Standard Drawings when reconstructing the guardrail on the project. The various ODOT Standard Drawings pertaining to the guardrail work include the following:

- [ODOT Standard Drawing THRI-1](#) includes details regarding the three beam guardrail bridge connections (31" guardrail height).
- [ODOT Standard Drawing SKT-1](#) includes details regarding the guardrail end treatments (31" guardrail height).
- [ODOT Standard Drawing GA31-1](#) includes details regarding the guardrail anchor units (31" guardrail height).
- [ODOT Standard Drawing GHW1-1](#) includes details regarding the guardrail and hardware (31" guardrail height). (1 of 2 sheets).
- [ODOT Standard Drawing GHW2-1](#) includes details regarding the guardrail and hardware (31" guardrail height). (2 of 2 sheets).
- [ODOT Standard Drawing DBF1-1](#) includes details regarding the guardrail bridge connections with adding rub rail to existing D-BF bridge connections (27-3/4" guardrail height).
- [ODOT Standard Drawing DBF2-1](#) includes details regarding the guardrail bridge connections with rub rail to new D-BF bridge connections (27-3/4" guardrail height).

Refer to [Section 623.03.C of this Manual](#) for details regarding the inspection of the guardrail installation, including (but not limited to) the following:

- General guardrail installation requirements.
- Setting/driving posts for guardrail.
- Post installations in rock.
- Guardrail elements and hardware requirements from specifications and ODOT Standard Drawings.
- Guardrail end treatments (GETs).
- Guardrail anchor units.

- Guardrail bridge connections.
- Requirements specific to each style of guardrail (type of guardrail, GET, bridge connection, anchor unit, etc.), including (but not limited to) the following:
 - type of posts and footings,
 - post spacing,
 - length of post embedment into the ground, and
 - types of hardware materials.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and fence items from damage,
- Providing temporary fence or making necessary arrangements with adjacent property owners to ensure protection of livestock or other potential safety concerns.
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed guardrail as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Discussions with adjacent property owners (name and location) regarding fence removal/installation coordination.
- Work being performed on the fence or guardrail items (removals, storing materials, setting/driving posts, fence or guardrail installation, excavating or pouring anchor unit footing, etc.).
- Quantity of each pay item that is placed (LF).

- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 625.06 of the Standard Specifications, there are multiple pay items for the various remove and store/reconstruct fence or guardrail pay items that might be used on the project, as follows:

- *Remove and Store Fence*
- *Remove and Reconstruct Fence*
- *Remove and Store Guardrail*
- *Remove and Reconstruct Guardrail*

The final quantity for the remove and store/reconstruct fence or guardrail pay items will be determined by the methods defined in Section 625.05 of the Standard Specifications.

The residency project inspector will measure the length of completed removal and storage of fence or guardrail along the groundline (not Station to Station) from center to center of the end posts before removals.

The residency project inspector will measure the length of completed removal and reconstruction of fence or guardrail along the groundline (not Station to Station) from center to center of the end posts after reconstruction is completed and accepted. Connections to cross fences will not be measured for payment and are considered incidental.

In accordance with the various ODOT Standard Drawings, the following components of the fence and gate pay items are to be included in the contract unit prices for the relevant pay items:

- The cost of all materials and labor to install the fence wire, fence fabric, tie wire, posts, bolts, washer, nuts, concrete and all other appurtenances included in the ODOT Standard Drawing to be included in the contract unit price for the relevant fence and gate pay items.
- Connections to drainage structures and headwalls are considered incidental to the relevant fence pay item and will not be paid for separately.
- Fan details required at irregular terrain and drainage swales are considered incidental to the relevant fence pay item and will not be paid for separately.

In accordance with the various ODOT Standard Drawings, the following components of the guardrail pay items are to be included in the contract unit prices for the relevant pay items:

- The cost of all materials and labor to install the beam rail, blockouts, bolts, washer, nuts, concrete, reinforcing steel and all other appurtenances included in the ODOT Standard Drawing to be included in the contract unit price for the relevant pay items.
- Guardrail Curbing to be measured and paid for separately for the bridge connections when shown on the ODOT Standard Drawing.
- Guardrail Delineators to be measured and paid for separately for the guardrail when shown on the ODOT Standard Drawing.

Documentation of the various remove and store/reconstruct fence or guardrail pay items paid by the Linear Foot will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the descriptive location or the station to station extents and location (i.e., direction, station extents, lane designation, etc.).
- c. In the Placed Quantity field, enter the measured quantity (LF) of the relevant various remove and store/reconstruct fence or guardrail pay item completed.
- d. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

625.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Ensure the Contractor provided the following for use in the reconstruction of fencing and guardrail as specified in Sections 625.02 of the Standard Specifications:

- Salvaged materials in good condition from the existing installations. Materials in poor condition must be replaced.
- Aluminum paint (zinc-rich paint) for refurbishing salvaged materials in accordance with Section 730.02 of the Standard Specifications. (NOTE: Aluminum paint specifications were eliminated from Section 730 beginning in the 1996 Edition of the Standard Specifications. The recommended replacement language from Materials Division which will be added to the next edition of the specifications is, ***“Provide two coats of 93% pure zinc paint and overcoat with a polyurethane-based paint for outdoor use.”***)

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

C. Protection of the Work

Ensure the Contractor installed the fence, gates and appurtenances, including fan details in irregular terrain. Ensure the fence items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed.

Ensure the Contractor installed the guardrail and appurtenances, including guardrail delineators as required on Std. GHW-1. Ensure the guardrail items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed.

Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

625 CHECKLIST – REMOVAL AND STORAGE OR RECONSTRUCTION OF FENCING AND GUARDRAIL

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Fence:					
Have the relevant remove and store/reconstruct fence pay items shown in the Plans been identified and reviewed?					
Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the remove and store/reconstruct fence pay items been reviewed with the Contractor (locations & lengths for storage/reconstruction, location to store, types of fence and gate, etc.)?					
Has the method for establishing the alignment of the reconstructed right-of-way fence been discussed with the Contractor?					
Have the use of concrete footings on all gate, corner, end and stretcher posts for the WWF and CLF as required on the relevant ODOT Standard Drawings been discussed with the Contractor?					
Has the method and schedule for installation of the fence/gates been discussed with the Contractor to minimize/protect adjacent property at locations that are removed and replaced?					
Does the Contractor have a plan for maintenance of traffic and protection of the fencing operation during its construction?					
Guardrail:					
Have the relevant remove and store/reconstruct guardrail pay items shown in the Plans been identified and reviewed?					

Have the requirements for the relevant ODOT Standard Drawings been reviewed with the Contractor?					
Have the plan notes and details regarding the guardrail pay items been reviewed with the Contractor (locations & lengths for installation, location to store, types of guardrail, etc.)?					
Has the method and schedule for installation of the guardrail been discussed with the Contractor to minimize/protect guardrail locations that are removed and replaced?					
Does the Contractor have a plan for maintenance of traffic and protection of the guardrail operation during its construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Fence:					
Have the proposed products and sources of materials (fence/gate materials, PC concrete, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Is the Contractor completing the fence/gate items reconstruction in compliance with the requirements for the relevant ODOT Standard Drawings?					
Have any property owners questioned the type of fence to be installed on their property line?					
Has the Resident Engineer obtained any Right-of-Way Agreements that were executed between the ODOT Right-of-Way Division and the property owner from the District Construction Engineer?					
Is the Contractor complying with the plan notes and details regarding the remove and store/reconstruct fence/gate pay items (locations & lengths for installation, location to store salvaged material, types of fence/gates, etc.)?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor minimizing damage to the fence materials during removal?					
Is the Contractor using an acceptable method for establishing the alignment of the reconstructed right-of-way fence in the locations designated in the Plans?					
Has the Contractor contacted property owners for coordinating their schedule prior to removing existing fence to ensure protection/security of their property and livestock?					
Is the Contractor minimizing exposure time for removed fence and protecting fence/gate locations that are removed and reconstructed?					
Is the Contractor setting the required fence/gate posts to the dimensions (length of post, depth of embedment, spacing, etc.) shown on the relevant ODOT Standard Drawings?					
Is the Contractor using concrete footings on all gate, corner, end and stretcher posts for the WWF and CLF as required on the relevant ODOT Standard Drawings?					
Is the Contractor reconstructing with the type/style (SWF, WWF, CLF, height, number of strands, etc.) of fence that is shown on the Plans?					
Is the Contractor splicing and connecting the fence materials to the posts as required on the relevant ODOT Standard Drawings?					
Is the Contractor installing extra length posts (fan posts) for small depressions, if not practical for the fence to closely follow the contour of the ground as required on the relevant ODOT Standard Drawings?					
Is the Contractor installing the type and width of gates as required on the Plans and relevant ODOT Standard Drawings?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Resident Engineer identified any section of completed fence/gates that require remedial work?					
Guardrail:					
Is the Contractor completing the remove and reconstruct guardrail item installation in compliance with the requirements for the relevant ODOT Standard Drawings?					
Is the Contractor complying with the plan notes and details regarding the remove and store/reconstruct guardrail pay items (locations & lengths for installation, storage location, types of guardrail, etc.)?					
Is the Contractor minimizing damage to the guardrail materials during removal?					
Is the Contractor minimizing exposure time and protecting guardrail locations that are removed and reconstructed?					
Is the Contractor setting the guardrail posts to the dimensions shown on the relevant ODOT Standard Drawing?					
Is the Contractor lapping the guardrail beams as required on Std. GHW-1 (to prevent snagging from oncoming traffic)?					
Is the Contractor installing guardrail delineators as required on Std. GHW-1?					
Are all connections (bolt, nut, cable, etc.) and components installed in accordance with Std. SKT-1 or manufacturer's specifications for the GETs?					
Is the Contractor maintaining traffic and protecting the guardrail operation from traffic during its construction?					
Has the Resident Engineer identified any section of completed guardrail that will require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Fence:					
Has the Contractor taken adequate precautions to protect the completed fence/gate items from damage?					
Has the residency personnel verified all completed fence/gate items were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					
Did the Contractor use salvaged materials in good condition for the fence/gate reconstruction item?					
Did the Contractor maintain drainage swales that cross the right-of-way line and prevent causing any ponding of stormwater run-off?					
Guardrail:					
Has the Contractor taken adequate precautions to protect the completed guardrail items from damage?					
Has the residency personnel verified all completed guardrail items were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					
Did the Contractor use salvaged materials in good condition for the guardrail reconstruction item?					

SECTION 626 – MONUMENTS

626.01 GENERAL

This work consists of constructing or removing and resetting concrete monuments or right-of-way markers.

626.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of monument pay items (monument, R/W marker, remove & reset, etc.) included in the Contract.
- Review special provisions, plan notes and plan details included in the Contract for the requirements (dimensions, material requirements, aesthetics, details of installation, etc.) of the relevant monument pay items included in the Plans.
- Confirmation of planned locations to install monuments and any needed site work (grading, compaction of base, sodding, etc.).
- Methods and equipment to be used.
- Contractor's schedule/plan for the work.
- Requirements for any designated monument removals to be stored and reset.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 626.02 and other referenced sections of the Standard Specifications regarding the construction of monuments and right-of-way markers. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant monument and marker pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following monument and marker components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 626.02:

- PC Concrete, Class A meeting Section 701
- Reinforcing Steel meeting Section 723

The Contractor should submit its proposed sources of materials and mix designs at the Preconstruction Meeting. If the sources of materials and mix designs are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the monument and marker pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and mix designs. Resolve any questions or concerns with the submitted sources of materials and mix designs with the Contractor in a timely manner. A written response accepting the proposed sources of materials and mix designs must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Most monuments and their footings and right-of-way markers will require the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

PC concrete mix designs must be reviewed for approval by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant location in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plant submitted by the Contractor has a current ODOT certification. The plant must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following monument and marker materials should be verified on the QPL or approved aggregate source list:

- Components of the PC concrete listed on the mix design
- Reinforcing Steel

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

C. Preparatory Work and Contractor Work Plans

Review the Plans, Standard Specifications, Special Provisions and Plan Notes and determine any special requirements for the monument and right-of-way marker pay items that are required.

Consider the following before the monument and marker construction operations begin.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the monument and marker pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant monument and marker pay items included in the Plans.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to install the monuments and right-of-way markers in their submittals prior to beginning construction. Section

626.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install monument and marker items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The Contractor must provide equipment capable of off-loading, handling, and placing the monuments and markers. Ensure the excavation for the marker or monument footing is performed to the elevations and grades required for each specific structure as shown in the Plans. Ensure the Contractor has excavators capable of performing the excavation for the marker or monument footing to the required dimensions (width, depth and grade) and the equipment needed to meet the compaction requirements for the bedding and backfill material required for each specific structure as shown in the Plans.

3. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,

- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and monument and marker items from damage,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

626.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 626.02 and other referenced sections of the Standard Specifications regarding the construction of monuments and right-of-way markers. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant monument and marker pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following monument and marker components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 626.02:

- PC Concrete, Class A meeting Section 701
- Reinforcing Steel meeting Section 723

The Contractor should submit its proposed sources of materials and mix designs at the Preconstruction Meeting. If the sources of materials and mix designs are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the monument and marker pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and mix designs. Resolve any questions or concerns with the submitted sources of materials and mix designs with the Contractor in a timely manner. A written response accepting the proposed sources of materials and mix designs must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed PC Concrete Mix Designs

Most monuments and their footings and right-of-way markers will require the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 626.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the PC concrete for the monuments and markers.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 626.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, products and mix designs in advance of any work beginning on the relevant monument and marker pay items.

The Residency will verify that the proposed source of materials and products submitted by the Contractor on their PC concrete mix design is on the [ODOT Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate PC concrete items.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency must perform and document the following acceptance tests/procedures as applicable:

(a) PC Concrete and Reinforcing Steel for Monuments and Markers

Most monuments and their footings and right-of-way markers require the use of Class A Concrete. The Residency must perform and document the following acceptance tests/procedures on the PC concrete for the monuments and markers:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the monument and marker items is listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The

Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 626.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install monument and right-of-way marker items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Ensure the Contractor provides equipment and methods capable of the following:

- off-loading, handling, and placing the monuments and markers without causing any damage to the items,
- excavators capable of performing the excavation for the marker or monument footing to the required dimensions (width, depth, elevation, etc.), and
- equipment needed to meet the compaction requirements for the bedding and backfill material required for each specific monument or marker.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the monument and right-of-way marker pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant monument and marker pay items included in the Plans.

Details regarding the monuments and right-of-way markers are shown in the Plans. Monuments may include historical markers, state of Oklahoma monuments at the state line or welcome centers, etc. There are no ODOT Standard Drawings regarding the construction of monuments and right-of-way markers. Details that will be shown in the Plans include:

- shape,
- dimensions,
- texture,
- coating (type of coating, color, etc.),
- footing design, and
- location of placement.

Check the Plans for any designation for the Contractor to remove and reset monuments or right-of-way markers. Ensure the Contractor's methods for removing items required by the Plans to be reset, result in no damage to the salvaged material. Check the Plans for the specified locations to store and to reset the salvaged material. Emphasize the Contractor's

responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

Monuments and right-of-way markers will be constructed using reinforced PC concrete in accordance with Section 509 of the Standard Specifications, as shown on the Plans. Unless otherwise shown in the Plans, the monuments and right-of-way markers will have a carborundum finish in accordance with Section 626.04 of the Standard Specifications.

It is critical that right-of-way markers be placed at the location shown on the Plans, especially the distance (offset) from the centerline of the road. Verify that the Contractor places the marker on the right-of-way line.

Ensure the Contractor installs monuments and right-of-way markers to the depth shown on the Plans. Verify the items are set vertically plumb. Ensure the monuments and right-of-way markers have been backfilled and compacted with a backfill material approved by the Resident Engineer, and verify they have been stabilized and secured by the backfill operation.

The Contractor is responsible to replace monuments or right-of-way markers damaged during construction before final acceptance, at no additional cost to the Department.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and monument and marker items from damage,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the monument or right-of-way marker items (removal of item, excavating or pouring footing, constructing item, setting item, applying coating, etc.).

- Quantity of each pay item that is placed (EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 626.06 of the Standard Specifications, there are multiple pay items for the various monument pay items that might be used on the project, including:

- *Monuments,*
- *Remove and Reset Monuments,*
- *Right-of-Way Markers,* and
- *Right-of-Way Markers Removed and Reset.*

The residency project inspector will measure the number of completed monument and right-of-way marker items by the Each. The cost of all materials and labor to install the monument or right-of-way marker items are to be included in the contract unit price for the relevant pay items.

Documentation of the monument and marker pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the station for each item and a descriptive location.
- c. In the Placed Quantity field, enter the quantity (EA) of the item completed.
- d. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, select the 'New' button to create a new row for the selected pay item.

626.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock,

Stone & Sand Sources, etc.), contact Materials Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor installed the monument and right-of-way marker items in accordance with the Plans (at the locations, with the dimension and other details, etc.). Ensure the monument and right-of-way marker items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed. Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

Verify that the Contractor places all right-of-way markers on the property (R/W) line.

626 CHECKLIST – MONUMENTS

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant monument and right-of-way marker pay items shown in the Plans been identified and reviewed?					
Have the plan notes and details regarding the monument and right-of-way marker pay items been reviewed with the Contractor (locations for installation, details for monuments, etc.)?					
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been verified on the QPL by the residency personnel?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					

Has the method for identifying the right-of-way line for the installation of markers been discussed with the Contractor?					
Have the details for the for the construction of the right-of-way markers (shape, dimensions, depth of installation, backfill, etc.) been discussed with the Contractor?					
Has the method and schedule for removal and resetting of the monuments and right-of-way markers been discussed with the Contractor?					
Has the method and schedule for installation of the monuments and right-of-way markers been discussed with the Contractor?					
Has a site investigation for the locations to install monuments been performed to discuss details (grading, specific location, staging of equipment and materials, etc.) with the Contractor?					
Have the requirements for the construction of the monument footing (grading/excavation, elevation, base compaction, etc.) been discussed with the Contractor?					
Have the details for the for the construction of the monument (shape, dimensions, texture, coating, etc.) been discussed with the Contractor?					
Does the Contractor have a plan for maintenance and protection of the monuments and right-of-way markers during the on-going construction of the project?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Have all of the FAST Guide requirements for sampling, testing and documenting in SiteManager been performed by the residency?					
Have all of the FAST Guide requirements for sampling, testing and documenting products on the QPL in SiteManager been performed by the residency?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Did the Contractor use an acceptable method to identify the right-of-way line for the installation of markers?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor complying with the details for the construction of the right-of-way markers (shape, dimensions, depth of installation, backfill, etc.)?					
Are the methods for removal and resetting of the monuments and right-of-way markers resulting in acceptable results without damage to the items?					
Are the methods for installation of the monuments and right-of-way markers resulting in acceptable results without damage to the items?					
Was a site investigation for the locations to install monuments performed to identify details (grading, specific location, staging of equipment and materials, etc.) with the Contractor?					
Is the Contractor complying with the requirements for the construction of the monument footing (grading/excavation, elevation, base compaction, etc.)?					
Is the Contractor complying with the details for the construction of the monument (shape, dimensions, texture, coating, etc.)?					
Is the Contractor properly maintaining and protecting the monuments and right-of-way markers during the on-going construction of the project?					
Has the Resident Engineer identified any monuments and right-of-way markers that require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed monuments and right-of-way markers from damage?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Has the residency personnel verified all completed monuments and right-of-way markers were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Did the Contractor use an acceptable method to identify the right-of-way line for the installation of markers?					
Has the residency personnel verified all completed right-of-way markers were installed on the right-of-way line?					
Did the Contractor use the products and sources of materials (PC concrete, reinforcing steel, etc.) reviewed/accepted by the Resident Engineer for the monument and right-of-way marker items?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the residency personnel perform all of the FAST Guide requirements for sampling, testing and documenting products on the QPL in SiteManager?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					

SECTION 627 – CONCRETE LONGITUDINAL BARRIER

627.01 GENERAL

This work consists of constructing longitudinal concrete barrier with concrete and reinforcing steel.

The Department will consider alternative designs that meet exterior dimensions, and test and performance criteria required by the Contract. Alternative designs must be submitted by the Contractor to the Resident Engineer for approval.

627.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of longitudinal concrete barrier pay items (concrete longitudinal barrier design 1 & 1A, end sections, longitudinal barrier inlets, etc.) included in the Contract.
- Review special provisions, plan notes, plan details and ODOT Standard Drawings included in the Contract for longitudinal concrete barrier (i.e., specific design, finishing/painting barrier requirements, etc.).
- Proposed sources of material and material requirements.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used, including protecting traffic from blunt ends of longitudinal concrete barrier (from removal of existing or construction of new barrier).
- Alternative design for longitudinal concrete barrier with supporting information (testing and performance certifications, etc.) to the Resident Engineer for approval.
- Contractor's schedule/plan for the work.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 627.02 and other referenced sections of the Standard Specifications regarding the longitudinal concrete barrier. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant longitudinal concrete barrier pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following longitudinal concrete barrier components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 627.02:

- PC Concrete, Class A meeting Section 701
- Reinforcing Steel meeting Section 723

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant longitudinal concrete barrier pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Longitudinal concrete barrier requires the use of Class A Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

PC concrete mix designs must be reviewed for approval by the Resident Engineer based on the criteria of the material and its intended use as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant location in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plant submitted by the Contractor has a current ODOT certification. The plant must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on the longitudinal concrete barrier items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following longitudinal concrete barrier materials should be verified on the QPL or approved aggregate source list:

- Components of the PC concrete listed on the mix design
- Reinforcing steel

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before the longitudinal concrete barrier construction begins.

1. Contract Plans and Specifications

Review the Standard Specifications, Special Provisions and Plan Notes for requirements governing the longitudinal concrete barrier construction. Additionally, review all relevant ODOT Standard Drawings, plan notes and details included in the Plans and special provisions in the Contract for the requirements

that pertain to the relevant longitudinal concrete barrier pay items included in the Plans. Ensure the Contractor is aware of any specified requirements for the work.

Typically, information regarding the longitudinal concrete barrier can be found in the Plans in either the “Summary of Barriers” or “Summary of Surfacing Quantities” schedule shown on one of the summary sheets in the Plans. Information pertaining to the longitudinal concrete barrier work includes:

- Station extents and location to be installed,
- Pay items to be installed (longitudinal concrete barrier, end sections, inlets, etc.) and
- Quantities for each pay item to be installed.

Ensure the applicable ODOT Standard Drawings are reviewed prior to beginning construction for the longitudinal concrete barrier items included on the project. The ODOT Standard Drawings pertaining to the longitudinal concrete barrier work are the following:

- [ODOT Standard Drawing CLB-2](#) includes details regarding the longitudinal concrete barrier construction.
- [ODOT Standard Drawing DU1-1](#) includes details regarding the median barrier delineators.
- [ODOT Standard Drawing BMF1-2](#) includes details regarding the safety longitudinal concrete barrier light pole footing details.

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to construct the longitudinal concrete barrier in their submittals prior to beginning construction. Section 627.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to construct longitudinal concrete barrier items. The choice of equipment and methods for this work is usually left to the Contractor’s discretion.

The methods for the construction of the longitudinal concrete barrier must meet the requirements of the applicable sections of the Standard Specifications, as follows:

- The measurement, batching and mixing of the PC concrete must be done in accordance with Section 414.04 of the Standard Specifications.
- Forming for the longitudinal concrete barrier must be done in accordance with Section 502 of the Standard Specifications.
- Reinforcing steel must be installed in accordance with Section 511 of the Standard Specifications.

- The placement, finishing and curing and of the PC concrete must be done in accordance with Section 509.04 of the Standard Specifications.

Ensure the Contractor is aware of the requirements governing the construction of the longitudinal concrete barrier.

3. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,
- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, "Water,"
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,

- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and longitudinal concrete barrier from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed longitudinal concrete barrier as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

627.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 627.02 and other referenced sections of the Standard Specifications regarding the longitudinal concrete barrier. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant longitudinal concrete barrier pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following longitudinal concrete barrier components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 627.02:

- PC Concrete, Class A meeting Section 701
- Reinforcing Steel meeting Section 723

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant longitudinal concrete barrier pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Longitudinal concrete barrier requires the use of Class A Concrete. Ensure the Contractor has submitted its proposed concrete designs in advance of any work beginning on the PC concrete for the longitudinal concrete barrier pay items.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List](#)

[\(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 627.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the PC concrete for the longitudinal concrete barrier pay items.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 627.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, products and mix designs in advance of any work beginning on the relevant longitudinal concrete barrier pay items.

The Residency will verify that the proposed source of materials and products submitted by the Contractor is on the ODOT [Materials Division Qualified Products List \(QPL\)](#). Ensure the product name and manufacturer is shown on the QPL. If a proposed source is not on the QPL, contact Materials Division to confirm the status of the source/product approval.

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

(a) PC Concrete and Reinforcing Steel for Longitudinal Concrete Barrier

Longitudinal concrete barrier require the use of Class A Concrete and Reinforcing Steel. The Residency must perform and document the following acceptance tests/procedures on the PC concrete and reinforcing steel for the longitudinal concrete barrier pay items:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard Specifications for the appropriate size number (57, 67, etc.). [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]

- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class A Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the longitudinal concrete barrier is listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 627.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to construct longitudinal concrete barrier items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

The methods for the construction of the longitudinal concrete barrier must meet the requirements of the applicable sections of the Standard Specifications, as follows:

- The measurement, batching and mixing of the PC concrete must be done in accordance with Section 414.04 of the Standard Specifications.
- Forming for the longitudinal concrete barrier must be done in accordance with Section 502 of the Standard Specifications.
- Reinforcing steel must be installed in accordance with Section 511 of the Standard Specifications.
- The placement, finishing and curing and of the PC concrete must be done in accordance with Section 509.04 of the Standard Specifications.

Ensure the Contractor is aware of the requirements governing the construction of the longitudinal concrete barrier.

C. Construction Operations

Review the Standard Specifications, Special Provisions and Plan Notes for requirements governing the longitudinal concrete barrier construction. Additionally, review all relevant ODOT Standard Drawings, plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant longitudinal concrete barrier pay items included in the Plans. Ensure the Contractor complies with all requirements for the work.

Typically, information regarding the longitudinal concrete barrier can be found in the Plans in either the “Summary of Barriers” or “Summary of Surfacing Quantities” schedule shown on one of the summary sheets in the Plans. Information pertaining to the longitudinal concrete barrier work includes:

- Station extents and location to be installed,
- Pay items to be installed (longitudinal concrete barrier, end sections, inlets, etc.) and
- Quantities for each pay item to be installed.

The ODOT Standard Drawings pertaining to the longitudinal concrete barrier work are the following:

- [ODOT Standard Drawing CLB-2](#) includes details regarding the longitudinal concrete barrier construction.
- [ODOT Standard Drawing DU1-1](#) includes details regarding the median barrier delineators.
- [ODOT Standard Drawing BMF1-2](#) includes details regarding the safety longitudinal concrete barrier light pole footing details.

Verify the following complies with Section 627.04 of the Standard Specifications and the ODOT Standard Drawing when performing the longitudinal concrete barrier construction:

1. Alternate Design of Longitudinal Concrete Barrier

In accordance with Section 627.01 of the Standard Specifications and [ODOT Standard Drawing CLB-2](#), ODOT will consider alternative designs of longitudinal concrete barrier (including precast concrete barrier) that meet exterior dimensions, and test and NCHRP 350 performance criteria.

The Contractor must submit alternative designs with supporting information (testing and performance certifications, etc.) to the Resident Engineer for approval. The Resident Engineer should contact the ODOT Traffic Engineering Division for input and guidance on proposed alternative designs and products, including the use of precast structures.

2. Batching PC Concrete

Ensure the Contractor meets the requirements of Section 414.04 of the Standard Specifications for the measurement, batching and mixing of the PC concrete used in the longitudinal concrete barrier construction as required in Section 627.04 of the Standard Specifications.

Refer to Section 414.03.B of this Manual for details regarding the equipment and methods required for batching and mixing PC concrete, including (but not limited to) the following:

- Concrete batch plant and mixer requirements.
- Storage and handling of aggregate stockpiles at the batch plant.
- Storage requirements for cementitious materials.
- Truck mixer requirements.

Refer to Section 414.03.C.1 of this Manual for details regarding the weather limitations for mixing and placing PC concrete, including (but not limited to) the following:

- Temperature of the mixed concrete must be between 50 °F to 90 °F during mixing, delivery and placement of the PC concrete.
- Contractor to protect placed concrete during extreme cold or hot weather conditions.

Refer to Sections 414.03.C.3 and 414.03.C.4 of this Manual for details regarding the inspection requirements for the batching and mixing PC concrete used for the longitudinal concrete barrier construction, including (but not limited to) the following:

- Ensure the concrete batch plant has a current ODOT certification prior to beginning production of PC concrete on the project.
- The concrete batch plant must use an electronically-controlled automatic batch weight and printer system that indicates the net batch weight of material delivered to the transporting truck.
- Ensure the weights are printed on a ticket that includes the quantities of admixtures and the volume of water incorporated into the load.
- Mixed concrete must be placed no more than 1 hr after the water, cement, and aggregate are combined.
- Adjust water to improve workability if transit mixers or agitators deliver the PCC. Increase mixing by 30 revolutions when adding water, and maintain the water to cementitious material ratio.

3. Formwork for Longitudinal Concrete Barrier

Ensure the Contractor meets the requirements of Section 502 of the Standard Specifications for building and setting forms used in the longitudinal concrete barrier construction as required in Section 627.04 of the Standard Specifications.

Refer to Section 502.03.C of this Manual for details regarding the building and setting forms, including (but not limited to) the following:

- To produce a clean, uniform finish on exposed concrete surfaces, acceptable form lumber must be used.
- Check that exterior corners are formed with a chamfer strip or other suitable means to produce smooth, even edges.
- Provide adequate bracing of all formwork to ensure consistent lines of longitudinal concrete barrier and avoid bulges in surface of barrier.
- Inspect formwork for:
 - trueness to line and grade,
 - warping,
 - smoothness of form faces,
 - condition of form ties,
 - proper bracing,
 - tightness of joints, and
 - cleanliness of forms.

Ensure the Contractor meets the requirements for contraction and expansion joints as depicted in [ODOT Standard Drawing CLB-2](#) when building and setting forms used for the longitudinal concrete barrier. There is a detail included on Standard CLB-2 for the information (dimensions, material requirements, etc.) necessary to construct the expansion joints. Note 5 on Standard CLB-2 requires the following:

- When longitudinal barrier is placed on flexible base or surfacing (asphalt), ensure the Contractor installs the following:
 - contraction joints or 3/4" chamfers at a maximum spacing of 20 ft, and
 - expansion joints at a maximum spacing of 200 ft.
- When longitudinal barrier is placed on rigid surface (PC concrete), ensure the Contractor saw-cut joints within 10 hours of barrier placement or installs 3/4" chamfers that match the contraction joints in the PCC pavement.

4. Reinforcing Steel

Ensure the Contractor meets the requirements of Section 511 of the Standard Specifications for placing reinforcing steel for the longitudinal concrete barrier construction as required in Section 627.04 of the Standard Specifications.

Refer to Section 511.03.C of this Manual for details regarding the placement of the reinforcing steel, including (but not limited to) the following:

- Handling and storage requirements to keep clean and free of damage. For epoxy coated reinforcing, special treatment is required, including:
 - supporting coated bars on pads,
 - padding bundled bands,
 - preventing bar-to-bar abrasion,
 - avoiding dropping or dragging bundles, and
 - using padded straps for lifting; chains for lifting or moving is not allowed.
- If epoxy coated reinforcing steel is to be stored at the Project site for more than two months, it must be protected from the sun by covering with a non-transparent material to prevent UV damage to the epoxy. (Note: A special provision is being considered to reduce the allowable exposure to one month.)
- Ensure that all nicks, scratches and damage to epoxy coating is adequately repaired.
- Check reinforcing bars for mud, oil, excessive rust that results in loss of section, and heavy scale as concrete will only bond with a clean bar surface.
- Check bars for straightness or proper bend dimensions. The Contractor must avoid field bending of reinforcing bars because excessive bending will cause damage to the bar and may result in failure.
- Check that bar size, alignment and spacing conforms to the dimensions shown on [ODOT Standard Drawing CLB-2](#).
- Ensure that the proper minimum clearance is obtained between the outside mat of steel and the surface of the concrete.
- Check bar splices to ensure that they are the proper length for the type and size of bar placed. Verify that lap lengths are as shown on the Plans.
- Ensure steel is properly supported to ensure adequate concrete coverage and that the reinforcing steel is at the proper location within the concrete.
- To minimize displacement, bars must be securely tied. Verify that the bars are tied at all intersections or as otherwise designated. Note that the use of coated ties is required for epoxy-coated bars.

5. Placing PC Concrete

Ensure the Contractor meets the requirements of Section 509 of the Standard Specifications for placing PC Concrete for the longitudinal concrete barrier construction as required in Section 627.04 of the Standard Specifications.

Refer to Sections 509.03.C.1 and 509.03.C.2 of this Manual for details regarding the placement and curing of the PC Concrete, including (but not limited to) the following:

- Check the information presented on load tickets to verify compliance with the proper mix design for the longitudinal concrete barrier being poured.
- Ensure compliance with the time limitations (one hour) for completion of concrete placement and concrete mix temperature (50 °F to 90 °F).
- Ensure that the quantity of water added to the concrete mix at the site is properly recorded on the load ticket.
- Concrete must be placed in horizontal layers less than 18 inches thick. Ensure the vibrators consolidate and merge new layers with the previous layer.
- Monitor the operation for reinforcing steel displaced by equipment or concrete during the pour.
- Mechanical vibrators must be used to consolidate the concrete immediately after placement. Do not allow the Contractor to use vibrators to move a mass of fresh concrete.
- Ensure the surface of the concrete is maintained in a moist condition for the minimum curing period, which includes the period during which the finishing operation is performed.
 - Verify that the Contractor's proposed curing method for each element is in accordance with Section 509.04.F of the Standard Specifications.
 - If the forms-in-place method is not used for the entire curing time of the placed element, then one of the other curing methods must be used for the remainder of the curing time.

6. Finishing PC Concrete Surface

Ensure exposed longitudinal concrete barrier surfaces are smooth and dense. The Contractor must fill rough areas, holes, and porous spots after removing the forms. The bolts, wires, or other appliances used to hold the forms must be cut at least 1/4 in below the concrete surface and the depressions filled with cement mortar.

Ensure the Contractor meets the requirements of Section 509.04.G of the Standard Specifications for finishing PC Concrete for the longitudinal concrete barrier construction as required in Section 627.04 of the Standard Specifications. When the class of finish treatment is not specified in the Plans, the Contractor must use a Class 1 Ordinary Surface Finish followed by either a Class 2 Rubbed Finish, or a Class 6 Mortar Finish as further described in Section 509.04.G of the Standard Specifications.

Refer to Section 509.03.C.3 of this Manual for additional details regarding the finishing of the longitudinal concrete barrier surface, including (but not limited to) the following:

- Maintain the surface of the concrete in a moist condition for the minimum curing period, which includes the period during which the finishing operation is performed.

- Class 1 Ordinary Surface Finish must be applied immediately after form removal, which requires that all cavities, honeycomb spots, and broken edges are properly cleaned, saturated with water, and pointed and trued (patched) with the specified mortar mixture.
- Class 2 or Class 6 must be applied following the Class 1 surface finish.
- When a Class 1 or Class 2 surface finish is performed, verify that the concrete surface temperature is at least 40 °F and is not forecast to drop below 40 °F until the grout has set.
- When a Class 6 surface finish is performed, verify that the concrete surface temperature is at least 50 °F with a forecast maintaining that temperature for at least 24 hours following application.

7. Delineator Placement on Longitudinal Concrete Median Barrier

Ensure the Contractor meets the requirements for installing delineators on the completed longitudinal concrete median barrier as depicted in [ODOT Standard Drawing CLB-2](#) and [ODOT Standard Drawing DU1-1](#). There is a detail included on Standard CLB-2 for the information (spacing, orientation, etc.) necessary to install the delineators. Note 7 on Standard CLB-2 requires the delineators must be placed on median barrier according to Standard DU1-1 and payment will be made using the *Barrier Delineator* pay item.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and longitudinal concrete barrier from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed longitudinal concrete barrier as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, direction, lane, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the longitudinal concrete barrier items (setting forms, reinforcing steel installation, pouring concrete, removing forms, rubbing/finishing barrier surface, installing delineators, etc.).
- Quantity of each pay item that is placed (LF, EA,CY, LB).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 627.06 of the Standard Specifications and [ODOT Standard Drawing CLB-2](#), there are multiple pay items for the various longitudinal concrete barrier pay items (design # of longitudinal concrete barrier, end sections, inlets, etc.) that might be used on the project.

Section 627.05 of the Standard Specifications does not provide any specific details regarding the method of measurement for the longitudinal concrete barrier pay items. Where specific methods of measurement are not defined in Section 627.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure the length of completed longitudinal concrete barrier from end to end of continuous barrier. Payment for light pole footings to be included in other items of work (typically, Structural Concrete and Reinforcing Steel) as shown on the Plans and [ODOT Standard Drawing BMF1-2](#). Inlets will be measured and paid by the Each as specified on [ODOT Standard Drawing CLB-2](#).

In accordance with the various ODOT Standard Drawings, the contract unit prices for the relevant pay items shall include the cost for all materials, labor and all incidentals necessary to complete the installation.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the *Concrete Longitudinal Barrier, Design 1* pay item paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.

4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

Documentation of the *Concrete Longitudinal Barrier End Section*, *Barrier Delineators* and *Inlet-Longitudinal Barrier* pay items paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

(c) Cubic Yard Unit of Measure Pay Items

Documentation of the *Class A Concrete (Longitudinal Barrier Design I-A)* and *Structural Concrete* pay items paid by the Cubic Yard (CY) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate removal pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the calculated quantity (CY) of the item completed.

4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

(d) Pound Unit of Measure Pay Items

Documentation of the *Reinforcing Steel* pay item paid by the Pound will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter the station extents or descriptive location for each item being installed.
3. In the Placed Quantity field, enter the quantities (LB) of the pay items completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, tally of tickets, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, select the 'New' button to create a new row for the selected pay item.

627.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, Approved Rock, Stone & Sand Sources, etc.), contact Materials Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional

sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor installed the longitudinal concrete barrier items, including barrier delineators as required on Std. CLB-2. Ensure the longitudinal concrete barrier items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed.

Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

627 CHECKLIST – CONCRETE LONGITUDINAL BARRIER

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant longitudinal concrete barrier pay items shown in the Plans been identified and reviewed?					
Have the requirements for the relevant ODOT Standard Drawings (contraction/expansion joints, delineators, etc.) been reviewed with the Contractor?					
Have the plan notes and details regarding the longitudinal concrete barrier pay items been reviewed with the Contractor (locations & lengths for installation, types of barrier items, etc.)?					
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been verified on the QPL by the residency personnel?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					

Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Has the method and schedule for installation of the longitudinal concrete barrier been discussed with the Contractor to minimize/protect guardrail locations that are removed and replaced?					
Has the Contractor submitted an alternative design for longitudinal concrete barrier with supporting information (testing and performance certifications, etc.) to the Resident Engineer for approval?					
Does the Contractor have a plan for maintenance of traffic and protection of the longitudinal concrete barrier during its construction?					
Has the curing method and class of concrete barrier surface finish been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Have all of the FAST Guide requirements for sampling, testing and documenting in SiteManager been performed by the residency?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Is the Contractor complying with the plan notes and details regarding the longitudinal concrete barrier pay items (locations & lengths for installation, types of barrier items, etc.)?					
Is the Contractor completing the longitudinal concrete barrier installation in compliance with the requirements for the relevant ODOT Standard Drawings?					
Is the Contractor minimizing exposure time and protecting longitudinal concrete barrier locations that are removed and replaced?					
Is the Contractor installing contraction and expansion joints in the longitudinal concrete barrier within the maximum spacing as required on Std. CLB-2?					
Is the Contractor installing longitudinal concrete barrier end sections as required on Std. CLB-2					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor installing light pole bases within the longitudinal concrete barrier as required on Std. CLB-2?					
Is the Contractor installing concrete median barrier delineators as required on Std. CLB-2?					
Is the Contractor performing the curing method and class of concrete barrier surface (Class 1 and 2 or 6) finish as required in the specifications and Plans?					
Is the Contractor maintaining traffic and protecting the longitudinal concrete barrier operation from traffic during its construction?					
Has the Resident Engineer identified any section of completed longitudinal concrete barrier that will require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed longitudinal concrete barrier items from damage?					
Has the residency personnel verified all completed longitudinal concrete barrier items were installed in compliance with the Plans and the requirements for the relevant ODOT Standard Drawings?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					
Did the Contractor use the products and sources of materials (PC concrete, reinforcing steel, etc.) reviewed/accepted by the Resident Engineer for the longitudinal concrete barrier items?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the residency personnel perform all of the FAST Guide requirements for documenting products on the QPL in SiteManager?					
Did the Contractor install concrete median barrier delineators as required on Std. CLB-2?					
Did the Contractor perform the class of concrete barrier surface (Class 1 and 2 or 6, painting, etc.) finish as required in the specifications and Plans?					

SECTION 628 – HIGH-TENSION CABLE BARRIER

628.01 GENERAL

This work consists of providing and installing complete sections of high-tension cable barrier or wire rope systems, including crashworthy end treatments, concrete socketed foundations, concrete anchors, and other appurtenances or hardware fittings.

628.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of high-tension cable barrier pay items (types of cable barrier, types of end anchor/terminals, guardrail transitions, etc.) included in the Contract.
- Review special provisions, plan notes and plan details included in the Contract for the requirements (details of installation, material requirements, sequencing of work, etc.) of the relevant high-tension cable barrier pay items included in the Plans.
- Confirmation of planned locations and lengths.
- Proposed sources of materials, products and material requirements.
- When required by the Plans, discuss the required Contractor's soil report provided to the cable manufacturer indicating all necessary soil information required for the manufacturer to design post footings and end anchors/terminals (depth, diameter, etc.).
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Contractor's requirement to provide a Tension Log Form to document the location, time, date and tension measured.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work.
- Requirements for any designated salvaged materials specified in the Plans.

B. Acceptance of Materials

Review the material requirements in Section 628.02 and other referenced sections of the Standard Specifications regarding the high-tension cable barrier and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant high-tension cable barrier pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following cable barrier components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 628.02:

- PC Concrete, Class AA meeting Section 701
- Reinforcing Steel meeting Section 723
- Anchor Bolts and Nuts meeting Section 724.02
- Galvanizing (Bolts, Nuts and Washers) meeting AASHTO M232
- Fittings (Steel Hardware) meeting Section 732.01
- Reflective Sheeting for Guide Posts meeting Section 733.05

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant cable barrier pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products. Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

1. Contractor Proposed Mix Designs

Unless otherwise required in the Plans, cable barrier posts and end anchor/terminal foundations require the use of Class AA Concrete. Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

PC concrete mix designs must be reviewed for approval by the Resident Engineer based on the criteria of the material and its intended use as further described in the

relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

2. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plant location in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plant submitted by the Contractor has a current ODOT certification. The plant must be reviewed for acceptance by the Resident Engineer based on the criteria of the type of plant as further described in the relevant sections of this Manual and as further detailed below in the **Preparatory Work and Contractor Work Plans** portion of this section below.

3. Sources of Materials

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If that information is not provided at that meeting, ensure it is submitted in advance of any work beginning on those items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following cable barrier post and end anchor/terminal foundation materials should be verified on the QPL or approved aggregate source list:

- Components of the PC concrete listed on the mix design
- Reinforcing steel (used in end anchors)

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL or approved aggregate source list due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

When the project includes the installation of traffic items, the Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). If a proposed traffic item product is not on the APL, contact Traffic

Engineering Division to confirm the status of the source/product approval. The following high-tension cable barrier materials should be verified on the APL:

- High-tension cable barrier
- End anchors, end treatments or end terminals

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

C. Preparatory Work and Contractor Work Plans

Consider the following before high-tension cable barrier work begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the high-tension cable barrier pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant high-tension cable barrier pay items included in the Plans.

The two pay items for the high-tension cable barrier are classified as either TL-3 or TL-4. These two classifications are related to the FHWA's cable barrier system test criteria from NCHRP-350 Test Level 3 (TL-3) or Test Level 4 (TL-4). The crash test levels evaluate the safety performance of the cable barrier system and are classified as follows:

- Test Level 3 (TL-3) is designed and tested to contain and redirect smaller and lighter vehicles (small cars, pickup trucks, etc.).
- Test Level 4 (TL-4) is designed and tested to contain and redirect larger and heavier vehicles (ten-wheel dump trucks, trailer trucks, etc.).
- NOTE: The TL-3 and TL-4 designations do not refer to the number of cables (wire ropes) installed in the cable barrier system.

Typically, the plan notes will provide many requirements for the installation of the high-tension cable barrier items. Various requirements found in the plan notes may include the following:

- Soil report to be provided by the Contractor to the cable manufacturer indicating all necessary soil information required for the manufacturer to design post footings and end anchors/terminals (depth, diameter, etc.) for the project. The Plans will typically include additional criteria to base the design, including:
 - A minimum depth and diameter for the footings are specified by plan note.
 - A maximum post spacing is specified by plan note, along with a maximum deflection of the cable barrier that is used for the manufacturer's design.
 - The manufacturer's design must be signed and sealed by a registered professional engineer.
- Number of cables (wire ropes) required to be installed in the cable barrier system on the project.
- Post requirements such as caps, reflective sheeting, etc.
- Surplus materials, including tension meter, to be taken into warehouse inventory.
- Salvaging of removed existing cable barrier materials to be taken into warehouse inventory.
- Turnbuckle splicing of cable placement limitations to the proximity of posts.
- Training by the cable manufacturer to ODOT personnel for the repair, maintenance and tensioning of the cable system.
- Letter of approval from FHWA indicating the cable barrier system being installed on the project meets all test criteria of NCHRP-350 Test Level 3 (TL-3) or Test Level 4 (TL-4).

The "Summary of Cable Barrier" schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the high-tension cable barrier work:

- Station extents and location to be installed,
- Pay items to be installed (high-tension cable barrier, end anchors, structural concrete, reinforcing steel, etc.) and
- Quantities for each pay item to be installed.

Some projects include plan notes that require some material to be salvaged during the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

2. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to install the high-tension cable barrier in their submittals prior to beginning construction. Section 628.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install high-tension cable barrier items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Cable barrier posts and end anchors will require excavating the hole to the dimensions required on the Plans or as designed by the cable manufacturer. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the high-tension cable barrier items.

For projects that include the removal of existing high-tension cable barrier items for their replacement with new units, ensure the Contractor has an acceptable plan to schedule the operations to minimize the time between the removal of the existing cable barrier and its replacement. Ensure the Contractor has a plan to protect areas vacated by the removed cable barrier as shown in the Plans or as approved by the Resident Engineer.

3. Contractor Proposed Mix Designs

Ideally, the Contractor will submit their proposed mix designs in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

Unless otherwise shown in the Plans or Contract, Sections 628.02 and 628.06 of the Standard Specifications require the foundations (post and end anchor) to be constructed of Class AA Concrete.

(a) PC Concrete Mix Designs

The Residency is responsible for reviewing and approving the proposed concrete mix designs submitted by the Contractor. Section 701.01.C prescribes the information that must be included in each concrete mix design. If the proposed concrete mix design fails to include any of the information listed, it should be returned in writing to the Contractor with a list of deficiencies needing to be included for resubmission. Each PC concrete mix design must include the following information:

- Project identification,
- Contractor's and Producer's name and address,
- Mix design designation,
- Mix design intended use,

- Expected travel time from batch to placement,
- If the concrete will be pumped,
- Aggregate sources, gradation, moisture content, and saturated surface dry batch mass,
- Water source and test reports required by Section 701.04, “Water,”
- Fine aggregate fineness modulus,
- Cement type and source,
- Type of cement substitutions, if used, and source,
- Type of admixtures and sources,
- High Range Water Reducer, if used in accordance with Section 701.03,
- Material proportions,
- Unit weight,
- Air content,
- Slump,
- Water to cement ratio,
- Compressive strengths at 7 days and 28 days,
- Compressive strengths at 72 hours for high early strength concrete, and
- Flexural strength at 28 days or 56 days for Class A used for concrete paving in accordance with Section 701.01.A.

Most of the criteria for the basis of acceptance of concrete mix designs can be found in Section 701 of the Standard Specifications, including the following:

- Table 701:1 – minimum cement content, air content, water/cement ratio, slump and minimum 28-day compressive strength,
- Tables 701:2 and 701:3 – maximum allowable cement substitutions,
- Table 701:12 – Types of coarse aggregate required for various Classes of PC concrete, and
- Section 701.03, “Admixtures”.

The proportions of the coarse and fine aggregate must be in accordance with ACI 211.1. Typically, the proportion by weight of coarse-to-fine aggregates is around 60/40 (roughly 55-65% coarse and 35-45% fine). Additionally, the total volume of the coarse and fine aggregates combined is typically 60-75% of the total concrete volume.

The Residency will verify that the proposed sources of materials submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved](#)

[Rock, Stone, & Sand Sources](#) lists. Ensure the product name and manufacturer/supplier is listed. If a proposed product/source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the product/source approval.

A written response approving the mix designs must be sent to the Contractor and kept in the project file.

4. Contractor Proposed Concrete Plants

Ideally, the Contractor will submit their proposed concrete plants in time for the Preconstruction Conference. If they are not submitted at that time, emphasize the need for timely submission to allow for review and corrections (if necessary) prior to construction beginning on the applicable items of work.

The Residency will verify that the proposed concrete plants submitted by the Contractor have current ODOT certifications.

(a) Concrete Plant Inspection and Certification

Concrete plant inspections are the responsibility of the residency or consultant engineering firm acting as a residency as stated in the [ODOT Concrete Plant Inspection Policy](#) found on the Materials Division website. Inspection requirements can be found in Section 414.03 of the Standard Specifications. Plants must be inspected every 6 months or after every relocation of a portable plant.

Concrete plants must be inspected to ensure compliance with the referenced specifications prior to accepting plant produced concrete material on an ODOT construction project. The [ODOT Inspection Form 414-IF](#) must be used to document the plant inspection. The completed inspection form along with a copy of the current scale certification needs to be submitted to the Materials Division – Independent Assurance (IA) Branch for their use to update the database. The residency may decide not to perform the plant inspection if they verify on the [Hydraulic Cement Concrete Plant List](#) that a recent inspection has been performed and the inspection status is “current”.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and cable barrier items from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed cable barrier as shown in the Plans,

- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

628.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 628.02 and other referenced sections of the Standard Specifications regarding the high-tension cable barrier and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant high-tension cable barrier pay items included in the Plans.

Unless otherwise required in the Plans, the Contractor must provide the following cable barrier and end anchor components meeting the applicable sections from Chapter 700 of the Standard Specifications as specified in Section 628.02:

- PC Concrete, Class AA meeting Section 701
- Reinforcing Steel meeting Section 723
- Anchor Bolts and Nuts meeting Section 724.02
- Galvanizing (Bolts, Nuts and Washers) meeting AASHTO M232
- Fittings (Steel Hardware) meeting Section 732.01
- Reflective Sheeting for Guide Posts meeting Section 733.05

The Contractor should submit its proposed sources of materials/products, mix designs and plant locations at the Preconstruction Meeting. If the sources of materials, mix designs and plant locations are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant cable barrier pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed mix designs, plants and sources of materials/products.

If the Contractor proposes the use of a cable barrier system that is not on the ODOT Traffic Engineering Division APL, the Residency should contact Traffic Engineering Division to

provide input and guidance regarding the cable barrier system source/product approval. When proposing a product that is not on the ODOT Traffic Engineering Division APL, the Contractor must provide the following information for evaluation:

- Compliance with National Cooperative Highway Research Program (NCHRP) Report 350,
- Meets Test Level 3 (TL-3) requirements, and
- Provide an FHWA letter of acceptance for proposed cable barrier system.

Resolve any questions or concerns with the submitted mix designs, plants and sources of materials with the Contractor in a timely manner. A written response accepting the proposed mix designs, plants and sources of materials/products must be sent to the Contractor and kept in the project file.

During construction, verify that the previously submitted and accepted mix designs, plants and sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

1. Contractor Proposed Mix Designs

Unless otherwise shown in the Plans or Contract, Sections 628.02 and 628.06 of the Standard Specifications require the foundations (post and end anchor) to be constructed of Class AA Concrete. Ensure the Contractor has submitted its proposed concrete designs in advance of any work beginning on the PC concrete for the cable barrier post or end anchor/terminal foundations.

(a) PC Concrete Mix Designs

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the ingredients on their concrete mix designs are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval.

The Resident Engineer will approve the concrete mix design in accordance with Section 701.01.C of the Standard Specifications. Refer to Section 628.02.C.3(a) of this Manual for additional details regarding the review and approval of concrete mix designs. A written response approving the mix designs must be sent to the Contractor and kept in the project file. As soon as practical, the Residency will obtain sufficient samples of aggregates to be utilized and perform applicable tests on these materials.

2. Contractor Proposed Concrete Plants

Ensure the Contractor has submitted its proposed concrete batch plants in advance of any work beginning on the PC concrete for the cable barrier post or end anchor/terminal foundations.

(a) Concrete Plant Inspection and Certification

The Residency will verify that the proposed concrete batch plant submitted by the Contractor has a current ODOT certification. If the proposed concrete batch plant does not have a current certification, it is the Residency's responsibility to conduct the plant inspection and submit the inspection report to the ODOT Materials Division. Refer to Section 628.02.C.4(a) of this Manual for additional details regarding the plant inspection. A written response accepting the plants must be sent to the Contractor and kept in the project file.

3. Acceptance of Materials

Ensure the Contractor has submitted its proposed sources of materials, products and mix designs in advance of any work beginning on the relevant high-tension cable barrier pay items.

The Residency will verify that the proposed sources of materials and products submitted by the Contractor for the various materials required on the project are on the ODOT [Materials Division Qualified Products List \(QPL\)](#) or [Approved Rock, Stone, & Sand Sources](#) lists. If a proposed source is not on the QPL or approved aggregate source list, contact Materials Division to confirm the status of the source/product approval. The following cable barrier post and end anchor/terminal foundation materials should be verified on the QPL or approved aggregate source list:

- Components of the PC concrete listed on the mix design
- Reinforcing steel (used in end anchors)

Notify the Contractor if a proposed source/product is not approved for use by the ODOT Materials Division. The Contractor may want to arrange for an alternate source of materials if their proposed source is not on the QPL due to the time necessary for a producer/supplier to obtain approval from the Materials Division to be listed. The policies and procedures to obtain approval of a source for the various products can be found on the Materials Division website ([Material Source Qualification](#)).

The Residency will verify that the proposed source and traffic item's product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). Ensure the product name and manufacturer is shown on the APL. If a proposed traffic item product is not on the APL, contact

Traffic Engineering Division to confirm the status of the source/product approval. The following high-tension cable barrier materials should be verified on the APL:

- High-tension cable barrier
- End anchors, end treatments or end terminals

Notify the Contractor if a proposed traffic item's source/product is not approved for use by the ODOT Traffic Engineering Division. The Contractor may want to arrange for an alternate source/product if their proposed product is not on the APL due to the time necessary for a supplier to obtain approval from the Traffic Engineering Division to be listed. The policies and procedures to obtain approval of a traffic products can be found on the Traffic Engineering Division website ([Traffic Engineering Division Approved Products List \(APL\)](#)).

Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials should be sent to the Contractor and kept in the project file.

The Residency will conduct the sampling and testing described below in accordance with the frequency guidelines defined in the [FAST Guide](#) project's Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel. Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, visual appearance (excessive or insufficient asphalt binder, segregation, etc.), or other special provision requirements where Contractor tests are used for acceptance purposes.

The Residency must perform and document the following acceptance tests/procedures as applicable:

(a) PC Concrete and Reinforcing Steel for Foundations

Unless otherwise required in the Plans, cable barrier posts and end anchor/terminal foundations require the use of Class AA Concrete and Reinforcing Steel is required for the end anchors. The Residency must perform and document the following acceptance tests/procedures on the PC concrete and reinforcing steel for the cable barrier and end anchor pay items:

- Obtain a sample of the Fine Aggregate from the concrete batch plant and verify the gradations comply with Table 701:11 of the Standard Specifications. [Document in Template T27]
 - Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Fine](#))
- Obtain a sample of the Coarse Aggregate from the concrete batch plant and verify the gradations comply with Table 701:12 of the Standard

Specifications for the appropriate size number (57, 67, etc.).
[Document in Template T27]

- Verify the product and source is listed on the Approved Rock, Stone & Sand Sources list ([HC Concrete Aggregate, Coarse](#))
- Verify the Hydraulic Cements (Type I, Type II, etc.) product and source used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-Hydraulic Cements](#). [Document in Template AM5001]
- Verify the Fly Ash (Class C or Class F) product and source used in the PC concrete as indicated on the concrete mix design is listed on the [QPL-Fly Ash](#). [Document in Template AM5001]
- Verify the Admixture products and sources (Air Entraining, Corrosion-Inhibiting, other chemical admixtures) used in the PC concrete as indicated on the concrete mix design are listed on the [QPL-HC Concrete Admixtures, Liquid](#). [Document in Template AM5001]
- Obtain fresh concrete samples from the project site and verify the PC concrete complies with the requirements for Class AA Concrete:
 - Fresh Concrete Test (slump, air, temperature, etc.) - AASHTO T 119 and AASHTO T 152 [Document in Template C94025]
 - Compressive Strength of Concrete Cylinders – AASHTO T 22 [Document in Template C94014]
- Verify the Reinforcing Steel product and source used in the end anchors are listed on the [QPL-Reinforcing Steel](#) under the Bar Steel Reinforcement, Billet-Mill portion of the list. [Document in Template AM5001]

If any test results do not meet the specification requirements, notify the Contractor in a timely manner and discuss the manner in which the failing test result will be handled (i.e, resample/retest, remove & replace work, accept work at a reduced price, make adjustments to material being delivered, improve stockpiling methods, etc.).

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division to confirm the status of the source/product or mix design approval.

(b) High-Tension Cable Barrier and End Anchor Treatment/Terminal

The Residency will verify that the proposed source and product name submitted by the Contractor is on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#). The Residency must document the following acceptance procedures for the cable barrier and end anchor items:

- Verify the proposed source and product for the high-tension cable barrier (TL-3 or TL-4) is listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#).
- Verify the proposed source and product for the end anchor treatments/terminals is listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#).

If the Contractor proposes the use of a cable barrier system that is not on the ODOT Traffic Engineering Division APL, the Contractor must provide the following information for evaluation:

- Compliance with National Cooperative Highway Research Program (NCHRP) Report 350,
- Meets Test Level 3 (TL-3) requirements, and
- Provide an FHWA letter of acceptance for proposed cable barrier system.

The Residency should contact Traffic Engineering Division to provide input and guidance regarding the cable barrier system source/product approval.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work. The Residency may contact Materials Division and/or Traffic Engineering Division to confirm the status of the source/product or mix design approval.

B. Equipment and Methods

Section 628.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install high tension cable barrier items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Cable barrier posts and end anchors will require excavating the hole to the dimensions required on the Plans or as designed by the cable manufacturer. Other equipment typically used includes the hand tools necessary for installing the hardware (bolts, nuts, etc.) for the high tension cable barrier items.

For projects that include the removal of existing high tension cable barrier items for their replacement with new units, ensure the Contractor has an acceptable plan to schedule the operations to minimize the time between the removal of the existing cable barrier and its replacement. Ensure the Contractor has a plan to protect areas vacated by the removed cable barrier as shown in the Plans or as approved by the Resident Engineer.

Some projects include plan notes that require some material to be salvaged during the removal operations and for the salvaged material to become property of the Department. Verify if the Plans define where the salvaged material is to be stored or stockpiled. Ensure

the Contractor is aware of any specified requirements of the ownership and handling of the salvaged material.

C. Construction Operations

Review the Plans and distinguish the pay items included in the contract for the high-tension cable barrier pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant high-tension cable barrier pay items included in the Plans.

The two pay items for the high-tension cable barrier are classified as either TL-3 or TL-4. These two classifications are related to the FHWA's cable barrier system test criteria from NCHRP-350 Test Level 3 (TL-3) or Test Level 4 (TL-4). The crash test levels evaluate the safety performance of the cable barrier system and are classified as follows:

- Test Level 3 (TL-3) is designed and tested to contain and redirect smaller and lighter vehicles (small cars, pickup trucks, etc.).
- Test Level 4 (TL-4) is designed and tested to contain and redirect larger and heavier vehicles (ten-wheel dump trucks, trailer trucks, etc.).
- NOTE: The TL-3 and TL-4 designations do not refer to the number of cables (wire ropes) installed in the cable barrier system.

For projects that include the removal of existing cable barrier items for their replacement with new barrier, ensure the Contractor schedules the operations to minimize the time between the removal of the existing cable barrier and its replacement. Review the plan notes and pay item notes in the Plans for any limitations for the removal/replacement of the existing cable barrier. Ensure the Contractor protects the area vacated by the removed cable barrier as shown in the Plans or as approved by the Resident Engineer.

Check the Plans for any designation for the Contractor to salvage materials from cable barrier removal that are to become property of ODOT. Ensure the Contractor's methods for removing salvageable material required by the Plans result in no damage to the salvaged material. Check the Plans for the specified locations to store the salvaged material. Emphasize the Contractor's responsibility to repair and replace damaged items due to negligence as approved by the Resident Engineer, at no additional cost to the Department.

The "Summary of Cable Barrier" schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the high-tension cable barrier work:

- Station extents and location to be installed,
- Pay items to be installed (high-tension cable barrier, end anchors, structural concrete, reinforcing steel, etc.)
- Quantities for each pay item to be installed.

Typically, the plan notes will provide many requirements for the installation of the high-tension cable barrier items. Various requirements found in the plan notes may include the following:

- Soil report to be provided by the Contractor to the cable manufacturer indicating all necessary soil information required for the manufacturer to design post footings and end anchors/terminals (depth, diameter, etc.) for the project. The Plans will typically include additional criteria to base the design, including:
 - A minimum depth and diameter for the footings are specified by plan note.
 - A maximum post spacing is specified by plan note, along with a maximum deflection of the cable barrier that is used for the manufacturer's design.
 - The manufacturer's design must be signed and sealed by a registered professional engineer.
- Number of cables (wire ropes) required to be installed in the cable barrier system on the project.
- Post requirements, such as caps, reflective sheeting, etc.
- Surplus materials, including tension meter, to be taken into warehouse inventory.
- Salvaging of removed existing cable barrier materials to be taken into warehouse inventory.
- Turnbuckle splicing of cable placement limitations to the proximity of posts.
- Training by the cable manufacturer to ODOT personnel for the repair, maintenance and tensioning of the cable system.
- Letter of approval from FHWA indicating the cable barrier system being installed on the project meets all test criteria of NCHRP-350 Test Level 3 (TL-3) or 4 (TL-4).

Verify the following complies with Section 628.04 of the Standard Specifications and the relevant plan notes and details when constructing the high-tension cable barrier required in the Plans:

1. General Requirements for High-Tension Cable Barrier System

Review the requirements of Section 628.04.A of the Standard Specifications regarding the general requirements for the high-tension cable barrier to be installed on the project. Additionally, review all relevant plan typical sections, plan notes and plan details for any requirements that would supersede the specifications.

The Contractor must provide crashworthy impact attenuators or end treatments for high-tension cable barrier systems at the locations shown on the Plans or as directed by the Resident Engineer. Ensure the Contractor complies with the following requirements from the specifications, unless stated otherwise in the Plans:

- High-tension cable barrier systems and end treatments must satisfy the NCHRP Report 350 for Test Level 3 (TL-3) or Test Level 4 (TL-4) and are approved for use on the National Highway System.
- The product used by the Contractor must be listed on the ODOT [Traffic Engineering Division Approved Products List \(APL\)](#).
- Ensure the manufacturer provides an FHWA letter of acceptance before approval by the Resident Engineer and installation.
- The high tension cable barrier system must include four cables (wire ropes) and a maximum post spacing of 10.5 ft (center to center), unless otherwise shown on the Plans

Ensure the Contractor installs the cable barrier system in the locations and along the alignments shown on the Plans or as directed by the Resident Engineer. Ensure proper wire rope height as required by the Contract. Ensure the surface between the cable barrier system and the edge of the traveled way complies with the slope required in the Plans and is uniform and smooth, without edge drop offs, holes, depressions, or slope changes.

Ensure the Contractor installs the cable barrier posts plumb and in line along the alignments shown on the Plans.

(a) High-Tension Cable Barrier Tension Log Form

The Contractor must place and tension the cable barrier system in accordance with the manufacturer's recommendations immediately after initial installation. The tension must be rechecked two to three weeks after the initial tensioning and adjusted if necessary.

The Contractor must complete a Tension Log Form, signed by the person performing the tension reading, which includes the following:

- Time,
- Date,
- Location,
- Ambient temperature,
- Final tension reading, and
- The manufacturer's recommended tension chart.

The Tension Log Form must be submitted to the Resident Engineer upon completion of the high-tension cable barrier work.

2. Foundations for Cable Barrier Posts and End Anchor Treatments

Concrete foundations for cable barrier posts and end anchor treatments/terminals must be constructed in accordance with Section 509 of the Standard Specifications,

plan notes and the manufacturer's recommendations. Unless otherwise required in the Plans, cable barrier posts and end anchor/terminal foundations require the use of Class AA Concrete. Additionally, the end anchor/terminal foundations require the use of Reinforcing Steel. The concrete foundations are typically measured and paid for as *Class AA Concrete* or *Structural Concrete*, whichever pay item is included in the Contract. The reinforcing steel required for the end anchor treatments/terminals are typically included in the contract unit price for the *End Anchors* pay item as stated in Section 628.06 of the Standard Specifications. Review the plan notes for any designation that the cost of the concrete or reinforcing steel is included in other items of the cable barrier work (such as the concrete being included in the *End Anchor* pay item's unit price or reinforcing steel being measured and paid for using the *Reinforcing Steel* pay item).

Standard Pay Item Note TP-52 requires the following, when included in the Plans:

- Soil report to be provided by the Contractor to the cable manufacturer indicating all necessary soil information required for the manufacturer to design post footings and end anchors/terminals (depth, diameter, etc.) for the project.
- A minimum depth of 36" and diameter of 12" for the cable barrier post footings.
- Concrete footings shall not extend above the ground more than 1".
- The manufacturer's design must be signed and sealed by a registered professional engineer.

The Plans will typically include additional criteria by plan note for the installation of the cable barrier system, including but not limited to:

- Cable barrier system must meet the test criteria from FHWA's NCHRP-350 Test Level 3 (TL-3) or Test Level 4 (TL-4), whichever pay item is included in the Contract.
- Four cables (wire ropes) required in cable barrier system.
- Maximum post spacing.
- Maximum deflection of the cable barrier.
- Maximum slope for cable barrier system to be placed (typically on 1:6 slope or flatter).
- Minimum depth and diameter of the end anchor treatments/terminal footings (such as 60" depth and 18" diameter).
- All cable posts shall have caps affixed with a durable liquid adhesive, such as Liquid Nails, in accordance with plan note TP-47.
- Every fifth cable post shall be delineated in each direction with reflective sheeting in accordance with plan note TP-47.
- Splicing turnbuckles shall be no closer than 1' to the cable posts in accordance with plan note TP-50.

Ensure the concrete foundations are excavated to the depth determined by the manufacturer's design engineer (based on the soil report of the in situ soils), but to no less than the depth and diameter specified in the Plans. Ensure excavated materials do not fall back into the hole.

Ensure the top of the cable barrier post and end anchor treatments/terminal concrete foundations conform to the slope of the surrounding surface. Concrete foundations must be installed at the locations shown on the Plans and to the grade directed by the Resident Engineer. If an obstruction prevents construction of the foundation at the location shown on the Plans, the Resident Engineer will direct a new location.

End anchor treatment/terminal foundations must be placed in excavations of natural, undisturbed ground to the size and shape required by the wire rope safety cable manufacturer, based on soil type and ground conditions. If over excavation is unavoidable, ensure the sides of the excavation are vertical, and use additional concrete to fill completely the excavated area. Alternatively, the Contractor may form and cast the foundations, then backfill using mechanical vibration to achieve at least 95% compacted density.

Each of the four cables must be anchored independently to a concrete end anchor in accordance with the manufacturer's recommendations.

3. Placement Requirements for High-Tension Cable Barrier System

Unless otherwise required in the Plans, ensure the Contractor installs the cable barrier system in accordance with following requirements shown in Section 628.04.C of the Standard Specifications:

- on a slope no steeper than 1V:6H,
- at least 8 ft from the traveled way or hazardous objects, and
- for slopes located within a median ditch, do not place the cable barrier from 1 ft of the toe of slope to 8 ft up the slope.

Review the plan notes and details to verify any plan requirements that would supersede these requirements in the specifications.

D. Safety and Environmental Considerations

Ensure the Contractor protects workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and cable barrier items from damage,
- Providing traffic control devices or truck mounted attenuators to protect areas vacated by the removed cable barrier as shown in the Plans,
- Providing personal protective equipment (PPE) for workers, and

- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the cable barrier items (grading slope to acceptable limits, excavating or pouring concrete footings, setting posts, cable installation, installing guardrail transitions, tensioning cable, etc.).
- Receipt of Tension Log Form from the Contractor.
- Quantity of each pay item that is placed (LF, EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 628.06 of the Standard Specifications, there are multiple pay items for the various high-tension cable barrier pay items (cable barrier TL-3 or TL-4, end anchors, guardrail transitions, etc.) that might be used on the project.

The final quantity for the high-tension cable barrier pay items will be determined by the methods defined in Section 628.05 of the Standard Specifications or as required by pay item notes in the Plans. Where specific methods of measurement are not defined in Section 628.05 or plan notes, refer to Section 109.01 of the Standard Specifications for clarification.

Standard Pay Item Note TP-48 requires the residency project inspector will measure the length of completed high-tension cable barrier from the beginning of wire rope cable to the end of the wire rope cable. Unless otherwise specified in the Plans, the length of high-tension cable barrier measured will include the length of wire rope cable attached to end anchors and guardrail transitions.

In accordance with Section 628.05 of the Standard Specifications, the residency project inspector will measure and pay for the volume of Class AA Concrete used in the construction of concrete foundations for cable barrier posts and end anchors in accordance with Section 509 using the pay item included in the Contract (*Class AA Concrete* or *Structural Concrete*).

In accordance with Section 628.06 of the Standard Specifications, the cost of the excavation, backfilling, reinforcing steel and other incidentals to be included in the contract unit price for *End Anchors*.

In accordance with Section 628.06 of the Standard Specifications, the following components of the *High-Tension Cable Barrier (TL-3)* or *High-Tension Cable Barrier (TL-4)* pay items are to be included in the contract unit prices for the relevant pay item:

- Anchor bolts,
- Nuts and washers,
- Ground rod,
- Socket or sleeve,
- Excavation,
- Backfilling,
- Caps, and
- Other incidental work required to construct the cable barrier system (such as the reflective sheeting on the barrier posts as specified by Standard Plan Note TP-47).

Review the plan notes and details to verify any plan requirements that would supersede the measurement and payment requirements in the specifications.

Document the completed items as follows:

(a) Linear Foot Unit of Measure Pay Items

Documentation of the *High-Tension Cable Barrier (TL-3)* and *High-Tension Cable Barrier (TL-4)* pay items paid by the linear foot (LF) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate pay item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (LF) of the item completed.
4. In the Remarks bubble, document the option used for calculating the quantity for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations with different dimensions, select the 'New' button to create a new row for the selected pay item.

(b) Each Unit of Measure Pay Items

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

Documentation of the *End Anchor* and *Guardrail Transition* pay items paid by the Each (EA) will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

1. Select the appropriate item from the list of contract pay items.
2. In the appropriate field, enter both a descriptive location and the station-to-station extents where the work was performed.
3. In the Placed Quantity field, enter the quantity (EA) of the item completed.
4. In the Remarks bubble, document the method used for calculating the quantity (i.e., spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
5. For additional areas or additional locations, with different dimensions, select the ‘New’ button to create a new row for the selected pay item.

628.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Verify that the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were utilized on the project. If there were any substitutions used by the Contractor, ensure that the substituted material is acceptable before final payment and acceptance of the work. If the previously accepted proposed sources of materials and mix designs which were submitted by the Contractor were not utilized on the project and are not on the various pre-approved lists (QPL, APL, Approved Rock, Stone & Sand Sources, Asphalt Mix Designs Approved for Use, etc.), contact Materials and/or Traffic Engineering Divisions to confirm the status of source/product and mix design approvals. The use of unapproved materials will require action by the Contractor as directed by the Resident Engineer such as additional sampling/testing of materials, removing & replacing work, accepting work at a reduced price, etc.

Ensure the sampling and testing rates complied with the frequency guidelines defined in the [FAST Guide](#) project’s Sampling and Testing Checklist generated by SiteManager for the appropriate items. The frequencies may be modified by the Residency personnel.

Typical reasons for revising the frequencies would be consistency or inconsistency of the material being produced, size and frequency of placements, or concern with visual appearance or characteristics of the material.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

Immediately after initial installation, the Contractor must tension the cable barrier system in accordance with the manufacturer’s recommendations. The tension must be rechecked two to three weeks after the initial tensioning and adjusted if necessary. Ensure the Contractor completed and submitted a Tension Log Form, signed by the person performing the tension reading, which includes the following:

- Time,
- Date,
- Location,
- Ambient temperature,
- Final tension reading, and
- The manufacturer’s recommended tension chart.

C. Protection of the Work

Ensure the Contractor installed the high-tension cable barrier and appurtenances, including cable barrier post caps and reflective sheeting. Ensure the high-tension cable barrier items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed. Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

628 CHECKLIST – HIGH-TENSION CABLE BARRIER

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant high-tension cable barrier pay items shown in the Plans been identified and reviewed?					
Have the plan notes and details regarding the high-tension cable barrier pay items been reviewed with the Contractor (locations & lengths for installation of cable barrier and end anchors, TL-3 or TL-4, etc.)?					
Have the proposed products and sources of materials (cable barrier materials, PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed products and sources of materials (cable barrier materials, end anchor treatment/terminal, etc.) been verified on the Traffic Engineering Division APL by the residency personnel?					
Has the proposed mix design for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					
Are all of the products and sources of materials listed on the proposed concrete mix design listed on the QPL?					
Has the proposed concrete batch plant for the production of the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Does the residency need to perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					

Is a soil report required by plan note to be submitted to the cable manufacturer by the Contractor for the project's concrete foundation designs for cable posts and end anchor treatments/terminals?					
Is there a plan note specifying that removed cable barrier must be salvaged and delivered to a location to become property of ODOT?					
Has the method and schedule for installation of the high-tension cable barrier been discussed with the Contractor to minimize/protect cable barrier locations that are removed and replaced?					
Has the completion and submittal of the cable Tension Log Form after the cable has been re-tensioned been discussed with the Contractor?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor have a plan for maintenance of traffic and protection of the high-tension cable barrier operation during its construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (cable barrier materials, PC concrete, reinforcing steel, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Have the proposed products and sources of materials (cable barrier materials, end anchor treatment/terminal, etc.) been verified on the Traffic Engineering Division APL by the residency personnel?					
Have the proposed mix designs for the PC concrete been submitted by the Contractor and reviewed by the Resident Engineer for approval?					
Does the proposed concrete mix design include all the information required in Section 701.01.C?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the components (aggregates, portland cement, fly ash, admixtures, etc.) listed in the concrete mix design been verified on the QPL?					
Does the proposed concrete batch plant for the production of the PC concrete have a current certification?					
Did the residency perform a concrete plant inspection due to the plant not having a current certification?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the mix designs, PC concrete plants and sources of materials?					
Have all of the FAST Guide requirements for sampling, testing and documenting in SiteManager been performed by the residency?					
Have all of the FAST Guide requirements for documenting products on the APL/QPL in SiteManager been performed by the residency?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Has the cable manufacturer provided the project's concrete foundation designs for cable posts and end anchor treatments/terminals based on the Contractor provided soil report?					
Is the Contractor completing the high-tension cable barrier system installation in compliance with the requirements of the cable manufacturer's concrete foundation design, specifications and plan notes?					
Is the Contractor complying with the plan notes and details regarding the high-tension cable barrier pay items (locations & lengths for installation of cable barrier and end anchors, TL-3 or TL-4, etc.)?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor salvaging and delivering removed cable barrier to the specified location to become property of ODOT?					
Is the Contractor minimizing exposure time and protecting cable barrier locations that are removed and replaced?					
Is the Contractor constructing the cable post and end anchor foundations to the dimensions shown on the cable manufacturer's concrete foundation design, specifications and plan notes?					
Is the Contractor installing the splicing turnbuckles no closer than 1' to the cable posts in accordance with plan note TP-50?					
Is the Contractor installing caps on cable posts using a liquid adhesive in accordance with plan note TP-47?					
Is the Contractor installing reflective sheeting in each direction on every fifth cable post with in accordance with plan note TP-47?					
Are all connections (bolt, nut, cable, etc.) and components installed in accordance with the cable manufacturer's concrete foundation design, specifications and plan notes?					
Did the Contractor perform the tensioning of the cable barrier system immediately after initial installation and rechecked the tension 2-3 weeks after the initial tensioning?					
Is the Contractor maintaining traffic and protecting the cable barrier installation operation from traffic during its construction?					
Is the Contractor completing the cable Tension Log Form after the cable has been re-tensioned?					
Has the Resident Engineer identified any section of completed high-tension cable barrier that will require remedial work?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed cable barrier items from damage?					
Has the residency personnel verified all completed cable barrier items were installed in compliance with the cable manufacturer's concrete foundation design, specifications and plan notes?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					
Did the Contractor salvage and deliver the removed cable barrier to the specified location to become property of ODOT?					
Did the Contractor use the products and sources of materials (cable barrier materials, PC concrete, reinforcing steel, etc.) reviewed/accepted by the Resident Engineer for the cable barrier items?					
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the residency personnel perform all of the FAST Guide requirements for documenting products on the APL/QPL in SiteManager?					
Did the Contractor complete the cable Tension Log Form after the cable has been re-tensioned and submit the completed form to the Resident Engineer?					
Did the Contractor place caps and reflective sheeting on the cable posts as required by plan note TP-47?					

SECTION 629 – MAILBOXES

629.01 GENERAL

This work consists of placing mailboxes on public rights-of-way within the roadway "Clear Zone," as defined by the AASHTO *Roadside Design Guide*, to ensure public safety and safe access for mail delivery and retrieval.

Refer to the Plans for a summary of the various sizes, types, quantities, and locations of mailboxes.

629.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the various types of mailbox pay items (single or multiple installations, removals, resetting, etc.) included in the Contract.
- Review specifications, special provisions, plan notes and ODOT Standard Drawings included in the Contract for the requirements (details of installation, material requirements, etc.) of the relevant mailbox pay items included in the Plans.
- Confirmation of planned locations and types of mailbox installations.
- Proposed sources of material, material requirements and Type D Certification required for mailbox support post system materials.
- Contractor's requirement to provide a Buy America certification and meet all associated documentation submittal requirements.
- Methods and equipment to be used.
- Contractor's schedule/plan for the work including coordination with adjacent property owners to ensure uninterrupted delivery of their postal service.
- Maintenance and protection of traffic during construction.

B. Acceptance of Materials

Review the material requirements in Section 629.02 of the Standard Specifications regarding the mailbox materials and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant mailbox pay items included in the Plans. There are no sections in Chapter 700 of the Standard Specifications pertaining to the material requirements for the mailbox items.

There are no requirements listed in the ODOT FAST Guide for the mailbox items. Also, there are no mailbox products listed on the ODOT Materials Division Qualified Products List or Traffic Engineering Division Approved Products List.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources of materials are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant mailbox pay items.

The Contractor must provide a Type D Materials Certification for the mailbox support post system materials in accordance with Sections 106.04 and 629.02 of the Standard Specifications. As stated in Section 106.04.C of the Standard Specifications, the Type D Material Certification is a certification prepared by the manufacturer stating that the material meets the Contract requirements, listed by specification reference number, section reference, or other appropriate identification approved by the Resident Engineer.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Resident Engineer must review for acceptance the Contractor's proposed sources of materials and products. Resolve any questions or concerns with the submitted sources of materials with the Contractor in a timely manner. A written response accepting the proposed sources of materials and products must be sent to the Contractor and kept in the project file.

The material requirements in Section 629.02 of the Standard Specifications regarding the mailbox materials and appurtenances and guidance for ensuring Contractor compliance can be found below in Section 629.03.A of this Manual.

C. Preparatory Work and Contractor Work Plans

Review the Plans, Standard Specifications, Special Provisions and Plan Notes and determine any special requirements for the mailbox pay items that are required.

Consider the following before the mailbox installation operation begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract for the mailbox pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans for the requirements that pertain to the relevant mailbox pay items included in the Plans.

The "Summary of Mailbox Installation" schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station and location to be installed,
- Pay items to be installed (single or multiple installations, removals, resetting, etc.),
- Mailbox Design Type (1, 1-A or 2) required for each installation (NOTE: the design type might be specified by plan note), and
- Quantities for each pay item to be installed.

There is an ODOT Standard Drawing pertaining to the installation of the mailbox items. Ensure the applicable ODOT Standard Drawing is reviewed prior to beginning construction for the mailbox items included on the project. The ODOT Standard Drawing pertaining to the mailbox work is as follows:

- [ODOT Standard Drawing MI-4](#) includes details regarding the installation of mailboxes (single or multiple installations, height, location layout and clearance requirements, etc.).

Review the requirements of the pay items and materials being used and the related tests and acceptance criteria.

2. Potential Changes to Mailbox Items Required in the Plans

Occasionally, a property owner will request modifications to the type of mailbox scheduled to be installed on their property or to add a mailbox where it is not shown on the Plans. Before agreeing to any changes, check with the District Construction Engineer and obtain the Right-of-Way Agreement that was executed between the ODOT Right-of-Way Division and the property owner. There are instances where the property owner has received compensation for their mailbox or the type was clearly designated that would be installed. Do not proceed with changes to the planned mailbox installation without concurrence from the District Construction Engineer.

3. Existing Mailbox Removals

In accordance with Section 629.04.A of the Standard Specifications, the Contractor is responsible to coordinate with mailbox owners and the U.S. Postal Service (USPS) to ensure that property owners receive mail deliveries during construction of the project. Additionally, there is a General Construction Note that is typically included in the plan notes that states:

THE CONTRACTOR SHALL REMOVE AND RESET MAILBOXES AS NECESSARY. MAILBOXES ARE TO BE MAINTAINED IN AN UPRIGHT POSITION AND ACCESSIBLE TO MAIL CARRIER'S CAR DURING CONSTRUCTION. ANY DAMAGE TO BOXES OR SUPPORTS SHALL BE REPAIRED BY THE CONTRACTOR. ALL COST TO BE INCLUDED IN OTHER ITEMS OF WORK.

It is critical for the Contractor to coordinate their schedule and plan for their work with property owners and the USPS to ensure continued postal service.

If the Contractor does not comply with this requirement, the Resident Engineer may take action to ensure compliance (withholding progressive payments, etc.).

4. Contractor Proposed Methods and Equipment

The Contractor may include the equipment needed to install the mailbox in their submittals prior to beginning construction. Section 629.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install mailbox items. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Posts for mailbox installations are set from digging post holes. Other equipment typically used includes the hand tools necessary for installing the hardware (level to ensure plumbness, wrench for securing mounting brackets, etc.) for the mailbox items.

For projects that include the removal of existing mailboxes for their replacement or resetting, ensure the Contractor coordinates their schedule for the work with property owners and has an acceptable plan to ensure continued postal service.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and mailbox items from damage,
- Providing temporary or resetting existing mailboxes or timely installation of new mailboxes to ensure continued postal service.
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

629.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 629.02 of the Standard Specifications regarding the mailbox materials and appurtenances. Additionally, review all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the relevant mailbox pay items included in the Plans. There are no sections in Chapter 700 of the Standard Specifications pertaining to the material requirements for the mailbox items.

There are no requirements listed in the ODOT FAST Guide for the mailbox items. There are also no mailbox products listed on the ODOT Materials Division Qualified Products List or Traffic Engineering Division Approved Products List.

The Contractor should submit its proposed sources of materials and products at the Preconstruction Meeting. If the sources of materials are not provided at that meeting, ensure that they are submitted in advance of any work beginning on the relevant mailbox pay items.

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. Project specific certification letters from the Contractor and subcontractors demonstrating their understanding and intent to comply with the Buy America requirements should be submitted at the Preconstruction Conference and no later than work beginning on steel containing items. Installation of steel products should not begin until all required certification documentation, including the letters, have been submitted.

The Contractor must provide a Type D Materials Certification for the mailbox post system materials in accordance with Sections 106.04 and 629.02 of the Standard Specifications. As stated in Section 106.04.C of the Standard Specifications, the Type D Material Certification is a certification prepared by the manufacturer stating that the material meets the Contract requirements, listed by specification reference number, section reference, or other appropriate identification approved by the Resident Engineer.

Certifications must also include:

- the project number,
- name of the Contractor,
- identification markings on shipment (when applicable), and

The Resident Engineer will be responsible for the evaluation and acceptance of the Type D Material Certification upon the visual inspection of the materials to ensure compliance with the specification requirements.

During construction, verify that the previously submitted and accepted sources of materials are used by the Contractor. If there are any substitutions being used by the Contractor, stop the operation and ensure that the substituted material is acceptable before resuming work.

The material requirements in Section 629.02 of the Standard Specifications regarding the mailbox materials and appurtenances include the following:

1. Mailboxes

The Contractor must provide mailboxes made of light metal or formed thermoplastic in accordance with United States Postal Service (USPS) requirements. Mailboxes must comply with the dimensions, nomenclature, and

marking in accordance with [AASHTO, “A Guide for Erecting Mailboxes on Highways,” Appendix C.](#)

Property owners are responsible for providing newspaper tubes of the appropriate material and dimensions that are desired and for placing names or addresses on their mailbox.

2. Post Systems

Unless otherwise specified in the Plans, the Contractor may utilize metal or wood posts for the mailbox installation in accordance with ODOT Standard Drawing MI-4 and Section 629.02 of the Standard Specifications, as follows:

(a) Wood Posts

When the Contractor chooses to use wood posts, they must provide a post support system consisting of a 4 in × 4 in nominal wood post capable of withstanding the elements and soil-borne attacks (treated or untreated.) Posts that are square and either smooth or rough sawn are allowed. Ensure that any surface splintering is not hazardous or dangerous to the property owner. A natural, oiled, or painted surface finish are all allowed.

An alternative round wood post with a 4-1/2 in nominal diameter, treated or untreated, and capable of withstanding the elements and soil-borne attacks is also allowed. Ensure the post is free of bark and, if using untreated wood posts that requires finishing the post surface, use oil or paint.

(b) Metal Posts

When the Contractor chooses to use metal posts, they must provide metal posts (e.g. steel pipe, cold rolled shape, hot rolled member) with strength in bending equal to or less than a standard weight steel pipe (Schedule 40) with a nominal diameter of 2 in. Use the following equation to calculate:

$$SM_{40} \times YS_{40} \geq SM_N \times TYS_N$$

Where,

SM_{40} = Section Modulus of Schedule 40, 2 in steel pipe = 0.561 in³,

YS_{40} = Yield Strength of Schedule 40, 2 in steel pipe = 36,000 psi,

SM_N = Section Modulus of new post system, and

TYS_N = Tested Yield Strength of new post system.

The Department will allow round or square, aluminum or aluminized steel tubing if the section is capable of supporting the mailbox array and withstanding lateral loads caused by mail and paper delivery and retrieval.

The Contractor may use commercially available metal post systems integrating a mailbox support arm for one to five mailboxes. Provide patented materials in accordance with Subsection 107.03, “Patented Devices, Materials, and Processes.”

(c) Post-to-Box Attachment

The Contractor must provide post-to-box attachment fittings capable of preventing separation of the mailbox from the post if the installation is struck by an automobile or light truck.

(d) Basis of Acceptance

The Contractor must provide a Type D Materials Certification for the mailbox post system materials in accordance with Sections 106.04 and 629.02 of the Standard Specifications.

As stated in Section 106.04.C of the Standard Specifications, the Type D Material Certification is a certification prepared by the manufacturer stating that the material meets the Contract requirements, listed by specification reference number, section reference, or other appropriate identification approved by the Resident Engineer.

The Resident Engineer will be responsible for the evaluation and acceptance of the Type D Material Certification upon the visual inspection of the materials to ensure compliance with the specification requirements.

B. Equipment and Methods

Section 629.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install mailbox items. The choice of equipment and methods for this work is usually left to the Contractor’s discretion.

Posts for mailbox installations are set from digging post holes. Other equipment typically used includes the hand tools necessary for installing the hardware (level to ensure plumbness, wrench for securing mounting brackets, etc.) for the mailbox items.

For projects that include the removal of existing mailboxes for their replacement or resetting, ensure the Contractor coordinates their schedule for the work with property owners and ensures continued postal service.

C. Construction Operations

Safety of the highway users and the safety of the postal carriers and residents collecting their mail is the primary basis for the stringent specification requirements for the installation of the mailboxes. The material requirements for the post system and type of mailbox provides limits on the size and strength of the mailbox installation to reduce the roadside hazard that is being placed within the clear zone of the highway or local road. The Department will not approve (under any circumstances) rigid, massive, or unyielding

mailbox support systems or housings that may cause heavy damage to impacting vehicles or may cause severe injury or death. Additionally, the location and proximity of the mailbox to the travel way is also specified to reduce the risk of a collision. You may refer to the [AASHTO, “A Guide for Erecting Mailboxes on Highways”](#) for further information.

Review the Plans and distinguish the pay items included in the contract for the mailbox pay items required in the Plans. Additionally, review all relevant plan notes and details included in the Plans for the requirements that pertain to the relevant mailbox pay items included in the Plans.

The “Summary of Mailbox Installation” schedule shown on one of the summary sheets in the Plans includes the following information pertaining to the fence work:

- Station and location to be installed,
- Pay items to be installed (single or multiple installations, removals, resetting, etc.),
- Mailbox Design Type (1, 1-A or 2) required for each installation (NOTE: the design type might be specified by plan note), and
- Quantities for each pay item to be installed.

There is an ODOT Standard Drawing pertaining to the installation of the mailbox items. Ensure the applicable ODOT Standard Drawing is reviewed prior to beginning construction for the mailbox items included on the project. The ODOT Standard Drawing pertaining to the mailbox work is as follows:

- [ODOT Standard Drawing MI-4](#) includes details regarding the installation of mailboxes (single or multiple installations, height, location layout and clearance requirements, etc.).

Verify the following complies with the relevant ODOT Standard Drawing and Section 629.04 of the Standard Specifications when performing the mailbox installation operation:

1. General Mailbox Installation Requirements

The mailboxes that are provided by the Contractor must be capable of withstanding wind loads and lateral loads. When approved by the Resident Engineer, the Contractor may use a concrete footing, or a footing of native soil mixed with cementitious material to ensure the posts remain upright. Care should be taken to not exceed the strength criteria for specified posts in accordance with Section 629.02 of the Standard Specifications. Excessive strength of the post/footing could result in an unacceptable roadside hazard being installed. If directed by the Resident Engineer, the Contractor must provide weakened plane joints for posts at the ground surface to guarantee bending or failure during vehicular impact.

Accepted post designs may include the use of a concrete footing or installation of the posts through an asphalt or portland cement concrete surface. The posts must be embedded no deeper than 2 ft, or to the depth recommended by the post system manufacturer or supplier. When using a metal post system with an anti-twist

device, the post must be embedded no deeper than 10 in into the ground, or to the depth recommended by the post system manufacturer or supplier.

Mailboxes placed on public right-of-way are privately owned. The Contractor must coordinate with mailbox owners and USPS to ensure that owners receive mail deliveries during construction. Ensure the Contractor allows mailbox owners to claim salvageable items from existing mailbox installations for the duration of the Contract.

In accordance with Section 629.04.A of the Standard Specifications and [ODOT Standard Drawing MI-4](#), there can be no more than two mailboxes mounted on a single-post support system.

Property owners are responsible for providing newspaper tubes of the appropriate material and dimensions that are desired. Newspaper receiver tubes may be mounted below the mailbox, or on the post under the mailbox. In accordance with Section 629.05 of the Standard Specifications, the cost of installing owner-provided newspaper tubes is included in the contract unit price for the relevant pay items.

The Contractor must obtain prior approval from the Resident Engineer when proposing use of an alternate design mailbox post support system that is not in compliance with Section 629.02.A of the Standard Specifications or [ODOT Standard Drawing MI-4](#). The Department will not approve (under any circumstances) rigid, massive, or unyielding mailbox support systems or housings that may cause heavy damage to impacting vehicles or may cause severe injury or death.

When required in the Plans, the Contractor must install post support systems using a cantilever arm to maximize the post offset where terrain allows. A post detail should be included in the Plans when this type of offset is required. A detail for a cantilever mailbox support example is included in the [AASHTO, "A Guide for Erecting Mailboxes on Highways"](#).

During the mailbox installation operation, ensure the Contractor complies with the following installation requirements from [ODOT Standard Drawing MI-4](#):

- Use of an USPS approved mailbox and crash-tested post support system.
- Vertical clearance from groundline to bottom of the mailbox is 42" to 48".
- Post spacing for single or double mailbox installation is a minimum of 32" (3/4 of 42").
- Maximum number of mailboxes on a multiple mailbox support post system is five.
- Mailbox Design Types are listed in a table that provides the dimensions for Types 1, 1-A and 2 mailboxes. (Note: The type of mailbox required on the project may be specified by pay item note or in the Summary schedule in the Plans.)

- Per Note 5 on the Standard, payment of the mailbox will be paid for by the Each and separately from the post support system.

2. Placement Requirements

Ensure the Contractor places mailboxes at locations shown on the Plans and where access is allowed by law. Never allow placing mailboxes at locations with access from the through lanes of a freeway or at other prohibited locations. The horizontal spacing of single-post support systems must be at least three-quarters of the exposed height of the post, as shown on the Standard Drawing.

Mailboxes must be placed on the right-hand side of the road in the direction of the delivery route. On one-way streets, mailboxes are allowed to be installed on the left-hand side of the road. The bottom of the mailbox must be set at the elevation specified by USPS, from 3 ft to 4 ft above the roadway (42" to 48" above the groundline according to Std. MI-4).

Mailboxes should be placed on the near side of driveways in the direction of the delivery route. Mailboxes located near intersecting and through roads should be placed as shown on the Plans or the ODOT Standard Drawing to ensure acceptable minimum distances are achieved for safety.

The face of the mailbox must be offset from the edge of the traveled way as shown on the Plans or the ODOT Standard Drawing. On residential streets and rural roads, the lateral placement and clearance of mailbox systems may be adjusted as directed by the Resident Engineer. The following is the Offset Table found in [ODOT Standard Drawing MI-4](#) for various highway types and traffic conditions:

OFFSET TABLE				
HIGHWAY TYPE AND TRAFFIC CONDITIONS	WIDTH OF ALL-WEATHER SURFACE OF TURNOUT OR AVAILABLE SHOULDER AT MAILBOX		DISTANCE ROADSIDE FACE OF MAILBOX IS TO BE OFFSET BEHIND EDGE OF TURNOUT OR USABLE SHOULDER	
	PREFERRED	MINIMUM	PREFERRED	MINIMUM
RURAL HIGHWAY OVER 10,000 VPD	12'	8'	8" TO 12"	0
RURAL HIGHWAY 1,500 TO 10,000 VPD	12'	8'	8" TO 12"	0
RURAL HIGHWAY 400 TO 1,500 VPD	10'	8'	8" TO 12"	0
RURAL ROAD ADT UNDER 400 VPD	8'	8'	8" TO 12"	10"
RURAL ROAD ADT UNDER 50 VPD SPEED 40 MPH OR LESS	8'	2'	8" TO 12"	0
RESIDENTIAL STREET WITHOUT CURB OR ALL-WEATHER SHOULDER	8'	0	8" TO 12"	10" ●
CURBED STREET	NOT APPLICABLE		8" TO 12" BEHIND FACE OF CURB	6" BEHIND FACE OF CURB

ADT - AVERAGE DAILY TRAFFIC, THROUGH ROAD ONLY
 VPD - VEHICLES PER DAY
 ● IF TURNOUT IS PROVIDED, THIS MAY BE REDUCED TO ZERO.

Figure 629:1. Mailbox Offset Table from Std. MI-4

During the mailbox installation operation, ensure the Contractor complies with the following placement requirements from [ODOT Standard Drawing MI-4](#):

- Suggested minimum clearance distances to nearest mailbox stops at intersections.
- Mail stop turnout details and layouts for speed limits of 40 mph or less and greater than 40 mph.
- Minimum and preferred offset distances for various highway types and traffic conditions.
- Per Note 3 on the Standard, if mailbox is installed in an area with guardrail, the mailbox and/or post assembly should be behind or flush with the face of the guardrail.
- Per Note 7 on the Standard (and related Protruding Object Detail), if a mailbox is installed behind the curb, then a minimum of 4' clear continuous space must be allowed between the mailbox and the outside edge of the designated pedestrian accessible route per Public Right-of-Way Accessibility Guidelines (PROWAG).

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and mailbox items from damage,
- Providing temporary or resetting existing mailboxes or timely installation of new mailboxes to ensure continued postal service.
- Providing personal protective equipment (PPE) for workers, and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly disposing of waste materials.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Discussions with adjacent property owners (name and location) regarding mailbox removal/installation coordination.

- Work being performed on the mailbox items (relocating mailbox, setting posts, excavating or pouring mailbox post footings, temporary or permanent mailbox installation, etc.).
- Quantity of each pay item that is placed (EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 629.06 of the Standard Specifications (and the 2019 Edition Errata), there are multiple pay items for the various mailbox items that might be used on the project, as follows:

- *Mailbox Installation - Single*
- *Mailbox Installation - Multiple*
- *Removal of Mailbox Installation*
- *Remove and Reset Mailbox*
- *Mailbox*

The final quantity for the mailbox pay items will be determined by the methods defined in Section 629.05 of the Standard Specifications and Std. MI-4. Where specific methods of measurement are not defined in Section 629.05, refer to Section 109.01 of the Standard Specifications for clarification.

The residency project inspector will measure mailbox installations as single (one mailbox per support system) or multiple (two or more mailboxes per support system). The residency project inspector will measure each existing mailbox within the Project limits affected by the construction as *Removal of a Mailbox Installation* or *Remove and Reset Mailbox*. The residency project inspector will measure each *Mailbox* for payment separately from the post support system.

In accordance with Section 629.05 of the Standard Specifications, the cost of removing, storing, and reconstructing the mailbox installation, including the serviceable, crashworthy support system and the mailbox is included in the contract unit price for *Remove and Reset Mailbox*.

In accordance with Section 629.05 of the Standard Specifications, the cost of installing owner-provided newspaper tubes is included in the contract unit price for the relevant pay items.

In accordance with Std. MI-4, the contract unit prices for the *Mailbox Installation-Single* and *Mailbox Installation-Multiple* pay items includes payment for installation of the post system, support post, all attachment hardware and mounting of the mailbox. Payment for the mailboxes will be paid by the Each separately from the installation pay items.

Documentation of the various mailbox pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the station for each item and a descriptive location.
- c. In the Placed Quantity field, enter the calculated quantity (EA) of the item completed.
- d. In the Remarks bubble, document the method used for calculating the quantity (i.e. spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

629.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

The Contractor must provide a Buy America certification in accordance with Section 106.01.B of the Standard Specifications including all required forms and mill test reports as specified. The Resident Engineer will be responsible for withholding payment for the work until compliance has been determined.

Ensure the Contractor provided the following for use in the mailbox and appurtenances as specified in Sections 629.02 of the Standard Specifications:

- Mailboxes made of light metal or formed thermoplastic in accordance with United States Postal Service (USPS) requirements.
- Post support systems made of wood or metal that do not exceed the strength of the specified acceptable products, to ensure roadside hazards are not installed on the project. The specified allowable posts are:
 - 4" x 4" wood post, or
 - 2" diameter, schedule 40 steel pipe post.
- Post-to-box attachment fittings capable of preventing separation of the mailbox from the post if the installation is struck by an automobile or light truck.
- Type D certification for the basis of acceptance of mailbox support post system materials. The Resident Engineer will be responsible for the evaluation and acceptance of the Type D Material Certification upon the visual inspection of the materials to ensure compliance with the specification requirements.

B. Audit Requirements

Ensure the Contractor provided a Type D certification for the basis of acceptance of mailbox support post system materials. The Resident Engineer is responsible for the evaluation and acceptance of the Type D Material Certification upon the visual inspection of the materials to ensure compliance with the specification requirements.

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the basis of payment is Plan Quantity, ensure that the total quantity paid equals the plan quantity. Authorized deviations from plan quantity must be documented by a change order.

A partial payment of an “Each” pay item is not acceptable. Any partial payment for an “Each” pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor installed the mailboxes and post support systems in accordance with the Plans and ODOT Standard Drawing. Ensure the mailbox items are not damaged during any remaining construction operations and are satisfactorily maintained until the project is completed.

Verify any conditions and locations requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer at no additional cost to the Department.

629 CHECKLIST – MAILBOXES

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant mailbox pay items shown in the Plans been identified and reviewed?					
Have the proposed products and sources of materials (mailbox and post system materials, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Has a Type D Certification requirement for the mailbox support post system materials been discussed with the Contractor?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the sources of materials?					
Have the requirements for ODOT Standard Drawing MI-4 been reviewed with the Contractor?					
Have the plan notes and details regarding the mailbox items been reviewed with the Contractor (locations for installation, types of mailbox installation-single or multiple, type of mailbox design type 1, 1-A or 2, etc.)?					
Have the dimensions and minimum offsets shown on ODOT Standard Drawing MI-4 for the mailbox turnouts been discussed with the Contractor?					
Has the method and schedule for removal or resetting of mailboxes and ensuring uninterrupted postal delivery been discussed with the Contractor?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Does the Contractor have a plan for maintenance of traffic and protection of the mailbox installation operation during its construction?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Have the proposed products and sources of materials (mailbox and post system materials, etc.) been submitted by the Contractor and reviewed by the Resident Engineer for acceptance?					
Are the mailboxes in compliance with the design types (1, 1-A, or 2) required in the Plans and meet the requirements of 629.02.A?					
Does the mailbox support post system (wood or metal) meet the requirements of 629.02.B?					
Has a Type D Certification been submitted for the mailbox support post system materials?					
Has the Resident Engineer sent responses to the Contractor on the acceptance/nonacceptance of the products and sources of materials?					
Has the Contractor provided proper material certifications, forms and mill test reports including the Buy America letters from the Contractor and subcontractors for the steel products?					
Have any property owners questioned the type of mailbox to be installed on their property?					
Has the Resident Engineer obtained any Right-of-Way Agreements that were executed between the ODOT Right-of-Way Division and the property owner from the District Construction Engineer?					
Has the Contractor contacted property owners for coordinating their methods and schedule prior to removing existing mailboxes to ensure uninterrupted postal delivery?					
Is the Contractor complying with the plan notes and details regarding the installation of the mailbox pay items (locations for installation, types of mailbox installation-single or multiple, type of mailbox design type 1, 1-A or 2, etc.)?					
Is the Contractor completing the mailbox item installation in compliance with the requirements for ODOT Standard Drawing MI-4?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Do the mailbox turnouts comply with the dimensions and minimum offsets shown on ODOT Standard Drawing MI-4?					
Is the Contractor installing mailboxes to the layout requirements (minimum distance from intersections, compliance with pedestrian accessible routes, etc.) shown on ODOT Standard Drawing MI-4?					
Is the Contractor setting the required mailbox support post systems to the dimensions (length of post, height above ground to mailbox, distance from travel way, distance between mailboxes, etc.) shown on ODOT Standard Drawing MI-4?					
Is the Contractor maintaining traffic and protecting the mailbox installation operation during its construction?					
Has the Resident Engineer identified any completed mailboxes that require remedial work?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Has the Contractor taken adequate precautions to protect the completed mailbox items from damage during construction of the remainder of the project?					
Has the residency personnel verified all completed mailbox items were installed in compliance with the Plans and the requirements for ODOT Standard Drawing MI-4?					
Did the Contractor use the products and sources of materials (mailbox and post system materials, etc.) reviewed/accepted by the Resident Engineer for the mailbox items?					
Did the Contractor submit a Type D Certification for the mailbox support post system materials?					

Part 3: Post-Construction

Issue	Yes	No	N/A	Comments	Initials
Was payment for the work withheld until all required Buy America certifications for the steel products were approved by Materials Division?					
Did the Contractor comply with the dimensions, minimum offsets and mailbox turnout details shown on ODOT Standard Drawing MI-4?					
Have all conditions and locations requiring corrective action been successfully remedied to the satisfaction of the Resident Engineer?					

SECTION 640 – FIELD OFFICE OR LABORATORY

640.01 GENERAL

This work consists of providing a field office on the project and a laboratory building at asphalt or ready-mixed concrete plants, for the independent and exclusive use of Department personnel for the duration of the Project.

NOTE: Pay item 640(B) Laboratory in the Standard Specifications in this section has not been utilized for many years by ODOT and there are no instances of its use in construction contracts dating back to the adoption of the 2009 Edition of the Standard Specifications.

640.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the pay items (field office or laboratory) included in the Contract.
- Review special provisions, plan notes and plan details included in the Contract for the requirements (specialized equipment, wifi capabilities, location required, etc.) of the field office or laboratory pay items included in the Plans.
- Evaluation of proposed location to install field office or laboratory and any needed site work (traffic considerations including site distance to enter/exit, grading, connection to power source, etc.).
- Type and details of building to be used for the field office or laboratory (dimensions, security, number of doors/windows, etc.).
- Contractor's schedule/plan for the work.
- Methods and equipment to be used for installation of field office or laboratory facility.
- Maintenance of field office or laboratory facility.

B. Acceptance of Materials

Review the material requirements in Section 640.02 of the Standard Specifications and all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the field office or laboratory pay items included in the Plans. The Contractor's proposed building (either permanent structure or mobile unit) must comply with the requirements of the specifications and plan notes.

In accordance with Section 640.02 of the Standard Specifications, ensure the weatherproof building provided by the Contractor includes the following characteristics:

- Outside dimensions of at least 8 ft × 16 ft.
- Inside ceiling height of at least 7 ft.

- Floors.
- At least four windows that can be opened, closed, and locked.
- Two doors near opposite ends of the building that can be locked.
- Includes required utility services, including telephone or internet service.

Additionally, field office buildings must be furnished with at least one office desk and at least one chair. Ensure the building is wired for electricity and has at least three double wall plugs and three overhead ceiling lights. The field office building must be capable of maintaining an interior temperature from 70°F to 80°F.

In accordance with Section 640.02 of the Standard Specifications, ensure laboratory buildings meet the following additional requirements:

- Locate the building at the plant site, at a location convenient to the physical control center of the plant and in view of delivery, loading, and unloading, as approved by the Resident Engineer.
- Equip the building with a 3 ft × 6 ft work bench.
- Provide a gas or electric oven and hot plate.
- Provide an inside cold water supply line, plumbed to a potable water supply.
- Provide a pressurized, dry-chemical, ABC-rated fire extinguisher of at least 20 lb rated capacity. Place the fire extinguisher on a wall at a location approved by the Resident Engineer. Maintain the fire extinguisher in a completely charged condition. Ensure the local fire authority inspects, approves, and tags for serviceability at least every 12 months.
- For building units used as the laboratory for asphalt extractions, provide a fume hood for removing flammable organic vapors generated by routine laboratory testing. Ensure the fume hood adheres to the following characteristics:
 - Fireproof with an explosion-proof motor, blower, and light.
 - Interior dimensions of at least 3 ft wide by 1/3/4 ft deep by 2-1/2 ft high.
 - Tempered safety glass front panel which slides up at least 2 ft to provide access to the fume hood, and slides down to fully enclose the fume hood.
 - Produce a volume of airflow per minute at least 14 times the nominal external volume of the fume hood.
 - Vent the exhaust from the fume hood to the outside atmosphere.
 - Equip the fume hood with an air bypass that prevents “jet-stream” effects as the front panel closes.
 - Include catalog cut sheets, brochures, and specifications with the fume hood.

Review all relevant plan notes and details included in the Plans and special provisions in the Contract for any additional requirements that pertain to the field office or laboratory

pay items that are not stated in the specifications. Resolve any questions or concerns with the proposed building and appurtenances with the Contractor in a timely manner and before the building is delivered to the project site.

C. Preparatory Work and Contractor Work Plans

When the Contract includes the Field Office or Laboratory pay items, it is the Contractor's responsibility to provide the field office on the project or a laboratory building at asphalt or ready-mixed concrete plants, for the independent and exclusive use of ODOT personnel for the duration of the Project. Consider the following before the field office or laboratory facility installation begins.

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract that pertain to the field office or laboratory facility. Review the Standard Specifications, Special Provisions and Plan Notes and determine any special requirements for the work required, such as providing wifi capabilities.

Ensure the Contractor's proposed building complies with the requirements for the dimensions and appurtenances listed in Section 640.02 of the Standard Specifications and any relevant Special Provisions and Plan Notes prior to the building being delivered to the project site.

2. Location and Site for Installation of Field Office

In advance of delivery of the field office building, discuss the proposed location for its installation with the Contractor. Evaluate the proposed location to ensure that there is sufficient site distance to enter/exit the location in a safe manner. If the Contractor proposes placing the field office on the right-of-way and near an intersection, ensure the building location does not obstruct the view of vehicles using the intersection (do not place within the sight triangle at the intersection).

Discuss any site work that will be needed at the proposed locations such as grading, maintaining drainage and a surfaced driveway and parking area (such as TBSC or asphalt millings). The Contractor should consider the potential for a connection to a power source when selecting a field office location.

3. Contractor's Schedule and Timely Installation

It is the intention of the specifications that the field office or laboratory facility be available for use for the full duration of the project or as agreed upon with the Resident Engineer. In accordance with Section 640.02 of the Standard Specifications, the Resident Engineer will direct a time and location for the installation of the field office or laboratory. Ensure the Contractor installs a fully-operational field office or laboratory facility in a timely manner at the start of the project.

If the Contractor postpones the installation of a fully-operational field office or laboratory facility, the Resident Engineer may take action to emphasize the urgency for the Contractor to remedy the delay, as follows:

- In accordance with Section 109.06 of the Standard Specifications, the Resident Engineer may withhold payment of progressive estimates if the Contractor does not timely comply with the requirements of the Contract.
- In accordance with Section 640.06 of the Standard Specifications, the Resident Engineer may reduce the amount of payment for the field office or laboratory proportional to the time the facility was not in working condition.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and field office or laboratory facility from damage,
- Ensuring the location for the field office does not result in a safety concern (traffic considerations including site distance to enter/exit, obstructing sight triangle at intersections, etc.).
- Ensuring the Contractor provides any necessary site preparation where the field office or laboratory facility is being installed (grading, maintaining drainage, surfaced driveway and parking area, etc.), and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

640.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

Review the material requirements in Section 640.02 of the Standard Specifications and all relevant plan notes and details included in the Plans and special provisions in the Contract for the requirements that pertain to the field office or laboratory pay items included in the Plans. The Contractor's proposed building (either permanent structure or mobile unit) must comply with the requirements of the specifications and plan notes. See Section 640.02.A of this Manual for further information regarding the requirements that pertain to the field office or laboratory facilities.

The Resident Engineer must review for acceptance the Contractor's field office or laboratory facility. Resolve any questions or concerns with the buildings with the Contractor in a timely manner.

B. Equipment and Methods

Section 640.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used to install the field office or laboratory facilities. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Ensure the Contractor uses equipment needed for site preparation, as needed, for grading, maintaining drainage, etc.

C. Construction Operations

The only requirement that is stated in Section 640.04 of the Standard Specifications is that the Contractor must remove the field office or laboratory building or mobile unit from the project or plant site as directed by the Resident Engineer.

In accordance with Section 640.05 of the Standard Specifications, on optional tied projects that are awarded as a combination in a single contract, the Department will delete at least one field office and one laboratory from the tied portion of the Proposal. The remaining field offices must be maintained on the job sites, and the remaining laboratories at the plant sites, until tied projects are complete.

It is the Contractor's responsibility to provide the field office on the project site or a laboratory building at asphalt or ready-mixed concrete plants, for the independent and exclusive use of ODOT personnel for the duration of the Project. The Contractor's building (either permanent structure or mobile unit) must comply with the requirements of the specifications and plan notes. See Section 640.02.A of this Manual for further information regarding the requirements that pertain to the field office or laboratory facilities.

Other aspects that should be considered regarding the field office or laboratory facility pay items in the Contract include the following:

1. Contract Plans and Specifications

Review the Plans and distinguish the pay items included in the contract that pertain to the field office or laboratory facility. Review the Standard Specifications, Special Provisions and Plan Notes and determine any special requirements for the work required, such as providing wifi capabilities.

Ensure the Contractor's building complies with the requirements for the dimensions and appurtenances listed in Section 640.02 of the Standard Specifications and any relevant Special Provisions and Plan Notes. Resolve any deficiencies or concerns with the building and appurtenances with the Contractor in a timely manner to ensure compliance with the specifications and plan notes.

2. Location and Site for Installation of Field Office

In advance of delivery of the field office building, discuss the proposed location for its installation with the Contractor. Evaluate the proposed location to ensure that

there is sufficient site distance to enter/exit the location in a safe manner. If the Contractor proposes placing the field office on the right-of-way and near an intersection, ensure the building location does not obstruct the view of vehicles using the intersection (do not place within the sight triangle at the intersection).

Discuss any site work that will be needed at the proposed locations such as grading, maintaining drainage and a surfaced driveway and parking area (such as TBSC or asphalt millings). The Contractor should consider the potential for a connection to a power source when selecting a field office location.

3. Timely Installation and Maintenance of the Building

It is the intention of the specifications that the field office or laboratory facility be available for the independent and exclusive use of ODOT personnel for the duration of the Project or as agreed upon with the Resident Engineer. In accordance with Section 640.02 of the Standard Specifications, the Resident Engineer will direct a time and location for the installation of the field office or laboratory. Ensure the Contractor installs a fully-operational field office or laboratory facility in a timely manner at the start of the project.

If the Contractor postpones the installation of a fully-operational field office or laboratory facility or fails to maintain the building to meet the requirements of Section 640.02 of the specifications and any additional requirements stated in plan notes, the Resident Engineer may take action to emphasize the urgency for the Contractor to remedy the delayed installation or maintenance issues, as follows:

- In accordance with Section 109.06 of the Standard Specifications, the Resident Engineer may withhold payment of progressive estimates if the Contractor does not timely comply with the requirements of the Contract.
- In accordance with Section 640.06 of the Standard Specifications, the Resident Engineer may reduce the amount of payment for the field office or laboratory proportional to the time the facility was not in working condition.

If the Resident Engineer decides to take action to emphasize the urgency for the Contractor to remedy the delayed installation or maintenance issues, a written notification should be sent to the Contractor that addresses the following:

- List of deficiencies that must be addressed by the Contractor.
- Specify a deadline for their remedy of the deficiencies.
- State what action will be taken (pay reduction of lump sum pay item, withholding of progressive payments, etc.) if the Contractor fails to provide an acceptable remedy to the deficiencies.

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should effectively address the following:

- Providing traffic control during construction that minimizes delays to the traveling public but also protects the vehicles and field office or laboratory facility from damage,
- Ensuring the location for the field office does not result in a safety concern (traffic considerations including site distance to enter/exit, obstructing sight triangle at intersections, etc.).
- Ensuring the Contractor provides any necessary site preparation where the field office or laboratory facility is being installed (grading, maintaining drainage, surfaced driveway and parking area, etc.), and
- Properly disposing of waste materials, excess soil, concrete truck washout, etc. (Do not allow the Contractor to place concrete or other materials near or in streams or waterways.)

Discuss any issues that are not being adequately provided, including properly maintaining field office site, addressing safety concerns, etc.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Locations (station extents, descriptive location, etc.) and pay item(s) being constructed.
- Work being performed on the *Field Office* or *Laboratory* pay items (site preparation, setting building, connection of utility service, maintenance of building or site, etc.).
- Quantity of each pay item that is placed (EA).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 640.05 of the Standard Specifications, on optional tied projects that are awarded as a combination in a single contract, the Department will delete at least one field office and one laboratory from the tied portion of the Proposal. The remaining field offices must be maintained on the job sites, and the remaining laboratories at the plant sites, until tied projects are complete.

In accordance with Section 640.06 of the Standard Specifications, the Contractor must include the cost of utility connections and site preparation for the field office and laboratory in the contract unit price for the *Field Office* and *Laboratory* pay items.

The project residency inspector will pay full price for these pay items once they are placed and are fully operational. If the Contractor does not maintain the Laboratory

or Field Office in a working condition, the Resident Engineer may reduce the amount of payment proportional to the time the facility was not in working condition.

Documentation of the *Field Office* and *Laboratory* pay items paid by the Each will be performed within the SiteManager / Daily Work Reports / Work Items tab in accordance with the steps listed below.

- a. Select the appropriate pay item from the list of contract pay items.
- b. In the appropriate field, enter the station for each item and a descriptive location.
- c. In the Placed Quantity field, enter the calculated quantity (EA) of the item completed.
- d. In the Remarks bubble, document the method used for calculating the quantity (i.e. spreadsheet, hand calculations, etc.) for each item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantities shown.
- e. For additional areas or additional locations, with different dimensions, select the 'New' button to create a new row for the selected pay item.

640.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

None required.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that no features or gaps in the extents of the work were omitted or duplicated.

If the Contractor does not maintain the Laboratory or Field Office in a working condition, the Resident Engineer may reduce the amount of payment proportional to the time the facility was not in working condition. A partial payment of an "Each" pay item is not acceptable. Any partial payment for an "Each" pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor maintains the field office and laboratory for the duration of the project or as directed by the Resident Engineer. Ensure all conditions requiring corrective action or maintenance have been successfully remedied to the satisfaction of the Resident Engineer. The Contractor must remove the field office or laboratory building or mobile unit from the project or plant site and restores the site to its original condition as directed by the Resident Engineer.

640 CHECKLIST – FIELD OFFICE OR LABORATORY

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the relevant field office and laboratory pay items shown in the Plans been identified and reviewed?					
Have the specifications and plan notes for the requirements of the field office and laboratory (specialized equipment, wifi capabilities, location required, etc.) been discussed with the Contractor?					
Has the type and details of the building to be used for the field office or laboratory (dimensions, security, number of doors/windows, etc.) been discussed with the Contractor?					
Has the proposed location to install field office or laboratory and any needed site work (traffic considerations including site distance to enter/exit, grading, connection to power source, etc.) been discussed with the Contractor?					
Has the residency personnel evaluated the proposed location for the field office for any safety concerns or site work required (site distance to enter/exit, proximity to intersections, grading, connection to power source, etc.)?					
Has the schedule for setting the field office or laboratory and having it fully operational been discussed with the Contractor?					
Does the Contractor have a plan for maintenance of the field office and laboratory for the duration of construction of the project?					
Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor complying with the requirements of the specifications and plan notes for the field office and laboratory (specialized equipment, wifi capabilities, etc.)?					

Does the type and details of the building used for the field office or laboratory meet the requirements of the specifications (dimensions, security, number of doors/windows, etc.)?					
Does the field office and laboratory have the required utility services connected and operational (electric, telephone, internet, wifi, etc.)?					
Is the location of the field office free of any safety concerns (site distance to enter/exit, proximity to intersections, etc.)?					
Did the Contractor adequately prepare the site for the installation of the field office (grading, maintain drainage of site, surfaced drive/parking area, etc.)?					
Was the field office or laboratory installed and fully operational in a timely manner when the project work began?					
Is the field office or laboratory providing exclusive use for the project residency inspector?					
Did the project residency inspector pay full price for the field office and laboratory pay items once they were placed and fully operational?					
Is the Contractor providing adequate maintenance of the field office and laboratory for the duration of construction of the project?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor provide adequate maintenance of the field office and laboratory for the duration of construction of the project?					
Did the Contractor remove the field office/laboratory and restore the site to its original condition?					
Did the Resident Engineer need to reduce the price of the field office or laboratory by change order due to not having the building fully operational during the full duration of the project?					

SECTION 641 – MOBILIZATION

641.01 GENERAL

This work consists of the Contractor's preparatory operations, including moving personnel and equipment to the project site, and establishing the Contractor's offices, buildings, and facilities.

641.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Review the specifications for payment schedule of the lump sum mobilization pay item (i.e., first payment of 50% of unit price, second payment is the remaining 50%, maximum amount payable calculation, etc.).
- Verify the Contractor's lump sum unit bid price for Mobilization does not exceed the "Maximum Amount Payable for Mobilization Item" as defined in Table 641:1 of the Standard Specifications.
- Contractor's schedule/plan for mobilization to the project and the related topics of the issuance of the Notice to Proceed, the installation of the temporary traffic control devices and the initiation of time charges to the Contract Time.

B. Acceptance of Materials

None required.

C. Preparatory Work and Contractor Work Plans

Consider the following before payment of the *Mobilization* pay item:

1. Contract Plans and Specifications

Review the Standard Specifications for requirements governing the payment of the mobilization lump sum item. In accordance with Section 641.06 of the Standard Specifications, if the lump sum unit bid price for *Mobilization* is less than or equal to the "Maximum Amount Payable for Mobilization Item" as defined in Table 641:1 of the Standard Specifications, the first payment for *Mobilization* will be 50 percent of the lump sum price. The Resident Engineer will pay the first payment on the first progressive estimate following partial mobilization and construction initiation and the second payment on the progressive estimate following substantial mobilization.

Payment of the lump sum mobilization item will be paid in two installments, except for the following instances:

- If the first pay estimate submitted is the final estimate, the Resident Engineer will pay the total lump sum bid in a single payment.
- If the Contractor's unit bid price exceeds the "Maximum Amount Payable for Mobilization Item" as defined in Table 641:1, the Resident Engineer will pay the difference in the lump sum price for *Mobilization* and the "Maximum Amount Payable for Mobilization Item" (the overbid amount) when the project is complete and assigned a Completion Date in accordance with Section 105.17.B of the Standard Specifications.

Progressive estimates are due in accordance with Section 109.06 of the Standard Specifications. The Resident Engineer must not consider the payment of the Mobilization pay item when determining when a progressive estimate is due (Contractor must have other earnings due to meet the specified thresholds). Ensure the Contractor is aware of the payment schedule for the mobilization that will be used on the project.

2. Contractor's Proposed Schedule for Mobilization

The Contractor's sequence of mobilization operations will impact the payments for the lump sum mobilization item. In accordance with Section 641.06 of the Standard Specifications, the Resident Engineer will pay the first payment on the first progressive estimate following partial mobilization and construction initiation and the second payment on the progressive estimate following substantial mobilization.

Evaluation by the Resident Engineer of partial mobilization and construction initiation to make the initial payment of the lump sum item is easily determined. The evaluation of substantial mobilization is more complicated and sometimes debated. There are many factors that can be evaluated including the types of project construction operations, number of subcontractors, duration of contract time, etc. ODOT has typically been very liberal when determining substantial mobilization and does not significantly delay the second installment of the payment of the lump sum item.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing appropriate traffic control during mobilization of the construction operation to ensure no risk to health, safety and property damage.

641.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

None Required.

B. Equipment and Methods

Section 641.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the Contractor's mobilization operations. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the mobilization of their equipment to the project site. If portions of the mobilization operation pose no disruption to the traffic flow through the project, there may be instances when the temporary traffic control is not critical to be in place (i.e., delivery to an off-site staging area). Ensure the Contractor is aware of how their schedule/plan for mobilization to the project affects the initiation of time charges to the Contract Time.

C. Construction Operations

The *Mobilization* pay item is payment for the Contractor's preparatory operations, including moving personnel and equipment to the project site, and establishing the Contractor's offices, buildings, and facilities.

Verify the following is completed in accordance with Section 641.06 of the Standard Specifications and other related sections of the specifications and ODOT policies when performing the mobilization operation:

1. General Considerations Regarding Mobilization

In accordance with Section 108.02 of the Standard Specifications, the Notice to Proceed (NTP) is the written authorization for the Contractor to proceed with the Contract work. In no case shall work, other than mobilization, start before the Department issues the NTP. The Department will begin charging Contract Time from the time work actually starts, but not later than the effective date of the Notice to Proceed. The mobilization operation is not qualifying work that will require that time charges are initiated. However, the installation and payment of the temporary traffic control devices may require that time charges begin for that work to be reflected on the initial progressive payment for the project. Ensure the Contractor is aware of how their schedule/plan for mobilization to the project affects the initiation of time charges to the Contract Time.

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the mobilization of their equipment to the project site. If portions of the mobilization operation pose no disruption to the traffic flow through the project, there may be instances when the temporary traffic control is not critical to be in place (i.e., delivery to an off-site staging area).

2. Payment of Mobilization Lump Sum Item

In accordance with Section 641.06 of the Standard Specifications, if the lump sum unit bid price for *Mobilization* is less than or equal to the "Maximum Amount

Payable for Mobilization Item” as defined in Table 641:1 of the Standard Specifications, the first payment for *Mobilization* will be 50 percent of the lump sum price. The Resident Engineer will pay the first payment on the first progressive estimate following partial mobilization and construction initiation and the second payment on the progressive estimate following substantial mobilization.

Table 641:1 Mobilization Payment Schedule	
Total Original Contract Amount, Including Mobilization, \$	Maximum Amount Payable For Mobilization Item
0 – 500,000	10% of total contract amount
500,001 – 4,000,000	$\$50,000 + 5\% \times (\text{total contract} - \$500,000)$
>4,000,001	$\$225,000 + 4\% \times (\text{total contract} - \$4,000,000)$

Figure 641:1. Table 641:1 – Mobilization Payment Schedule from Section 641

Payment of the lump sum mobilization item will made in two installments, except for the following instances:

- If the first pay estimate submitted is the final estimate, the Resident Engineer will pay the total lump sum bid in a single payment.
- If the Contractor’s unit bid price exceeds the “Maximum Amount Payable for Mobilization Item” as defined in Table 641:1, the Resident Engineer will pay the difference in the lump sum price for *Mobilization* and the “Maximum Amount Payable for Mobilization Item” (the overbid amount) when the project is complete and assigned a Completion Date in accordance with Section 105.17.B of the Standard Specifications.

Progressive estimates are due in accordance with Section 109.06 of the Standard Specifications. The Resident Engineer must not consider the payment of the Mobilization pay item when determining when a progressive estimate is due (Contractor must have other earnings due to meet the specified thresholds). Ensure the Contractor is aware of the payment schedule for the mobilization that will be used on the project.

The pay system used by ODOT (SiteManager or AWP) will provide an alert to the residency personnel when the Contractor’s unit bid price exceeds the “Maximum Amount Payable for Mobilization Item” as defined in Table 641:1 as payment is made on the *Mobilization* pay item. If the lump sum price for *Mobilization* is more than the “Maximum Amount Payable for Mobilization Item”, the first payment for Mobilization will be 50 percent of the “Maximum Amount Payable for Mobilization Item.” The Department will pay this amount on the first estimate following partial mobilization and construction initiation. The Department will pay the remaining 50 percent of the “Maximum Amount Payable for Mobilization

Item” on the estimate following substantial mobilization. The Department will pay the difference in the lump sum price for *Mobilization* and the “Maximum Amount Payable for Mobilization Item” (the overbid amount) when the project is complete and assigned a Completion Date in accordance with Section 105.17.B of the Standard Specifications.

For contracts that include multiple tied projects, the “Total Original Contract Amount Including Mobilization” in Table 641:1 is the sum of the original contract amounts of the separate tied projects. For contracts that contain multiple mobilization items, the sum of mobilization items will be subject to the limitation of the “Maximum Amount Payable for Mobilization Item.”

D. Safety and Environmental Considerations

Ensure the Contractor follows its plan to protect workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing appropriate traffic control during mobilization of the construction operation to ensure no risk to health, safety and property damage.

Discuss any issues that are not being adequately provided.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Work being performed on the mobilization item (hauling in equipment and types, installing contractor or residency field office, contractor or subcontractor crews on-site, achieving partial mobilization, achieving substantial mobilization, etc.).
- Quantity/percentage of pay item that is being paid (LS).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Section 641.06 of the Standard Specifications, if the lump sum unit bid price for *Mobilization* is less than or equal to the “Maximum Amount Payable for Mobilization Item” as defined in Table 641:1 of the Standard Specifications, the first payment for *Mobilization* will be 50 percent of the lump sum price. The Resident Engineer will pay the first payment on the first progressive estimate following partial mobilization and construction initiation and the second payment on the progressive estimate following substantial mobilization.

If the lump sum price for *Mobilization* is more than the “Maximum Amount Payable for Mobilization Item”, the first payment for Mobilization will be 50 percent of the “Maximum Amount Payable for Mobilization Item.” The Department will pay this amount on the first estimate following partial mobilization and construction initiation. The Department will pay the remaining 50 percent of the “Maximum Amount Payable for Mobilization Item” on the estimate following substantial mobilization. The Department will pay the difference in the lump sum price for *Mobilization* and the “Maximum Amount Payable for Mobilization Item” (the overbid amount) when the project is complete and assigned a Completion Date in accordance with Section 105.17.B of the Standard Specifications.

Documentation of this LS item for *Mobilization* will be performed within the SiteManager / Daily Work Reports / Work Items tab.

- a. Select the *Mobilization* pay item from the list of contract pay items.
- b. In the appropriate field, enter the station-to-station extents or a descriptive location where the mobilization operations were taking place.
- c. In the Placed Quantity field, enter the calculated quantity (LS) of the item completed.
- d. In the Remarks bubble, document the method used for calculating the quantity for the item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantity shown.

641.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

None required.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that the incremental payment of the lump sum pay item complies with the payment schedule specified in Section 642.06 of the Standard Specifications.

A partial payment of a “Lump Sum” pay item is not acceptable. Any partial payment for a “Lump Sum” pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the mobilization of their equipment to the project site. If portions of the mobilization operation pose no disruption to the traffic flow through the

project, there may be instances when the temporary traffic control is not critical to be in place (i.e., delivery to an off-site staging area).

641 CHECKLIST – MOBILIZATION

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the payment schedule requirements for the mobilization pay item stated in the specification been identified and reviewed (two payments, maximum allowable bid price, etc.)?					
Has the Resident Engineer compared the Contractor's unit bid price for the mobilization pay item with the "Maximum Amount Payable for Mobilization Item" as defined in Table 641:1 in the specification?					
Has the Notice to Proceed been issued for the project?					
Has the Contractor's schedule for mobilization been discussed with the Contractor?					
Has the installation of the temporary traffic control devices prior to the mobilization been discussed with the Contractor?					
Has the initiation of time charges to the Contract Time in relation to the mobilization been discussed with the Contractor?					
Has the determination of the payment of a progressive estimate not including the payment of the mobilization been discussed with the Contractor?					
Has the conditions evaluated by the Resident Engineer for determination of partial mobilization and substantial mobilization been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Was the Notice to Proceed issued for the project prior to the mobilization operation?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor install the necessary temporary traffic control devices prior to the mobilization?					
Did the Resident Engineer initiate time charges to the Contract Time when the Contractor began the mobilization operations?					
Is the Contractor's unit bid price for the mobilization pay item less than or equal to the "Maximum Amount Payable for Mobilization Item" as defined in Table 641:1 in the specification?					
Has the Resident Engineer determined the Contractor has achieved partial mobilization and substantial mobilization on the project to warrant the first and second installments for payment of the mobilization pay item?					
Did the Contractor have enough earnings to warrant the payment of a progressive estimate without including the payment of the mobilization pay item?					
If the Contractor's unit bid price for the mobilization pay item exceeds the "Maximum Amount Payable for Mobilization Item", was the overbid amount withheld from payment until the Completion Date is assigned to the project?					
Does the Contract include tied projects with multiple mobilization pay items and was the evaluation of the "Maximum Amount Payable for Mobilization Item" based on the sum of the mobilization items?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
If the Contractor's unit bid price for the mobilization pay item exceeds the "Maximum Amount Payable for Mobilization Item", was the overbid amount withheld from payment until the Completion Date was assigned to the project?					

SECTION 642 – CONSTRUCTION STAKING

642.01 GENERAL

This work consists of providing, placing, and maintaining construction layout stakes for the proper prosecution and inspection of the work.

642.02 PRECONSTRUCTION CONSIDERATIONS

A. Preconstruction Meeting

Discuss the following at the Preconstruction Meeting:

- Distinguish the construction staking pay items (Level I, Level II, etc.) included in the Contract.
- Review special provisions, plan notes and ODOT Standard Drawings regarding requirements for performing the construction staking on the project.
- Review the specifications for payment schedule of the lump sum construction staking pay item (25% on first pay estimate, incremental payments based on the percentage of contract work completed, and final 10% upon work completion and submission of staking documentation).
- Review the specifications for the Department's responsibilities and Contractor's responsibilities for the Level I or II construction staking pay item in the Contract.
- Discuss the qualifications of the Contractor's staff (or subcontractor) that will be performing the construction staking.
- Contractor's schedule/plan for construction staking operations on the project and the related topics of the issuance of the Notice to Proceed, the installation of the temporary traffic control devices and the initiation of time charges to the Contract Time.

B. Acceptance of Materials

None required.

C. Preparatory Work and Contractor Work Plans

Consider the following before the construction staking operation begins.

1. Contract Plans and Specifications

Review the Standard Specifications and Plan Notes to determine any special requirements for the work required on the project, such as additional responsibilities of the Contractor.

Ensure the Contractor is aware of the Department's responsibilities and Contractor's responsibilities for the Level I or II construction staking pay item in the Contract.

2. Payment of Construction Staking Lump Sum Item

In accordance with Section 642.06 of the Standard Specifications, there is a payment schedule defined for the incremental payments to be made for the construction staking pay item. Ensure the residency project inspector is aware of the milestones listed in the specifications and monitors the project status so that the percentages of the lump sum item are paid when warranted.

D. Safety and Environmental Issues

Discuss with the Contractor its plan to protect workers and traffic during construction. At a minimum, the Contractor's plan should address the following:

- Providing traffic control during construction to minimize inconvenience and damage to vehicles during the construction of the construction staking operation,
- Providing traffic control during construction to ensure the safety of the personnel performing the construction staking operation, and
- Providing personal protective equipment (PPE) for workers.

642.03 INSPECTION GUIDELINES DURING CONSTRUCTION

A. Acceptance of Materials

None required.

B. Equipment and Methods

Section 642.03 of the Standard Specifications does not contain any specific requirements for the equipment that will be used for the Contractor's construction staking. The choice of equipment and methods for this work is usually left to the Contractor's discretion.

Section 642.04 of the Standard Specifications requires the Contractor to provide qualified staff with appropriate equipment to perform their responsibilities for the construction layout work. Additionally, the use of Department employees or Department-owned equipment for construction staking work that is the responsibility of the Contractor is not permitted.

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the construction staking operations on the project site. If portions of the construction staking operations pose no disruption to the traffic flow through the project, there may be instances when the temporary traffic control is not critical to be in place. Ensure the Contractor is aware of how their schedule/plan for construction staking on the project affects the initiation of time charges to the Contract Time.

C. Construction Operations

Review the Standard Specifications and Plan Notes to determine any special requirements for the work required on the project, such as additional responsibilities of the Contractor.

Ensure the Contractor is aware of the Department's responsibilities and Contractor's responsibilities for the Level I or II construction staking pay item in the Contract.

Verify the following complies with Section 642.04 of the Standard Specifications and the relevant plan notes when performing their responsibilities for the construction staking:

1. Contract Plans and Specifications

In accordance with Section 108.02 of the Standard Specifications, the Notice to Proceed (NTP) is the written authorization for the Contractor to proceed with the Contract work. In no case shall work, other than mobilization, start before the Department issues the NTP. The Department will begin charging Contract Time from the time work actually starts, but not later than the effective date of the Notice to Proceed. The installation and payment of the temporary traffic control devices and performance of the construction staking may require that time charges begin for that work to be reflected on the initial progressive payment for the project. Ensure the Contractor is aware of how their schedule/plan for construction staking on the project affects the initiation of time charges to the Contract Time.

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the construction staking operations on the project site. If portions of the construction staking operations on pose no disruption to the traffic flow through the project, there may be instances when the temporary traffic control is not critical to be in place.

Depending on the availability and expertise of the Resident Engineer's survey staff, the Contract may require either Construction Staking – Level I or Level II. Review the Plans and distinguish the pay items included in the contract that pertain to the construction staking (Level I or II).

Review the Standard Specifications, Special Provisions and Plan Notes and determine any special requirements for the work required, such as additional responsibilities of the Contractor. Ensure the Contractor is aware of the Department's responsibilities and Contractor's responsibilities for the Level I or II construction staking pay item in the Contract.

2. Construction Staking – Level I

Ensure the Contractor is aware of the Department's responsibilities and Contractor's responsibilities for the Level I construction staking pay item in the Contract. Review the plan notes to determine any special requirements for the work required, such as additional responsibilities of the Contractor. In accordance with Section 642.04.A of the Standard Specifications, the distribution of the staking responsibilities are as follows:

(a) Department Responsibilities

The Resident Engineer's staff will perform the following construction staking activities:

- Locate and reference the centerline or control line of permanent construction;
- Stake the right of way lines;
- Identify and verify bench marks;
- Take original and final cross sections for earthwork construction features to obtain volumes for pay quantities;
- Set major control points on the tangents and at the beginning and ending points of curves on the centerline or control line; and
- Establish bench marks for bridges and special structures.

If the survey centerline and the construction reference line are not the same, the Resident Engineer's staff must set the major control points on the construction reference line.

(b) Contractor Responsibilities

The Contractor's staff or subcontractor will perform the following construction staking activities:

- Set additional stakes and other horizontal or vertical controls to establish a correct work layout;
- Stake the centerline or control line of temporary features;
- If the Contract requires measurement of earthwork quantities using photogrammetry, clear and grub the required area for the project before taking the original photos or beginning the excavation work;
- Place stakes for line and grade to maintain the tolerances specified in the Contract for the operation being performed;
- On grade stakes, mark the station number and the distance from the centerline of construction;
- Measure the profiles of existing highway features that will connect to the project for 100 ft to ensure a smooth transition; and
- Verify the original cross sections.

The Contractor is responsible to preserve survey stakes and bench marks and reset if damaged, lost, or removed. Qualified staff with appropriate equipment must be provided to perform the construction layout work. The use of Department employees or Department-owned equipment for construction staking work that is the responsibility of the Contractor is not permitted.

3. Construction Staking – Level II

Ensure the Contractor is aware of the Department's responsibilities and Contractor's responsibilities for the Level II construction staking pay item in the Contract. Review the Plan Notes to determine any special requirements for the work required, such as additional responsibilities of the Contractor. In accordance with Section 642.04.B of the Standard Specifications, the distribution of the staking responsibilities are as follows:

(a) Department Responsibilities

The Resident Engineer's staff will perform the following construction staking activities:

- Take original and final cross sections for earthwork construction features to obtain volumes for pay quantities.

If the survey centerline and the construction reference line are not the same, the Resident Engineer's staff must set the major control points on the construction reference line.

(b) Contractor Responsibilities

The Contractor's staff or subcontractor will perform the following construction staking activities:

- Locate and reference the centerline of permanent construction;
- Stake the right-of-way lines;
- Identify and verify bench marks;
- Set major control points on the tangents and at the beginning and ending points of curves to mark the centerline;
- Establish bench marks for bridges and special structures;
- Set additional stakes and other horizontal or vertical controls to establish a correct work layout;
- Stake the centerline or control line of temporary features;
- If the Contract requires measurement of earthwork quantities using photogrammetry, clear and grub the required area for the project before taking the original photos or beginning the excavation work;
- Place stakes for line and grade to maintain the tolerances specified in the Contract for the operation being performed;
- On grade stakes, mark the station number and the distance from the centerline of construction;
- Measure the profiles of existing highway features that will connect to the project for 100 ft to ensure a smooth transition; and
- Verify the original cross sections.

The Contractor is responsible to preserve survey stakes and bench marks and reset if damaged, lost, or removed. Qualified staff with appropriate equipment must be provided to perform the construction layout work. The use of Department employees or Department-owned equipment for construction staking work that is the responsibility of the Contractor is not permitted.

If bench marks or major survey control points previously established by the Department have been destroyed, damaged, or removed, the Contractor must notify the Resident Engineer. The Resident Engineer's staff must re-establish the control points if needed.

4. Error Correction and Resident Engineer Notification

The Contractor must provide platforms and equipment for safe access by the Resident Engineer's staff to verify and check the construction staking that is performed. If errors are discovered in the construction staking, the Contractor must resurvey to the satisfaction of the Resident Engineer. Regardless of inspection or acceptance of the layout by the project residency personnel, the Contractor is responsible for establishing the proper dimensions, grades, and elevations for the work.

The Contractor must notify the Resident Engineer of perceived plan errors by the end of the next working day upon discovery. If errors are discovered in the Plans, the Resident Engineer will resolve plan errors in cooperation with the Design Engineer, as needed. The Resident Engineer will perform additional survey as needed to determine corrective action for plan errors.

The Contractor is responsible to measure the profiles of existing highway features that will connect to the project for 100 ft. If the profiles of the project and the existing features do not match to create a smooth transition, the Contractor must immediately notify the Resident Engineer. Ensure the surface of the finished Project creates a smooth ride for the entire length of the Project including all connections to the existing pavement at the ends of the mainline construction and connections to bridges and side streets.

The Contractor is responsible to verify the original cross sections depicted in the Plans. If requested, the Department will provide the original cross section electronic files used by the Design Engineer to the Contractor for their use. Resolve disputes regarding the Plan's original cross sections before beginning earthwork activities in the disputed areas. The Resident Engineer may suspend contract time if the dispute resolution stops work that is critical to the timely completion of the Project. If requested or required in the Plans, the Resident Engineer will provide the completed final cross sections. For a dispute regarding original or final cross sections, jointly gather the cross section data with the Resident Engineer's and Contractor's surveyors to resolve the dispute.

In accordance with Section 642.04.C of the Standard Specifications, the Contractor must perform survey work, compilation of field notes, and documentation in accordance with the ODOT *“Guide for Construction Staking”*. However, the *“Guide for Construction Staking”* was published in 1989 and there have been many changes in technology and surveying methods since the time the document was written. The use of electronic models of the design files, GPS automated construction equipment and GPS survey equipment has rendered much of the *“Guide for Construction Staking”* outdated. Ensure the survey work and documentation provided by the Contractor meets the current industry standards when it fails to be in strict compliance with the *“Guide for Construction Staking”*.

5. Payment of Construction Staking Lump Sum Item

The project residency inspector will pay for construction staking in accordance with the following payment schedule:

- 25 percent on first pay estimate,
- 25 percent when 10 percent of the contract work is completed,
- 25 percent when 50 percent of the contract work is completed,
- 15 percent when 75 percent of the contract work is completed, and
- the final 10 percent when the Resident Engineer verifies that all construction features have been properly placed and completed, the Contractor has submitted all staking documentation to the Engineer, and the Engineer has accepted the staking documentation.

The Resident Engineer may make a partial deduction of payment for staking if the notifications required by the Standard Specifications in Section 642.04.C, “Error Correction and Resident Engineer Notification,” are not made.

D. Safety and Environmental Considerations

Ensure the Contractor protects workers and traffic during construction. At a minimum, the Contractor’s plan should address the following:

- Providing traffic control during construction to minimize inconvenience and damage to vehicles during the construction of the construction staking operation,
- Providing traffic control during construction to ensure the safety of the personnel performing the construction staking operation, and
- Providing personal protective equipment (PPE) for workers.

Discuss any issues that are not being adequately provided, including proper traffic control to ensure the safety of the staking personnel and vehicles.

E. Documentation

1. Daily Work Report

Record the following information, as appropriate:

- Work being performed on the construction staking item (contractor survey crew on-site, verifying horizontal/vertical controls or cross-sections, staking features, residency staking verifications, etc.).
- Quantity/percentage of pay item that is being paid (LS).
- Any conditions and locations requiring corrective action or maintenance and individual contacted.

2. Measurement and Payment

In accordance with Sections 642.06 of the Standard Specifications, the Resident Engineer will make a partial deduction of payment for the *Construction Staking* pay item if the notifications specified in Section 642.04.C, “Error Correction and Resident Engineer Notification,” are not made. Additionally, if the Contractor fails to submit all staking documentation to the Resident Engineer, a partial deduction should be applied. The Resident Engineer may at their discretion accept out of specification work in accordance with Section 105.03 of the Standard Specifications at a reduced cost. Typically, the final 10% incremental payment would be deducted for failure to provide the staking documentation.

Documentation of this LS item for *Construction Staking* will be performed within the SiteManager / Daily Work Reports / Work Items tab.

- a. Select the *Mobilization* pay item from the list of contract pay items.
- b. In the appropriate field, enter the station-to-station extents or a descriptive location where the mobilization operations were taking place.
- c. In the Placed Quantity field, enter the calculated quantity (LS) of the item completed.
- d. In the Remarks bubble, document the method used for calculating the quantity for the item and provide the physical location (Folder #, Envelope #, File, etc.) of the supporting documentation for the quantity shown.

642.04 POST-CONSTRUCTION CONSIDERATIONS

A. Acceptance of Materials

None required.

B. Audit Requirements

Utilize the Contract Item Work Report within SiteManager to verify that correct quantities have been placed and paid. Compare the Contract Item Work Report with the

documentation provided for each pay item to verify the accuracy of the quantities submitted and to ensure that the incremental payment of the lump sum pay item complies with the payment schedule specified in Section 642.06 of the Standard Specifications.

Ensure the Contractor submits all staking documentation to the Resident Engineer as required in Section 642.06 of the Standard Specifications. If the Contractor fails to submit all staking documentation to the Resident Engineer, a partial deduction should be applied. The Resident Engineer may at their discretion accept out of specification work in accordance with Section 105.03 of the Standard Specifications at a reduced cost. Typically, the final 10% incremental payment would be deducted for failure to provide the staking documentation.

A partial payment of a “Lump Sum” pay item is not acceptable. Any partial payment for a “Lump Sum” pay item must be made by change order.

C. Protection of the Work

Ensure the Contractor has installed the required temporary traffic control items on the project prior to their initiation of the construction staking operations on the project site. If portions of the construction staking operations pose no disruption to the traffic flow through the project, there may be instances when the temporary traffic control is not critical to be in place.

Ensure the Contractor preserves survey stakes, project control points and bench marks and resets any that are damaged, lost or removed.

642 CHECKLIST – CONSTRUCTION STAKING

Part 1: Preconstruction					
Issue	Yes	No	N/A	Comments	Initials
Have the construction staking pay items (Level I or Level II) included in the Contract been identified and reviewed?					
Have the specifications and plan notes for the requirements for the construction staking (responsibilities of residency and contractor staff) been discussed with the Contractor?					
Have the qualifications of the Contractor's survey staff or subcontractor been discussed?					
Have the payment schedule requirements for the construction staking pay item stated in the specification been identified and reviewed (initial and incremental payments, final payment after submission of staking documentation, etc.)?					
Has the Notice to Proceed been issued for the project?					
Has the Contractor's schedule for construction staking been discussed with the Contractor?					
Has the installation of the temporary traffic control devices prior to the construction staking operations been discussed with the Contractor?					
Has the initiation of time charges to the Contract Time in relation to the construction staking been discussed with the Contractor?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Is the Contractor complying with the specifications and plan notes for the requirements for the construction staking (responsibilities of residency and contractor staff)?					

Part 2: During Construction					
Issue	Yes	No	N/A	Comments	Initials
Are the qualifications of the Contractor's survey staff or subcontractor acceptable?					
Was the Notice to Proceed issued for the project prior to the construction staking operation?					
Did the Contractor install the necessary temporary traffic control prior to the construction staking?					
Did the Resident Engineer initiate time charges to the Contract Time when the Contractor began the construction staking operations?					
Has the project residency inspector included the initial 25% payment on the first progressive estimate for the construction staking pay item?					
Did the Contractor measure the profiles of existing highway features that will connect to the project for 100 ft to ensure a smooth transition?					
Did the Contractor verify the original cross sections depicted in the Plans?					
Is the Contractor preserving project control points, survey stakes and bench marks?					
Did the Contractor resurvey all staking errors identified by the residency project inspector?					
Did the Contractor notify the Resident Engineer of perceived plan errors by the end of the next working day upon discovery?					

Part 3: Post-Construction					
Issue	Yes	No	N/A	Comments	Initials
Did the Contractor submit all staking documentation to the Resident Engineer?					
Ensure the Contractor preserves survey stakes, project control points and bench marks and resets any that are damaged, lost or removed.					

CHAPTER 600 – APPENDIX

- ODOT Form - *ADA Facility Technically Infeasible Determination Process*



OKLAHOMA **Transportation**

ADA Facility Technically Infeasible Determination Process

10/14/2022

Introduction

The goal of the Oklahoma Department of Transportation (ODOT) is to ensure that pedestrians with disabilities have the opportunity to use the transportation system in an accessible and safe manner. In accordance with the requirements of Title II of The Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973, ODOT will not and does not discriminate against qualified individuals with disabilities on the basis of disability in ODOT services, programs, activities, or employment practices.

Background: This document is intended to provide a consistent process in the determination of identifying an area as technically infeasible to construct to meet ADA compliance requirements on projects that qualify as an alteration or dedicated ADA projects. This document is for ODOT construction districts, or any entity directly involved with the construction and/or design of pedestrian facilities in order to ensure that ADA compliance requirements are met to the maximum extent feasible. These requirements apply to Federal and State funded projects. Sporadically ODOT will encounter ADA-related projects in which the applicable area(s) is/are technically infeasible to design or construct in order to comply with the Americans with Disabilities Act. This procedure is to be used to determine if the area is technically infeasible, and to document and record the applicable area(s).

Note: If the party that is inspecting the applicable project is consulted to do the duties of inspection, before determining an area as "technically infeasible" to construct, the consultant shall make all initial determinations with the applicable ODOT Construction District personnel prior to submission of the form.

For questions or more information contact, Chris Thompson, ADA Coordinator, by phone at (405)521-4140 or by email at cmthompson@odot.org

10/14/2022

Alteration: Where existing areas, elements, spaces, and/or facilities are changed, modified, or altered to a certain degree. This includes both facility and roadway alterations. Refer to the ODOT Guidance for ADA Compliance Flowchart and the U.S. Department of Justice/U.S. Department of Transportation - FHWA 2013 Joint Technical Assistance for additional information regarding alterations.

Facility: Any building, structure, pedestrian pathway, or vehicular way within the applicable public rights-of-way in its entirety or as individual area/element.

Historic Property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior.

Technically Infeasible: Something that has little likelihood of being accomplished because existing structural conditions would require removing or altering a load-bearing member that is an essential part of the structural frame; or because other existing physical or site constraints prohibit modification or addition of elements, spaces, or features that apply to the occasional case where the nature of an existing facility makes it virtually impossible to comply fully with the minimum ADA/ODOT requirements.

Possible Technically Infeasible Electives:

- An area or element that changes the scope of what the project was originally intended for including, but not limited to:

1. Limited Right-of-Way. Note: Right-of-Way can be attained/accessed through acquisitions or easement permits. Only under certain conditions will Limited Right-of-Way be approved as being Technically Infeasible.

2. Existing Utilities

3. Structures, Buildings, Facilities

4. Environmental Areas

5. Grade or Elevation Separation Areas

- An area or element that would prove to have an adverse effect on the historical significance of a facility or area.

Exception: A facility that is not required to fully comply with applicable ADA/ODOT Standards, due to being determined as technically infeasible to be constructed. An exception will be handled according to the Procedure and on a case-by-case basis. All information relevant to the area will be analyzed prior to this determination.

Form Completion: The form must be completed entirely before submission. All forms that are submitted incomplete, will be returned for additional information prior to review.
•If an information box is not relevant to the applicable project due to the developmental stage or other reasoning, fill "N/A" in the applicable information box(es).

Project Stage: Design, Construction.

Project Type: Resurfacing, Signal, Widening, Reconstruction, New Construction, Other.

Scope of Project: Include complete intentions of project, project location/description, beginning and ending points (Street names, Station to Station extents, City/County, etc.)

Exception Facility Type: Record the specific type of facility that is an elective to be an exception. If the affected area contains multiple types of facilities identify each one separately. (Ex. Curb Ramp, Sidewalk, Pedestrian Signal, or Pedestrian Pushbutton, etc.)

Existing Conditions: Identify the current characteristics of the affected area that do not comply with ADA/ODOT Standards. (Ex. 13.5% Running Slope Type B Ramp)

ADA/ODOT Standards: Identify the applicable ADA/ODOT Standards for each individual facility. (Ex. 8.33% Maximum Running Slope for Curb Ramps)

Proposed Design Alternative: Identify the applicable proposed design alternative specifications for each individual facility, or if the area is being proposed to remain as is due to existing conditions. (Ex. 32" Sidewalk Width - As Is)

Specific Location/Station: Include all information pertaining to the specific location of the proposed exception area. Including station to station extents, streets/highways, or any other relevant information.

Description of Proposed Design Alternatives: Provide detailed information regarding the reasons as to why the proposed design alternative is being submitted in full compliance or not, including but not limited to: Detailed description of proposed design alternative, existing limitations causing inconstructability, reasoning of why the proposed design is the best fit under the current circumstances, funding/change order amounts, designer/contractor quotes, etc.

Procedure: Once an area is determined to be an elective as being technically infeasible to be constructed to meet applicable ADA/ODOT Standards, the ADA Facility Exception Form (AFE-01) will be completed, signed, and submitted to the ADA Coordinator. Upon receiving the AFE-01 form, the ADA Coordinator will then review the form for completion. After initial review of the documents submitted and all information needed has been submitted, the ADA Coordinator will then review the area with all required personnel to discuss existing conditions and limitations that are present.

Upon further discussion and review, the area will then be determined to be technically feasible or infeasible to construct. If determined to be technically infeasible to construct or an exception, the area will be handled as follows in both the Design & Construction Phases:

- The area will be documented and recorded, upon final authorization and depending on the characteristics of the element, the area will be planned to be constructed to the maximum extent feasible on the current project; or to remain on the Transition Plan for a future project in which allocated funds can be applied in order to achieve full compliance. Upon final determination, the applicable area will then be recorded to reflect on the ADA Compliance GIS map. If full compliance is unable to be achieved on the current project, the applicable area will be updated to High Priority level. The District will then allocate funds for future correction of the exception to bring the area to full compliance, if applicable.

Procedure, Continued: If achieving ADA/ODOT Standards in an area is determined to cause an adverse effect to a Historical Property (facility) by the Federal Agency (likely FHWA), in consultation with the State Historic Preservation Officer (SHPO), during the design process, the area shall be handled as follows:

- The applicable document containing the reasoning of the adverse effect from SHPO shall be included with this form.
- The form will then be completed by the Designer, and submitted to all applicable parties (Divisions) involved in the planning process. Dependent on the impact that the overall conditions of the determination have on the original intentions of the project (i.e. safety, traffic calming, accessibility, mobility, etc.) will determine if the conditions are to be concurred or not concurred with.
- The final determination will follow all requirements set forth under 36 CFR, Part 119, ADA Chapter 2 & 28 CFR, Part 36.
- In the case of 28 CFR, Part 36.405 Historic Preservation applying to a facility under Title III, this will require additional correspondence between ODOT, Design consultant, SHPO, & the applicable historic building owner.
- Where the adverse effect on the Historic Property (facility) is concurred with, the building owner shall provide alternative methods of access pursuant to the requirements of 28 CFR, Part 36, Subpart C.
- The official documentation will be stored in the applicable project folder for each party (Division) involved with the project planning process.
- The ADA Compliance GIS map will then be updated to reflect the final determination of the applicable facility involved in the historical preservation process.



OKLAHOMA
Transportation

ADA Facility Exception Form

Project Stage	Project Type		Project #	Job Piece #
Select One				
Contract ID	Highway	County	Designer	Contractor
Scope of Project				
Exception Facility Type	Existing Conditions	ADA/ODOT Standard Design	Proposed Design Alternative	Specific Location/Station
Reasoning of Proposed Design(s)				
Attach related documents (photos, drawings, contractor/designer quotes)				

Provide additional comments/reasoning as necessary on additional pages.

Name (Print): _____	Date: _____
Name (Signature): _____	
Office: _____	
Address: _____	
Phone Contact: _____	
Email Contact: _____	
ODOT District: _____	
Distribution: <input type="checkbox"/> Contract Compliance Division <input type="checkbox"/> District Office <input type="checkbox"/> Project Management Office <input type="checkbox"/> Environmental Programs Division	

10/14/2022

ADA Facility Exception Comments	
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