500's – Bridges

Safety

Bridge construction poses many potential risks to workers, the Inspector, and motorists. The Inspector must work with the Project Manager to ensure that the Contractor utilizes safe methods, as well as ensuring that ODOT and others use safe practices, and that motorists are not placed in danger.

The Inspector should ensure that:

- The Contractor constructs falsework, forms, shoring, cofferdams, and other supporting or restraining devices in the manner that is approved by the Engineer of record for that work.
- Forms and temporary access methods are constructed, supported, and maintained according to the specifications or accepted working drawings.

Section 00501 – Bridge Removal

This work consists of removing and disposing of existing bridges or portions of existing bridges as shown or specified.

Quality

There generally are no quality requirements for this work, unless specified differently. The Inspector, though, should record pertinent information in the General Daily Progress Report (form 734-3474).

Construction

Check that:

- The Contractor is aware of, and does not knowingly violate, the requirements and restrictions of the specifications or regulatory agencies. This includes work in-water or other sensitive environments, and treatment of hazardous materials. The Project Manager may involve the Region Environmental Coordinator in reviewing the Contractor's plan for removal, etc.
- If an unknown, potentially hazardous material(s) is discovered, ensure that the Contractor works with the affected regulatory agencies to develop a method to handle it.

Ensure that:

- If only part of a structure is to be removed, the removal line is performed as specified.
- The Contractor handles and disposes of the removed material, including:
    - If removed material is to remain on the project, it is placed, obliterated, or broken as specified.
    - If material is to be removed from the project, the Contractor's operations comply with the specifications.
    - The affected area is repaired, smoothed, and finished

Measurement

No measurement of quantities will be made for this work. Payment is on a lump sum basis unless specified otherwise. As work is performed, prepare and submit a source document, such as an Installation Sheet (form 734-2605), to justify payment.

Section 00503 – Bridge Deck Cold Plane Pavement Removal

This work consists of removing existing pavement from bridge deck surfaces.

Quality

There generally are no quality requirements for this work, unless specified differently. The Inspector should record pertinent information in the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The Contractor uses one of the specified equipment types.
- The Contractor blocks all deck drains and catch basins. Continuously verify that no grindings, chippings, sweepings, or shot blasting material enters them.
- The Contractor does not damage any joints.
- The Contractor cleans all deck surfaces as specified.
- The Contractor repairs all damage to abutting concrete surfaces or other surfaces that are damaged by the Contractor's operations.
- For asphalt concrete surfacing, the Contractor does not grind into the existing concrete bridge deck.

- The Contractor removes full width and length of travel lane pavement in one work shift.
- The Contractor removes the shoulder area within 24 hours after removing travel lane pavement.
- The Contractor verifies the surface tolerance with straight edge and the results are documented on the General Daily Progress Report (form 734-3474).
- The Contractor handles and disposes of the removed material, as specified
- The Contractor cleans and sweeps the surface prior to exposing to traffic.

Measurement

Measurement for cold plane pavement removal will be by area, unless specified otherwise. As work is performed sketch and calculate the area of cold plane pavement removal completed daily, and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment

Section 00510 – Structure Excavation and Backfill

This work consists of excavating, backfilling, and disposing of materials in connection with the construction of bridges, grade separation structures, rigid frame structures, and other major structures.

This work does not include any earthwork that may be specifically included and provided for as incidental work for particular items or parts of the work. The construction, measurement, and payment of embankment at bridge ends and engineered fills will be covered in other specifications.

Quality

Quality requirements are as specified, and in the Non-Field Tested Materials Acceptance Guide, and the *Manual of Field Test Procedures*.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For backfilling, the Contractor uses a method to ensure that the material will be placed, compacted, and tested, as specified.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Construction

Check that:

- Construction does not cause an impact to the stream, waterway, or other environmentally sensitive area.
- The Contractor has involved utilities and others in identifying and locating underground facilities.
- If the excavation is specified to require a cofferdam, cribbing, shoring, or other bracing, the Contractor has provided a plan for that work, the plan and construction has been accepted by the Project Manager prior to commencing work.
- If shoring or other bracing will be needed, the Contractor has the materials and other resources needed to construct it, available before the excavation work starts.

Ensure that:

- If the excavation is specified to require a cofferdam, cribbing, shoring, or other bracing, the Contractor follows the plan accepted by the Project Manager.
- The location and limits for the work are identified and marked, and both the Contractor and Inspector understand the markings.
- Clearing, grubbing, and other removal work is performed as specified.
- Excavated materials are stored or removed to prevent dangerous conditions or damage to water or other environmental concerns, as specified.
- The Contractor removes water from the excavated area and disposes of it as specified.
- If blasting is required, the Contractor utilizes controlled blasting techniques as specified.
- If subsequent concrete is to be placed against undisturbed material, the excavation is made in close tolerance to the specified dimensions, with firm surfaces.
- The bottoms of excavations are made to the correct depth, loose material is removed, and the surface is compacted, as specified.

- Do not allow equipment to operate in, or any material to be placed in, a stream, waterway, or other environmentally sensitive area unless allowed by the specification and regulatory agency.

For cofferdams, shoring, cribs, etc.:

- The cofferdam, shoring, crib, etc. is constructed according to the Contractor's accepted plan.
- Work is performed as specified.
- For backfilling:
    - The concrete, against which the backfill is to be placed, has reached the specified strengths.
    - All forms and other unacceptable material have been removed from the area to be backfilled.
    - Concrete surfaces have been finished as specified.
    - Structures are backfilled in a manner that prevents unbalanced loading, as specified
    - Backfill is placed in a manner that does not damage the structure or cause other damaging stresses, as specified.
    - Backfill is placed, compacted, and tested as specified.
    - Affected areas are smoothed, restored, and finished.
    - The Contractor disposes of excess material.

Measurement

Refer to the specifications for the method of measurement.

If measurement is by volume in the original position, calculate the volume based on the "neat-lines" specified or within the limits specified. As work is performed sketch and calculate the volume of material placed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

If payment is on a lump sum basis no measurement of quantities will be made for this work. As work is performed, prepare and submit a source document, such as an Installation Sheet (form 734-2605), to justify payment.

Section 00512 – Drilled Shafts

This work consists of excavating and constructing drilled, cast-in-place, and reinforced concrete shafts.

It is expected that inspection will be performed by a Certified Drilled Shaft Foundation Inspector.

Quality

Qualify requirements are as specified, and in the *Manual of Field Test Procedures*, and the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Construction

Check that:

- The specified Drilled Shaft Coordination meeting has been held.
- The Project Manager and Contractor have agreed on the required quality control for the work.

Ensure that:

- The Contractor follows the accepted mix design for the concrete to be used in the drilled shafts.
- The locations for the drilled shafts have been accurately located and marked, and both the Contractor and Inspector understand the markings.

- If applicable, measures are installed as specified to control slurry, mud, and other materials that could damage the surroundings, drainage, or environmentally sensitive areas.
- Only qualified individuals meeting the specification requirements are used to perform the specified elements of the work.
- Drilling and other excavation does not cause damage to, or disturbance of, the surrounding soil.
- The Contractor disposes of excavated material as specified.
- The Contractor ensures the stability of the excavation, including use of slurry or casing.
- If drilling slurry is utilized, the Contractor is conducting the required slurry tests and using approved qualified personnel to perform the specified testing.
- The shaft is excavated within the specified tolerance for vertical and horizontal alignment and location.
- If the Contractor encounters material that is different from that shown on the Soils and Geological Exploration Logs, or the Contractor alleges encountering a differing site condition, immediately contact the Project Manager.
- If groundwater seepage is encountered the amount and rate of groundwater seepage is measured and documented
- The shaft excavation is performed to the specified elevation or dimension into specified soil or rock material.
- While excavation is being performed, the Inspector must complete the Drilled Shaft Excavation Log (734-2604).
- The excavated shaft is cleaned of loose material prior to placement of reinforcement and concrete.
- The reinforcement is assembled as specified and placed to prevent settlement and ensure adequate concrete cover,
- The crosshole sonic log (CSL) access tubes are installed, as specified.
- The concrete slump is as specified and the concrete is placed to avoid segregation and contamination and ensure a continuous, dense mass, as specified.
- Prior to placement of concrete, the Inspector must complete the Drilled Shaft Concrete Volume form (734-2603).
- As the concrete is placed, the Inspector must complete the Drilled Shaft Concrete Placement Log (734-2597).
- The Contractor contains and disposes of all displaced water, slurry, and contaminated concrete as specified.
- All temporary casing is removed without causing damage to the excavation, concrete, or other work.

- All CSL tubes are filled with water immediately after concrete placement and then capped.
- If unacceptable work happens, the Contractor prepares and submits a repair plan to the Project Manager for approval to correct the work, or stops the work.
- The top of the shaft concrete is placed to the specified elevation and is prepared as specified.
- The Contractor cures the exposed concrete as specified.
- CSL testing of the drilled shafts is conducted, as specified.
- After completion of each drilled shaft, the Inspector must complete the Drilled Shaft Inspection Report (734-2598).
- The Contractor disposes of unwanted material.
- The affected area is smoothed, restored, and finished

Measurement

Measurement shall be as specified.

Where measurement is by length, measure and record the length of drilled shaft along its longitudinal axis. As work is performed, sketch and total the length constructed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Where measurement is on the unit basis, count each test completed daily and document that count with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00520 – Driven Piles

This work consists of furnishing and driving piles.

Quality

Quality requirements are specified in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- The Contractor arranges for inspection to be done at supplier or manufacturer facilities as specified.

Ensure that:

- The ODOT Structure Services Unit is informed of work schedule to perform all required inspection and verification testing.
- The Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Safety

The pile driving operation involves lifting and swinging of heavy materials to significant heights, excessive noise, work in excavation, cofferdams, or around or over water, and removal of excess pile material above the cutoff elevation.

Check that the Contractor:

- Will not violate noise ordinances or disturb surrounding residences or facilities and has obtained required variances to ordinances.
- If nearby buildings or other installations could be damaged by the pile driving operation, it has performed pre-work inspections.
- Secures piles and other materials during each operation.
- Provides safe access to allow its workers and the Inspector to perform their responsibilities.
- Provides or requires hearing protection and hard hats for its workers and the Inspectors.
- If work is over water, provides life jackets to workers and the Inspectors.
- Safely handles the pile material during the cutoff and removal operation.

Construction

Complete the Pile and Driving Equipment Data (form 734-2608), Pile Driving Checklist (form 734-2609), Pile Record Book (form 734-3485), as applicable, for the project file.

Check that:

- The Contractor provides required information to allow approval of the pile driving equipment by the Project Manager, as specified.
- If utilities are present, the Contractor arranges to have them moved or implements other safety precautions to prevent damage to the facilities or equipment or injury to workers and others.
- The person performing welding for pile splices is certified per specifications.

Ensure that:

- The surface, into which the piles are to be driven, has been excavated or embanked to the specified elevation and the excavation is supported or restrained, as specified.
- The location for each pile is accurately determined and marked, whether on the ground or with a template or other locating device, and both the Contractor and Inspector understand the markings.
- The pile driving equipment conforms to the approved submitted information.
- The piles have pile tips as specified.
- Piles are not damaged. If any pile is damaged, the Contractor repairs the damage or replaces the affected pile.
- The piles are driven in the specified sequence.
- If the pile hammer cannot effectively drive the piles, contact the Project Manager immediately.
- The Contractor does not pre-bore the holes, or jet the piles, unless specified or specifically allowed in writing by the Project Manager.
- The Inspector marks and measures each pile, before it is used, to be able to calculate the pay quantity and tip elevation.
- As it is driven, the pile does not deviate from specified tolerances.
- Each pile is driven to the specified required tip elevation and bearing.
- The finished location of the cutoff elevation of each pile is within specified tolerances to plan location.
- If needed, splices are constructed and welds are inspected by Contractor according the AWS D1.1.
- If piles are not achieving the specified minimum tip elevation, consult the Project Manager.
- The elevations for cutoffs are accurately located and marked.
- If the cutoff material is acceptable for use as other piles, the Inspector marks the material to identify quality information for this or other projects.
- If soil has "heaved" during the driving process, the Contractor removes the excess material to the specified elevation.
- Pile heads are treated, as specified.
- As each pile is constructed, all pertinent information is recorded by the Inspector, in the Pile Record Book (734-3485) for the project.
- The Contractor disposes of excess material, makes smooth and finishes affected areas.

Measurement

Measurement shall be as specified.

Where measurement is by length, measure and record the length of piles along their longitudinal axis. As work is performed, sketch and total the length constructed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Where measurement is on the unit basis, count each item/test used/completed daily and document that count with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00530 – Steel Reinforcement for Concrete

This work consists of furnishing and placing reinforcement in concrete construction.

Quality

Quality requirements are as specified and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- The Contractor arranges for inspection to be done at supplier or manufacturer facilities as specified.

Ensure that:

- The ODOT Structure Services Unit is informed of the work schedule to perform all required inspection and verification testing.
- The Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Construction

Complete the Steel Reinforcement Checklist for the project records.

Ensure that:

- As material is delivered, it is stored and protected as specified.
- The location or placement of reinforcement within the structure is within the specified tolerance of plan locations.
- Reinforcement is not exposed to any welding, unless specifically allowed in writing.
- All debris and other material, such as grease or oil, are cleaned from reinforcement and other material, before placement.
- Reinforcement and other material is placed, supported, and secured in a manner to ensure specified final location and coverage with concrete.
- Only specified materials are used to secure and support reinforcement and other materials, and no material will be used on or near an exposed surface.
- All lap splices have at least the length of material and are tied per specifications.
- Mechanical splices are constructed according to the specifications.
- All splices are staggered.
- Reinforcement is tied at least at the specified locations.
- Coated reinforcement is tied with non-metallic or coated ties.
- All damage to coated reinforcing is repaired per specification.
- Before starting concrete placement, all required reinforcement and materials are in place, including excessive ends of tie materials, to ensure specified coverage with concrete.
- Concrete placement operations will not damage the reinforcement or its placement or support.

Measurement

Unless specified otherwise, measurement is lump sum or by weight.

If payment is by lump sum no measurement of quantities will be made for this work. As work is performed, prepare and submit a source document, such as an Installation Sheet (form 734-2605), to justify payment.

If measurement is by weight, compute the weight for the sizes and lengths of reinforcement specified or authorized. As work is performed prepare a sketch on an Installation Sheet (form 734-2605) of where the reinforcement is placed. Calculate the sum of reinforcement installed each day and submit that calculation on an Installation Sheet as a source document to justify payment.

Section 00535 – Resin Bonded Anchor Systems

This work consists of drilling and preparing holes in hardened concrete and providing and installing anchor bolts and/or reinforcement using a resin bonded anchor system.

Quality

Quality requirements are as specified and in the Non-Field Tested Materials Acceptance Guide. Check that the Contractor is aware of those requirements.

Ensure that the Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Construction

Check that:

- Placement of the epoxy resin and anchor device is coordinated to ensure that no air pockets remain in the installation.

Ensure that:

- Resin bonded anchor systems have been tested according to specifications prior to installation.
- Locations for the work are accurately located and marked, and both the Contractor and Inspector understand the markings.
- Weather conditions meet specified limits to perform the work, especially construction of the epoxy resin.
- The Contractor does not allow material to enter drainage or otherwise sensitive areas.
- The Contractor uses the size, depth, and method of drilling as required by the manufacturer of the anchor or as specified.
- The holes are cleaned of dust, foreign matter, and excess water with a brush or compressed air as specified.
- Epoxy resin is mixed and placed as recommended by the manufacturer.
- Installations are protected until the epoxy resin has adequately set.
- The nuts on anchor bolts are tightened to ¼ turn beyond snug tight unless specified otherwise.
- The affected area is cleaned and restored.

Measurement

Unless specified otherwise there will be no measurement of quantities for Resin Bonded Anchor Systems. As work is performed document the work with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00540 – Structural Concrete

This work consists of furnishing, placing, and finishing portland cement concrete, for bridges and other structures.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality requirements are as specified in the *Manual of Field Test Procedures* for concrete, and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit specified quality documentation.

Construction

Complete the Pre-pour Checklist (form 734-2626), the Bridge Deck Pour Checklist and/or the Retaining Wall Checklist, as applicable, for the project records.

Check that:

- ODOT has furnished the required and correct survey information and elevations of final surfacing to the Contractor.
- If the work will restrict travel lanes or vertical clearances, the Motor Carrier Services Section is notified in a timely manner to allow them to notify haulers of oversize loads.
- The Contractor is aware of all environmental and other restrictions specified or required by regulatory agencies, and the Contractor does not plan work in violation of those restrictions.
- The Contractor submits the specified working drawings and they are accepted by the Project Manager before beginning the affected work.

Ensure that:

- As the Contractor performs surveying to locate and mark elevations for the work, both the Contractor and Inspector review that work to detect apparent errors in location, dimension, or elevation and understand the markings.
- Buried and overhead utilities and other facilities have been located and conflicts with the work have been resolved.

<u>For work bridges, trestles, or other temporary structures needed to provide access to the work areas:</u>

Check that:

- The Contractor has obtained approval and permits as required for the temporary structure from the appropriate regulatory agencies.
- The temporary structure is removed before it violates restrictions of the specification or regulatory agencies.

Ensure that:

- The Contractor constructs the temporary structure according to the accepted working drawings.
- The temporary structure is fully removed and the affected area is smoothed and restored.

For placement of concrete:

- Forms have been constructed to the specified shape and depth, and reinforcement and other appurtenances, including electrical conduit and anchor bolts, have been placed, secured, and supported as specified.
- The Contractor has marked the elevation to which the concrete is to be placed to ensure the specified depth.
- The space in which the concrete is to be placed has been cleaned of deleterious material, and the forms and reinforcement have been dampened prior to placement of the concrete.
- Forms are set and maintained to the specified line and grade until the concrete hardens. If forms appear to deviate from specified line and grade, either before or during concrete placement, notify the Project Manager.
- Weather and climatic conditions are as specified.
- The Contractor has resources and equipment to place, consolidate, finish, and cure the concrete as specified.
- The concrete will be placed within the specified allowable time from mixing to placement. Review the information on the delivery ticket that must accompany each load.
- The concrete is placed in its final position by the delivery device and no segregation of the mix occurs.
- The concrete is consolidated with a vibrator and the vibrator is not used to move the concrete.
- The concrete is smoothed and finished as specified, including the construction of required shear keys.
- The concrete is protected and kept moist for the period specified, including requirements regarding strength and subsequent loading.
- If the air temperature is forecast to be below 40°F within 7 calendar days of concrete placement, the Contractor either uses approved insulated forms or encloses the concrete and heats the enclosed space.
- As allowed by the specifications, the forms are removed and any damaged or deficient areas are repaired.
- The surfaces are finished as specified, including removal of all metal to at least the specified distance below the surface.

For foundations:

Check that:

- ODOT records information on existing ground and the required excavation to calculate pay quantities.

Ensure that:

- Embankment is constructed to the specified density and is smoothed and finished to the specified elevations.
- The Contractor constructs cofferdams, shoring, and other restraining devices according to the accepted working drawings.
- Excavation is performed as specified and provides a smooth, firm foundation, at the specified elevations.
- If a cofferdam protects the foundation work:
    - The cofferdam is constructed according to the accepted working drawings.
    - Construction of the coffer dam and all subsequent work does not violate restrictions in the specifications or required by regulatory agencies.
    - Excavation is performed to the specified elevation, including any possible heaving caused by subsequent pile driving, and the Contractor disposes of or stores the excavated material.
    - If specified, the Contractor places seal concrete to the specified elevation and allows the concrete to achieve the specified strength before de-watering the cofferdam.
    - The Contractor removes water within the cofferdam and disposes of it without violating any restrictions. If water begins seeping through the cofferdam, the Contractor seals the seepage and removes the water from the work area.
    - The Contractor places backfill and other material, as specified, and removes the cofferdam without violating restrictions.
- If a spread footing will be constructed, the underlying soil material is stable and firm, and is cleaned and finished. Unstable material is removed and replaced with concrete or other stable material.
- The Contractor constructs forms that will produce a concrete element of the specified dimensions and geometry. If concrete is to be placed against undisturbed material, the material is firm and unyielding.
- Reinforcement of the size, number, and dimension is placed, secured, and supported, as specified to prevent movement during concrete placement or other work.

- Other appurtenances, such as electrical conduit or fasteners, are placed and secured.
- Concrete is placed per industry standards and specifications
- Concrete is cured, forms are removed, defects and damage are repaired, and finishing is performed.
- Backfill is placed as specified and affected areas are smoothed and finished.

For substructure elements:

- All prior work has been performed, including:
- Concrete has been placed and cured and has achieved the specified strength.
- All underlying soil materials have been excavated or placed to the specified elevations, have been compacted, and are smooth.
- All unwanted material, within the area of the substructure construction, has been removed and surfaces have been cleaned.
- All elements have been located and marked, and both the Contractor and Inspector understand the markings.
- Falsework, if specified, is constructed according to the accepted working drawings.
- All reinforcement is placed and secured as specified.
- Forms of the dimensions, geometry, and height are constructed and secured as specified.
- Reinforcement is secured/blocked to ensure specified coverage of concrete.
- All other appurtenances, including bolts, drain pipe, fasteners, and electrical conduit, have been installed and secured in the location, orientation, and height as specified.
- If elements of the substructure will be constructed in multiple lifts, devices are installed in the lower lifts to allow the upper lift of forms to be attached, and the concrete achieves the specified strength before the forming for the next lift is started.
- All unwanted material is removed from the formed area prior to placing concrete.
- Forms are set and maintained to the specified line and grade until the concrete hardens. If forms appear to deviate from specified line and grade, either before or during concrete placement, notify the Project Manager.
- Concrete is mixed, placed, finished, and cured as specified.
- When forms are removed, all damage is repaired and the surface is finished as specified.

For superstructure elements:

- All prior work has been completed and unwanted material has been removed from the superstructure area.
- Placement of all superstructure concrete conforms to the sequencing specified.
- The locations and elevations for all portions of the superstructure are located and marked, and both the Contractor and Inspector understand the markings.
- For cast-in-place girders:
    - Falsework is constructed, including:
        - According to the accepted working drawings.
        - If piles are used for the falsework, they are driven to the bearing capacity specified in the accepted working drawings.
        - It is adjusted to provide the specified elevations, slope, and cross section for the work.
        - Tell-tales are installed at supports and other necessary locations and monitored to detect unexpected settlement during and after concrete placement in elements of the superstructure.
    - For the bottom slab:
        - Locations for the stems and diaphragms and the outside of the slab are accurately determined and marked.
        - Forms for the outside beam are constructed to the line, slope and height, including placement of a chamfer strip, as specified.
        - Reinforcement and post-tensioning ducts are placed, secured, and supported to ensure location and coverage of concrete, as specified.
        - Construction joints are formed at the specified locations.
        - Required access holes, and drains at the low points of the box girder, are located and formed.
        - Other appurtenances, such as luminaire blockouts, electrical conduit, and bolts or connectors for utility lines, are installed and secured.
        - All unwanted material is removed prior to placement of concrete.
        - Elevations of the top of concrete placement are marked to ensure specified thickness of concrete.
        - Concrete is placed and cured as specified.
    - For stems and diaphragms:
        - All damaged or missing reinforcing, post-tensioning ducts and anchors, electrical conduit, utility blockouts, and other appurtenances are repaired or installed.

        - Forms are constructed and reinforcement is blocked to ensure required coverage of concrete.
        - The elevations for the top of concrete are marked to ensure that concrete will not extend into the deck area or above the location of the specified joint at the top of the stem or diaphragm.
        - Construction joints are constructed per specification.
        - All unwanted material is removed prior to placement of concrete.
        - Concrete is placed and cured as specified.
        - All formwork and unwanted material is removed prior to constructing the deck.
- If precast concrete or structural steel girders are utilized, they are placed, assembled, and stabilized as needed.
- For deck construction ensure that:
    - The specified pre-placement conference between key ODOT and Contractor personnel occurs,
    - Elevations for construction of the deck formwork are marked on the girders, stems, etc. Ensure that appropriate camber has been included in the grades.
    - If precast concrete or steel girders have excessive camber, notify the Project Manager and work with the Contractor to adjust the deck elevations to avoid constructing any section of the deck with insufficient thickness.
    - Forms for the deck are constructed to ensure that the deck is constructed to the specified thickness, dimensions, and cross section.
    - Outside forms for the deck are constructed at the location, vertical and to the specified height, are secured to accommodate all forces on them during construction, and will produce the line and grade on the outside of the deck, including placement of a chamfer strip.
    - Reinforcement and other appurtenances are placed and secured and all damage to coatings is repaired.
    - If the Contractor must construct additional build-up over girders due to camber in the girders, additional reinforcement must be placed in that build-up as specified.
    - The deck finishing machine support system is constructed as detailed in the accepted working drawings.
    - The Contractor surveys and sets the elevation of the support system rail to be a uniform distance above the specified deck elevations, including camber. Remember that the concrete will cause the finishing machine drum to float.
    - Prior to placement of concrete:

        - Ensure that all drawings are cross checked for rail, transition, deck, and end panel placements are correct.
    - The Contractor adjusts the deck finishing machine carriage rails to match the required cross section for the deck. Remember that the concrete will cause the finishing machine drum to float.
    - The Contractor operates the finishing machine over the entire area of the deck and ensures that:
        - The finishing machine will produce a deck surface with the specified thickness of deck beneath.
        - All reinforcement and appurtenances will have the specified coverage of concrete.
        - All bulkheads and construction joint forms have been set to the specified grade and cross section.
    - The Contractor cleans the deck area of all unwanted material and checks all reinforcement and other appurtenances to ensure that they are secured.
    - Weather and climatic conditions, on the day of concrete placement and for the specified following period, comply with specified requirements.
    - The Contractor delivers, tests, places, consolidates, finishes, and cures the deck concrete, including:
        - Form surfaces, reinforcement, and other appurtenances are dampened prior to placing concrete.
        - Concrete is delivered at a rate to allow timely placement, as specified.
        - The Contractor does not use the vibrator to move concrete.
        - If concrete must be moved, only shovels, or other devices that will not cause segregation, are used.
    - Concrete, in areas of subsequent construction such as rails or curbs, is roughened or has required shear keys constructed, as specified.
    - No water is added to the concrete from the time of its discharge from the delivery truck until finishing and texturing are complete.
    - The Contractor frequently tests and ensures the specified deck thickness and smoothness, including ensuring that the finished surface at the ends of the placement will match the grade line of adjoining surfaces.
    - Texturing is performed at the specified time in the process to ensure adequate texturing, but to avoid tearing of the surface.
    - The concrete is protected from damage.
- If post-tensioning is required, deck and side forms for the superstructure are removed before tensioning is performed.

- All forms and falsework for the superstructure are removed or released before above deck construction, such as curbs, sidewalks, and rails, is performed.
- All damage is repaired and surfaces are finished as specified.
- For above deck construction:
    - Required post-tensioning has been done and supporting forms and falsework have been removed or released.
    - Reinforcement and other appurtenances, such as electrical conduit and bolts, have been placed and secured, including allowance for expansion and contraction joints.
    - Forms have been constructed, or an approved slipform system is used, that will produce a structural element of the specified dimensions and height with the specified line, elevation, and grade.
    - Concrete is placed and cured, forms are removed if used, damage is repaired, and the surfaces are finished as specified.
    - Other elements, such as metal rail, sign mounts, and luminaries, are installed.
- The Contractor and Inspector test the smoothness of the roadway surface as specified, and, if needed, the Contractor grinds or repairs areas of unacceptable smoothness.
- Required utility fixtures and other appurtenances are attached to or installed in the structure.
- The Contractor removes and disposes of all unwanted materials.
- All approach work is completed.

Measurement

Measurement will be on the lump sum or volume basis, unless specified otherwise, for concrete. Unless otherwise specified, measurement for saw cut texturing will be on the area basis.

If payment is by lump sum no measurement of quantities will be made for this work. As work is performed, prepare and submit a source document, such as an Installation Sheet (form 734-2605), to justify payment.

If measurement is by volume, measure each structure, and record those measurements. As work is performed sketch and calculate the volume of each structure completed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

If measurement is by area, as work is performed, sketch and calculate the area of texturing completed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00545 –Reinforced Concrete Bridge End Panels

This work consists of constructing reinforced Portland cement concrete bridge end panels.

Quality

Quality requirements are as specified, in the *Manual of Field Test Procedures* for field-tested materials, and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Since the reinforced concrete bridge end panels are the transition from roadway to bridge deck, it is extremely important that the Contractor and Inspector exercise extra care to ensure that the transition will be smooth. Among other things, that involves ensuring that:

- The roadway and bridge deck are on the same grade line, cross section, and superelevation.
- The backfill and embankment in the area are placed and compacted as specified.
- Forms for the panels will produce a panel of the specified and smooth grade. For example, if the panel is in an area of significant vertical curvature, the Contractor may need to construct some curvature into the panel forms and the finished surface.
- The finished surface of the panel is of the specified grade and smoothness.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- Elevations to be set for the panel indicate that the bridge deck and abutting roadway are on the same grade line, cross section, and superelevation.
- Elevations set for the panel will result in a panel of the specified depth, dimensions, geometry, line, and grade.
- The underlying material is compacted and is smoothed and finished as specified.
- Reinforcement of the size and type is placed and supported to provide the cover of concrete specified.
- Weather conditions are as specified to perform quality work.
- The forms and underlying material are dampened prior to placing concrete.
- Prior to placement of concrete:
    - Ensure that all drawings are cross checked for rail, transition, deck, and end panel placements are correct.
    - The concrete is mixed, furnished, and tested as specified.
- The Contractor does not add any water to the concrete or its surface during the placing or the finishing process.
- The Contractor performs other screeding, floating, and finishing to produce the specified finished elevation of, and to seal, the surface.
- The Contractor checks and ensures the specified finished elevations and grades of the panel using a straightedge, string line, or other device(s).
- The surface is textured as specified.
- The concrete is cured by keeping it moist for the specified period.
- The Contractor removes forms and unwanted material, disposes of it, repairs any damage, and prepares the surfaces for remaining work.
- If the panel will be overlaid with an asphaltic concrete wearing surface, the Contractor constructs a saw cut in the wearing surface at the ends of the panel and fills it with poured joint filler.

Measurement

Measurement will be on the area basis, unless specified otherwise. As work is performed, sketch and calculate the area completed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00550 – Precast Prestressed Concrete Members

This work consists of the manufacture, storage, transport and installation of precast, prestressed, concrete members.

Quality

Quality requirements are as specified, in the *Manual of Field Test Procedures* for field tested materials, and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Construction

In most cases, representatives of the ODOT Structural Services Engineer will inspect the production of precast, prestressed concrete members. If so, check that the ODOT Structural Services Engineer is aware of the work schedule.

As the members are delivered to and incorporated into the project, ensure that:

- The surface, on which each member will be supported, is cleaned and prepared as specified, including placement of bearing pads or other devices if required.
- Each precast member is located on the supporting member, with the correct clearance from adjacent construction.
- Tie rods are installed and tensioned, as specified.
- If the members must be post-tensioned, the ductwork openings and joints between members will allow the post-tension material to be placed and tensioned.
- Keyways are cleaned and filled with joint material, as specified.
- Surfaces are protected and kept clean to allow following work.

Measurement

Unless specified otherwise, measurement is by length. Measure and record the length of structure as work is performed, and sketch and total the length constructed daily. Submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment

Section 00555 – Post-Tensioning

This work consists of post-tensioning cast-in-place and precast concrete.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality requirements are as specified and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.
- The Contractor submits stamped working drawings for review by the Engineer.
- Samples of the tensioning strand, bolts, or other material are submitted to the ODOT Materials Laboratory for testing as required. Check that test results meet specifications before the material is incorporated.

Ensure that:

- The Contractor provides quality documentation as required.
- As the tensioning strand, bolts, or other tensioning material is delivered, it is protected from moisture or other damage until it is encapsulated in the work.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Complete the Post-Tension Record (form 734-2594 or 2594a), Post-Tensioning Grouting Record (form 734-2697), and the Post-Tensioning Strand Installation Record (form 734-2696) for the project records.

Ensure that:

- As the ducts are installed:
  - The specified number of ducts is located with the specified geometry and within specified tolerances at the specified location.
  - Anchor devices are installed at the location and angle specified.
  - Ends of ducts are covered to prevent entry of moisture or debris.
  - All joints are made mortar-tight.
  - Vents are provided in each duct at each high and low point.
  - All ducts are secured to reinforcement or other materials to prevent displacement during the placement of concrete.
  - All damage to the ducts is repaired or the duct is replaced.
  - Before forms are installed, the Contractor demonstrates that all ducts are free of obstruction.
  - Forming and other work does not damage ducts or the damage is repaired.
- The placement of concrete does not damage or displace the ducts.
- After concrete is placed, the Contractor checks each duct for any obstruction that would impair the tensioning operation.
- For the tensioning operation:
  - The Contractor provides certified calibration information for each jack that will be used for the tensioning work.
  - The Contractor and Inspector each calculate the required jack gauge pressure, from the calibration charts, and agree on the required pressure. Involve the Project Manager if unable to agree.
  - All ducts are cleaned of water and debris when strand is placed in them.
  - The concrete achieves the specified strength before tensioning is performed.
  - All tendons are tensioned as specified, and the Contractor and Inspector verify the tensioning by comparing the jacking force and the resulting elongation. Since this is a potentially dangerous operation, stay away from the tensioning direction of the jack during tensioning operations.

- For the bonding and grouting operation:
    - The ducts and tensioning tendons are bonded and grouted as specified within the specified timeframe and after the strands are placed in the ducts.
    - Each duct is cleaned before grout is installed.
    - The Contractor furnishes a commercial, pre-packaged, thixotropic grout as specified.
    - All grout is mixed to the manufacturer recommended proportions and is installed in the ducts within the specified allowable timeframe after mixing.
    - Vents are plugged only after grout has replaced all water, air, and other unacceptable materials.
    - All grouting and anchorage recesses are filled with concrete and finished as specified.

Measurement

Unless specified otherwise there will be no measurement of quantities. As work is performed document the work with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00560 – Structural Steel Bridges

This work consists of furnishing, fabricating and erecting structural steel structures as shown or specified.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer's facility, the required inspection is performed.

- The Contractor prepares and submits working drawings for review by the Project Manager.
- Samples of the steel, bolts, finishes, or other material are submitted to the ODOT Materials Laboratory for testing as required. Check that test results meet specifications before the material is incorporated.

Ensure that:

- The Contractor provides quality documentation as required.
- As the bolts or other material is delivered, it is protected from moisture or other damage until it is incorporated into the work.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Check that:

- The Project Manager, with assistance from the ODOT Structural Services Engineer as appropriate, identifies the ODOT Inspector of the structural steel fabrication process
- The Project Manager, Contractor, Steel Fabricator, the ODOT Inspector of the structural steel fabrication, and ODOT Structural Services Engineer, as appropriate, meet for a prefabrication conference to discuss all phases of the steel fabrication and work.

Check that:

- The ODOT Inspector of the steel fabrication process ensures that:
    - The Contractor provides quality documentation, and only utilizes material and labor that meets specified requirements.
    - Discrepancies in the shop or working drawings are identified, as soon as possible, and corrected or resolved.
    - Elements are fabricated and joined as specified.
    - All required testing is performed, including ultrasonic and magnetic particle inspection of welds.
    - The Contractor removes and replaces elements that have been improperly fabricated or constructed.
    - All material is handled and stored as specified.

  - Elements are prepared, coated and protected as specified until they are shipped to the project site.
  - All elements are marked or identified to ensure specified sequence of shipping and erection.
- Bolts are tightened and tested as specified.

Ensure that:

- As materials and elements are delivered and erected:
  - If work is over or near a waterway or other environmentally sensitive area, the Contractor complies with all requirements.
  - All material is handled, stored, and supported to prevent damage.
  - If material has been damaged, it is replaced.
  - The Contractor implements required safety devices and processes during and after the erection process, including scaffolds, access, netting, etc., and those devices and processes comply with OR-OSHA requirements.
  - As required, locations of all installation and erection have been located and marked, and both the Contractor and Inspector understand the markings.
  - All areas of erection have been constructed, cleaned of unwanted materials, and have received the specified treatment before erection starts.
  - Required falsework or temporary supports have been constructed in the specified/designed locations and to the specified/designed elevation and grade.
  - Bolts and other materials are as specified.
  - Bearings and anchorages are installed as specified.
  - All elements are erected and assembled as specified and as appropriate according to industry practice.
- All damage is repaired and all structural steel is prepared and coated as specified.
- The Contractor removes all falsework, temporary supports, and other unwanted materials, disposes of them, makes smooth and restores affected areas, as specified.

Measurement

Unless specified otherwise there will be no measurement of quantities for Structural Steel Bridges. As work is performed document the work with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00570 – Timber Bridges

This work consists of furnishing and installing timber and glued laminated timber bridges.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes as specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.
- The Contractor prepares and submits working drawings for review by the Project Manager.
- Samples of the timber, fasteners, finishes, or other material are submitted to the ODOT Materials Laboratory for testing as required. Check that test results meet specifications before the material is incorporated.

Ensure that:

- The Contractor provides quality documentation as required.
- As the material is delivered, it is protected from moisture or other damage until it is incorporated into the work.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

In most cases, representatives of the ODOT Structural Services Engineer will inspect the manufacture of timber members. Check that the ODOT Structural Services Engineer is aware of such work. The Project Manager and Inspector are responsible for inspecting work as and after the members are delivered to the project.

Check that the ODOT Structural Services Engineer ensures that:

- Each member is constructed of the material and dimensions specified.
- Beams or stringers are constructed such that all knots or other defects are in the top, or compressive, portion of the member.
- Members do not have checking, cracking, warping, or other defects. If needed.
- Material is handled, stored, stacked, and protected as specified.
- If wood material must be treated, the manufacturer performs tests to ensure specified treatment.

As the materials are delivered to the project and incorporated, ensure that:

- If work is over or near a waterway or other environmentally sensitive area, the Contractor complies with all requirements.
- Treated timber is carefully handled to prevent damage to the treatment. Do not allow any devices that will penetrate or damage the surface of the wood.
- All members are installed in the locations dimensions and spacing, as specified.
- Beams or stringers are installed such that all knots or other defects are in the top, or compressive, portion of the member.
- Members have not developed checking, cracking, warping, or other defects. If needed, consult with the ODOT Structure Services Engineer on questionable defects.
- Treated timber is not cut or bored after treatment.
- All cuts and abrasions in treated timber are treated with a field preservative.
- All damaged wood and other material is removed and replaced.
- All fasteners are installed and tightened, as required, and damage to treatment is repaired.
- Trusses show no irregularity of line.
- Line and grade of wheel guards and railings is smooth and true.
- The Contractor cleans up all unneeded or unwanted material and disposes of it.

Measurement

Refer to the specification for measurement. As work is performed, measure, and prepare and submit the measurements, and supporting calculations, on an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00581 – Bridge Drainage Systems

This work consists of constructing metal deck drains, drain pipe, and appurtenances for bridges.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- Locations for the deck drains are accurately located and marked, and both the Contractor and Inspector understand the markings.
- If work is over or near a waterway or other environmentally sensitive area, the Contractor complies with all requirements.
- Deck drains are installed to the specified elevation and slope to meet the surrounding deck surface.
- Deck drains are installed, secured, and supported to prevent movement during concrete placement or other work.
- Drain pipes and appurtenances are installed to provide a water tight connection and are secured to the supporting surface.
- The Contractor tests the systems to ensure that each system is water tight and free of obstructions.
- The Contractor cleans up unwanted material and disposes of it and repairs any damage.

Measurement

Unless specified otherwise, measurement will be on a unit basis. Count each location where a drainage system is constructed. Sketch and calculate the number of systems completed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00582 – Bridge Bearings

This work consists of constructing and installing bearings for bridges.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, in the Non-Field Tested Materials Acceptance Guide, and in the Qualified Products List. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- Bearings are constructed of the specified components.
- All exposed steel surfaces are prepared and coated as specified.
- All materials have been protected, as recommended by the manufacturer, including protection from physical damage.
- If work is over or near a waterway or other environmentally sensitive area, the Contractor complies with all requirements.
- Elastomeric bearings are placed over a concrete surface as specified.
- Bearings are installed as recommended by the manufacturer.
- The final alignment of the bearings corresponds to the alignment of the girder or other supported element.
- The Contractor repair all damage, and removes and disposes of all unwanted material.

Measurement

Unless specified otherwise, measurement will be on a unit basis. As work is performed, prepare and submit the quantities on an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00583 – Electrical Conduit in Structures

This work consists of furnishing and installing electrical conduit in structures.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- All electrical installation is performed by a licensed Electrician.
- The Contractor is aware of all required locations for electrical conduit and other devices in structures, and ensures their installation before concrete forming and concrete placement is done at each location.
- Conduit is of the size and type that is specified.
- Where conduit is to be imbedded in concrete, the conduit is secured and supported to prevent displacement during placement of concrete and other work.
- Expansion joints are installed at all joints where movement may occur. Also, work with the Contractor to determine other locations where expansion joints may be needed, but are not specified.
- Elbows, junction boxes, cabinets, and other appurtenances are also installed to allow the specified installation of wiring and future maintenance needs.
- All ends of conduits are covered to ensure that unwanted material does not enter the conduit.
- Any damage to other work is corrected.

Measurement

Unless specified otherwise, measurement will be on a length basis. As work is performed take measurements, and prepare and submit the measurements on an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00584 – Elastomeric Concrete Nosing

This work consists of furnishing and placing elastomeric concrete nosing to form a bulkhead at bridge ends or expansion joints.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- If an asphalt concrete overlay will be constructed on the structure before the elastomeric nosing is constructed, the Contractor places a bond breaker in the area where the elastomeric concrete nosing will be constructed.
- As material is delivered to and stored on the project, it is protected as recommended by the manufacturer.
- The manufacturer's representative has advised the Contractor and the Inspector about installation procedures and is on-site during installation.
- The Contractor has trained its installers, and complies with and provides all health and safety requirements for the product(s) that will be used.
- Abutting pavement is sawcut to provide a smooth, solid surface.
- The surface, for the application, has been cleaned and prepared, including the removal of the wearing surface material, bond breaker, concrete, and other material, as specified.
- Primer is applied as specified by the manufacturer.
- Elastomeric concrete is mixed and placed, before the primer has set, and is compacted, smoothed, and finished to the required shape, as specified.
- Nosing is protected until cured.
- The Contractor cleans up and disposes of unwanted material.

Measurement

Refer to the specification for measurement. As work is performed, measure, and prepare and submit the measurements, and supporting calculations, on an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00585 – Expansion Joints

This work consists of fabrication, joint preparation, and installation of expansion joints in structures.

It is expected that bridge related inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, in the Non-Field Tested Materials Acceptance Guide, and in the Qualified Products List. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The Contractor is providing and installing a product that complies with specified requirements, and has been approved by the Project Manager.
- As material is delivered to, handled, and stored on the project, it is protected as recommended by the manufacturer.
- All manufactured materials comply with shop or accepted working drawings and all specified coatings have been applied.
- The manufacturer's representative has advised the Contractor and the Inspector about proper installation procedures and is present during construction of joints.
- The Contractor has trained its installers, and complies with and provides all health and safety requirements for the product(s) that will be used.
- Abutting existing concrete and pavement is sawcut to provide a smooth, solid surface.
- Existing concrete, that is unacceptable, has been removed and repaired.
- The surface, for the application, has been cleaned and prepared, including the removal of unacceptable concrete and other material.

- For filled expansion joints:
    - The Contractor supports the joint filler, to prevent deflection, if placing concrete against it.
    - If specified, traffic loop sealant or poured joint sealer is placed at the top.
- For closed expansion joints:
    - The installation is constructed according to the accepted working drawings.
    - The Contractor performs a leakage check and performs all needed repair.
- For armored corner joints:
    - The new devices are installed to specified elevation, slope, and cross-section, and are secured and supported to prevent movement during subsequent work.
    - Concrete or elastomeric concrete is mixed, placed, compacted, smoothed, and finished as specified.
    - The preformed strip seal is installed.
- For asphaltic plug joint seals:
    - Before the preceding deck wearing surface is placed, the Contractor places a bond breaker in the area of the joint seal.
    - Wearing surface material, bond breaker, and other unwanted material is removed to the specified dimensions.
    - The joint is constructed and the materials are mixed, placed, compacted, smoothed, and finished, as specified.
- For poured sealant joint seals:
    - The backer rod is placed and secured to prevent loss of the sealant.
    - Sealant is placed to the depth and finished as specified.
- For preformed compression joint seals:
    - The Contractor provides the specified size of preformed seal.
    - The seal is installed in one continuous strip across the full roadway width and into the curbs, with no splices.
    - The seal is installed at the specified location in the joint.
- For preformed strip seals:
    - Steel retainers are spliced, as needed, and placed, secured, and supported to prevent movement, provide the required joint opening, and provide the required elevation and slope.
    - Seals are installed in one continuous strip across the full roadway and into the curbs, without splices.
    - The seal is installed at the specified location in the assembly.

- For modular expansion joint seals:
    - Each device is installed according to the shop drawings and provides the specified elevation, slope, and cross section to match the abutting deck.
- Each installation is protected from damage until all materials have set or achieved the specified strength.
- The specified three levels of inspection are satisfied.
- The Contractor cleans and disposes of all unwanted material.

Measurement

Refer to the specification for measurement. As work is performed, measure, and prepare and submit the measurements, and supporting calculations, on an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00587 – Bridge Rails

This work consists of constructing bridge rails.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality Documentation is as specified, and in the Non-Field Tested Materials Acceptance Guide. Check that the Contractor is aware of those requirements. Ensure that the Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The Contractor removes existing rails and disposes of the unwanted material as specified.
- For constructing concrete rails:
    - Specified reinforcement was placed in previous construction to allow placement of rail reinforcement or anchor devices are installed in existing construction.

- Specified size, shape, and quantity of reinforcement is installed and secured to ensure specified coverage by concrete.
- Contraction and expansion joints areas are installed in the reinforcing as specified.
- If required, electrical conduit and other appurtenances are installed and secured.
- Expansion joint materials, including those in electrical conduit or other appurtenances, are placed and secured.
- If used, fixed forms:
  - Are of a composition and finish to provide a smooth concrete surface without excessive finishing.
  - Are of the shape to produce the specified rail shape.
  - Are secured to prevent movement during concrete placement.
  - Have indentations or other devices to construct expansion and contraction joints and the location of those devices matches the locations in the reinforcement and conduit, as specified.
  - Are placed such that the specified width and other dimensions of the rail will result.
- If the Contractor will use a slipform operation:
  - The reinforcing is braced to prevent longitudinal movement.
  - The mold is of the specified shape and size.
  - The concrete and slipforming operation complies with the requirements of Section 00587.42(c)
- Prior to placement of concrete:
  - Ensure that all drawings are cross checked for rail, transition, deck, and end panel placements are correct.
- After placement of concrete:
  - Concrete is furnished, mixed, and placed as specified.
  - Contraction joints are constructed as specified.
  - Surfaces are finished as specified.
  - Concrete is cured and protected from damage as specified.
  - **THE INSPECTOR MUST REMAIN ON-SITE UNTIL THE CURE IS COMPLETELY IN PLACE.**
  - All damage is repaired and surfaces are finished and coated as specified.

- For metal rails:
  - Bolts or other anchors are located and cast into prior concrete construction.

  - Rails are coated as specified.
  - Posts and rails are installed and adjusted to provide a smooth line and grade.
  - All connections are tightened
  - Grout pads are constructed under the posts as specified.
  - All damage is repaired.
- The Contractor cleans up and disposes of unwanted materials.

Measurement

Unless specified otherwise there will be no measurement of quantities for Bridge Rails. As work is performed document the work with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00591 – Waterproofing Membrane

This work consists of furnishing and placing bridge deck waterproofing membrane on bridge decks.

It is expected that inspection will be performed by a Certified Bridge Construction Inspector.

Quality

Quality requirements are as specified, in the Non-Field Tested Materials Acceptance Guide, in the *Manual of Field Test Procedures* – Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Determine which type of system that the Contractor will construct, and become familiar with the manufacturer's recommendations and the specified requirements.

Check that the specified pre-placement meeting with the Project Manager has been held.

Also, ensure that:

- Limits for the installation are identified and marked and both the Contractor and Inspector understand the markings. Be sure that the limits include the specified amount up the face of curbs or concrete railings.
- The weather and surface conditions are as specified for constructing the installation, and that the specified time has elapsed before the system is placed on new concrete.
- The surface, on which the system is to be installed, is prepared and cleaned.
- If required, the Contractor applies a leveling course of asphalt pavement to specified thickness, grade, cross section, and smoothness.
- The Contractor has adequate personnel, equipment, and materials on hand before starting the membrane work.
- The Contractor performs the work according to the manufacturer's recommendations.
- The Contractor removes or releases bubbles beneath the membrane.
- The Contractor protects the work from traffic or other damage until the subsequent layer of surfacing is in place and repairs any damage.
- The Contractor contains and disposes of waste or excess material.

Measurement

Measurement for waterproofing membrane will be by area, unless specified otherwise. As work is performed sketch and calculate the area of membrane completed daily, and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment

Section 00593 – Powder Coating Metal Structures

This work consists of preparing and powder coating new and existing metal structures and features.

Quality

Quality requirements are as specified, in the Non-Field Tested Materials Acceptance Guide, and in the *Manual of Field Test Procedures*– Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.

- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The Contractor follows the manufacturer's recommendations.
- When not in conflict with the Specifications or Special Provisions, the Contractor follows best practices of the trade.
- The Contractor protects the material surfaces from damage and contamination.
- The Contractor protects the material during storage on the project site.
- The Contractor repairs any damaged surface and coating.

Measurement

Unless specified otherwise there will be no measurement of quantities for Powder Coating Metal Structures. As work is performed document the work with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00594 – Preparing and Coating Steel Structures

This work consists of preparing and coating new metal structures and features in the shop and in the field.

Quality

Quality requirements are as specified, in the Non-Field Tested Materials Acceptance Guide, and in the *Manual of Field Test Procedures*– Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Complete Structure Coating Daily Progress Report (form 734-1789).

Check that:

- The specified Pre-coating Conference with the Project Manager has occurred.

Ensure that:

- The Inspector and Project Manager develop an inspection plan, detailing a chronological sequence of inspection activities. The Contractor's supervisor or employees should be performing similar inspections. Inspection activities include:

- Have the following equipment to perform inspection:
  - Thickness gages with calibration standards (to check thickness of dried coating).
  - Wet mil gage (to check thickness of applied coating).
  - Surface profile gage (measures profile of prepared surface).
  - Psychrometer with charts (to measure and determine relative humidity).
  - Thermometers both air and surface (to verify application conditions and determine relative humidity).
  - Flashlight and mirror (to inspect difficult locations, corners, bolts, etc.).
  - Adhesion tester (checks adhesion of coating to substrate).
  - Tooke gage (to verify number of coatings and thickness).
  - Clean, white cloth (to check for oil or water in compressed air).
  - Knife or sharp scraper (for quick adhesion test).

- Become familiar with the equipment that the Contractor will use for the work, including its basic operation, function, and possible environmental problems that could arise.
- Prior to work, ensure that compressed air is checked for contaminants, air for breathing is monitored for carbon monoxide or other hazardous substances, the containment meets specified requirements, and the Traffic Control Plan will be implemented and maintained.
- Frequently, assess the operation of the containment, including:
  - Verify containment is performing as required.
  - Verify that workers receive specified ventilation.
- Prior to surface preparation work:
  - Identify structural surfaces that are contaminated by oil, grease, bird droppings, and other material that must be removed prior to normal surface preparation.
  - Ensure that processes will contain the removed materials.
- Immediately prior to application of each coat:
  - Verify that environmental conditions are appropriate for coating application.
  - Ensure that areas of unacceptable surface preparation have been corrected.
  - Inspect the prepared surface for flash rust prior to application of the prime coat.

  - Verify that no contamination has occurred to the prepared surface prior to application of the prime coat or to the previously coated surface prior to application of succeeding coating.
- Following each coat application:
  - Measure the dry film thickness and verify that the thickness complies with specified requirements and the manufacturer's recommendations.
  - Verify that coverage is complete and as specified, especially in areas that are difficult to coat (use mirrors, lights, etc. in those areas as needed).
- Following the curing of each coat:
  - Inspect for complete cure.
  - Look for coating failures, including delamination, blisters, pinholing, mudcracking, dryspray, embedded dirt or debris, or other detrimental problems.
- After coating is complete:
  - Inspect the entire structure, or area being worked, to ensure complete coverage and uniform appearance.
  - Ensure that the Contractor repairs all deficient, non-compliant, or damaged areas.
- The Contractor:
  - Protects pedestrians, traffic, other structure surfaces, and elements of the environment
  - Constructs the containment system according to shop or working drawings and the requirements of the specification and regulatory agencies.
  - Regularly evaluates the required function, operation, and safety of the containment system.
- The Contractor's equipment is appropriate for the work, including:
  - Compressed air is checked for oil and water to avoid contaminating the steel surfaces.
  - Air for breathing is filtered and monitored for presence of carbon monoxide and other hazardous substances.
- Oil, grease, bird droppings, and other similar material are removed prior to required surface preparation.
- Surfaces are prepared to the required specification and are protected or restored until coating is applied.
- Removed material is collected, stored, and disposed. Also, no material is allowed to leak from containers.
- The containment system does not allow any leaking of material.

- All surfaces and elements, that are not to be prepared or coated, are protected and any damage is repaired.
- Coatings are:
    - Mixed, thinned, and applied according to the manufacturer's recommendations.
    - Applied only when weather, climatic, and other environmental conditions are as recommended by the manufacturer or as specified.
    - Applied to the thickness, in the number of applications required by the manufacturer, product, or application conditions, as specified.
    - Allowed to cure between applications or coats.
    - Protected until the next application, including exposure to the cleaning process.
    - Repaired, if damage or improper application occurs.
    - Tested for thickness and deficient or unacceptable areas are corrected.
- The date of application and type of coating are stenciled on the structure's finish coat.
- If coating is performed in the shop and the structure elements will be further handled, all damage to coatings is repaired and restored.
- The Contractor cleans up and restores the site and removes and disposes of all unwanted material.

Measurement

No measurement of quantities will be made for this work. Payment is on a lump sum basis unless specified otherwise. As work is performed, prepare and submit a source document, such as an Installation Sheet (form 734-2605), to justify payment.

Section 00595 – Reinforced Concrete Box Culverts

This work consists of constructing cast-in-place reinforced concrete box culverts and precast reinforced boxes.

Quality

Quality requirements are as specified in the Specification, in the *Manual of Field Test Procedures*, and the Non-Field Tested Materials Acceptance Guide – Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Check that:

- The Contractor complies with all specified environmental and in water restrictions or those required by regulatory agencies.
- That ODOT performs verification testing for concrete.

Ensure that:

- The location and limits for the structure have been located and marked, and both the Contractor and Inspector understand the markings.
- The location and limits for the structure match the waterway or other feature that will go through the structure.
- Flowing water is re-routed or handled during construction.
- The surface underlying the structure is constructed or excavated to the specified elevation and limits, and is compacted as specified.
- If the work will tie into an existing structure, all affected portions of the existing structure have been removed, abutting surfaces have been finished, and required anchors have been installed.
- For precast elements:
    - The underlying material will uniformly support the new elements to the specified line and grade.

  - Joints between elements are clean and sealed.
  - Surfaces and damage are repaired and finished.
- Reinforcement is placed, secured, and supported to ensure placement in the structure with coverage of concrete, as specified.
- Forming for all elements will ensure that specified thickness will be controlled and specified shapes and dimensions will result.
- Construction joints are placed in the specified orientation.
- The timing and sequence of concrete placement for walls and top slab comply with specified requirements.
- Concrete is mixed, delivered, tested, placed, and finished as specified. Ensure that ODOT performs verification testing as needed.
- Concrete receives the specified cure after placement.
- **THE INSPECTOR MUST REMAIN ON-SITE UNTIL THE CURE IS COMPLETELY IN PLACE.**
- Before forms or falsework are removed or subsequent loading is applied, the concrete has achieved the specified strength or the specified time has elapsed since the concrete was placed.
- The concrete surfaces are finished as specified.
- Backfilling is performed according to Section 00510 and affected areas are smoothed and finished.

Measurement

Unless specified otherwise, quantities of reinforced concrete box culverts will be measured on the length basis, no measurement of quantities will be made for wingwalls and aprons, and no separate measurement will be made for concrete and reinforcement used.

Where measurement is by length, measure and record the length of box culvert along its longitudinal axis. As work is performed, sketch and total the length constructed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment

Section 00596 – Retaining Walls

This work consists of constructing retaining walls.

Quality

Quality requirements are as specified, in the *Manual of Field Test Procedures*, and in the Non-Field Tested Materials Acceptance Guide – Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Check that:

- The Contractor submits shop drawings, working drawings, or other required submittals for the wall that it intends to construct and for required support of excavated slopes during construction.
- For needed aggregates and other produced materials, the Contractor tests the material and ODOT QA performs required verification testing.
- For proprietary systems, the manufacturer's representative participates in a pre-construction meeting with the Project Manager, Inspector, and supervisory personnel of the Contractor and involved subcontractor(s), and is present on the site.

Ensure that:

- The location for each wall is located and marked, and both the Contractor and Inspector understand the markings.
- For excavation and backfill:
    - Excavation is performed to the specified lines, grades, and slopes and slopes are supported or restrained as specified.
    - Unsuitable and unstable material in the bottom of the excavation is either stabilized or removed and replaced with suitable material.
    - The bottom of the excavation is to the specified elevation, and is smooth, firm, and compacted as specified.
    - Backfill is placed in the specified lift thickness, compacted to the specified density and stability, and tested as required and needed. Unacceptable density or compaction must be corrected or the affected material is removed and replaced.
- Drainage systems for the wall are installed or constructed as specified.
- Forming for each element of cast-in-place concrete is done to ensure the specified size, shape, thickness, and surface treatment of the element.
- Reinforcement of the specified size and spacing, and other appurtenances are placed, including expansion and contraction joints.
- For cast-in-place concrete:
    - Concrete is mixed, delivered, placed, consolidated, and finished to the specified elevations.
    - Concrete is cured and protected.
    - **THE INSPECTOR MUST REMAIN ON-SITE UNTIL THE CURE IS COMPLETELY IN PLACE**.
    - Before forms are removed, concrete has reached the specified time or strength requirement.
    - After forms are removed, concrete is finished as specified.
    - After concrete has achieved the specified strength, backfill material is placed, and compacted. Unacceptable compaction is repaired or the material is removed and replaced, as specified.
- For walls and wall elements other than cast-in-place concrete:
    - Leveling pads or footings, if specified, are constructed.
    - Elements are placed in the specified sequence, connected or attached, and backfilled with specified materials placed and compacted in specified lift thickness.
    - The work is continually checked for deviations in wall line, grade, etc. Unacceptable work is corrected or the unacceptable elements are removed and replaced.

- The Contractor cleans up and disposes of unwanted material, makes smooth and finishes the affected area as specified.

Measurement

Measurement for retaining walls will be by area, unless specified otherwise, and will be the area shown in the plans, in a vertical plane, for each retaining wall. Calculate the area wall shown in the plans. As work is performed, sketch the walls completed daily, and submit that sketch along with the related area calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Section 00597 – Sound Walls

This work consists of furnishing and constructing sound walls.

Quality

Quality requirements are as specified, in the *Manual of Field Test Procedures*, and in the Non-Field Tested Materials Acceptance Guide – Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.
- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The location of each sound wall is located and marked, and both the Contractor and Inspector understand the markings.
- The Contractor ensures that buried utilities and other facilities are located and marked.
- Excavation is performed to the limits, shoring or other slope protection is constructed, unsuitable or unstable material is repaired or replaced, and the excavated area is smoothed and compacted, all as specified.
- Wall components are installed in the specified manner and to produce the specified alignment, grade, and finish.
- All damage is repaired or the element is replaced.
- For concrete block walls:
    - The specified reinforcement and grout is furnished and placed as specified.
    - Specified surfaces are waterproofed or damp proofed.
    - The Contractor cleans up and disposes of unwanted materials and makes smooth and finishes the affected area.

Measurement

Measurement for sound walls will be by area, unless specified otherwise, and will be the actual wall face area projected onto a vertical plane along one side of the wall. As work is performed sketch and calculate the area of walls completed daily, and submit that sketch along with the related area calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

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Section 00599 – Concrete Slope Paving

This work consists of constructing concrete slope paving on bridge end slopes.

Quality

Quality requirements are as specified, in the *Manual of Field Test Procedures*, and in the Non-Field Tested Materials Acceptance Guide – Field Tested Materials Acceptance Guide, and in the Qualified Products List.

Check that:

- The Contractor is aware of those requirements.

- The Contractor utilizes specified certified personnel to sample and test materials for quality control.
- For those manufactured elements that require inspection at the manufacturer facility, the required inspection is performed.

Ensure that:

- The ODOT Quality Control Compliance Specialist (QCCS) is aware of the work schedule, and required verification testing is performed.
- The Contractor provides quality documentation as required.

Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

Construction

Ensure that:

- The location and limits for the work have been located and marked, and both the Contractor and Inspector understand the markings.
- The surfaces, on which the work will be performed, are compacted as specified, and smooth, and have been finished to specified line, slope, and grade.
- Bedding material has been placed to the thickness and compacted as specified.
- Curbs are constructed to the specified elevation, grade, orientation, and geometry to result in the specified exposure from the slope or berm paving and the surrounding surface.
- Joints of the blocks or panels form a smooth line in the specified orientation.
- Joints between precast blocks are preserved by placement of spacers until the joint filler material is placed.
- Joints between the precast blocks are filled with specified material and excess joint material is removed from the surface.
- The Contractor disposes of excess materials.
- Affected areas are smoothed and finished.

Measurement

Measurement shall be as specified.

Where measurement for slope or berm paving is by area, as work is performed, sketch and calculate the area of paving completed daily, and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.

Where measurement is by length measure, record the length of slope paving curb along the longitudinal axis. As work is performed, sketch and total the length constructed daily and submit that calculation with an Installation Sheet (form 734-2605) as a source document to justify payment.