

**CITY OF CINCINNATI  
DEPARTMENT OF TRANSPORTATION & ENGINEERING**

**CONSTRUCTION MANAGEMENT SECTION  
CONSTRUCTION  
INSPECTOR'S  
MANUAL**

**Introduction and Sections 1 - 10  
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## Introduction

A Construction Management (CM) organization must adopt standard operating procedures in order to promote uniformity and efficiency. The use of consistent CM and Inspection practices as provided in this Manual and the CM Manual will be beneficial.

### Construction Engineering and Inspection

Construction engineering and inspection services provided during the construction phase of a project will usually include monitoring of the construction work through inspection and testing, monitoring progress against the construction schedule, checking and recommending interim and final payments, administration of changes, maintaining and filing records for audits, and providing documentary records that the project has been built in accordance with plans and specifications. The management will usually include a Construction Engineer (CE) who will be supported by inspectors. The CE and CI make up the construction management team and must work together for the success of the project. The Construction Inspector works under the direction and supervision of the Construction Engineer. The Construction Inspector (CI) plays an important role in effective Construction Management.

### Role and Responsibility of the Construction Inspector

The CI's primary function should be to observe and monitor (but not to certify or ensure) that the project is built in accordance with the plans and specifications and in accordance with sound engineering and construction practices and that the completed work is documented, recorded and properly paid for. This Manual describes the duties involved in the construction inspection of projects. This is not a complete list of duties and responsibilities but offers guidance to the CI as to what is expected of them.

The CI is expected to follow all City of Cincinnati standard operating procedures, rules, and regulations.

## Section 1.0

### GENERAL DUTIES

#### **OBSERVE AND MONITOR ALL MAJOR CONSTRUCTION ACTIVITIES FOR THE CONTRACT ASSIGNED TO THEM**

**General:** The CI is the eyes and ears of the City for administering construction contracts. The CI should know what the contractor is doing at all times. The CI can offer suggestions on means and methods of construction but cannot direct the contractor how to do the work.

**Workday:** The CI's normal workday should be the same as the contractor's. The CI should plan on arriving at the job when the contractor plans on starting work for that day and should do a final inspection just before the contractor quits for the day. The CI's time starts when they arrive at the job or the field/district office. The CI should be on site and observe all major activities.

**Overtime:** On most construction jobs there is the need to work overtime. The CI should plan to work whatever overtime is needed to observe the critical work items being performed by the contractor. If the CI cannot work the overtime to cover the construction activities they should contact the CE as soon as possible and work with them to get someone to replace them. The CI should call the CE on a daily basis to get pre-approval to work and log date and time of call on time sheet. Overtime to work Sunday or Holidays must be pre-approved by the City Engineer, notify the CE as soon as this work is scheduled so pre-approval can be obtained. Not all construction activities require a CI to be present full time. Items like watering sod or removing curing blankets may not need an inspector present, while items like asphalt paving and concrete pours are critical and require the CI's presence. The CI should consult with the CE to have a thorough understanding of what they need to monitor. On certain jobs it may be necessary for the CI work overtime to complete the paperwork required for that day's activities, if this is required it needs to be pre-approved by the Engineer.

**In general, items being incorporated into the final product and pay items should be monitored.**

#### **COMMUNICATE WITH THE CONTRACTOR**

The CI is the first line of communication with the contractor. The CI needs to establish a means of open and honest communication with the field supervisors and needs to know what work the contractor is doing and is planning. At the start of a contract the CI needs to know who is in charge of field activities for the contractor and their subcontractors. The CI should exchange office, mobile and emergency phone numbers with these people. The 2008 ODOT specification requires that the contractor have a superintendent on site at all times work is being performed.

The CI should meet with the contract representative on a daily basis to review the work he plans to do in the next 48-hour period. The CI should meet and review the contractor's two-week work schedule at least once a week. If work is to be performed on Force Account, the CI shall meet with the contractor prior to doing any work to agree on crew size and methods to perform such work. The CE and Contractor needs to agree at the end of the day the time and materials used on Force Account.

Most written communication should go through the CE to the contractor or from the contractor to the CE. However, there are some instances when the CI needs to send something directly to the contractor. The CI should notify and copy the CE as soon as possible when they do this. Any verbal communication significant to the administration of the contract should be recorded on the inspector's daily report.

The CI will ensure that inspection of the work is so organized as to support the Contractor's schedule and coordinate with the CE so that inspection forces are available and sufficient to meet the schedule. Every effort should be made to cooperate with the Contractor so that inspection activities will dovetail with the Contractor's work.

The CI should conduct his relations with the Contractors in a professional, cooperative, and business-like manner. Absolute integrity is required and excessive fraternization with key personnel of the Contractor's staff must be discouraged. **The acceptance of gifts or favors from Contractors by any member of the Construction Management staff is strictly forbidden, regardless of their size or value.**

### **BE FAMILIAR WITH THE PLANS, SPECIFICATIONS AND METHOD OF MEASUREMENT FOR THE WORK**

In order for the CI to inspect the ongoing work he needs to be thoroughly familiar with the plans, specifications and method of measurements for each specific item of work. Before the contractor starts an item of work the CI should read the ODOT Construction and Material Specification, the City of Cincinnati Supplement to the ODOT specification, the relevant section of this manual and any contract special provisions and manufacturers' instructions relative to the work to be performed. Most contract items of work correspond to a specification reference number. The CI should understand completely the description of work and method of payment under that reference item. If there is any doubt as to what should be done or how the item is paid the CI should ask the CE for clarification.

The CI should review all plans including any related standard drawings and approved shop drawings for the items of work being performed. Although it is solely the contractor's responsibility to build the project per plans, a well-informed CI can catch many mistakes before the work is done and can avoid costly redoing of work and delays. The CI should bring any deficiencies found to the attention of the contractor and the CE immediately. The CI should check the contractor's operations on a regular basis to ensure that he is performing the work in accordance with plans and specifications. The CI should not give any direction to change or deviate from the plans without first consulting with the CE. The CI should immediately contact the CE if it appears that the plans are in error or the conditions of the job are different than shown.

The CI will be called upon to assist in the interpretation of plans and specifications and can offer valuable insight on methods and techniques of construction. They must be careful not to direct the Contractor in means, methods, techniques, sequences, or procedures of construction or to make recommendations. Any advice requested and offered must be qualified with the statement that the Contractor alone is responsible for the construction of the work.

By contract, the most specific specification or drawing governs over general specifications and details. In general, the hierarchy is as follows: contract special provisions and drawings; contractors and manufactures shop drawings and catalog cuts sheets; City Standard Drawings and City Supplement to ODOT CMS; ODOT standard drawings and CMS. When reviewing specifications and drawings the CI should start with the most specific.

### **BE FAMILIAR WITH PERMIT REQUIREMENTS**

The CI should be aware of any permits and special inspection requirements that are required as part of the contract and should not allow work to begin until the permits are obtained. As a general practice all work described in the contract within the right of way does not require the contractor to obtain a DOT&E permit. Water mains, sanitary sewers, telephone, gas, and electric facilities installations require special inspections by the owning agency. Any deviations from the contractual maintenance of traffic conditions need a DOT&E street blocking permit. All work outside the right of way usually requires a Building permit

and falls under the jurisdiction of the Building inspector. All work performed by a utility company within the right of way that is not part of the contract, requires a street opening permit and the CI should coordinate inspection with the DOT&E Right of Way Management inspectors. Street closings that are different than specified in the contract also need a permit. If an electric meter is being relocated or newly installed, an IBI permit and inspection is required for all electric work associated with that meter.

A CI may be assigned the inspection of a DOT&E permit. The CI should follow the procedures for inspecting and documenting as required by the DOT&E Right of Way Management Section for permits.

### **COMPLETE INSPECTOR'S DAILY REPORTS**

It is mandatory for the CI to fill out an Inspector's Daily Report (IDR), one for each contract day and one for each contract they are working on. Even if there is no work performed that day an IDR should be filled out. The CI should use standard IDR forms. The CI should attempt to complete the IDR the same day the IDR is reporting on. At the latest, all IDRs need to be complete by the end of the following day. The IDR will constitute the official daily diary of the project. It will provide the most comprehensive record of the installation of the work of the project, the weather, and other conditions affecting the work. The IDR must adequately describe the day, date and contract day number, (determined usually by the Notice to Proceed, i.e., Day #1 is the first day after date of Notice to Proceed), weather conditions and temperatures, personnel and equipment on site, work performed, instructions given or received, problems encountered, delays and disruptions, materials received, quantities of work installed, visitors to the site and other relevant information. As this is one of the principal forms of documentation on the project, great care should be taken to be thorough and accurate when completing the IDR. The IDR should not be viewed as an exception report, detailing only the negatives, but rather as a definitive report that accounts for all construction work and practices observed by each inspector, whether or not they are in compliance with the contract documents. It is permissible to commend good work and extra efforts as well as record deficiencies. It is required that the IDR be made out using ink pens, not pencil that can fade and smudge over time. The IDR shall be filled out on the City's standard form per the instructions attached.

All original IDR's including all calculation sheets, tickets, certifications and testing slips should be given to the CE at a minimum of every week to be filed in a secure location.

All areas on the IDR must be filled out. If the area is non-applicable put NA in the box.

### **INSPECT THE WORK AND MATERIALS INCORPORATED**

The CI should physically inspect and verify that the project is being constructed in accordance with the plans and specifications, in compliance with the terms of the contract and/or in accordance with sound engineering and construction practices. The CI should observe and measure as many of the contractor's activities as possible. It is important for the CI to observe any work during installation that will be covered up or not accessible once completed. If possible, the CI should be present for all concrete pours. Work items of high dollar value, for example asphalt paving, should be given special attention and the CI should be present during the entire operation if possible and talk to the CE if additional resources are needed.

The CI should inspect all materials delivered to the worksite and confirm that the materials meet the specified requirements. All incoming materials should have required documentation including certification that materials have been manufactured/processed in accordance with specified quality standards and passed all required inspections and tests. The CI will check all such documentation and forward it to the CE for filing. Storage and protection of all delivered materials shall be checked periodically to ensure that there is no

deterioration of the materials prior to incorporation in the work. The CI should try to identify any deficient material before installation.

Offsite inspections may be required. The CE and the CI should schedule with the Contractor any offsite inspections needed. Inspectors shall provide details of inspections, tests, sampling performed, and conditions observed on the IDR. Status of progress in fabrication/production and conformance with the required schedule should be noted and the CE informed of any potential for delays due to quality or production problems.

The CI should ensure that all necessary testing is performed on all items that are to be incorporated into the work. Record all testing done on the IDR.

## **RECORD QUANTITIES FOR COMPLETED WORK**

Recording measured quantities for completed work is one of the most important duties of a CI. Quantities, location and the related pay item for each activity of work completed needs to be accurately recorded on the IDR. The CI shall include complete and attach to the IDR accurate calculations for each pay item. Quantities need to be kept per street (asset). Quantities will be entered in to the construction database by the Data Inputter. The database will record and tally the quantities. The CI shall notify the CE of any deviation in as-built quantity compared to contract quantity. If an item is going to overrun contract quantity the CI shall notify the CE immediately to get direction as to how to proceed.

For any item of work where there is no pay item, the CI should notify the CE as soon as possible. The CI should keep Force Account Records for any of these items or for any item where the contractor or the CI feels that the existing conditions are so different from the plan that the contractor could not have planned for in his bid. Force Account Record sheets need to be as accurate and detailed as possible. The CI should get the contractor's representative to sign off on any force account record kept.

The CI should keep a clean set of contract drawings to use to record as-built information. The as-built set of drawings should include any changes made to original contract drawings. Dates of when items are completed should not be put on the as-built set. The CI should compare on a weekly basis their set drawings with the contractor's information.

## **CONSTRUCTION INSPECTOR'S GENERAL DUTIES AND RESPONSIBILITIES**

### **1. GENERAL**

- Get to know the plans and specs
- Be equipped with the tools needed to perform their duties: tape measure, measuring wheel, ruler, safety equipment, relevant standard drawings and specifications, relevant supplemental specification, City of Cincinnati policy, procedure and safety manuals, calculator, pen, scale, camera, cell phone, a sufficient supply of relevant forms, and any other relevant specific job-related equipment
- Look for potential conflicts with plans, specs and existing conditions
- Check with the contractor to understand his plan and resources to complete the work
- Check with the contractor on access, storage, and dumping areas with approved dumping permit
- Talk to the contractor about planning ahead for any tie-ins, shutdowns and tests required
- Verify the contractor has checked key elevations before installing permanent work. If necessary have the City surveyors check
- Review material and equipment installation against the approved shop drawings
- Verify approved shop drawing and contract drawings are used for construction
- Keep Force Account Records for all items of dispute or for items of work where there is no pay item

- Assist in preparing punch list
- Do a final inspection assuring all punch list items are complete
- Do a one-year warranty inspection
- Be familiar with permit requirements and other agencies' inspection requirements
- Monitor the contractor's short term schedules
- Keep a set of as-built drawings and review contractor's as-built information on a weekly basis
- Verify traffic control is per installed per plan

## **2. PAY QUANTITIES**

- Ensure that the quantities for payment agree with the work in place and are documented on the IDR and that pay item numbers, locations and calculations are complete and accurate.
- Verify quantities for stored materials for which payment is being requested
- Get from the CE a copy of the designer's take-off and quantity calculation sheets. Use these to verify bid quantities match actual work complete
- Notify the CE of any deviation from as-built compared to contract quantities

## **3. INSPECTOR DAILY REPORTS (IDR)**

- Complete IDR daily in black ink pen
- Each area of the IDR is filled in
- The IDR should be accurate and factual and have no erasures. Cross out mistakes and initial corrections (no white out)
- Record rainfall and weather conditions
- Record who was representing the contractor on site
- Describe progress made
- Record any problems and the cause for (example, contractor's equipment failures)
- Record all pay items and quantities completed
- Record any change order work done and note if any force account records were kept
- Record any verification of line and grade and when contractor's as-built information was checked
- Record total work force on site including all subcontractors
- Record all equipment on site including idle equipment
- Record location and quantity of rock and unsuitable material encounter, and keep forced account records
- Record any changed existing conditions, keep force account records if needed
- Record the delivery of materials. Get copy of certifications
- Record any testing done and how long testing agent was on site
- Record any safety concerns
- Record any visitors
- Record surveying activities
- Record any relevant conversations with property owners or businesses
- Record contractor's and inspector's work hours

## **4. PREPARATORY INSPECTION MEETINGS**

Before the beginning of each segment of work participate in quality control meeting with the contractor. The following topics should be discussed:

- Contract requirements for the work activity
- Quality standards and codes
- Action items required before the work can start, e.g. approved shop drawing, samples, mock-ups, permits
- Testing requirements



- Contractor's person in charge of specific work items
- Safety and environmental requirements
- How do outstanding RFIs, RFPs and Change Orders affect planned work
- Discuss any layout needed

#### **5. UTILITIES**

- Check with the contractor to verify that the utility owner has been notified of the intended work. The Contractor shall contact the Ohio Utility Protection Service at 1-800-362-2764, 48 hours prior to any excavation
- Verify any proposed construction is marked in white paint
- Check to see if the general area of excavation is clear of marked utilities and there are no conflicts with proposed work. Compare with what is shown on the plans
- Verify the contractor's method of uncovering utilities
- If damage to a utility results from the contractor's work, see that the owner is notified immediately and the damage is not covered up

#### **6. NOTICES AND REQUESTS**

- *Verify and record that notices have been made per the contract requirements, e.g. driveway replacements and no parking restrictions*
- Verify other agencies that have inspection requirements have been notified as to start of work
- Verify release of real estate parcel and temporary construction easements
- Verify Police and Fire District is notified of major access changes or road closures

#### **7. MATERIAL CERTIFICATES**

- Check to ensure that delivered materials for which certificates of compliance have been approved have a copy of the certificate included with the shipment and contain the information per City Supplemental Spec Section 106
- Notify the CE of any deviations found between the materials delivered and the certificates provided
- Attach material certificates to the IDR

#### **8. PHOTOGRAPHIC RECORDS**

- Photograph any special event worthy of extraordinary attention and note on the IDR photos were taken
- Photograph any condition that differs from what is shown on drawings
- Take random area-wide photographs to document overall conditions. Select a location that covers a wide area of construction
- Select a convenient place near each major part of the project and photograph the work in progress regularly from that same location
- Signs of inactivity are just as important as activity photographs
- Ensure that you are close enough to the work to show detail in the photograph and that the scale of items in the photograph can be easily determined: Use people, tape, hardhat, for reference
- Label and give all photographs to the CE to put in the project file
- Photograph any existing damaged conditions or damage caused by a contractor
- If the camera has a data back make sure that it is properly set

#### **9. TESTING SERVICES**

The City has service contracts with pre-approved testing firms. These contracts need to be administered just like any other City contract. Money for specific services needs to be certified and the work done needs to be verified and recorded.

- Review and discuss with the CE contract documents for testing requirements
- Get name of testing agency and contact from the CE
- Talk to the contractor on a daily basis and decide what testing is needed for the next day's work
- Call testing agency 24 hours in advance for any testing needed
- Log on the IDR any test performed that day
- Coordinate with the CE and Contractor any off-site testing
- Pay items should be recorded on the IDR

#### **10. PERSONAL SAFETY**

- Clothing: long pants (shorts when appropriate per DOT&E policy), hard hat, shirt, and work boots are minimum
- Wear eye protection when around: grinding, chipping, cutting and air blowing operations, welding
- Wear ear protection when near jack hammering, pile driving or loud equipment
- Wear dust respirators when around flying dust particles
- Safety harness must be worn when in presence a fall hazard
- The CI should have a first aid kit in his car at all times
- Do not enter any confined space without proper equipment and training and obtaining the appropriate permit
- Wear safety vest when needed
- Report any personal injuries immediately to your supervisor and fill out any required forms
- Be familiar with the requirements in the City of Cincinnati's Employee Safety Instruction Manual (Green Book)

#### **11. CONTRACTOR'S SAFETY**

- Observe but do not direct the contractor's safety operations
- Know the name and contact number for the contractor's field safety person
- Bring to the contractor's attention any unsafe conditions you notice and record on the IDR
- Issue a stop work order for any contractor's operation you feel puts an employee or citizen in immediate danger; notify the CE immediately
- Avoid putting yourself in any unsafe condition
- Record any accidents or injuries on the IDR
- Observe that the contractor has Material Safety Data Sheets (MSDS) for any required materials
- Have available and be familiar with the contractor's specific site safety plan

#### **12. TRAFFIC CONTROL**

- Review contractor's traffic control plan and check to see that it is in place
- A street blocking permit is required for any lane closures not identified in the contract
- Meet with the contractor and review his plan for putting traffic control in place
- Check to see that flaggers are properly equipped: vests, paddles, signs
- Ensure off-duty police are in place where required
- Check routinely: warning signs, barricades, lights, striping, cones and drums are being maintained, and at minimum check before leaving the site at the end of the day. Note on IDR
- Verify tenants and owners adjacent to the work site have been notified well in advance of any operation that may impair access
- Notify Traffic Engineering and the CE of any deviations in the approved traffic control plan or if the CI has any question or suggestion about the traffic control installed

- Make sure all traffic control equipment and signs are removed at the end of the project
- Have available and be familiar with the requirements of the relevant standard traffic control manual
- Verify Police and Fire Districts have been notified of any major change in traffic patterns

### **13. TEMPORARY FACILITIES**

- Assist the contractor in selecting a location for the field office, get approval from the CE
- Verify the field office meets minimum contract requirements
- Upon completion ensure that all temporary facilities have been removed, all trash and debris are cleaned up and the area is graded to proper elevations
- Work with the contractor to get temporary utilities hooked up in a timely manner

### **14. CLEANING**

- Check to ensure all work areas are being kept clean on a daily basis
- Inspect the worksite on a regular basis for hazardous conditions and note on the IDR
- Do a final inspection to ensure the entire site is clean of all construction debris
- Ensure that spillages of materials onto roadways, walking surfaces, and private property are removed immediately
- Ensure proper dust control is used when sweeping streets and sidewalks with mechanical equipment

### **15. LAYOUT**

- On most City contracts the DOTE is responsible for layout. The CI should get from the CE the name of the surveyor responsible for the contracts assigned to them
- The CI should talk with contractor frequently to find out what layout will be required and when it is needed. Record on IDR when layout is requested
- The CI will arrange with the surveyor for the layout to be done. It is important that timely layout be done so as to not delay the contractor. Record on the IDR when the surveyor is contacted and when the layout is done
- The CI should meet with the surveyor once he arrives on site and go over the layout needed. The CI is responsible to know what the survey stakes and markings say and how to interpret them compared to the plan drawings; ask the surveyor or CE to explain if not sure. The CI should also notify the contractor when the surveyor arrives on site.
- The CI should check the contractor's work against the survey stakes on a regular basis. Record on the IDR this was done
- For critical items such as a bridge column the CI may want to contact the surveyor to verify line and grade of the contractor's formwork before the concrete is poured
- Where line and grade is critical (example: paving a flat street) the CI should call the surveyor for assistance

### **16. PROJECT RECORDS**

- The IDR is the most important record of the entire contract. It is desired that the CI turn in the original IDR and all the attachments to the CE on a daily basis. However, this not always possible and at a minimum the IDRs should be given to the CE weekly. The CI is responsible to keep their IDRs in a secure place until they are turned in to the CE
- 
- The CI's as-built drawings shall be kept in the field or district office; they are not to be removed. They should be kept clean and in good condition
- The CI and CE should review the contract files before a job begins. They need to determine where the appropriate storage place for the contract files should be

- At the end of the contract the CI should give the CE **ALL** their files before the contract is closed out

### **17. PUBLIC RELATIONS**

- The CI usually has direct contact with the property owners affected by the contract they are assigned to. The CI should be available to answer any questions and address any concerns the property owners may have. A simple conversation may save much aggravation in the long run. Be proactive not reactive
- The CI is viewed as a representation of all City employees when they are in contact with the general public. The CI should treat the general public with respect
- The CI should not talk to the media; refer them to the CE. Immediately notify the CE if approached by any type of media
- The CI should respond to complaints as soon as possible

## SECTION 2.0 EARTHWORK

### 1. CLEARING AND GRUBBING (ODOT 201)

- Consists of clearing, grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris within the project limits (unless removal of trees and stumps is a separate pay item).
- 201 Removal of trees and and/or Stumps may be a separate pay item; if not it is included in 201 Clearing and Grubbing – a Lump Sum pay item.
- Trees – if separate pay item – based on measure of diameter of trees at a height of 54 inches above the ground. Trees 12 inches and less in diameter are classified as brush.
- Contractor shall scalp areas where excavation or embankment will be performed.
- Scalping includes removal of roots, sod, grass, decayed vegetable matter from the surface of the ground.
- Scalping under 201 is not intended to include topsoil removal; additional material beyond roots, sod, etc. is paid under 203.
- Confirm the limits of clearing and ensure the area is clearly marked and document existing conditions with photographs as needed
- Check that trees and shrubs designated to remain are clearly marked for identification and protection. Contact Forestry to have a forester or arborist inspect any trees to remain to determine its relative structural safety and potential chances of survival. If trees to remain – do not excavate within the drip line of the tree or cut roots within the drip line of the tree. If roots do get cut - they need to be treated per Forestry direction.
- Check to see that the Contractor has located and marked existing utilities
- Verify the Contactor is complying with disposal requirements
- Burning and/or burying of debris is not permitted
- Verify the Contractor has protected survey benchmarks and offset stakes
- Verify existing elevation conditions with surveyors after scalping
- Before moving equipment across culvert pipe, waterlines ducts, other utilities, make sure the contractor has properly filled or supported the pipe
- Check to ensure the Contractor does not stockpile earth within the root zone of trees indicated to be saved

### 2. GENERAL BUILDING DEMOLITION

- Check to see demolition plan and procedures have been submitted and approved
- Demolition outside the right-of-way requires a building permit
- Verify that the plan includes items such as safety, fencing, dust control, rodent control, disposal and a schedule
- Verify environmental abatement that is required has been performed
- Verify premises are uninhabited and the City owns the property
- Verify utilities have been turned off and properly disconnected
- Verify that water sprinkling is used to control dust without causing run-off or icing
- Check to see rubble is broken up to appropriate size in accordance with contract
- Comply with contract and city deposal requirements, (ODOT 105.17 and/or City Municipal Code 1031).
- Verify final restoration requirements have been met

**3. REMOVAL OF STRUCTURES AND OBSTRUCTIONS (ODOT 202)**

- Consists of removal as directed by the specifications, salvaging or disposal, and backfill of voids incidental to the removal.
- If no 202 Item exists, removal shall be paid under 203 Excavation.
- For new sidewalk and curb, removal of existing sidewalk and curb is included in price of new, unless the Contract has a specific removal item for sidewalk and curb, then it is paid separately.
- Check ODOT 202 and the City Supplement for specific removal requirements for different type of structures.
- Check City Supplement 202 for specific plugging and filling requirements for abandoned pipes
- Pavement, walk, curbs etc. that are partially removed must be neatly cut prior to removal, with pavement and walk removed to the nearest joint
- Check City Supplement 1121 and 1122 for filling or removing CWW facilities
- Be familiar with the method of payment directed by contract: "lump sum," "cubic yard," "each," etc.

**4. CONSTRUCTION AND DEMOLITION DEBRIS – (ODOT 105.16 AND 105.17)**

- Verify the Contractor's plan for disposal of materials
- *Contractor to notify Board of Health and Local Ohio EPA office 7 days before placing fill in the right of way. Send copy of notification to CE.*
- *If applicable apply to the requirements of City Municipal Code Section 1031 Soil Contamination Standards*
- A cut/fill permit is required, if the deposal site is within the City of Cincinnati and outside the right-of-way
- Contractor must submit an executed copy of permission to dump from the property owner per ODOT 105 for each dumpsite. The contract or permission statement must state that the waste materials are not the property of the City of Cincinnati. It must also state that the City of Cincinnati is not a party to that permission statement and that the Contractor will hold the City of Cincinnati harmless from any claim that may arise from the permission statement
- Permission statement should also include ingress/egress plan, dust control plan, erosion/sediment control plan, and a restoration plan
- Contractor must obtain any other required permits from the appropriate jurisdiction prior to work
- Verify dumping procedures and log on IDR

**5. EXCAVATION AND EMBANKMENT (ODOT 203)**

- Consists of preparing areas upon which embankments are to be placed; excavating for the roadway including removal of all materials encountered not paid under another item; constructing embankments with the excavated material and material from an approved source as necessary; and disposing of unsuitable and surplus materials.
- The method for arriving at pay quantities for excavation, embankment and/or borrow should be agreed to in advance by the Contractor and the Engineer/Inspector. Payment is based on Cubic Yards of materials – in place.
- Payment for excavation, embankment and/or borrow is usually based on the plan quantities, plus or minus any measured deviations, such as undercuts
- Plans should provide cross sections along with the calculated volume for each cross section so that daily quantities can be calculated from station to station
- *If cross sections/volumes are not included on the plans, notify the Engineer so that*

*either the quantities calculated by the designer can be obtained and/or a before and after survey of the excavation, borrow or embankment area can be made. Note any deviation from cross sections on IDR.*

- Compare calculated quantities with contractor's truck count on a daily basis to mitigate discrepancies in quantities
- Earthwork consists of roadway excavations (cuts) and roadway embankments (fills)
- If pavement is to remain smooth and stable for years of service, the earthwork on which it is built must be stable and must furnish uniform support
- Embankment is a structure consisting of soil, granular material, shale, rock, or random material, constructed in layers to a predetermined elevation and cross sections.
- Embankments shall be constructed only of suitable material and shall be properly compacted according to the type of material being used and its location in the embankment; involvement of the testing agent is critical.
- Borrow is material obtained from approved sources, outside the right-of-way, required for the construction of embankments.
- Material from outside the right-of-way used in embankment is considered to be borrow even though it is not paid for as borrow
- Have borrow source material checked for suitability by a Proctor Test
- Embankment to be placed in 8" lifts
- 203 Embankment item includes furnishing suitable material from sources other than excavation if needed.
- Check to ensure the testing consultant is prepared for fill placement, i.e. Proctor tests have been performed, gradation tests have been performed, etc.
- Having a "Proctor" density test of bag sample of fill/backfill or base material provides the Maximum Theoretical Density (MTD) at the optimum moisture content
- All subsequent in place density tests are measured as a percentage of the MTD
- If the compaction of a material is not reaching the specified %MTD, the moisture content may have to be adjusted to bring closer to optimum either by disking the material to dry it out and lower the moisture content, or by adding water to raise the moisture content
- Schedule density test and/or proof roll observations in advance
- Compaction of embankments and subgrades are measured as a percentage of the MTD and range from 98% to 102% of the MTD (203.12)
- Review contract documents for earthwork requirements, i.e. compaction, moisture content, minimum dry density, etc.
- Coordinate between the Contractor and the testing consultant to ensure testing frequency is met
- Make sure the correct compaction equipment is used and that enough compactive effort is being exerted on lifts that are not tested
- Any tests that fail, make sure area is reworked until it passes before placing additional fill
- Contractor is required to provide drainage for the excavation to ensure thorough drainage of the excavated area or subgrade
- If under drains are needed, and they are not provided for in the plans, consult with the CE for remedy
- If the contract does not separately pay for 201 Clearing and Grubbing, 201 Removal of Trees and/or Stumps, or 202 Removal of Structures and Obstructions, they are considered subsidiary obligations of 203.
- If excavation uncovers bones, artifacts, potentially significant historical or

- archeological objects, cease operations immediately and notify the Engineer.
- If excavation uncovers abnormal material such as; drums, tanks, etc., or unusual odors or colors of material, contact the CE immediately. The work shall cease with equipment remaining in place. Fill out Force Account sheets for down time and the contractor shall cordon off the area until such abnormalities can be investigated by proper parties.
  - If excavating the unsuitable material two to three feet and suitable material is not found, consult with the CE for the appropriate remedy: geofabric, geogrid or other methods must be considered
  - Payment can be made for extra fill or excavation needed above through contingency items such as Special Fill and Special Excavation per City Supplement 210 ad 211.
  - In pavement widening construction, 203 shall include cutting away the old pavement along a neat line as directed by the Engineer, and removing and disposing of the old pavement.

#### **6.0 SUBGRADE COMPACTION AND PROOF ROLLING (ODOT 204)**

- Subgrade under new pavement shall be compacted according to type of material and the depth of the subgrade compaction required ODOT 204. Subgrade Compaction is paid as Square Yards of paved area plus 18" beyond the edge of the pavement.
- Areas of subgrade that are soft due to no fault or neglect of the Contractor shall be cut out and replaced with suitable material and paid through the appropriate excavation/embankment items.
- Areas of subgrade that are soft due to fault or neglect of the Contractor to provide drainage shall be cut out and replaced with suitable material at no expense to the City of Cincinnati
- Large areas of subgrade that are soft due to no fault or neglect of the Contractor should be examined by the Engineer and/or Geologist to determine an appropriate remedy which may include geofabric and/or geogrid. Geofabric and or geogrid should be included as contingency items in the contract in case of soft subgrade
- Proof rolling may be ordered to confirm subgrade or subgrade and subbase stability and should be included as a contract pay item. Proof rolling is generally performed by observing the subgrade with a loaded dump truck driving back and forth over compacted subgrade. Proof Rolling is paid by Hours - time spent utilizing truck over subgrade.
- Close inspection throughout proof rolling is necessary to observe the effects of the rolling and to mark locations of soft subgrade for correction
- Inadequate stability due to rolling is indicated by deflection, cracking or rutting of the surface of the subgrade
- The failure criteria for proof rolling is not as straightforward an answer as it might seem: failure is based on experience and if in doubt, consult with the CE
- If the CI is inexperienced in identifying inadequate subgrade from proof rolling, they should consult with the CE or another inspector to observe the operation with them until they feel comfortable in identifying problems
- Proof rolling should be done as soon as possible after regular compaction, before the subgrade has a chance to become too wet or too dry
- Drying or wetting of subgrade as described below shall be at the direction of the Engineer.
- If the compaction of a material is not reaching the specified %MTD, the moisture content may have to be adjusted to bring closer to optimum either by disking the material to dry it out and lower the moisture content, or by adding water to raise the moisture content



**7. SOIL EROSION AND SEDIMENT CONTROL (ODOT 207 AND SUPPLEMENT 832)**

- 
- Place according to the plans or as ordered by the Engineer before any clearing and grubbing, excavation, embankment, and/or borrow activities begin. Maintain for life of the contract
- Early seeding of slopes is the most effective erosion and siltation control
- Contractor should schedule his clearing and grubbing, excavation, embankment and borrow activities commensurate with his abilities to install permanent erosion control measures
- When seeding and mulching of significant areas is not performed in stages as directed by the Engineer/Inspector, work on earthwork items may be suspended until the exposed erodable areas are seeded and mulched
- Check erosion control after every significant rainfall or at least once a week and re-establish as necessary
- When suspension is necessary, the Contractor should be notified in writing, detailing deficiencies and necessary action required
- Maintain records of inspections in the IDR
- In accordance with 207, the Engineer/Inspector may withhold progress payments until proper control is achieved
- Verify removal at completion of project
- For all ODOT LPA projects and any Contract where one acre or more of surface is being disturbed and the run-off goes directly into a river or stream – then a Stormwater Pollution Prevention PLAN (SWP3) is required and Supplemental Specification 832 should be included in the Contract.
- Payment under Supp 832 is SWP3 – LUMP Sum – to be paid per 5 indicated in 832, and Erosion Control each. The each represents \$1.00 to be paid per established prices in 832 Appendix F.
- Complete Form in Appendix A weekly.

## SECTION 3.0 STREET REHABILITATION

### 1) INTRODUCTION

The Street Rehabilitation (Rehab) Program is the primary source of funding for the Construction Management (CM) Section. For that reason, an entire section is dedicated to the Street Rehab Program. In addition to the contract administration for the rehab contracts, the CM section also assists in the initial set-up of the contracts. It is essential for the overall success of the rehab program and the long term stability of the CM section, that those involved with the rehab program, perform their duties efficiently and consistent with the practices in this manual.

### 2) SET-UP

Contract set-up is usually performed in the winter months after construction is shut down. This gives those CI whose jobs are shut down for the winter a program to work on. Set-up crews consist of 2 to 6 people depending on available bodies and the size of the streets. Crews should meet and return to the same stationary office. Crews should maximize the time spent doing field work on days where weather is permitting and save calculations for the bad weather days.

Set-up consists of stationing the segment of streets to be rehabbed, doing a curb ramp assessment at each intersection and documenting the estimated quantities of work to be done. The CI is the eyes of the Design Engineers who rely on them to bring special notice of any irregularity in existing conditions or proposed work on the street segments. Standard forms have been developed to log and document proposed items of work (see appendix). Some of these forms are also used for documenting actual construction. Consistency and accuracy in the set-up process is essential for complete and competitive contracts and to maximize program funds. The following are the steps involved in set-up.

- Title Sheet and Summary Sheet

One person is usually dedicated to fill out the title sheet during the field visit. Note any recommendations, problems or irregularities found during set-up. List all intersecting streets and quantities to be included on those streets. Note if corings are needed. Note if the street is a bus route. Note if striping plans are needed and loop detectors exist. Note supplemental street lighting gas or electric.

The summary sheet is a tabulation of all the quantities on the set-up sheets. This is filled out in the office and can be done on bad weather days.

- Stationing

This function is performed by one inspector using a measuring wheel and white paint. Stationing starts at 0+00 at the near curb line. Stations run from east-west and south-north. Mark on the right side of the street, every 50 feet, on the sidewalk or curb where no walk exists.

- Curb and Flatwork

Follow the curb replacement policy for conditions and limits of curb removal. Replace broken, cracked, sunken and misaligned curbs. New curb adjacent to private property is to be separated from the walk and driveways. If replacing 100% curb, look at options for putting back different types of curb and opportunities to improve grades and profiles. Driveways should be replaced where there are grade changes. If the curb in front of a driveway is being replaced and the driveway is in poor condition include some quantity to repair the driveway.

Look for any unusual rutting due to transit buses. If needed set up quantity for new bus pads.

- Curb Ramp Assessment

A curb ramp assessment needs to be made at every intersecting street in accordance with the Street Rehab Curb Ramp Policy (see appendix), this is done by consultants. CAGIS maps are produced for each intersection listing 6 assessment questions for each corner. Ideally, so the proper quantities can be included. However, the set-up crews should include worse case quantities in the initial set-up.

- Manholes and Inlets

Set-up crews log the location and type of every utility casting. This existing condition record is needed to verify that no castings are buried during the rehab process. Assume every casting will need adjusting. Note if rings are suggested instead of brick and mortar adjustment. Note any old type or broken castings that need to be replace. Note if new bicycle grates are needed for inlets casting.

- Full Depth and Partial Depth

The rehab PM will calculate the partial depth quantity. Set-up crews estimate full depth repairs. Estimating full depth is difficult since you cannot see condition of the pavement base. Assume worse case and include any area where the pavement is alligating, offset, sunken or deteriorated. Streets with brick or stone bases should be carefully evaluated for other options than spot full depth repairs.

- Asphalt

Asphalt quantities are also calculated by the PM. Look for any unusual street conditions: rutting, flat crown, low areas, drainage problems, major deterioration, insufficient street thickness, low curb height. Note on the title sheet any recommendations needed that will vary from the normal 1" leveling and 1" surface or the type of asphalt used.

### 3) CONSTRUCTION STARTUP

The CI should plan his work so as to not be a hindrance in the startup of a rehab contract. The CI should get a list of streets, from the contractor, in the order they are to be worked on and plan his work accordingly as to stay ahead of the contractor. The CI should touch up the stationing and mark the limits of work prior to the contractor starting. The CI should compare proposed work quantities to be estimated and if there is a difference let the CE know. The CI should be familiar with the items and descriptions of work for each street. Do not assume all contracts are the same: read the special provisions of each contract prior start of work. Make a note of anything that is non-standard and discuss it with the contractor. Quantities are kept per asset (street). Record all completed quantities on the proper forms with street and location (station) and summarize on the IDR for each pay item of work for each street.

The CI should know who the primary contact person is for the contractor and get their daytime and 24 hour phone numbers. All Road Construction signs should be in place before any work begins. Proper posting of temporary no-parking restrictions is a must (see appendix). Remove all no parking signs at the end of each day's work.

### 4) DESCRIPTION WORK

- Pavement Planing

ODOT Item 254. Usually consists of removing 2" of existing asphalt. Prior to grinding the CI should look at the street for any drainage, profile or structural problems. The depth of grinding may be varied: to get more curb height, fix a drainage problem, change profile of the street or to get to the top of existing concrete base. Consult with the CE before making any changes to the contract. All manholes, driveways and butt joints need to be wedged and temporary striping needs to be in place before opening to traffic. Final quantities need to be verified by City Surveyor. Mark limits in to side streets to allow for proper installation of ramps.

- Partial Depth Repairs

ODOT Item 251. This item includes removal by grinding of 3"-5" of deteriorated concrete base, applying tack coat and placing asphalt (see City standard drawing for

details). Note on asphalt tickets the amount of material used for each pay item. Log quantities and locations on appropriate sheets.

- Asphalt Leveling Course

ODOT Item 448. This item includes placing tack coat and asphalt intermediate course. Clean street and place tack in accordance with contract requirements. Most contracts are set up for 1" of leveling. However, to establish a crown, fix a drainage problem or to add to the strength of the street, increased thickness may be needed. Consult with your CE before making any changes to the contract conditions. Compare actual placed asphalt versus estimated. On streets that are flat with little cross slope or fall from one inlet to another, pay special attention to final grade. Check with 25' level if necessary. Do spot measurements of uncompacted placement (1.25" uncompacted = 1" compacted). Asphalt material test and density tests need to be performed by City testing agent. The CI should be familiar with density requirements and meet with testing agent to confirm results. Log and tally asphalt tickets per street. Temporary pavement markings need to be in place before opening to traffic. Temporary markings shall be placed per the permanent drawings as provided by Traffic Engineer. The contractor should install uneven pavement signs where needed. Once in place call Traffic to inspect to see if any changes are needed on final surface.

- Full Depth Repairs

ODOT item 252 and 253. This item consists of the full depth removal of deteriorated concrete or asphalt base, correcting the subgrade and placing compacted asphalt. When full depth is to be performed after leveling the CI should inspect pavement base immediately after grinding and log areas to be done. The pavement repair is only as good as the subbase, so pay special attention to the condition of the exposed subbase. Density tests for the asphalt should be performed by City testing agent. Note on asphalt tickets the amount of material used for each pay item. Log quantities and locations on appropriate sheets.

- Concrete Curb, Driveways, Walks and Curb Ramps

ODOT item 609, curbs. This work consists of removing and replacing sections of deteriorated curbs and restoration of street and sod area. Adhere to the current rehab curb replacement policy for limits of replacement (see appendix). In accordance with city ordinance, all new curb in front of private property should be separated from walks and drives. Use Curb Sheet to document location and quantities of actual work complete. Replace curb within two days after removal.

ODOT Item 608, walks and curb ramps. This work consists of removing and replacing walks and curb ramps. Follow the procedures in the Street Rehab Curb Ramp Policy for laying out and constructing new curb ramps (see appendix). Log quantities and location on appropriate sheets. Curbs for curb ramps are poured as lug curb. All quantities for ramps are separate pay items for like rehab work.

ODOT Item 627. This work consists of removing and replacing concrete driveways. This item is used for driveways that need to be replaced due to grade change, not the condition of the drive. When replacing entire driveways document width and location of existing driveway. Contractor shall notify the residents prior to removal. Log quantities and location on appropriate sheets.

- Adjustments and Repairs of Inlets, Manholes and Castings

ODOT Item 602, 603, 604 and 1111. These items consist of adjusting manholes, inlets and valve chambers to grade using precast concrete shim or bricks and mortar and making necessary repairs with brick masonry. The CI should pay special attention to the elevation of the adjustment (string if necessary) since this will dictate the final surface course elevation. Review contract Special Provisions for pavement restoration requirements. Replace deteriorated casting as needed. Notify

SWM/MSD inspector prior to doing work, document work done on appropriate sheets and get sign off from SWM/MSD inspector. Utility adjustments other than water and sewer are done by the owner of the utility. The contractor is responsible to schedule this work. Utility contractors need to follow the same traffic restrictions and restoration requirements as city contractors. Except for keeping track of pay quantities, the CI should inspect this work the same as contract work.

Repairs to inlets and manholes need to be pre-approved by the SWM/MSD inspector.

- Asphalt Surface Course

ODOT Item 448. This item consists of placing tack coat and final asphalt surface. Clean street and place tack in accordance with contract requirements. Schedule testing agent to perform density and material tests as required per contract. Log and tally asphalt tickets per street. Match final grade of manholes, inlets, driveways and curb ramps. Seal edges and butt joints. Temporary striping needs to be in place before opening to traffic.

- Pavement Markings/Loop Detectors

ODOT item 644. This work consists of applying screed extruded thermoplastic pavement markings per drawing provided by the DOT&E Planning Section. Planning must approve layout prior to placement. Remove any conflicting or temporary markings.

ODOT items 1321, 1322, 1323 and 1328. This work consists of replacing traffic signal loop detectors per Traffic Engineering drawings. Traffic Engineering must approve layout prior to placement. Install loops after final pavement markings installed.

## 5) **CLOSE-OUT**

It is important that the street rehab contracts be closed out in a expeditious manner. The CI should produce a punch list immediately after final paving. Unless otherwise stated the contractor has 30 days to complete the punch list work. Upon completion of the punch list a final walkthrough inspection is held. Participants in the final walkthrough should include the CI, CE, PM, SWM/MSD Inspector, Sidewalk Manager, Planning and Traffic Engineering. The contractor is responsible to maintain the contract area until Final Acceptance.

The CI should do a final drive through on all rehabbed and adjacent streets to assure all temporary construction signs are removed.

Turn in any and all contract related documents or paperwork to the CE to be incorporated in the contract file.

Contact City Surveyor to do a final survey for as-built lane mile calculation.

Perform one-year correction and repair inspection.

## Section 4.0 Asphalt and Aggregate Base

### 1) Aggregate Base Course (ODOT 304)

- This work consists of furnishing, placing, compacting one or more courses of aggregate at grades shown in the plans for use as pavement base
- Review drawings and specifications for type, total thickness, maximum lift thickness (6 in maximum), and compaction requirements.
- Contact testing agent and arrange for stockpile sampling and testing for proper density. If contractor is having problems achieving proper density contact Engineer.
- Check that subgrade is at proper grade and compaction
- Check that material is coming from an approved source
- Get copy of each delivery ticket and attach to IDR
- Check that each layer meets grade, thickness and compaction requirements with special attention to areas near castings or other obstructions including edge of pavement.
- Material shall be spread by self propelled spreading machine if area is greater than 2000 SY  
Pay quantity is measured in Cubic Yards. See ODOT CMS 304 for conversion from tons to cubic yards.

### 2) Bituminous Aggregate Base (ODOT 301)

- This work consists of placing bituminous aggregate and compacting it at grades shown on the plans for use as pavement base.
- Follow the general guidelines of ODOT 448.
- Review drawings and specifications for type, total thickness, maximum lift thickness (6") and compaction requirements.
  - Second lift should not be placed until first lift is sufficiently cooled.
- Contact testing agent.
- Check that aggregate base is at proper grade and compaction.
- Verify that JMF is approved.
- Verify that all utilities, conduit and drainage have been properly installed.
- Check ground temperature to assure it is within proper range.
- Verify contractors contingency plan if there is a chance of poor weather.
- Obtain a copy of each delivery ticket and attach to IDR.
- Verify that material is being placed at proper temperature range. **(minimum 250°F)**
- Check that each layer meets grade, thickness and compaction requirements with special attention to areas near castings or other obstructions.
  - Pay quantity is in cubic yards per ODOT 401. Pay quantity to be paid at a ratio of 2 tons to 1 cubic yard. Pay quantity should not exceed plan quantity unless authorized by the engineer.

### 3) Asphalt Concrete (ODOT 448)

- This work consists of constructing a surface course or an intermediate course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface.
- The Inspector should be on site **fulltime** during all placement operations.

#### A. Before Asphalt is Placed:

- Review contract specifications and drawings (JMF, quality control report, traffic control, etc.).
- *Contractor to supply copy of Quality Control Plan*
- The contractor will develop a JMF to comply with composition limits and mix design criteria and submit to the City's testing agent and engineer for approval. The contractor will submit a JMF for asphalt used in ODOT Items 448 and 301.

- Verify that proper documents for recording are at site (**asphalt logs**).
- Verify that the prepared surface is cleaned and maintained free of accumulations of materials that would interfere with the spreading operation and/or contaminating the mixture.
- Verify that improperly placed wedges are removed prior to paving.
- Verify that butt joints are straight and squared off.
- Verify that where pavement courses or subgrade becomes loosened, rutted or defective, the deficiency is corrected in accordance with the requirements of the item or items involved prior to spreading of the asphalt mixture.
- Verify that all surfaces such as gutter plates, manholes, valve chambers, and other structures are painted with a thin uniform coating of tack meeting the requirements of ODOT 702, prior to the asphalt mixture being placed against them.
- Verify the locations of all castings.
- Verify that all inlets openings are covered prior to asphalt paving. In the event that asphalt has dropped into the inlets, require contractor to remove all asphalt debris immediately.
- Verify that prepared surface is dry and weather conditions are such that proper handling, finishing and compaction can be accomplished. Refer to ODOT 401 for minimum surface and ambient temperature requirements. Consult engineer if weather conditions are not dry. (**40°F surface, 40°F ambient for medium mix, 50°F surface and 50°F ambient for heavy mix**)
- Verify that the asphalt-leveling course has adequately addressed grade conflicts in order to meet final grade. Consult engineer or surveyor if needed.
- The contractor is to use spreading equipment that is self-contained and of sufficient size, power and stability to receive, distribute and strike off the asphalt mixture.
- The spreading equipment will have automatic control systems when grades are critical.
- Verify that spreading equipment is heated and ready to go.
- There should be a breakdown roller and finish roller on site meeting the requirements of ODOT 401.
- Verify that 'No Parking' signs are installed in a timely manner. (Streets are to be posted at a minimum of 14 hours in advance per CMC 508-12 *and Procedures for Posting No Parking Signs 2/6/03*)
- If police services are needed to assist in traffic control and parking enforcement, verify in advance that contractor has contacted the police district for availability. (**Police services must be approved by the CE**)
- Contact testing agent 24 hours in advance prior to asphalt paving.

#### **B. During Asphalt Paving:**

- Prior to placing a surface course onto an intermediate course, the contractor will apply a tack coat on the intermediate course per ODOT 407.
- Prior to placing an intermediate course, the contractor will apply a tack coat on the planed surface. The contractor will not apply tack coat to severely raveled or disintegrated pavement.
- Tack coat is uniformly applied at an application rate of 0.10 gallons per square yard. (Approximately 90-95% coverage should be achieved, do not over tack, watch for puddles)
- All transverse joints are to be thoroughly cleaned and have tack coat applied.
- The contractor is responsible for removing tack-coated aggregates in the event it has tracked onto other streets.
- Hand raking is permitted where the spreading equipment is impractical due to size or there are irregular areas to be paved.
- **The asphalt surface course should be flush with the top of inlets castings with an allowable 1" offset above the top of inlet castings on residential streets only. The CI should strive to achieve that the asphalt surface course is flush with the top of inlet castings. On thoroughfares, all inlets are to be flush with the asphalt surface course.**
- **The asphalt surface course should be flush with the curb ramps if positive drainage can be achieved.**
- Where curb heights are low (less than 3"), the placement of the intermediate course on residential streets will terminate 12 to 24 inches from the face of curb to maximize curb reveal per standard drawings.

- One copy of the plant ticket will be obtained for each load delivered to the paver and logged. Several streets may be paved in a one-day production. It is important to record on the asphalt plant ticket which street the ticket represents.
- Asphalt plant tickets should be attached to the IDR.

### C. Spreading and Compaction

- If an asphalt mixture is being delivered by a haul truck that dumps it directly into the paver, the truck should stop just short of the paver. The paver should be moving forward when it comes in contact with the truck. The paver should pick up the truck instead of the truck backing into the paver. When raised, the bed of the haul truck should not rest on any portion of the paver.
- Haul trucks should not bump paver at anytime.
- The paver speed should remain constant. The paver should not be operated at a slower-than-normal speed while the truck exchange is being completed. All paver stops during the spreading operation should be avoided, unless the paver is waiting for the next haul truck.
- The amount of mix in the paver hopper should always be kept at a level above the top of the flow gates. Do not allow paver to be emptied while waiting for haul trucks.
- Keep haul trucks off of newly placed asphalt mat.
- All haul trucks must be covered to help maintain the desired asphalt temperature and reduced any chances of significant temperature loss.
- The asphalt mixture will be compacted by a breakdown roller as soon as the temperature of the asphalt mixture is sufficient for roller coverage. (Blue smoke coming from the asphalt mixture usually means that it is too hot.)
- Verify that the proper thickness of asphalt is being achieved. (1-1/4" placed uncompacted to get 1" compacted)
- Keep breakdown roller as close to the paver as possible when adequate compaction temperatures exist.
- Breakdown roller should move in the direction of the paver.
- Roll cold longitudinal joints first with the breakdown roller on majority of the new mat.
- The most effective way to compact a longitudinal joint is to place the breakdown roller on the hot mat and overlap the joint by a distance of 6" over the cold mat.
- Roll curb line and work towards the middle of the asphalt mat.
- The temperature of the asphalt mixture during production ranges from 265 – 350°F. The temperature of the actual asphalt mixture will be maintained within the ranges of the JMF.
- Compaction must be accomplished before the asphalt mixture cools to a temperature below 175-185°F.
- Ask testing agent to run temperature checks on the asphalt mixture.
- Hand tampers should be used in areas where rollers are not accessible.
- The finish roller is used to smooth out roller marks and improve the smoothness of the pavement.

### D. Testing (per ODOT 2002 CMS Spec 448)

- *The Contractor is responsible to perform tests per ODOT 441. These tests are: AC Content, Gradation, Air Voids and Maximum Specific Gravity (MSG). One sample per 1/2 day paving.*
- *City to perform Verification Acceptance (VA) test. One test per 4 days of paving. VA tests are: AC content, and Gradation. VA tests are compared to contractor's tests per table ODOT 403. If test are within acceptable limits pay factor is adjusted per ODOT 403.*
- *The City is responsible for testing asphalt density, per special provision ODOT 401.*
- *For initial density tests, use MTD as determine by the JMF. To verify actual MTD the City is required to take Bulk Density sample to determine Maximum Specific Gravity (MSG), one per each day paving. Perform MSG Test per ASTM D2041. Maximum Theoretical Density is average of MSG results.*
- *The inspector should meet with the testing agent during paving concerning frequency and location of testing.*
- *Density readings should be taken every 50 feet.*



- Nuclear gauge readings should be taken after each pass of each roller, and the rate of increase in density after each pass determined.
  - A correction should be made to compare the theoretical maximum density to the actual in-place density. The actual in-place density will be used in the subsequent paving days. This value will be used to compute pay quantities and compute density results.
  - The theoretical maximum density is when there are no air voids and 100% compaction is achieved.
  - The required compaction is achieved when the density ranges from **92-96.9%** of the maximum theoretical density as indicated by the samples obtained by the City.
  - Pay quantity is in cubic yards per ODOT 401. Pay quantity to be paid at a ratio of 2 tons to 1 cubic yard. Pay quantity should not exceed plan quantity unless authorized by the engineer.
- The asphalt pay factor will be determined based on the *acceptance tables in ODOT 403*. *Pay is also adjusted at the end of a paving season for Asphalt Binder Price Adjustment per ODOT 401.*

#### F. After Asphalt Paving

- Verify that all butt joint surfaces are sealed
- Verify that all gutter edges are sealed **with the exception of the Central Business District. In the Central Business District, seal the gutter edges on the top of the asphalt leveling course only.**
- Avoid sealing at handicap ramps, inlets and castings.
- Verify that temporary striping is placed properly.
- Verify that any traffic control devices not needed are removed.
- Verify that 'No Parking' signs are removed.
- Verify that all asphalt debris is removed, especially at sidewalks, inlets and driveways.
- Obtain permanent striping plans and verify with Traffic Engineering of layout prior to permanent placement.
- **Verify that loop detector replacement layout is inspected by Traffic Engineering and a 48 hour advance notice given.**

#### G. Quality Control (ODOT 441)

- The contractor will develop a quality control program for design and controls of the asphalt mixture in accordance with 441.
- The contractor may begin production of the asphalt mixture once an approval is obtained.
- During the production of the asphalt mixture, the contractor will perform quality control procedures to verify that the asphalt mixture delivered to the paving site is in reasonable conformance with the limits set in the approved job mix formula.
- The contractor will submit a report to the engineer and testing agent of the results of the quality control measures taken following the completion of production of each acceptance lot.
- The contractor is required to take one (1) marshal sample for each half-day of paving.

The contractor is required to test for the following:

1. Bitumen content
2. Gradation
3. Air Voids – MSG test per ASTM D 2041 and Marshal test
4. Voids in mineral aggregate

*Submit test results on TE-199 report.*

## SECTION 5.0 CONCRETE

### 1) CONCRETE GENERAL (ODOT 499)

#### A) MATERIAL

- This work consists of proportioning and mixing portland cement concrete
- Review drawings and specifications for special notes – check for modified mix design.
- Verify that concrete mix design is approved – check type of mix required – types of concrete included: Class C (roadway), Class F (low strength), Class S (superstructure), HP (high performance), FS (fast-set), MS (moderate-set).
- The water-cement ratio in mix design shall not exceed maximum specified.
- Additional water up to one gallon per cubic yard of concrete may be added at jobsite to adjust the slump or air content, provided this is done prior to discharging any of the batch and within the time limitations. When making these adjustments, the concrete shall be mixed a minimum of 30 revolutions at mixing speed. Retempering after the start of discharge is not acceptable. Record amount of water added on batch ticket. The addition of any additional water (above the one gallon per cubic yard) needs to be approved by Engineer before adding.
- Testing of concrete – in general – concrete delivered to site should be tested as follows
  - Air Test – verify within limits
  - Slump Test – verify within limits
  - Temperature Taken – verify within limits
  - Fabricate beams when pavement is to be open to traffic within 7 days
  - Fabricate cylinders for strength tests
    - Minimum 4 cylinders per test
      - 1 Seven Day Break
      - 2 Twenty Eight Day Breaks
      - 1 Hold Cylinder – to be broken if problems with other cylinders.
- Concrete shall contain 6 (± 2) percent of total air as determined by field tests of fresh concrete.
- Concrete shall have a slump of approximately 1-4 inches with a maximum slump not to exceed 5 inches as determined by field tests of fresh concrete.
- Concrete shall have a temperature of between 50° and 70°F, determined by field tests, as delivered.
- Discharge of concrete shall be completed within 60 minutes after batching (as determined on the batch ticket) unless an approved set-retarding or a water-reducing and set-retarding admixture is used, then discharge of concrete shall be completed within 90 minutes of batching.
- Non-conformance of any of the items above – air content, slump, temperature, time – is just cause to reject that load of concrete. Notify engineer if material is rejected.
- Tickets for all concrete placed shall be collected and attached to IDR with proper labeling of bid item used for.

#### B) PLACEMENT

- This work consists of placing portland cement concrete in general.
- Inspector should be on site for concrete placement – this is a critical item that needs special attention.

#### Before placement

- Verify that the supplier and mix design has been approved.
- Verify that the contractor has proper placing and finishing tools.

- Verify that reasonable weather is predicted for the day of the concrete placement.
- Set up any testing prior to concrete delivery.
- Verify and coordinate proper joint placement and joint patterning.
- Formwork:
  - Review the contract drawings, specifications, shop drawings and any standard drawings for the proposed work.
  - Verify that the lines and levels of the formwork are as required, and that embedded inserts and blockouts are installed. If necessary, contact survey crew.
  - Check forms have been cleaned from previous use.
  - Verify all debris is removed from formwork –
  - Verify forms are oiled before use
- Reinforcement:
  - Verify size, length, lap splice distance, spacing, supports, ties are per specifications
  - Check epoxy coated bars for continuous coating – touch up with epoxy on scrapes and cut ends.
- Embeds:
  - Verify proper placement of all embeds shown on plans.

**During placement**

- Collect batch tickets from pour and record on IDR.
- Verify on batch ticket proper concrete mix.
- Coordinate proper test procedures with testing agent.
- Concrete is to be placed as close as possible to its' final location – not to be moved with vibrator.
- Vibrate all concrete – insure that proper vibration is being accomplished throughout concrete pour.
- Concrete pour is to be stopped at a joint (expansion joint, contraction joint, or approved construction joint). If problems develop between joints and pour cannot continue in approved method, consult engineer.
- Construction joints shall be vertical and aligned with finishing pattern.
- If rain starts during concrete pour – stop pour and protect material in place. Pour can continue if rain stops. Contractor is responsible for materials placed until accepted by City.
- Verify proper concrete finishing per specifications or standards – no water shall be added to surface during finishing.

**After placement**

- All concrete gets cured (see next section for reference).
- Verify protection of new concrete during curing period – hot weather, cold weather, adverse weather (rain, wind, direct sun).
- Removal of forms – forms can be removed when concrete has hardened sufficiently that it will not be damaged. If forms are removed before 7 days – all exposed edges are to be cured properly.
- Concrete surface repairs – repair concrete areas (including honeycomb areas) by proper technique, immediately after form removal.
- Insure concrete has achieved proper strength before placing into service. For pavements, beams need to be broken and modulus of rupture of 600 lbs/sq in.

**C) CURING**

- This work is incidental to any and all concrete work.
- Proper curing is critical to extended life of concrete
  - Surfaces are to be maintained continuously moist
  - Favorable temperature is between 40° and 80°F

- Begin curing immediately after finishing operations are complete and the surface will not be marred.
- Length of curing – under normal conditions – 7 days.
- Check application of curing compound for uniformity, application rate and timely placement
- Types of curing: Review specifications for specific curing method
  - Water cure – continuously wet condition – generally burlap. Care must be taken not to let the coverings dry out and absorb water from the concrete. The edges should be lapped and the materials weighted down so that they are not blown away.
  - Membrane cure – check manufacturer instructions for rate of application. Must conform to ODOT specifications. Apply directly to finish surface after all water on the surface is gone. Type of curing to be consistent throughout job (not mixing of clear and white curing compound).
  - Cover cure – seal in surface conditions. The edges should be lapped and the materials weighted down so that they are not blown away.

## 2) **CONCRETE PAVEMENT (ODOT 451 & 452)**

- This work consists of constructing a pavement composed of portland cement concrete on a prepared subgrade or base course.

### A) **BEFORE CONCRETE IS PLACED**

- Review drawings and specifications for special notes.
- Note type of concrete to be used.
- Check for joint layout and joint spacing (get copy of ODOT standard drawings BP-2.1 through 2.5). Check joint construction. Types of joints are: longitudinal, load transfer, expansion, contraction, construction.
- Review reinforcing requirements and check placement
- Contact testing agent
- Verify that subgrade has been compacted and properly graded by checking against survey stakes. If necessary to remove unstable material subgrade, the additional excavation and compacted granular material are separate pay items
- Concrete can be placed either in forms or by slip form machine.

#### **Forms**

- 1) Verify that steel forms are straight and are same depth as proposed pavement.
- 2) Forms must have locking end joints
- 3) Forms must be clean and oiled each time they are used
- 4) Forms are to be set on grade with compacted material under its entire length. Shimming is prohibited.
- 5) Check grade of form against survey stakes immediately before placing concrete
- 6) Radius
  - a) Over 200' use 10' straight sections to make curve
  - b) 100' to 200' use 5' straight sections to make curve
  - c) Less than 100' use curved steel forms or wood

#### **Slip form machine**

- 7) Verify that grade stakes are correct immediately before placing concrete
  - 8) If machine automatically grades subgrade verify that subgrade is recompactd
- Verify that subgrade is moistened before the concrete is placed

- Verify that all embedded items have been installed (conduit, anchor bolts, sleeves, etc)
- Verify all castings have been blocked out.
- Meet with contractor to insure concrete tickets will include the information on batch weights and water used.
- Verify lighting in place if night work is forecast. Lights required for any concrete placed at night.
- Verify subgrade and forms free of frost and not frozen

**B) DURING CONCRETE PLACING**

- Concrete must be vibrated with internal vibrator
- Concrete will be leveled off with vibrating screed or slip form machine. Verify that vibration of screed is within specifications
- Joints
  - Review ODOT standard drawing BP-2.5
  - All transverse joints shall be perpendicular to centerline unless directed otherwise
  - Concrete near joints must be placed with care to avoid damaging joint and concrete near joint must be vibrated with internal vibrator. Concrete is not to be discharge directly on joint.
  - Longitudinal joints can be sawed or formed.
  - Dowels can be placed in baskets or by mechanical means. The free end of the dowel shall be coated with bond breaking substance. If basket is used, it shall be held firmly in place with steel pins and retaining wire removed
  - Pressure relief joints are to be placed near each bridge per ODOT standard BP 2.4. Consult with Engineer for additional details
  - Contraction joints are continuous for the width of the pavement and are to be a minimum of 1/4 pavement thickness.
  - Construction joints shall be used at the end of the day or when work halts for 30 minutes or longer. Dowels are required in construction joints
  - Joints are to be cut as soon as pavement has cured enough to prevent raveling of surface of the concrete.
  - Contraction joints are spaced 15 ft maximum.
  - Construction joints are minimum of 6 ft from contraction joint
- Surface of the pavement shall be checked with 10 ft straight edge 1/8" in 10 ft
- The edge of the pavement shall be finished with radius tool.
- The pavement shall receive a broomed finish in the longitudinal direction then be grooved in the transverse direction as per 451 except no stations in pavement. Gutter plate is not to be tined.
- No additional water is to be added to surface of concrete to aid in finishing.
- Collect concrete tickets to verify concrete type. Tickets are attached to IDR
- Minimum concrete test include 4 cylinders, air, slump and temperature/100 CY. Consult with Engineer if additional tests are required. When pavement is to be open to traffic within 7 days beams need to be fabricated.
- Follow ODOT CMS section 499 for additional concrete requirements

**C) AFTER CONCRETE HAS BEEN PLACED**

- Immediately after the finishing operations have been completed and after the free water has disappeared, all exposed surfaces of the concrete shall be sealed by spraying a continuous uniform film of curing compound without marring the surface of the concrete.
- Curing compound shall be used at rate of 1 gal per 150 SF minimum. Do not mix colors of curing for duration of project.

- If temperature is expected to go below freezing, pavement must be protected from the cold with blankets or other means.
  - No equipment except finishing equipment can be placed on pavement until it reaches the proper strength.
  - Honeycombed areas shall be corrected immediately after the forms are removed.
  - Surface of the pavement shall be checked with 10 ft straight edge 1/8" in 10 ft. If pavement is ground because of surface variations, the grinding machine shall be self propelled and capable of grinding the concrete without spalling the pavement. The transverse grooves must be reinstalled with machine with diamond blades designed for this task.
  - The joints in the pavement shall be sealed before the pavement is used.
    - Joints shall be cleaned immediately before applying sealer.
    - Joints must be dry to be sealed.
    - Transverse contraction joints shall be sealed with a one piece preformed material. The seal shall be lubricated on both sides and when installed be 1/4" below level of pavement.
    - Expansion and longitudinal joints shall be filled with hot asphalt meeting 705.04
  - Concrete shall be properly cured for 7 days before it is opened to any traffic, and a modulus of rupture achieved of 600 pounds per square inch. The pavement may be opened in 5 days (3 days in high early concrete is used). Pavements can be opened in 24 hours for MS concrete and 4 hours for FS concrete provided a beam break modulus of rupture of 400 psi. Pay quantity is measured in Square Yards and will be adjusted based on final survey quantity.
- 3) COLD WEATHER CONCRETING (ODOT 511 AND ACI 306)**
- This work consists of placing portland cement concrete when temperatures are 32° or below
  - Review with engineer and contractor all procedures for cold weather concreting.
  - The subgrade, steel, and forms shall be above 32°F and entirely free of frost.
  - High-Low thermometers are to be supplied by the contractor. Check temperatures on a regular basis and record temperatures on IDR.
- 4) HOT WEATHER CONCRETING (ACI 305)**
- This work consists of placing portland cement concrete when high temperatures require special precautions be taken to ensure proper handling, placing, finishing and curing.
  - High temperature, high wind velocity, and low relative humidity can affect fresh concrete in two ways: 1) the high rate of evaporation may induce plastic shrinkage or drying shrinkage cracking, 2) the evaporation rate can remove surface water necessary for hydration unless proper curing methods are employed.
  - Thermal cracking may result from rapid drops in the temperature of the concrete, such as when concrete is placed on a hot day followed by a cool night.
  - Recognize the factors that effect concrete and plan to minimize their effects.
  - Concrete temperature shall not exceed 90°F. On hot days, this can be achieved by use of approved admixtures.
  - When ambient air temperatures exceed 90°F – discharge of concrete shall be within 60 minutes after batching.
- 5) CONCRETE FOR STRUCTURES (ODOT 511)**
- This work consist of furnishing and placing portland cement concrete including reinforcing steel in reasonably close conformity with the lines, grades and dimensions shown on plans.

- Materials shall conform to ODOT 499, Class C, S, or HP.
- Review Plans and specifications.
- Review permissible tolerances of measurement.
- Review contractors' equipment, organization and methods. Review concrete placement method.
- Review testing requirements – set up as needed.
  - Concrete cylinders shall be taken – minimum 2 cylinders per 50 cubic yards of concrete placed. Minimum one set per day - consult engineer for frequency.
  - If early form removal is desired, additional cylinders may be required.
- No superstructure concrete shall be placed if the ambient air temperature is 85° or higher or predicted to go above 85° during the concrete placement.
- Concrete for structures must be maintained between 50° and 100°F, including fresh concrete and for seven days when using Class C concrete. The concrete temperature can be reduced a maximum of 20° per day until the atmospheric temperature is reached after the seven days.
- Formwork – check tightness, location, alignment, plumbness, elevations, dimensions, cleanliness and stability. Formwork shall be securely braced. All exposed edges shall be chamfered.
- Rebar – check condition, cleanliness, size, steel grade, length, number, splicing, form clearance, support, bar ties, lap, embedment clearance and surface clearance. Confirm or verify with engineer any adjustments to rebar such as cutting, spacing and positioning. Reinforcing shall be securely and rigidly tied and shall be accurately located in the forms so as to maintain the location and clearances shown on the Plan.
- Concrete shall be placed to insure against segregation, shall be deposited as near as possible to its final position, concrete shall not be dropped more than 5 feet. Mechanical vibration is required.
- Construction joints shall be placed at predetermined locations, either shown on the plans or determined by the structural engineer.
- Curing is required and shall be by a method approved by structural engineer.
- Surface finish of formed surfaces per contract special provisions (ODOT 511).
- Bridge deck roadway finish per 451. A finishing machine shall be used unless approved by engineer on small areas.
- All holes and voids in concrete shall be patched regardless of whether the void or hole is above or below finished grade.
- Patching shall be performed prior to finishing and sealing the concrete surface. Test patches shall be performed in locations to be covered by soil to verify that patch material matches adjacent concrete color and texture.
- Review specifications to determine how long concrete shall cure before removing forms and opening structure to traffic.
- Pay quantity is measured in Cubic Yards of a specified Class of concrete determined by calculations from plan dimensions, in place, completed and accepted. This is to be recorded on the IDR.
  - No deduction will be made for the volume of the reinforcing steel, conduits, structural steel, embedded items or concrete piles.

#### **A) PIER WALL CONSTRUCTION**

- This work consists of placing portland cement concrete for pier wall construction.
- Review Plans and specifications.
- Review permissible tolerances of measurement.
- Review contractors' equipment, organization and methods.
- Review testing requirements – set up as needed.

- Verify diameter, length and soil conditions of pier.
- Check layout for correct location.
- Review overhead and underground utilities to verify that they are out of way.
- Review subsurface exploration log with geotechnical engineer and anticipate drilling characteristics.
- Obtain minimum depth. Contact geotechnical engineer if depth varies significantly from plan.
- During drilling check alignment, grade and plumbness of shaft.
- Record soil conditions and placement procedures on Log Sheet or Calculation Sheet and attach to IDR.
- Formwork – check tightness, location, alignment, elevations, dimensions and stability. Formwork shall be plumb and securely braced so that the centerline of the top of the pier is within 1" of the Plan location.
- Rebar – check condition, cleanliness, size, steel grade, length, number, splicing, form clearance, support, bar ties, lap and embedment clearance. Confirm or verify with engineer any adjustments to rebar such as cutting, spacing and positioning. Reinforcing cages shall be securely and rigidly tied and shall be accurately located in the forms and drilled shaft and adequately blocked, so as to maintain the location and clearances shown on the Plan.
- Check for any inserts and verify placement.
- Concrete shall be placed the same day of drilling pier. Concrete shall not be dropped into the drilled piers or forms, but shall be carefully placed in a compacted mass. Mechanical vibration shall be required. Care shall be taken not to dislocate the reinforcement during concrete placement. Concrete placement shall be continuous from bottom of pier to top and no construction joint shall be permitted. Piers shall be "crowned" so as to prohibit ponding of water on top of the pier.
- The Contractor shall not excavate for placement of precast panels and porous backfill until the pier concrete has attained at least 75% of design strength. Verify 'Near Face' of precast is the exposed face.
- The Contractor shall backfill the trench behind the pier wall within 48 hours after the excavation is completed (this includes placement of precast panels, porous backfill and embankment).

## **B) BRIDGE CONSTRUCTION**

- This work consists of placing portland cement concrete for bridge construction.  
**Construction Joints (511)**
- Check plans for location of construction joints.
- The Engineer shall approve construction joints proposed by contractor not shown in plans.
- All construction joints shall be made with bulkheads provided with keys which clear all exposed surfaces approximately one-third the thickness of the joint.  
**Curing and Loading**
- See specifications to determine how long concrete shall cure before removing forms and opening structure to traffic.  
**Foundations**
- See ODOT CMS Item 507 for construction of bearing piles.
- If foundation is on piles, verify location of piles are within tolerances described in 507.
- If foundation is placed on soil, contact geotechnical engineer to verify capacity of soil.
- Verify that foundation area is dry before placing concrete.  
**Abutment and Piers**
- Review plans and specifications for correct concrete finish.



- All holes and voids in concrete shall be patched regardless of whether the void or hole is above or below finished grade.
- Patching shall be performed prior to finishing and sealing the concrete surface. Test patches shall be performed in locations to be covered by soil to verify that patch material matches adjacent concrete color and texture.
- Verify reinforcing steel placement accuracy in pier caps and abutment seats to avoid future anchor bolts installation.

**Decks**

- Before placing concrete, all forms and structural steel that will be in contact with the concrete shall be thoroughly cleaned.
- Verify expansion joint armor is placed to plan grade.
- Verify all embedment (conduits, scuppers, etc.) are properly placed.
- Verify evaporation rate and ambient temperature ranges are within tolerances.
- Unless approved by the Engineer, concrete for decks shall be placed with a vibrating finishing machine.
- Contractor shall perform "dry run" with finishing machine to check deck thickness, reinforcing steel clearance, embedment interferences, and screed cross-section. Inspector shall record all this information every 25' and attach to IDR. Adjust forms, reinforcing steel, embedment or screed, if necessary.
- Verify that concrete trucks are appropriately scheduled to complete the concrete placement without cold joints or concrete setting too long in truck.
- Verify that contractor is monitoring bottom of deck while concrete is being placed.
- Verify that reinforcing steel is not being displaced during deck concrete placement.
- Surface of deck shall be grooved in accordance with 451 or the plans. A strip 9 to 12 inches wide adjacent to the curb or barrier shall not be grooved but finished by hand.
- Unless otherwise specified in the plans, sidewalk shall be finished with a float to produce a sandy texture.
- Curing of deck is critical. Verify contractor is prepared to cure deck immediately after concrete placement. Inspect deck every day to insure that burlap is wet and plastic is secure with no openings or exposed areas.

**6) ARCHITECTURAL CONCRETE**

- This work consists of placing portland cement concrete for architectural character and quality.
- Verify plans and specifications for desired fit, finish, color, texture, etc.
- Architectural concrete takes special attention – be sure it is treated as special.
- Test pour usually required to check color and finish texture.
- Schedule pre-pour meeting to discuss procedure for all aspects of architectural concrete.
- Verify supplier remains the same (with same production procedure) throughout job.
- Colored Concrete
  - Colored concrete mix shall be per project specifications.
  - Coloring agent shall be added and mixed with concrete at the plant.

## SECTION 6.0 STRUCTURES

### 1) **STRUCTURE GENERAL (ODOT 501)**

A Structure consists of a combination of concrete and steel elements that are fabricated, erected and constructed so that the entire unit and all its component parts will function as designed. The CI needs to pay special attention to the smallest of details while inspecting the building of a structure. One misplaced element can cause the entire unit to fail.

Shop drawings are the contractor's interpretation of the contract drawings and his detailed plan on how to fabricate and construct the structure. Shop drawings are to be reviewed and noted as such by the Designer of Record. The CI should keep a set of reviewed shop drawings on site and use these to do the inspection of the work. The shop drawing are to be incorporated in to the final set of As-Built drawings.

#### P. E. Stamped Construction Plan

The contractor is require to submit a construction plan stamped by a P.E. for the following:

- Sheeting and bracing of an excavation, demolition of structures or erection of a structure, within 14 feet of a railroad.
- Sheeting and bracing of an excavation or demolition of a structure, adjacent to live traffic.
- False work for cast in place concrete bridges over 20 feet span
- Erection of precast or structural members
- Jacking and support of existing structures
- Placing or movement of equipment over 60,000 pounds gross weight

The contractor is required to submit certified test data showing compliance with the contract specification for all material to be incorporated in to the structure.

The contractor is required to supply documentation that all fabricators have proper certifications required by contract specifications.

### 2) **EXCAVATION FOR STRUCTURES (ODOT 503)**

Excavation for structures is paid separately from general excavation. Payment is based on design calculations rather than actual amount of material excavated. Excavation made for footing should be made to actual dimension if possible. Do not over excavated, so that the sides of the excavation can be used as the formwork for the concrete.

If cofferdams, cribs and/or sheeting are required to support the excavation, the contractor is required to submit a plan detailing the work. This work is included in the cost of excavation if there is not a specific bid item.

### 3) **PILES (ODOT 507)**

Piles are steel members driven in to the ground by pile driving equipment or cast in place concrete piers drilled by a drilling rig. Piles are the underlying support for the structure.

Driven piles are place in to bedrock until the required ultimate bearing value is reached. Bearing capacity is measured by blow count. Determine the required blow count to achieve ultimate bearing value using the results of the dynamic testing as specified in ODOT 523. Location of piles, length of piles driven and blow counts achieved for each

pile shall be recorded on the appropriate log sheet. Consult with DOT&E Geotechnical section prior to doing any work.

Cast-in-place reinforced concrete piles are concrete and rebar placed in a cylindrical drilled casing. Drill in to bedrock or soil to the lengths specified on contract drawings. Consult with DOT&E Geotechnical Section prior to drilling. Ensure all water is removed from the hole before placing concrete. Place concrete using methods that prevent voids however, do not vibrate concrete. Record size and depths on appropriate log sheet.

#### 4) **FALSEWORK AND FORMS (ODOT 508)**

False work and forms are temporary structures that hold the concrete in place until it has developed the required strength.

Falsework is the support for forms. Falsework shall be designed to support the weight of the concrete and to not allow deflection in the structure until the concrete has reached its strength. Vehicular and pedestrian access needs to be considered when designing falsework.

Forms shall be clean and free from defects. Forming materials, inserts and liners may vary to get the desired architectural finish. Forms shall be oiled so the concrete is not damaged when forms are removed. Forms shall be unyielding and mortar tight so that the finish concrete conforms to the proper dimensions and contours. Check forms for grade and alignment prior to placing concrete, use surveyors if needed. Forms are not to be removed until the concrete achieves the specified strength.

#### 5) **REINFORCING STEEL (ODOT 509)**

Reinforcing steel (rebar) is steel bars placed in concrete to give it strength. Bars come in 1/8" diameter increments. A #3 bar is 3/8", a #4 bar is 1/2". Material certification and a bar list should be included with delivery of material. Stored material shall be kept free from dirt, oil, grease and rust. For epoxy coated steel use epoxy coated tie wire and supports. Repair damage epoxy before placing concrete.

Location of the placement of steel is critical. Rebar shall be placed per contract drawings and secured so it will not move during placement of concrete. Check placement of rebar prior to placing concrete. Verify that the rebar remains in place while placing concrete. Proper cover (clearance) of concrete is critical for the long-term durability of the structure. Support horizontal steel using mortar blocks, metal or plastic supports. Welding on rebar is prohibited, splice steel by overlapping per specified lengths or use mechanical connectors.

Rebar is paid per calculated plan quantity in pounds of steel placed. There should be a rebar schedule in the contract drawings.

#### 6) **STRUCTURAL STEEL (ODOT 513 AND 514)**

Structural steel consists of preparing shop drawings, furnishing and fabricating steel members, nondestructive testing, fabricator performed quality control, documentation, shop coating, shipping and field erecting steel members.

Fabricators need to be pre-qualified by ODOT for the type of work performing. There are 8 levels of ODOT pre-qualifications. Fabrication includes shop prime. Fabricator shall keep and maintain documentation records per ODOT Supplement 1078. Consult with CE to schedule periodic shop visits and inspections.

Shop drawings include details, dimensions, size of materials, match mark diagrams for field connections, welds type and sizes and other information necessary for the complete fabrication of and erection of the metal work. Each piece of steel shall have specific identification marks that conform with the shop drawings.

For all bolted connections use high strength bolts, washer and nuts. The CI should observe installation of bolted connections and witness tensioning of bolts to comply with specifications.

Welded connections should be tested by approved testing agent.

Welded shear studs can be installed on site. Perform shear stud bend test at the start of each work day.

Structural steel is paid lump sum or in pounds based on designers calculation. There should be a steel schedule in the contract documents or request a take-off from Designer. Welded shear stud connectors are paid each.

New steel painting consists of three coats (IZEU), an inorganic zinc prime coat, an epoxy intermediate coat and a urethane finish coat, existing steel uses organic zinc primer (OZEU). Painting superintendents need to be certified by ODOT, verify certification before any work starts. The contractor is required to supply a quality control specialist, who also needs to be certified by ODOT and be on site whenever work is performed. Identify who that person is and check certification before starting work. Field painting can only occur from April 1 to October 31. Check temperature and moisture restrictions. Know the thickness requirements and verify using a dry film thickness test. Perform final inspection per specification. On the final coat mark each structure with the completion date and type of paint system used, IZEU or OZEU. Painting of structural steel is paid in square foot for each coat place and accepted.

**Use appropriate safety precaution when inspecting structural steel.**

**7) PRESTRESSED CONCRETE BRIDGE MEMBERS (ODOT 515)**

Fabricators need to be ODOT certified. Fabricators are required to do and document quality control inspections. Consult with CE to schedule periodic site visits.

Precast concrete members are not to be shipped until concrete obtains 28-day strength. Members are to be transported, stored and erected in the upright position. Verify erection is performed in accordance with shop drawings.

Payment for precast concrete members is in number of member complete, Each.

**8) EXPANSION JOINTS AND BEARING DEVICES (ODOT 516)**

Fabricators need to be ODOT certified.

Ensure that expansion joints are completely open for the dimension specified for their full length. Finish adjacent surfaces shall be clean, smooth and uniform. The joint material shall neatly fill the space and have a uniform thickness.

Set bearing plates per shop drawings and specifications. Check level and alignment.

**9) RAILINGS (ODOT 517)**

Fabricators need to be ODOT certified.

Verify railings are installed per shop drawings and contract specifications. Check line and grade. Consult with CE to get approved method for touching up damaged galvanized paint.

Payment is made per linear foot of railing complete.

**10) DRILLED SHAFTS (ODOT 524)**

Contractor is to supply a written installation plan of procedures, review the plan with CE before starting any work.

Drilled shafts are used to support vertical or lateral loads. For vertical loads, drilled shafts are similar to piles and bear on bedrock in most cases. For lateral loads, drilled shafts act as retaining walls and need to be socketed well into bedrock. Be aware of which type of shaft you are inspecting. Consult with CE and DOT&E Geotechnical section to get drilling depth criteria. Log location, size of shaft, soil conditions and depths for each drilled shaft. Temporary or permanent casing may be required to support soil during drilling.

Install rebar immediately after drilling. Verify cage is properly placed and secure. Consult with CE to see if additional rebar is needed for shafts that are drilled deeper than plan depths.

Concrete can be placed using free falling method, provided the concrete does not strike the sides of the hole and the rebar cage. Use a center drop chute, minimum 3 feet long. Concrete can also be pumped. Use concrete pump at least 4 inches in diameter. Control rate of concrete placement as not damage the sides or rebar cage.

Drilled shafts are paid per linear foot for size of shaft drilled.

**SECTION 7.0**  
**DRAINAGE, SANITARY SEWERS AND WATER MAINS**

**1) SLOPE PROTECTION (ODOT 601)**

- This work consists of the excavation for and construction of gutters, interlock precast blocks, concrete, grouted items, tied concrete block mats, crushed aggregate, or rock items for protecting slopes and channels.
- Protecting slopes and channels can be achieved in a variety of ways. Review specifications and pay items for specific material and construction requirements and method of payment.

**2) MASONRY (ODOT 602)**

- This item consists of constructing and repairing headwalls, pipe cradles, collars, inlets and manholes.
- To prevent freezing, bricks and mortar must be 40 degrees or higher when placed. Protect from freezing for 48 hours. Place curing compound on exposed surfaces.
- Masonry is paid per cy of actual quantity used for Brick, Block or Concrete Masonry.

**3) PIPE CULVERTS, SEWERS AND DRAINS (ODOT 603)**

- Delete most of ODOT specification and use City Supplement.
- This work consists of constructing pipe culverts, sewers, and drains referred to as Type A,B,C,D,E,F,G,H and I Conduits.
- The work includes: excavation, clearing and grubbing, removal of all materials necessary for placing the pipe except those separately listed, bedding, backfill, and cofferdams, cribs and sheeting as needed, restoration of disturbed facilities and surfaces.
- All taps to existing pipes need to be made by a plumber licensed by MSD.
- Contractor must maintain flow.
- MSD inspector should inspect any sanitary installation.
- Pipe materials shall conform to type of pipe specified.
- Excavation includes removal of all unforeseen obstacles.
- All installations are to be open cut unless otherwise approved.
- Pipe can be lowered 1 foot at no additional cost.
- Video taping is a pay item if required.
- Bedding is critical to the long term stability of the pipe; pay close attention to bedding requirements for the type and size of pipe that is being installed. See City Standard Drawings for details.
- All joints are to be water tight, bituminous pipe joint filler is not allowed.
- CLSM is the required backfill for any pipe under or within 2 feet of street, sidewalk or driveways.
- All clearing and restoration of disturbed areas unless otherwise stated is included in unit price.
- DO NOT ENTER INTO A TRENCH UNLESS IT IS PROPERLY SUPPORTED AND THERE IS A LADDER FOR ACCESS.
- Lay conduit in the center of the trench starting at the outlet end with the bell or groove-end laid upgrade.
- Pipe is paid per linear foot of type and size of pipe installed, measured from center of structure to center of structure for new installations, to the internal face for relocated structures and actual length of pipe for repairs.

**4) MANHOLE, CATCH BASINS AND INLETS (ODOT 604)**

- This work consists of constructing manholes, catch basins and inlets. See City Standard Drawings for details.
- Precast manholes and inlets should have shop drawings.
- Restoration of pavements, curbs and walks is included unless otherwise stated.
- Remove any obstruction necessary at no additional cost.
- Flow line may be adjusted by one foot at no additional cost.
- Use CLSM for backfill.
- Payment is for each including casting and restoration as needed.
- Entry pipes are to be cut flush with inside walls.
- Pay special attention to final grade of casting.
- DO NOT ENTER INTO A MANHOLE OR INLET UNLESS IT HAS BEEN TESTED FOR A CONFINED SPACE.

**5) UNDERDRAINS (ODOT 605)**

- This item consists of construction of shallow underdrains.
- Material shall be as specified on City Standard Drawing ACC. No. 120091.
- Trench shall be excavated to the size shown on the standard drawing and wrapped in filter fabric.
- Backfill with #8 aggregate.
- Payment is made per linear foot of underdrain completed.

**6) WATER MAIN (ODOT 638 AND CITY SUPPLEMENT 1100)**

- This work consists of construction of water mains and appurtenances, chambers and services branches.
- ODOT 638 normally does not apply use City Supplement 1100.
- GCWW inspector should inspect all water main installations. However, they are generally just concerned with the actual water main installation and aren't as concerned about traffic control, backfill or restoration. The CI needs to be oversee these operations to assure the integrity of the city's infrastructure is maintained.
- All material must be inspected and approved by GCWW.
- Any shut down needs to be pre-approved and conducted by GCWW personnel.
- Mark up on labor for force account work is limited to 30%.
- Layout is done by GCWW.
- Excavation includes removal of any unforeseen obstacles.
- Do not disturb street pavement or sidewalk for a distance of more than 200 feet ahead of last laid pipe.
- Complete backfill within 50 feet of last laid pipe.
- Install permanent or temporary restoration within 200 feet of the last laid pipe.
- Dig test holes along the line of proposed water main a minimum of 50 feet ahead of last laid pipe.
- Use CLSM for backfill.
- Refer to City Supplement Items 1101 through 1138 for specific water work items description and pay method.

## SECTION 8.0 TRAFFIC CONTROL TEMPORARY AND PERMANENT

### 1) MAINTENANCE OF TRAFFIC (ODOT 614)

- Maintenance of traffic has more impact on the public than any other aspect of a project. Proper installation and maintenance of traffic control devices is critical so the traveling public can navigate through a construction zone safely and conveniently. The CI should inspect, at a minimum, the traffic pattern and traffic control devices the first thing upon arrival at the site and last thing before he leaves.
- All traffic control devices are to be installed per the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) and City of Cincinnati Traffic Safety Handbook (Blue Book).
- The contractor shall follow the guidelines in the Procedures for Posting No Parking Signs for posting temporary no parking restrictions. Police will not enforce temporary no parking signs unless these procedures are followed.
- Flashing arrow boards are required for all lane closures or as directed by Traffic Engineering.
- Maintenance of pedestrian traffic is also important. Do not lead pedestrians into conflicts within the work site. Provide a safe, convenient path that replicates as nearly as possible the existing sidewalks or footpaths. Keep in mind people with disabilities when signing and establishing temporary walkways.
- Unless otherwise stated in the contract all lanes are to be open during rush hours, 7-9 am and 4-6 pm. **Read the special provision** of the contract for any deviations to this requirement. Any lane closure other than those specified in the contract needs to be approved by the Engineer and requires a lane blocking permit from ROW Management.
- The use of off-duty law enforcement officers (LEO) is encouraged and sometimes required by Traffic Engineering. If LEO is a pay item use LEO Time Sheet form to log and track hours. The LEO should be considered an extension of the contractor's work force and should abide by the conditions as set forth in the contract.
- All traffic signals and street lighting shall be maintained at all times. Pedestrian signals at signalized intersection must be maintained. Signalized crosswalks are only closed if the corner sidewalk(s) are closed or the actual crosswalk area is under construction. Examples would include the demolition of sidewalks or utility trenching through a painted crosswalk. In such cases, the existing pedestrian signals shall be covered and "crosswalk closed" and no pedestrian crossing signs shall be installed.
- When existing pavement markings are removed the contractor must re-install them before opening the roadway to traffic. Temporary marking may be incidental to item 614 or can be a separate pay item.
- When a detour is posted the CI should drive the detour and make sure the signs make sense and direct the motorist where desired.
- Flaggers shall be equipped with STOP/SLOW paddles.
- Item 614 maintenance of traffic can be incidental to other pay items or can be a lump sum item. Item 614 may include separate pay items for LEO, temporary pavement markings or other devices as specified in the contract.

### 2) RAISED PAVEMENT MARKERS (ODOT 621)

- This consists of preparing the pavement, furnishing and placing raised pavement marker castings (RPMs) and prismatic reflectors.
- Do not install RPMs under the following conditions:
  - On pavement surfaces with cracking or spalling pavement or base failure
  - Within 1 foot of active loop detector wires
  - Over existing pavement markings



- Closer than 2" to a pavement construction joint or within an intersection
- Within 3' of a bridge expansion joint
  
- Cut parallel slots with 1/16" to 1/8" clearance on each side to install casting.
- Clean pavement and apply adhesive and casting within 24 hours of making cuts.
- Abide by temperature restrictions in ODOT 621.
- Attached reflector to casting prior to installing casting or after adhesive has cured.
- Reflectors are to be per City Standard drawing ES-6-3, yellow/yellow or white/red. The marker closest to the nearest fire hydrant is to be blue/blue.
- Pay item is per each RPM and RPM Reflector.

### 3) **TRAFFIC SIGNS AND SIGN SUPPORTS (ODOT 630)**

- This item consists of furnishing and installing traffic signs, sign supports and foundations. The work includes all excavation, backfill and restoration.
- The contractor is to submit for Traffic Engineering review and approval 7 copies of shop drawings or catalog cuts. Do not purchase or install any signs prior to approval.
- Sign supports and mounting details are shown on Standard Drawing ES-6-1 and ES-6-2.
- Parking meter heads shall be removed by City Parking Facility personnel only.
- Maintain all existing signs prior to installing new. Salvage all old signs and posts to be picked up by City forces.
- There are several pay items for signs, read the contract special provision and ODOT 630 prior to measuring the completed work.
- Contractor shall maintain and keep erect all existing street name signs during construction. When necessary due to construction conflicts, the contractor shall relocate the existing. If this is not possible, contractor shall remove the signs and safely store for pick-up by City forces.

### 4) **PAVEMENT MARKINGS (ODOT 640)**

- This work consists of installing permanent pavement markings.
- All new pavement markings shall be placed in accordance with ODOT Item 644 Thermoplastic Pavement Markings, unless otherwise approved by Traffic Engineering. Pay special attention to requirements for concrete pavements.
- The City will provide documentation for location and type of markings.
- Contractor is to perform layout.
- Call the Traffic Engineer representative 5 days in advance for approval of layout, prior to actual installation. Do not install new markings until layout is approved.
- Remove any conflicting existing markings, unless otherwise stated. The cost for this removal is incidental to the cost of new markings.
- Use Zebra-type crosswalks per City standards.
- **Thermoplastic (ODOT 644)**
  - The contractor shall use a Data Logging System (DSL) to document and record the following: application vehicle speed, pavement surface temperature, air temperature and thermoplastic temperature in the kettle and at the point of application. Contractor to give this information to the Engineer.
  - Air temperature is to be 50 degrees and rising on new pavement and 70 degrees and rising on old pavements.
  - Thermoplastic shall be between 400 and 440 degrees.
  - Thermoplastic shall be placed 125 mils (3 mm) thick.
  - Glass beads shall be placed at 8 pounds per 100 sf of thermoplastic surface
  - Contractor to furnish a report documenting each day's application. The report should include types of materials, quantities of each material, application rate, pounds of beads used and DSL data.

- Edge, lane and center lines are paid in miles. Channelizing, stop, crosswalk, dotted, transverse lines and removal of lines are paid per foot. Symbols are paid each.

**SECTION 9.0****ROADSIDE AND INCIDENTALS****1) GUARDRAIL (ODOT 606)**

- This consists of constructing or reconstructing guardrail, posts, bridge terminals, end terminals and impact attenuators.
- Guardrail shall be deep beam rail Type 5, 5A or 8.
- Use galvanized steel posts, rails, bolts and fittings. Per ODOT standard drawings post may be either 6" x 8" wood or W150 x 13.5 steel.
- Drive posts to specified heights.
- Spacing of posts depends on guardrail type.
- All metals are to be shop fabricated, no burning, bending or welding in the field.
- Repair any damaged galvanizing.
- Before installing impact attenuator read manufacture cut sheets and shop drawings for installation procedures.
- Guardrail is paid per linear foot and measured from center of end post to center of end post.
- Anchor assemblies, terminals, attenuators and post are all paid each.

**2) FENCE (ODOT 607)**

- This work consists of constructing fence and gates.
- Fence is designated as Type 47 and 47RA (wire woven) or CL and CLT (chain link).
- If not a separate pay item any clearing needed to install fence is included.
- Type CI fence post are driven at 10' on center. If post can not be driven and are set in concrete then the chain link fabric should not be installed until 5 days after concrete is placed.
- Chain-link fabric shall be stretched and secured to posts at 14" intervals and secured to top rail at 24" intervals.
- Fence is paid per linear foot of type and height of fence installed. Gates are paid each.

**3) LOW STRENGTH MORTAR BACKFILL (ODOT 613)**

- This items consists of installing low strength mortar backfill.
- All pipe installations with the right of way require LSM for backfill unless otherwise approved by the Engineer.
- Use only City approved mixes.
- See HAMCIN CLSM-CD (appendix 1) standard specification and list of approved suppliers and mixes.

**4) LAYOUT (ODOT 105.19 AND 623)**

- Unless otherwise stated in the contract the City Surveyor will set all line, grade, slope and location stakes. The contractor shall provide any clearing or traffic control required to complete this work.
- The CI should be the contractor's contact person to schedule layout. The CI should take an active role in scheduling and overseeing the layout as provided by the survey crews.
- The CE should be knowledgeable of what the surveyors are providing to the contractor and check the contractor's work off the provided layout stakes.
- The contractor is required to protect all layout stakes during the process of working.

**5) CURBS RESET (ODOT 629)**

- This work consists of resetting and trimming existing curbs.
- Reset curbs only in good condition.
- Excavate 24" deep x 12" wide. Spread a layer of stiff concrete on the bottom of the trench. Set curb to proper line and grade. Place concrete in the back of curb to a depth of 8" from top of curb. Backfill and restore street, walks, drives and sod areas.
- If not otherwise stated all restoration is incidental to this item.
- Curb reset is paid per linear foot.

**6) TOPSOIL (ODOT 651, 652, 653)**

- ODOT Item 651 topsoil stockpiled. Remove all heavy grass, weeds and other vegetation before stripping topsoil. Remove to a depth as required on by the contract. Store topsoil separate from the rest of the excavated materials. Topsoil stockpiled is paid per cubic yards as calculated per plan.
- ODOT Item 652 placing stockpiled topsoil. This work consists of hauling and spreading topsoil from stockpile. Prepare surface and place per ODOT 653. Placing topsoil stockpiled is paid per cubic yards as calculated per plan.
- ODOT Item 653 and Item 659 topsoil furnished and placed. Topsoil shall be loose, friable, loamy material with no more than 40% clay and between 4% and 20% organic matter. Test topsoil per ODOT 659 if required. Before placing topsoil remove all rocks 3" or greater in size. Place in 4" compacted lifts. Topsoil is paid per cubic yards as calculated per plan.

**7) SEEDING AND MULCHING (ODOT 659)**

- If specified provide and spread commercial fertilizer. Fertilizers are type 10-20-10 or 12-12-12. Apply 10-20-10 at 20 pounds per 1000 square foot and 12-12-12 at 10 pounds per 1000 square foot.
- Provide seed mix a specified.
- Remove all rocks 3" or greater before spreading seed.
- Seeding should be done between March 1 and October 30. If seeding is done between March 1 and August 15 increase seed mix by 5%. Hydro seeding may used which spreads fertilizer, mulch, seed and water in the same process.
- Mulch consists of straw, compost or wood fiber. Mulch shall be placed within 24 hours after seeding.
- Water all seeded areas at 300 gallons per 1000 square foot two times within 7 days of initial seeding. Perform a secondary watering between 7 and 10 days after seeding.
- Maintain all seeded and mulched areas until final inspection.
- Inspect all seeded areas within 6 to 12 months after final seeding. For any areas with uniform density of less than 70% grass cover, repair seeding as specified.
- Pay items are: topsoil per cy; commercial fertilizer per ton; seeding and mulching per sy; repair seeding and mulching per sy; water per gallons.

**8) SODDING (ODOT 660)**

- Furnish sod consisting of well rooted Kentucky Blue Grass or Canadian Blue Grass free of weeds.
- Sod should be certified by supplier with the following information; name of producer; amount shipped; location of sod field; date cut; date sold; and thickness as cut.
- Sod strips shall be between 3 and 6 feet long and 24" wide.
- Sod shall be delivered to jobsite within 24 hours of being cut and shall be placed within 48 hours of being cut.
- Do not place sod on frozen ground.
- When placing sod between June 1 and October 15 immediately cover with straw.
- After laying sod thoroughly water and tamp.
- Keep all sod areas moist for 30 days.
- Pay item is sodding per sy.

**9) PLANTING TREES, SHRUBS AND VINES (ODOT 661)**

- Plant materials, the CI shall arrange to have maintaining agency inspect and approve materials before being installed.
- All plantings shall be performed between September 15 and June 1.
- Set plants in holes at a level that is 1" above surrounding soils.
- Remove all twine, bags or roping before planting.
- Remove top 1/3 of wire from root balls having wire baskets.
- Remove all rot-proof burlap.
- Brace trees as shown on standard drawings.
- The contractor shall be responsible for planting for full growing season.
- On or about September 15 the CE will do an inspection. Replace any plants identified as dead or missing. Replacement plants are subject to a new period of establishment.
- Payment is made per each of type and size of plants. Pay 50% at delivery to jobsite and 50% at time of planting. At the end of the establishment period an additional 20% bid price will be paid for all living plants. Relace any dead plants at contractor's cost.

**SECTION 10.0****STREET LIGHTING AND TRAFFIC SIGNALS****1) GENERAL (CITY SUPPLEMENT 1300)**

- Inspection of street lighting and traffic signals is a joint effort between the Construction Inspector and Traffic Engineering personnel. The CI should contact the Traffic Engineering Inspector before any work is performed to coordinate who is going to be responsible each item of the electric work and signage.
- Traffic Engineering will do a final inspection once all work is complete. The work can not be accepted until Traffic Engineer approves it, including all electric work, pavement markings and signage. Coordinate final inspection through the CE so all right sections of Traffic Engineer are represented.
- **All equipment and materials (City Supplement 1303)** are to be new and free of any damage. Replace any material at no cost to City that fails for any reason of defective material for one year after acceptance. Provide catalog cuts, to be approved by Traffic Engineering for all materials and equipment.
- **Install all equipment (City Supplement 1309)** with a minimum of 2' clearance from face to curb of face of equipment. Install all equipment over roadways with a minimum of 17' vertical clearance.
- **Inspect (City Supplement 1311)** all trenched conduit and pull box installation before backfilling. Inspect all foundations including conduit, anchor bolts and rebar before pouring concrete. Inspect all location stakes before any excavation. Coordinate inspection responsibility with Traffic Engineering Inspector.
- **Power service (City Supplement 1312)** is to be provided by Duke Energy, tie-in must be coordinate though and approved by Traffic Engineering.
- **Test (City Supplement 1313)** Contractor should test the insulation resistance for each conductor of cable or wire terminating at the controller. Prior to acceptance, street lighting systems need to operate for 10 days without interruption and free from any malfunctions (10 day burn test). Traffic Engineering will monitor the results. For traffic signals, operate all new traffic signals for 5 continuous days of flashing operation, unless otherwise instructed by the Engineer. New signals are those where no traffic signal was present before the project. Rebuilt or replaced traffic signals will not be run in flash mode, but proceed directly to "color" operation. Prior to acceptance of all new and/or replaced/rebuilt traffic signals, the traffic signal shall have a final test consisting of 30 minutes of "color" operation without failure. Staff from Public Services (Traffic Services Bureau) shall also be present for this test.
- **Maintain (City Supplement 1314)** all street lighting and traffic signals at all times, unless otherwise approved by Traffic Engineering, this includes pedestrian signals, interconnect cables and loop detectors.
- **Provide temporary (City Supplement 1316)** lighting and traffic signals as required.
- **Remove** street lighting and traffic signal equipment not slated for reuse and deliver to Traffic Engineering. The contractor shall schedule the delivery with Public Services. Remove all poles to 1' below grade, salvage poles and deliver to Public Services.
- **Paint (City Supplement 1317)** all equipment in accordance with ODOT 514. Follow color charts in City Supplement.
- **Restoration (City Supplement 1334)** of any disturb work areas needs to be restored in kind and incidental to that item of work.
- **Identify (City Supplement 1335)** all lighting cable by circuit with tags in accordance with ODOT Item 625.17.

**2) POLES AND SUPPORTS (CITY SUPPLEMENT 1318)**

- Fabricate poles and supports per size, type and dimension as indicated on the Standard or Contract drawings.
- Shop drawings are required for all poles.
- Anchor bolts are to be galvanized. Where exposed provide anchor bolt covers. Check anchor bolts layout using a template prior to pouring concrete.
- All steel hardware, fasteners and bracket arms are to be hot dipped galvanized, shop primed and painted to match poles.
- Cure new concrete anchors for 7 days before installing poles. Do not load poles for at least 14 days after concrete is cured. This time frame can be accelerated using fast set concrete with the approval of Traffic Engineering
- Provide identification pole tags showing gauge, base type, lighting arm length, lighting arm type, lighting fixture mounting height and gusset plate for signal arm attachment.
- Check orientation and location of mast and bracket arms.
- All poles should have a hand hole near the base and at the orientation as shown.
- Pay items for poles are each, per type and size of pole.

**3) FOUNDATIONS (CITY SUPPLEMENT 1319)**

- Stake location and call OUPS. Inspect staking prior to excavation.
- Contact Traffic Engineer prior to first pour to coordinate inspection.
- When drilling near utilities, hand excavate until exact location of all utilities are know.
- Pour foundation against undisturbed earth. If the soil caves in, place additional concrete to fill in excavation or use casing or corrugated metal pipe to support sides. Contact the CE for direction as to how to construct and how to pay for any additional work due to changed conditions. If a corrugated pipe is used backfill with CDF.
- Place and secure embedded items, rebar and conduit as required. Inspect before pouring concrete. Pay special attention to anchor bolt layout.
- Unless otherwise required use class C concrete.
- Foundation are paid per cubic yard of concrete, per plan dimensions including excavation, backfill and all embedded items.

**4) GROUNDING EQUIPMENT (CITY SUPPLEMENT 1320)**

- Ground all non-current carrying metal parts, poles, pedestals, cabinets, conduit and equipment.
- Ground rods are copper clad high strength steel 1" x 10'. Use No. 4 AWG copper wire to connect to ground rod.
- Connect wire to rod by exothermic weld or 1" ground rod clamp, (clamp is preferred method).
- Drive ground rod with at least 1' cover and 1' from foundation, or otherwise shown.
- Measure the earths resistance in ohms of each ground rod immediately after installed, needs to be 25 ohms or less, log on Ground Rod Resistance Test Record Sheet. If tests fail contact the CE for direction.
- Ground rods are paid by each.

**5) CONDUIT, RISERS AND TRENCHING (ODOT 625, CITY SUPPLEMENT 1321)**

- Mark location of trenching to be approved prior to saw cutting.
- Saw cut and remove pavement, excavate to depth as shown on plans.
- Excavate, backfill and restore in kind per ODOT 603.
- Conduit shall be rigid metal or PVC scheduled 40 concrete encased.
- Provide conduit markers where conduit is installed dead ended beneath grade.
- Conduit and trench are paid per linear foot of trench and conduit per type and size.

**6) ELECTRICAL BOXES ( CITY SUPPLEMENT 1322)**

- Concrete pull boxes, construct per size and type specified. Most contractor's use precast pull boxes, shop drawings are required.
- Provide cast iron casting grouted to pull box.
- Note specification for 22" x 22" downtown special pull box, mostly used in streetscape areas. Use composite lid as specified.
- Pull boxes are paid per each including frame and cover.

**7) CABLE, CONNECTORS, AND ACCESSORIES ( CITY SUPPLEMENT 1323)**

- Install and route cable and wire by size and type as shown on plans. Wire is sized by AWG, the higher the number to thinner the wire. Wire and cables are sized by the voltage of the load that is required plus the drop in voltage for the length of the run. Cable is a group of wires, for example a 7 conductor #14 is a group of seven #14 wires.
- Feeder cable shall be color coded with red, black and green (ground) and the colors shall be impregnated into the insulation.
- All wire should be marked every 5' with manufacturer's name, wire size, voltage rating, type and style.
- If connector kits and splice kits are called for, follow the manufacture's installation requirements. Optional methods may be used if approved by Traffic Engineering.
- Notify city forces to make connection with a live master cable. The contractor can make connection to de-energized master lines. Prior to any connection contact Traffic Engineering.
- Duke Energy personnel will make all connections and disconnects with Duke Energy systems. Contact Traffic Engineering, they need to approve and contact Duke.
- Wire is measured horizontally from center of pull box, cabinet, power source, pole, ect. to center of pull box, cabinet, ect. with an additional 5 feet for slack and connections at each end. Measure vertically between pole and conduit outlets. The CI needs to physically measure wire lengths in the field.
- CTCS type interconnect cable shall be tested by the contractor to verify the capability of voice transmission and the absence of excessive induced noise. Measurements shall be performed by the Contractor on all data circuits to measure the transmission bandwidth and verify that the bandwidth is reasonable for data transmission at 1200 baud using frequency shift keyed modulation at 1200 and 2200 Hertz. The tests shall also verify that there are no shorts or opens to any termination point, and that each pair is capacitive balanced to ground. Any discrepancies or test failures shall be corrected by the Contractor.
- Wire, cable is measure per linear foot of size and type of wire installed. Connector and splicing kits are paid per each.



**8) TRAFFIC AND LIGHTING CONTROLS (CITY SUPPLEMENT 1324)**

- Provide photo-electric cell to control on/off operations. Photo-cells are used on most highway lighting circuits.
- Mount photo-cell at least 25' up on designated pole.
- Provide street lighting relays, as required in plans. A relay switch is used on most downtown lighting circuits since power is supplied from a timed Duke Energy circuit.
- Provide relay in weather proof housing.
- Install street lighting controller and/or safety disconnect switches as specified.
- Provide NEMA type 4X fabricated enclosure. Enclosure shall include a door that can not be opened when the handle is in the ON position.
- The City will provide all traffic signal controllers. The contractor shall arrange to pick up, deliver to the site and install the controller. For new controllers put on flash for 5 days before activating. For replacement of existing controllers, the switch to the new controller needs to be coordinated with Traffic Engineer, off-duty police officers are generally used to control traffic.
- Photo-cells, street lighting relays, street lighting controllers, safety switches, controller cabinets are all paid per each.

**9) STREET LIGHTING LUMINARIES (CITY SUPPLEMENT 1325)**

- Install luminaries of type as specified including, complete lighting device, housing, support hardware, reflector refractor, socket lamp, integral ballast, disconnection device, terminal block, photo-cell receptacle and incidentals as required.
- Contact Traffic Engineering to inspect traffic luminaries material prior to installing.
- Mount luminaries on poles to adjust vertically and horizontally to the required mounting height and specified alignment with the roadway.
- Install a lamp for each street lighting luminaries per City supplement 1326.
- Luminaries are paid per each of size and type.

**10) TRAFFIC SIGNALS (CITY SUPPLEMENT 1327)**

- Contact Traffic Engineering to inspect traffic signals material prior to installing.
- Contact Traffic Engineering during installation.
- Maintain existing signals until new signals are fully functional. Cover any new or existing signal not in use.
- Signals are paid per each of type and size.

**11) TRAFFIC SIGNAL DETECTORS (CITY SUPPLEMENT 1328)**

- Layout loop detectors after final striping, get approved by Traffic Engineering before sawing.
- Loop detector pavement cutting, saw 3/8" slots in pavement for installation of detector wire. Use 1" PVC conduit to go through curbs.
- Loop detector wire is paid under item 1323. Install under clear, dry weather. Brush and blow all slots clean of loose materials. Install No. 14 wire. Protect loop wire with a flexible plastic tubing before installing into slot. Place tubing and wire into slots and seal with flexible embedding sealant.
- Furnish pushbuttons with two instruction signs, one mounted below the pushbutton and one mounted across the street on top of the complementary actuated pedestrian signal.
- Payment of detector pavement cutting is per linear foot. Payment for pedestrian pushbutton with associated signs is per each.

**12) TRAFFIC CONTROL SIGNS AND INSTALLATIONS ( CITY SUPPLEMENT 1329)**

- Internally illuminated signs include plastic sign face, frame, lamp holders, ballasts, terminals, wiring and mounting hubs.
- Supply shop drawings for all signs.
- Traffic Engineering should inspect and approve signs before installation.
- Flat sheet signs are not required to be internally illuminated and are made of flat sheet aluminum, painted and reflectorized in accordance with ODOT 630, type G.
- Payment for internally illuminated signs are per each of type and size. Payment for flat sheet signs are per square foot and/or each as specified.

**13) RELOCATION OF EXISTING EQUIPMENT ( CITY SUPPLEMENT 1332)**

- The plans may specified lighting or traffic equipment to be relocated. Carefully remove, clean, remove any rust and spot paint.
- Furnish new hardware.
- Payment is per each for relocation of specific existing equipment.

**14) MODIFICATION OF EXISTING LIGHTING CIRCUITS ( CITY SUPPLEMENT 1333)**

- Where plans specify modify and reconnect the specified lighting circuit as directed.
- Schedule work as not to disable the existing lighting circuit during the hours when the circuit is normally operative.
- Payment is per each for circuit to be modified.

**APPENDIX 1.0**  
**HAMCIN: CLSM-CDF SPECIFICATION**

The latest version of the CLSM-CDF specification can be found on the DOT&E S drive at S:\HAMCIN.