# 400's – Drainage and Sewers

Ensure that drainage facilities are constructed to the lines and grades shown on the plans. Check with the designer or Engineer of record prior to changing pipe size, elevation, or location of the inlet or outlet of a pipe.

## Section 00405 – Trench Excavation, Bedding and Backfill

This work consists of excavating trenches, constructing trench foundations, and placing bedding, pipe zone material, and backfill. This section applies to pipes under 72 inches as excavation for pipes greater than 72 inches is covered under major structures in Section 00510.

### Quality

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

Ensure that the Contractor is aware of those requirements, performs required testing with certified technicians, and check that it provides required quality documentation and test results. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Additionally, ensure that:

- Backfill material is not contaminated.
- Bedding and backfill material is compacted and density testing is performed as specified.

### Safety

During underground construction:

- Verify that the Contractor has requested that existing underground utility and other facilities are located and marked, and this is actually accomplished for known facilities. The inspector and the contractor should review locate markings. Have a backup plan with Engineer approval if you think there could be conflicts with pipe.

- Ensure that excavated material, if it is placed near the excavation, does not create an unsafe condition.
- Ensure that the Contractor uses shoring or other devices or practices such as sloping the sides of trenches, to prevent trenches from collapsing. Shoring, sloping, or shielding is required if trench is over 5 ft deep.
- Ladders are required to be within 25′ of workers in trenches over 4′ deep. Know your "Competent Person" and their evaluation of trench wall sloping requirements if shoring is not used.
- Ensure that workers do not enter unsafe trenches, even for very short times.
- Ensure that placement of and compaction of materials in the trenches is performed as specified and does not place the workers, the trench, or the facility being constructed at risk.
- If the Contractor appears to be working in an unsafe manner and the Inspector wants additional advice, the Inspector should consult with the Project Manager or the Region Safety Officer. They may request OR-OSHA to perform a consultation (courtesy) inspection to get additional advice or, if the Contractor is apparently working unsafely and not willing to correct the situation, may request OR-OSHA to perform an enforcement inspection. Also refer to the discussion in the Safety chapter (17) of the *Construction Manual*.

## Construction

Review the layout and staking of each installation to detect errors and ensure that the installation will:

- Include specified appurtenances.
- Tie to inlet and outlet structures and locations as specified.
- Ensure that both the Contractor and Inspector understand the layout.
- Ensure that the Contractor effectively controls line and grade of the construction from the survey markings. Methods of accomplishing this include using a stringline, laser beam, or other method. Typically stakes should be provided every 25 feet or more frequent.

Ensure that:

- You are familiar with Standard Drawing RD300: *Trench Backfill, Bedding, Pipe Zone and Multiple Installations.*
- Pavements are sawcut full depth. Cut trench width to that shown on standard drawing RD302. Make sure that the existing surfacing that borders the trench

does not get undermined during excavation (i.e. roadway, sidewalks, curbs, etc.). Undermined surfaces need to be removed and replaced.

- Excavation is performed to the dimensions and slope specified in the plans and in the surveyor's markings.
- If water is present in the bottom of the trench excavation, provide an outlet at low end or pump from low end to an area that does not cause sedimentation of waterways.
- The foundation under the pipe and/or bedding is firm and rock or other hardpan has been removed to allow specified material between that and the pipe.
- The foundation is checked before placing pipe bedding to ensure a firm, non-yielding soil under foot pressure. Otherwise, overexcavate and backfill with a granular material. Typically granular pipe backfill is used to "bridge" over soft foundations. The pipe foundation is critical to ensure long term pipe function.
- Bedding materials, placement, compaction, and testing are performed as specified.
- All pipe materials comply with Specification requirements.
- Construction of pipes and other minor structures is completed as specified, including randomly checking line and grade of the installation, before backfilling is performed.
- For waterlines, thrust blocks have been constructed to the size and locations specified. Also refer to discussion in Part 01100 of this Manual.
- The Contractor compacts backfill under the haunches of the lower half of pipes and other, similar locations. Backfill with pipe equally on both sides in 6″ lifts. WORK MATERIAL UNDER HAUNCHES OF PIPE. Compact. Work in this area is difficult -- poor compaction can cause lateral movement and excessive stress on the lower part of the pipe and may allow water movement alongside, rather than through, the pipe.
- The backfill under, around, and over the pipe is placed and compacted as specified. Get QC and QA tests early to ensure proper compaction methods are being used. Know how many passes of the compaction equipment is required to achieve required density.
- The pipe has not been displaced during backfilling operations or damaged. Lightweight pipe, Poly pipe or PVC pipe can easily be floated up by careless backfill operations.
- If equipment will be operating over a pipe, the backfill provides the specified cover to prevent damage to the pipe installation by the equipment.
- After the embankment is complete, verify each pipe and other minor structures have not been damaged or knocked out of alignment.

- Waterlines are pressure tested and disinfected as specified, including having owners of the facility observe those operations if requested. Also refer to Part 01100.
- If specified, the Contractor performs remote (television or video) inspection of underground facilities and corrects deficiencies.
- Surfacings (AC, PCC, Gravel, lawns etc) are restored to original or better condition. Get buy off from property owners if they will maintain area. Until such time as permanent surfaces are restored, provide an acceptable temporary surfacing. Maintaining temporary surfacing until permanent surfacing is installed is a contractor responsibility. Also refer to discussion in Section 00495 of this Manual.
- The Contractor disposes of unwanted material.
- The affected area is smoothed and finished.

### Measurement

Measure the work as specified to calculate quantities. If the Inspector uses information provided by the Contractor to calculate quantities, perform cursory validation of that information. As work is performed, measure all of the specified neat line dimensions, and prepare and submit the measurements, and supporting calculations, on an Installation Sheet (form 734-2605) as a source document to justify payment.

## Section 00406 – Tunneling, Boring and Jacking

This work consists of installing pipes, casings, linings, and sleeves by tunneling, boring, and jacking without excavating the overlying surface.

### Quality

Quality documentation for this work is specified in the Field Tested Material Acceptance Guide.

Ensure that the Contractor is aware of those requirements, performs required testing, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

### Construction

Ensure that:

- Utilities within the area of construction are located and marked.
- The installation is located and marked and both the Contractor and Inspector understand the markings.
- Construction of boring, jacking, etc. pits is performed according to acceptable working drawings.
- Work and material conform to the requirements of the Specification or acceptable working drawings.
- Excavation or installation does not cause or result in voids in surrounding material, and all resulting voids are repaired or grouted as specified.
- Excavated material and/or water from the work area are disposed of, without impacting or damaging waterways or other environmentally sensitive areas.
- If specified, cradles are properly installed to support the pipe in the casing.
- The Contractor disposes of unwanted material.
- The affected area is restored, smoothed, and finished.

### 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 00410 – Pipe Lining

This work consists of rehabilitating existing pipes by furnishing and installing pipe liners by pipe bursting and lining, slip lining, and cured-in-place lining.

### Quality

Ensure that all material used meets the Specification requirements and all of the documentation that the Non-Field Tested Materials Acceptance Guide (NFTMAG) requires are submitted.

Ensure that the Contractor uses only equipment that is specified or approved by the pipe manufacturer and the Engineer. Also make sure the Contractor uses approved technicians for installing and welding of pipes, per the Specification specifications.

Ensure that the Contractor is aware of those requirements, performs required testing. Gather and submit required quality documentation. Record other pertinent information on the General Daily Progress Report (form 734-3474).

### Construction

Ensure that:

- The Contractor has not damaged the pipe prior to installation.
- The Contractor cleans all pipes, and disposes of unused and contaminated materials, as specified.
- If required by the Specification, the Contractor has the pipe video inspected.
- The Contractor follows all post installation instructions prior to connecting pipes to any structure.
- The Contractor submits all specified documentation for the warranty.

### Measurement

Unless specified otherwise, measurement is on the length basis, for other than point repairs and service line reconnections which will be measured on the unit basis. 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 00420 – Salvaging Pipe

This work consists of removing, cleaning, and either stockpiling or relaying culvert pipe and other pipe.

### Quality

Ensure that materials are properly cleaned and are not damaged or defective.

Prepare a Field Inspection Report, form 734-3469, to document that the materials have been cleaned as specified and are not damaged.

If new materials must be used in reinstalling the pipe, require and submit quality documentation required under Section 00445.

### Construction

Ensure that:

- The locations have been marked to indicate salvage.
- If the pipes will be reinstalled, the new installation is marked.
- Both the Contractor and Inspector understand the markings.
- Materials are:
    - Cleaned as specified.
    - Not damaged or defective.
- If reinstalled, installed according to appropriate requirements of Section 00445.
- If stockpiled, placed as directed or specified, including protecting the pipe from damage during any part of the operation, including the stockpiling operation.
- The Contractor disposes of unwanted materials.
- The affected area is smoothed, restored, and finished.

### Measurement

Unless specified otherwise, measurement is on the length basis. 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 00430 – Subsurface Drains

This work consists of constructing subsurface drains to the lines and grades shown or established using drain pipe, special filter material or granular drain material, and drainage geotextile.

### Quality

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

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Additionally, ensure that:

- The drainage material does not get contaminated
- The geosynthetic separates the drainage material from the surrounding soil material as specified
- No material is damaged or, if damaged, is replaced or acceptably repaired, if allowed.

## Construction

Ensure that:

- Installations have been located and marked, the layout complies with the Specifications, and both the Contractor and Inspector understand the markings.
- Needed installations, additional to the plan locations, have been identified and laid out.
- Utility facilities have been located and marked.
- The trench is excavated as per specifications.
- Pipe is installed as per specifications.
- Filter material or geosynthetic and drain backfill material is installed as specified, without contamination.
- Installation is backfilled and compacted to required elevation, as specified.
- Locations of outlet pipes, other than those connected to inlets or other structures, are properly marked so Maintenance forces can locate them.
- The Contractor disposes of unwanted material.
- The affected area is smoothed, restored, and finished.

## Measurement

Measurement will be as specified. If the Inspector uses information provided by the Contractor to calculate quantities, perform cursory validation of that information.

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 00432 – Wearing Surface Drains

This work consists of constructing wearing surface drains and outlets.

## Quality

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

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

Ensure that:

- The Contractor provides equipment that produces a trench with clean and vertical sides.
- The Contractor compacts as per the specifications.
- The Contractor constructs wearing surface drain prior to placing open-graded HMAC wearing surface and in accordance with the specifications.
- The Contractor hauls, deposits, and places wearing surface drain material that is acceptable to the Engineer.
- The Contractor does not crush the outlet drain pipe during compaction.
- The Contractor disposes of unwanted material.
- That the wearing surface drain material is smoothed and finished as per specification.

## Measurement

Unless specified otherwise, measurement is on the length basis, except for drain outlets which will be measured on the unit basis. 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 00435 – Prefabricated Vertical Drains

This work consists of furnishing and installing prefabricated vertical drains.

## Quality

Quality documentation is specified in the Non-Field Tested Materials Acceptance Guide and 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).

Additionally, ensure that the drain materials are protected as specified until they are installed.

## Construction

The Inspector must:

- Ensure that the vertical drains have been located, numbered and staked, and both the Contractor and Inspector understand the markings.
- Check that the Contractor submitted proposed installation details for review at least 14 days before beginning the trial installation
- Observe the trial installation process to confirm an ability to follow the installation process. Coordinate with the Project Manager.
- Ensure that monitoring equipment, if needed or specified, is installed and protected.
- Ensure that drains are installed in the locations and to specified tolerances.
- Ensure that the drainage material is not contaminated.
- Ensure that the drains are not damaged during their installation.

If an obstruction is encountered:

- Coordinate with the Project Manager to order the Contractor to implement obstruction clearance procedures as specified.
- If the obstruction cannot be cleared, work with the Contractor to install the drain(s) at alternate locations. Coordinate with the Project Manager.
- Ensure that the Contractor disposes of unwanted material

- Ensure that the drainage material is smoothed and finished to the specified elevation and that any contaminated drainage material is removed and replaced with specified material.

### Measurement

Unless specified otherwise, measurement is on the length basis. 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 00440 – Commercial Grade Concrete

This work consists of furnishing, placing, and finishing commercial grade concrete. Commercial grade concrete is typically used for non-structural applications like sidewalks, curbs, islands, thrust blocks and paved end slopes.

### Quality

Quality requirements are specified in the *Manual of Field Test Procedures*.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Do not allow the Contractor to place concrete that is of questionable quality, including concrete that has exceeded the allowed time from mixture until placement.

If the CGC fails to achieve its specified strength, work with the Project Manager to determine whether the CGC must be removed and replaced or may be left in place with a price adjustment. This will need to be discussed with the Engineer of record and/or the technical specification owner for direction.

### Construction

Ensure that:

- Each structure is accurately located and staked and both the Contractor and Inspector understand the markings.
- The forms, into which the CGC is to be placed, appear to be constructed according to best common practice, as specified.

- Underlying and/or adjacent material is compacted, firm, or undisturbed, as specified.
- The CGC has been batched and mixed as specified.
- Weather conditions are as specified for placing the CGC.
- Every load of concrete that is plant-batched has a batch ticket. No batch ticket = No Pour.
- Concrete tests are done prior to adding water or admixtures.
- Water is added one time only as directed by the Quality Concrete Technician (QCT) to bring the slump of that particular load within the specified range for the project. Addition of water cannot increase the water-cement ratio above the maximum permitted by the mix design (ASTM C94).
- The CGC is placed and consolidated as specified.
- The CGC is placed within 90 minutes after batching and mixing.
- The concrete is placed with less than a 5-foot free fall.
- Special care is taken to vibrate concrete in areas that contain a lot of reinforcement.
- Surfaces are finished as specified, without addition of water.
- The CGC is cured and otherwise protected from unsuitable climatic conditions or damage as per specifications.
- When forms are removed, surfaces are finished as specified.

## Measurement

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

## Section 00442 – Controlled Low-Strength Materials

This work consists of furnishing and placing controlled low-strength materials (CLSM).

### Quality

Quality requirements are in the specifications, and Field Tested Material Acceptance Guide.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

### Construction

Ensure that:

- The limits of the CLSM placement are staked and both the Contractor and Inspector understand the markings.
- The materials are mixed and placed to fill the specified voids, spaces, volumes, or depths, as specified.
- CLSM material does not leak or flow into unwanted areas.

### Measurement

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

## Section 00445 – Sanitary, Storm, Culvert, Siphon and Irrigation Pipe

This work consists of constructing or reconstructing culvert, siphon, sanitary sewer, storm sewer, and irrigation pipes. This work includes constructing joints and connections to other drainage structures or systems for complete installation.

## Quality

Quality documentation is in the specifications, the Non-Field Tested Materials Acceptance Guide, and the Field Tested Material Acceptance Guide.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Inspect pipe shortly after it is unloaded. Identify sections of pipe or other materials that are unacceptable for use on the project.

In general, check the markings on the pipe as soon as it is delivered to the project and compare them with the "pipe data sheet" to ensure that proper materials were delivered. Pay particular attention to the thickness required and verify it during installation. Many times the plans allow the contractor options on material types.

Take a picture of the pipe markings and include it on your FIR. Make sure and get the manufacturer's name, pipe size, AASHTO/ASTM designation, etc. Make sure you have a Certificate of Materials Origin (CMO) Form 734-2126 for all of the following; metal pipe, reinforced concrete pipe, slip joints, pipe anchors, connecting bands, and hardware BEFORE the contractor installs them.

Items to check include:

Concrete pipe

Pipe is of the specified class with appropriate identifying markings. Gaskets and other materials conform to requirements. Check for chips and cracks. Concrete pipe should come from NFTMAG pre-approved manufacturer. No "Q" (quality compliance certification) is needed if the pipe comes from the pre-approved supplier list. A Certificate of Materials Origin (CMO) Form 734-2126 is provided prior to installation if the concrete pipe is reinforced.

Metal pipe

Materials are of proper size and type, with appropriate identifying markings. Gaskets, if specified, bands, and hardware are furnished. A Certificate of Materials Origin (CMO) Form 734-2126 is provided prior to installation.

Plastic or other pipe

Materials are of specified size and type, with appropriate identifying markings. Gaskets and other connecting materials are furnished.

Have the Contractor separate unacceptable material so it is not used on the project and is not included for payment. Do not use paint or other such marking methods to identify unacceptable material so that the material may be able to be used elsewhere, even though it is unacceptable on this project.

Include pipe and material identification marks on the Field Inspection Report or other quality documentation. If material is rejected, describe the reasons and disposition of rejected material.

For siphon and sanitary sewer installations, obtain a copy of the Contractor's records of the watertightness testing or record the results in the daily report.

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

## Construction

Ensure that:

- Installations are located and staked and both the Contractor and Inspector understand the markings. Obtain copies of the survey marking notes.
- The Contractor effectively controls line and grade of the installation from the survey markings.
- For excavation, bedding, and backfill work is accomplished as specified. See Section 00405.
- All damage to coatings is repaired, as specified, or the element is replaced.

For laying pipe:

- Pipe is of the specified size and type.
- Check staking to ensure pipe ends match ditches, side slopes or existing pipes or structures before work starts.
- Review line and grade tolerances listed in Section 00445.40(b)
- Pipe is handled during installation to prevent damage, including to ends and coatings. Repair all gouges, scrapes and all "field-cuts" on metal pipes with an appropriate method (i.e., Zinc primer, cold-stick galvanizing, etc.).
- Placement is started at the downstream end unless conditions specified otherwise.
- For elliptical pipe, the major axis is placed as specified.
- For riveted pipe, outside laps are placed upstream and seams at sides.
- Perforations in drain pipe are installed down unless otherwise specified.

- Bell or grooved ends are placed upstream.
- Start pipe at correct offset from center of manhole or inlet. Pipes are staked from center to center of structure in storm sewers.
- Check line and grade at first piece of pipe and several consecutive pieces to ensure starting out on correct line and grade. This should be done by contractor but a little assistance by Inspector can ensure this happens. Thereafter spot checks are the norm unless very flat pipe or poor workmanship is occurring.
- Verify pipe laser % slope is correct. These checks will help ensure pipe will not have to be removed and re-laid. Some pipe materials are extremely difficult to salvage pipe. If field adjustments are made to start and end point of pipe or grade adjustments are made, the Inspector or the Contractor will need to correct the pipe staking note to reflect the "as-built" pipe.
- The paved invert is installed in the pipe's flowline.
- Most pipes use gaskets to prevent infiltration or exfiltration of water from pipe. These are known as water tight connections. Make sure gaskets are installed in the proper direction and a joint lube is used to ease installation. If bands are used for metal or poly pipe, use and install manufacturer's bands. Fully engage spigot end into bell ends for water tight connection.
- The Contractor uses and places tracer wire per specifications. Test all tracer wire with locating equipment prior to acceptance of pipe (00445.48).
- TV storm pipe (if there is a bid item) and review tape *before* surfacing is placed in case repair is needed.
- Deflection tests are for PVC and Poly pipe. These pipes are flexible and can be squashed by backfilling or construction traffic. The deflection test uses a "mandrel", to pull through pipe to check for squashed pipe. Be present to witness this test.
- All sanitary gravity systems, siphon systems, and irrigation systems need to pass a hydrostatic or air test prior to acceptance.

For joining pipe:

- The specified type of joint is used, including gaskets or other materials.
- Joints are assembled per manufacturer recommendations for the type of joint used.
- Joints fit close and tight and, when specified, are watertight.
- Dirt and foreign material is cleaned from the pipe and joint areas as specified.
- Mortar joints for concrete pipe are constructed as specified.
- Bands are aligned and installed as specified.
- Bolts are tightened as specified.

- For corrugated pipe, the Contractor may tap the band with a mallet while the bolts are being tightened, to jar the corrugations together and allow a tight fit.

Ensure that the Contractor:

- Properly places the pipe zone material as specified.
- Performs all compaction of pipe zone material as required.
- Performs all compaction testing of pipe zone material as required.
- As the Inspector, pay special attention to the compaction of trench backfill. This is the area between the pipe zone and the bottom of the base rock. This is especially important with shallow buried pipes.
- The Contractor disposes of unwanted material.
- The Contractor performs all post installation testing as specified.
- The Contractor makes any and all necessary repairs that were identified.
- Affected areas are smoothed, restored, and finished.

### Measurement

Measurement will be as specified. Ensure that ODOT has recorded sufficient information before work starts, if needed, to calculate pay quantities.

If the Inspector uses information provided by the Contractor to calculate quantities, perform cursory validation of that information.

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 00450 – Structural Plate Pipe, Pipe Arch and Arch

This work involves the construction of structural plate pipe, pipe arches, plate arches, horizontal ellipses, vehicular underpasses, and special shaped structures.

### Quality

Quality documentation is in the specifications, the Non-Field Tested Materials Acceptance Guide, and the Field Tested Material Acceptance Guide.

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

QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Inspect the delivered materials for damage shortly after delivery, including damage to shape and coatings.

## Construction

Surveying and Layout

Ensure that the structure, as located and staked, conforms to the plans and matches the adjacent terrain. Ensure that both the Contractor and Inspector understand the markings.

Excavation, Bedding, and Backfill

Ensure that this work is accomplished as specified.

Erection

Ensure that:

- Footings have been constructed to the specified line and grade.
- The Contractor understands the Specification requirements and the manufacturer's assembly instructions, and performs the work according to those requirements.
- Bolts are of lengths according to the plans or as specified.
- Bolts are installed and tightened in the sequence as specified.
- Strutting is installed as required by the manufacturer's specifications and as specified.
- To monitor changes in shape and alignment, monitoring devices, such as tell-tales, are utilized.
- Damage to coatings is repaired as specified.
- Headwalls, aprons, and other appurtenances are constructed as specified to line and grade.

Work Quality

The Inspector should check for:

- Dents or bends in the metal.
- Legible brands.
- Loose or unevenly spaced bolts.
- Ragged edges.
- Scaled, unrepaired, or broken coating.
- Uneven laps.
- Variation from the specified alignment.
- Wrong plate locations.

### Measurement

Measurement will be as specified. Ensure that ODOT has recorded sufficient information before work starts, if needed, to calculate pay quantities.

If the Inspector uses information provided by the Contractor to calculate quantities, perform cursory validation of that information.

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 00460 – Paved Culvert End Slopes

This work consists of constructing portland cement concrete paved culvert end slopes.

### Quality

Quality requirements are specified in the Non-Field Tested Materials Acceptance Guide and in the *Manual of Field Test Procedures*. Refer to Section 00440 of this Manual and the specifications for Commercial Grade Concrete quality requirements.

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

Ensure that:

- The dimensions and layout for each installation comply with the Specification documents.
- The underlying material is compacted per specifications.
- The forms appear to be constructed according to best common practice, as specified, and are of the specified size and shape to match the end of the culvert or other pipe and adjacent finished surface.
- The welded wire fabric is of specified spacing and dimensions, and is supported so that it will be in the specified location in the completed structure.
- Weather conditions are as specified for placing concrete.
- The specified concrete has been batched and delivered.
- Surfaces are finished as per specifications.
- Concrete is cured and protected from unsuitable climatic conditions or damage, as specified.
- After removal of forms, the surfaces are finished as per specifications.
- The Contractor disposes of unwanted material.
- The affected areas are smoothed and finished.

### Measurement

Unless specified otherwise, measurement is on the area basis. Measurement will be based on the paved end slope area table identified on the plans

As work is performed, measurements should be taken to verify and check work. Prepare and submit an Installation Sheet (form 734-2605) as a source document to justify payment.

## Section 00470 – Manholes, Catch Basins and Inlets

This work involves the construction of cast in place or precast manholes, inlets, and similar structures.

### Quality

Quality requirements are in the Specifications, the Non-Field Tested Materials Acceptance Guide, the Field Tested Material Acceptance Guide, and the Qualified Products List.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

## Surveying and Layout

Ensure that:

- If the Contractor plans to use precast elements, the Contractor has prepared acceptable working drawings that accurately show the location and elevation of all inlet and outlet pipes and other appurtenances.
- The installation, as marked, complies with the Specification documents or modifications ordered by the Project Manager.
- Installations have been properly located and staked and both the Contractor and Inspector understand the markings.
- There are no apparent errors in location or elevations.

## Construction

Ensure that:

- Precast units come from one of the NFTMAG pre-approved suppliers. No "Q" (quality compliance certification) is needed if the units come from the pre-approved supplier list. An "O" (Certificate of Materials Origin) is needed for all steel materials including; reinforcement in the precast units, ladders, frames, grates, and covers.
- The delivered materials are inspected for damage.
- Precast sections of manholes or inlets have key ways or connecting pins to interlock sections together.
- Two stakes are used to establish line and grade.
- Manholes are not placed in the wheel paths of the roadway. Check the proposed placement prior to the Contractor beginning the connecting run of pipe to see if an adjustment is needed.
- Excavation, bedding, and backfill are performed as specified.
- A stable foundation is established that provides full and adequate support for the element and the element is installed to the specified elevation and orientation. A poor foundation will be a long term maintenance problem and may break pipe and

cause catastrophic failure of roadway, walls or bridges. The foundation must not deflect under firm foot pressure. Check with probe or lath for ease of penetration. If poor foundation is observed, over excavate backfill and compact with a granular material.

- Reinforcement is installed as specified and will have the specified coverage with concrete.
- The orientation of the structure is properly set. It may need to fit a curb line or other roadway feature to function properly. This starts at the base and is difficult to correct if installed incorrectly, the pipes are grouted and the structure is backfilled.
- Structure is plumb to ensure good line and grade at surface and that traffic loading does not fail structure from eccentric or point loading.
- Structures are water tight between sections and pipe to structure connections by use of mortars, gaskets or mastic sealants.
- Base or subgrade drain pipes are installed as specified
- The Contractor performs all tests that are specified and required.
- Grates, frames, and covers are installed to the specified elevation and slope to match the adjacent finished surface. It is generally best for the Contractor to make the final adjustments after the adjacent finished surface is constructed.
- For manholes, the first ladder rung is within 26″ of the top of the manhole. See Standard Drawing RD336.
- The Contractor disposes of unwanted materials.
- The affected area is smoothed, restored, and finished.

### Measurement

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

## Section 00475 – Drain Wells

This work consists of drilling 8 inch diameter wells, including furnishing and installing steel well casings, for the purpose of intersecting large voids in underlying rock.

### Quality

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

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

Ensure that:

- The installation, as laid out, complies with the Specification requirements.
- Drill the drain wells at the specified locations prior to constructing manholes and inlets.
- Test each drain well per specifications.

### Measurement

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

## Section 00480 – Drainage Curbs

This work consists of constructing mechanically extruded curbs using either commercial grade concrete or asphalt concrete.

### Quality

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

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

## Surveying and Layout

Ensure that:

- The installation, as laid out and staked, will comply with Specification requirements and local conditions.
- Curb breaks for outlet drainage and other needs are properly located.
- Both the Contractor and Inspector understand the markings.

## Construction

Ensure that:

- The area, upon which the curb is to be placed, is clean and free of extraneous matter.
- Where the curb is placed with a curb machine following a string line, there are no sags or high spots in the string where they shouldn't be.
- A bonding agent has been placed under the curb location and is still in a condition to bond the curb to the underlying material when the curb material is placed, as specified.
- Curb material includes materials and has been mixed and handled, as specified.
- Placement and finishing results in a well-compacted mass and the surface is smooth.
- Expansion joints are placed and contraction joints are constructed, as specified.
- Defective sections are removed and replaced.
- Line and grade of the finished product meet Specification requirements.
- Portland cement concrete is cured as specified.
- Curb is protected as specified.
- The Contractor cleans up and disposes of unwanted material.

## Measurement

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

# Section 00490 – Work on Existing Sewers and Structures

This section consists of joining new work to existing work, repairing or abandoning of sewer lines and structures, and adjusting existing manholes, sumps, inlets, boxes, and similar structures. Also, removal and disposal of pipe, manholes and catch basins scheduled for removal.

## Quality

Quality requirements are in the Specification and the Non-Field Tested Materials Acceptance Guide and in the Field Tested Material Acceptance Guide.

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

Inspect the delivered materials for damage shortly after delivery. Ensure that the materials of the existing installation are not damaged. If they are, work with the Project Manager to have damage repaired or new materials installed.

## Construction

Ensure that:

- Installations have been located and marked and both the Contractor and Inspector understand the markings.
- There are no apparent errors in final elevation or location of the facilities.
- The planned adjustment, connection, or removal procedure conforms to specification requirements.
- The Contractor does not allow material and debris to enter the facility.
- Specified materials are used.
- Joints and connections are constructed per specifications.
- Adjustments are performed to the specified elevation and slope and match the adjacent finished surface.
- All facilities to be abandoned are drained, plugged, and filled if specified.
- The Contractor disposes of unwanted materials.
- The affected area is smoothed, finished, and resurfaced as specified.

### Measurement

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

## Section 00495 – Trench Resurfacing

This work consists of resurfacing pipe trenches, including replacing pavement, curbs, sidewalks, rock surfacing, topsoil, landscaping and other features damaged or removed during pipe trenching operations.

### Quality

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

Ensure that the Contractor is aware of those requirements, and provides acceptable quality documentation before the material is incorporated. Also ensure that the ODOT QCCS is aware of scheduled work so he/she can arrange with the ODOT QAC for required verification testing.

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

### Construction

Ensure that:

- The area to be restored is excavated to the depth, the underlying material is compacted, and the area to be restored is clean, as specified.
- The materials are of the quality and type specified, and are placed to the depth, as specified.
- Replacement materials are smoothed, compacted, and finished, and are cured and protected from damage as specified.
- Surfacings (AC, PCC, Gravel, lawns etc) are restored to original or better condition. Get buy off from property owners if they will maintain area. Until such time as permanent surfaces are restored, provide an acceptable temporary surfacing. Maintaining temporary surfacing until permanent surfacing is installed is a contractor responsibility.
- The Contractor disposes of unwanted material.

- Affected areas are smoothed, restored, and finished as specified.

## Measurement

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