The Manual for Uniform Recordkeeping (MURK) Part 1B Construction Inspection Manual (CIM) provides guidance to Department construction inspection staff for Standard Specification Sections 200 through 699. Specific procedures are provided that construction inspection staff can use to ensure that appropriate tests are performed; inspections are performed at the appropriate times; and only materials meeting the specifications are incorporated into the work. The primary sources of requirements for inspection are New York State Department of Transportation:

- Standard Specifications for Construction and Materials
- Standard Sheets
- Contract specific details and special specifications
- Independent Assurance Sampling and Testing Program

American Standards Testing and Materials (ASTM) and American Association of State Highway and Transportation Officials (AASHTO) materials and testing specifications play a major role in the standard specifications and in assuring conformance with both federal and industry standards.

Material certifications of approved materials, in accordance with §106-04 Material Certifications and Approved Lists, for standard specification in Section 700 are associated with many items inspected with CIM procedures. The certifications help ensure that appropriate quality materials are incorporated into the work.

Project schedules submitted consistent with the standard specification and CAM §108-01 Start and Progress of Work should be consulted to ensure that critical issues associated with each construction stage are addressed before work on that item begins.

Other MURK manuals for construction program activities are noted below:

**MURK Part 1A** the Contract Administration Manual (CAM) contains guidance for Standard Specifications, Section 100 General Provisions. Requirements or information that do not correspond to any specific subsection, or cover general requirements, are covered in Sections 90 through 99.

**MURK Part 1C** the Office of Construction Safety and Health Program Manual, contains guidance for safety and health requirements on Department contracts that apply to contractor's construction operations, to program staff, and to construction inspection consultants' staff.

**MURK Part 1D** the Construction Consultant Manual is a comprehensive reference to all aspects of the administration of consultant contracts for construction activities, including consultant inspection and construction services.

**MURK Part 2A** the Materials Inspection Manual (MIM), is published by the Materials Bureau and contains guidance for materials testing and acceptance. The MIM corresponds to Standard Specifications Section 700 Materials and Manufacturing.
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201-3.01 Limits of Work Areas
This work, as stated in the Standard Specifications, consists of clearing, grubbing, removing and disposing of all trees, brush, stumps, fences, debris and miscellaneous structures not covered under other contract items, within the construction area and such other areas as specified or directed.

Safety and aesthetic interests relate to the proximity of trees to the traveled way. From a safety perspective:
1. collisions with trees are the leading cause of fatalities for run-off-the-road crashes,
2. the closer the trees are, the higher the crash rate is, and
3. the closer the trees are, the greater the accident severity is.

Roadside trees, shrubs and herbaceous plants provide seasonal aesthetic value to highway travelers, screen unsightly adjacent land uses for motorists and bicyclists, screen the highway from adjacent sensitive residential, recreational and commercial properties, and provide important wildlife habitat. Existing vegetation, including dead trees, provide food sources, nesting sites, refuge areas and travel corridors for many species of birds, mammals, amphibians and insects. Existing vegetation also serves to protect water quality and to stabilize the banks of streams, ponds and rivers.

There is no standard for clear zone area width that will provide a “safe condition”. Instead we try to provide as much clear zone as we reasonably can without adverse socio-environmental impacts. To aid the EIC in making decisions about width, the HDM states “It is desirable for the designer to note on the plans locations where it may be possible to conveniently provide more clear area than the Design Clear Zone Width”. Almost without exception, the wider a clear zone is, the safer the facility will be. At some point, of course, the safety benefits decline to less than the economic and aesthetic cost. The Engineer should coordinate the limits of vegetation to be saved with the Regional Landscape Architect.

For aesthetic and wildlife habitat reasons, avoid removing vegetation in even width bands for long stretches of roadway. This creates a monotonous appearance and degrades wildlife habitat. Trees and shrubs should be retained on uphill slopes, along stream corridors, at rock outcroppings, behind guide rail and in areas where there is no history of accidents. This will help to create a varying width clear zone that is more aesthetically pleasing. In no case should vegetation be cleared at a distance of greater than 50 feet, measured horizontally, from edge or pavement unless a documented accident history exists. The Engineer should coordinate the limits of vegetation to be saved with the Regional Landscape Architect and the Regional Environmental Contact.

The designer does not quantify clear zone widths. It would require a complex assessment involving traffic volumes, traffic speeds, vehicle types, embankment slopes, degrees of curvature, and environmental considerations. Obviously, there will be locations where special features limit the widths that can be cleared. There will be other locations where safe widths can be provided. In fact, there will be continuous variation in the widths that can be reasonably obtained over the length of the project. It has been viewed as impractical to describe and/or specify the construction of a continuously varying width of clear zone. The approach is to divide the roadside into stretches having similar roadside conditions and specify design clear zone widths for each segment on the plans. The design clear zone width, once established, represents our legal commitment to maintain that width in a cleared and safely transversable condition.

As a result of the permit work, ROW acquisition debates, discussions with environmental agencies and groups and public hearings, the Department should be in a good position to know where the efforts should be made to obtain more than the minimum width of clear area and where efforts should not be made.

The importance of designating carefully selected clear zone limits in wooded areas of the Adirondack and Catskill Parks and along parkways, scenic byways, signed bike routes, river and stream corridors,
SECTION 201 - CLEARING AND GRUBBING

designated scenic touring routes, and adjacent to public parks and wildlife management areas should be readily apparent. In these locations statewide, even greater consideration should be given to retaining existing woody vegetation. Doing a sensitive job under clearing and grubbing will be instrumental in improving the Department's environmental image and performance.

Often, formal and informal agreements on vegetation removal or retention have been made during planning and design with the regulatory and resource agencies, environmental groups and municipalities. The Engineer should ascertain from the Regional Design Engineer and the Regional Environmental Contact as to what commitments have been made. If these are not reflected in the contract documents, any conflicts between such commitments and the Department's safety standards should be resolved through the Construction Supervisor with direct involvement by the Regional Landscape/Environmental Unit.
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS

202-3.01 General and Safety Requirements

General
Demolition of structures and buildings, and the replacement of structural elements on structures that are to remain in place, represent significant safety risks both to the works involved and to the traveling public. It is essential that these operations are carried out under the careful supervision of the contractor with adequate consideration of safety. The Engineer's attention is directed to Sections 202 and 589 of the Standard Specifications, which provide specific requirements that the contractor must address. Any demolition or removal of structural elements carried out under other sections of the specifications must address the same general requirements as listed in Section 202 and 589, based on the general health and safety provisions of §107-05A of the Standard Specifications, and on Subpart T of 29 CFR Part 1926 (OSHA health and safety regulations for Construction).

Specific requirements include the following:

1. Prior to demolition operations, the contractor's competent person shall make an engineering survey of the building or structure.

2. The written findings and recommendations of this survey shall constitute a removal plan, which must be given to the Engineer and filed with the Project Safety and Health Plan. The removal plan must meet all the requirements of Title 29 Code of Federal Regulations Part 1926, Subpart T-Demolition, and also be consistent with the contractor's Project Safety and Health Plan. It should address the following areas of concern:

   a. Existing condition of the building or structure.
   b. Possibility of collapse of any portion during demolition operations.
   c. Condition of adjacent buildings or structures within 300 meters (if directed by the Engineer). To make this determination, the Engineer should consider whether the stability of adjacent buildings or structures will be significantly affected by demolition operations.
   d. Description of type, size and location of equipment to be used in the demolition operations.
   e. Sequence and preliminary schedule of removal activities. The schedule should also identify any critical operations which will require on-site monitoring by the contractor's competent person.
   f. Bracing or shoring required to secure or stabilize deteriorated buildings or structures so that workers can perform operations safely.
   g. Walls, supports and bracing necessary to accomplish the demolition of party wall structures.
   h. Details of the shoring and shoring foundations necessary to prevent damage to adjacent property.
   i. Designation and identification of non-access areas (areas that could become unstable or subject to collapse).
   j. The presence of potentially hazardous materials that were noted during the necessary structural survey. The competent person is not expected to perform hazardous materials survey and testing (this should have been done during the design phase), but suspect materials should be identified for testing by the State.
   k. Plans for monitoring the building or structure during demolition operations. The contractor's competent person does not always have to be present, but should monitor the operations on a frequent and continuing basis, and be on-site to monitor any critical operations.
   l. Plans for shutting off or maintaining utilities on the building or structure.
   m. Maintenance and protection of traffic scheme.
3. For bridge structures longer than 6 meters, the competent person must be a registered Professional Engineer, unless this requirement is specifically waived in the contract documents. The decision to waive the requirement is made by the project designer, based on the type of structure, the condition of the structure and the type of feature crossed. For buildings, other than ordinary wood frame construction, the competent person must be a registered Professional Engineer or a registered Professional Architect.

4. Removal plans that must be prepared by a Professional Engineer or a Professional Architect shall be submitted to the Engineer 30 days prior to the commencement of demolition operations. Other removal plans shall be submitted 15 days prior to commencement.

Review of Contractor’s Demolition Plan

The Engineer should review the contractor’s demolition plan to ensure that it addresses all appropriate specification requirements. If any obvious omissions are noted, the plan should be returned to the contractor with a request that the necessary information be provided. On particularly large and complicated jobs, the Engineer may also request the Regional Structures Engineer to review the demolition plan.

Inspection During Demolition
During the course of demolition operations, the Engineer and the inspection staff must ensure that the contractor complies with all aspects of the demolition plan submitted. Inspectors must be knowledgeable about the specific aspects of the demolition operations for which they are responsible.

Changes to Demolition Plan
Any changes to the demolition plan must be submitted to the Engineer for review as noted above. The Engineer is responsible for ensuring the inspection staff is kept informed of all such changes.

References:
LOCAL BUILDING CODES
NYS FIRE PREVENTION & BUILDING CODE
NYC BUILDING CODE (FOR NYC PROJECTS)
29 CFR, PART 1926, SUBPART T-DEMOLITION
SECTION 203 - EXCAVATION AND EMBANKMENT

203-2.01 Tests and Control Methods
Included as Exhibit 203A is the Geotechnical Engineering Bureau’s recommended frequency of sampling and testing of various earthwork items for quality control purposes. The number of samples and tests, as well as the distribution of locations from which they are taken, should be such as to adequately assure and verify that the materials incorporated in the work and resulting construction are acceptable and in accordance with the plans and specifications.

The sampling and testing should be augmented and coordinated by adequate visual inspection. It is important not only to assure that the methods and equipment used are in accordance with the specifications, but also to assure that the samples and tests are taken from material which is representative of the entire mass of materials. It is expected that inspection personnel on major earthwork projects will continuously observe all earthwork operations at all times and that the sampling and testing will be done by other personnel, to preclude the necessity for earthwork inspectors to leave the scene during operations to perform a test.

Earthwork compaction control tests may only be waived if, in the judgement of the Engineer-in-Charge, with the concurrence of the Regional Geotechnical Engineer (in writing), the material being placed and compacted contains a sufficient proportion of gravel, stones and cobbles, as to make the performance of compaction control tests impractical.

However, compaction control tests shall not be waived on materials containing less than 30% by weight of particles retained on the 19 millimeter sieve. Waivers shall be properly noted in the project records, whenever compaction control tests are waived. The compaction control tests should reflect the in-place density of the entire lift thickness. The Contractor is required to provide adequate access to sources in order to perform these control tests.

All areas of failing tests should be retested after reworking the materials or applying additional compactive effort until a passing test is obtained. The Inspectors Daily Reports should cross-reference the failing test(s) and passing test(s).

203-3.01 General
Soils and soil related items account for a significant proportion of the work involved in the construction of transportation facilities. Therefore, control of these items by the earthwork inspectors under the supervision of the Engineer-in-Charge (EIC) is essential. Although the EIC is wholly responsible for the enforcement of all the requirements of the specifications and the control of these items on the project, he/she may convene a preconstruction meeting on projects involving particular Geotechnical procedures or operations. Additionally, the EIC may request the advice and assistance of the Regional Geotechnical Engineer on soil engineering problems that develop as the job progresses.

The requirements for the earthwork items are found in the 200 section of the specification book. However, the plans and proposal should be examined closely for special notes and special specifications. The General Provisions, given in Section 100 of the specifications, also contain requirements which affect excavation items.

§107-01 requires that the Contractor abide by all applicable laws and regulations. 12 NYCRR 753 applies to all excavation work by the Contractor. This rule establishes the legal responsibilities for the operators of public or private underground facilities and excavators. In essence, 12 NYCRR 753 requires that prior to the start of excavation or demolition work the Contractor obtain a listing of the owners and operators of underground facilities in the area and notify them of the plan to perform this work. A listing can be obtained from the central registry maintained by each town or city outside the City of New York and each County within the City of New York. The operator is then required to stake out all of his underground facilities within the work area which the Contractor must verify as to the type, size, direction of run and depth and encasement before starting work. The work required to comply...
SECTION 203 - EXCAVATION AND EMBANKMENT

with Code Rule 753 is incidental to the contract and as such no separate contract payment is made for this work.

In general all earthwork operations should cease between November 1st and March 31st. Temperatures below 0°C do not allow adequate compaction of most materials because frozen water inhibits consolidation of the individual soil particles. However, the Regional Director may grant exceptions which can contain additional requirements in order for the work to proceed. The construction of crushed rock embankments, are generally allowed under this exemption provision.

203-3.03 Soil Erosion and Water Pollution
Section 203 Excavation and Embankment and Section 209 Temporary Soil Erosion and Water Pollution Control both require schedules to be submitted. Work should not be permitted until these schedules have been received and approved. These schedules should be compared to and should be consistent with the contract documents erosion and sediment control plan to ensure that a logical sequence of excavation and control measures exist throughout the construction staging or until final site stabilization.

203-3.05 Rock Excavation & Scaling
Prior to drilling of any holes and blasting operations on projects involving rock and/or structural removal, a project pre-blasting meeting is required. Those in attendance should include the Engineer, Contractor, Blaster, representatives of all affected agencies, utility companies and an Engineering Geologist from the Geotechnical Engineering Bureau.

The Earthwork Inspector should document all aspects of the drilling and blasting operations on Form GE-469 (Exhibit 203B), "BLASTING REPORT," and append it to the MURK-1, "INSPECTOR'S DAILY REPORT." Consult an Engineering Geologist for assistance in completing these forms.

Engineers on projects involving rock scaling where weighing of scaled materials is required shall complete FORM SM-428 (Exhibit 203C), "DAILY RECORD OF SCALE WEIGHTS."

On projects with contractor-supplied scales, the Contractor may use Certified Public Scales or may furnish certified scales. Inspect the contractor-supplied scales. Record the certification and presence of an unexpired seal of the appropriate Sealer of Weights and Measures on MURK-1, "INSPECTOR'S DAILY REPORT," documenting that only certified scales are used on the project. In the case of certified public scales, the Engineer shall provide the Contractor with written authorization to use specific scales.

As indicated in the specification, the tare weight of each truck shall be furnished to the Engineer prior to the start of work. After weighing and before reloading, a delivery ticket for each truck load shall be provided to the Engineer (or his representative) with at least the following information: scale identification, date, time and loaded truck weight.

203-3.06 Suitable Material
Excavation items do not generally require testing of the excavated material. It is generally either suitable or unsuitable for embankment as defined in the specifications. In most cases, design investigations have determined whether suspect sites are contaminated and the proper disposal method. If soil is excavated that appears to be contaminated, work should immediately be stopped and the Regional Environmental Contact notified. The Regional Environmental Contact would then give direction to the EIC on how to properly proceed with the work.

203-3.08 Disposal of Surplus Excavated Materials
Any surplus material generated in the course of a DOT construction project becomes the property of the Contractor to dispose of in accordance with all applicable laws and regulations. As per the
specifications, the EIC must approve of the Contractor’s proposed spoil/waste site regardless of whether it is on DOT ROW or on private land. Also these approved spoil sites must be restored in a manner consistent with §107-10 and §107-11. Disposal should not be approved in wetlands or flood plains, or adjacent to.

The Contractor may request to dispose of surplus material for the flattening of existing embankment slopes or filling of other areas within DOT’s ROW. The EIC should verify that this fill will not infringe on a wetland or flood plain. A wetland, depending on its size and location, is regulated by DEC, APA, and/or the Army Corps of Engineers. All of these agencies have strict regulating processes to follow before an approval is granted to place fill in a wetland. Filling wetlands outside of the ROW may affect the type and conditions of the wetland permits obtained during design for work within the project limits. Even if the wetland spoil area were approved, the Contractor or the Department may be required to mitigate the loss of the wetland by creating an equal sized wetland in another location. In summary, the widespread availability of nonwetland spoil sites, time for approval, and associated costs, should preclude the consideration of wetlands for spoil sites.

Flood plains are regulated by DEC to ensure that construction activities do not increase the severity of flooding due to encroachment into the floodway or fringe areas. The floodway and fringe areas are the components of the flood plain. By definition, the flood plain is the land that is flooded by the 100 year flood. The elevation to which the flood will rise is termed the base of the flood elevation and is determined by the Federal Emergency Management Agency (FEMA). Because an outside agency has the responsibility to review and approve the disposal of material in these designated areas, the time for review and the decision itself are uncertain. Therefore, common sense would again dictate that flood plains should not be considered as a spoil area.

The only surplus demolition material that can be allowed in a waste site on or off DOT ROW is milled asphalt concrete or crushed portland cement concrete provided there is no exposed rebar. The EIC should refer to DEC’s waste regulations, 6NYCRR, Part 360 to ensure proper disposal for all other demolition material. The Contractor must supply the EIC with all the appropriate paperwork which will be filed with the appropriate documentation.

203-3.10 Embankment Construction
203-3.12 Compaction

Embankment construction includes operations such as stripping, benching, and preparation of the embankment foundation, as well as the placement and compaction of suitable embankment materials. The major controls of embankment construction are the lift thickness, compactive effort, type of equipment and density requirements. Moisture content is controlled by the Contractor.

Lift thickness and compactive effort depend on the compaction equipment supplied by the Contractor. When a smooth drum is provided, a current list of the “Manufacturer’s Data for the Rating of Smooth Drum Vibratory Compactors for Earthwork Construction” is available (see Exhibit 203D). The basic machine data for the various models required to determine loose lift thickness are unsprung drum weight, dynamic force, rated frequency, and drum width. Machines which do not meet the specifications are so noted. Machines which have had their specifications altered without changing the model number designations have been listed with the minimum acceptable parameters. The words low, medium, high, super, or the initials L, M, H, etc., appearing after the model number indicate a machine that has the capability of changing the dynamic force applied by varying the amplitude and/or rated frequency. The acceptable frequency range data provides limiting frequency values within which the compactor may operate (the acceptable frequency range is limited to 1100-1500 VPM by specification). The actual operating frequency must be verified by a tachometer supplied by the Contractor. For assistance in evaluating compaction equipment that is not on the current list, call the Regional Geotechnical Engineer. It is advisable to request assistance promptly to allow sufficient time to obtain the necessary data to rate the equipment.
SECTION 203 - EXCAVATION AND EMBANKMENT

Determination of loose lift thickness for the use of smooth wheel steel drum vibratory roller meeting the specifications and given in Exhibit 203D is as follows:

1. Given the manufacturer, model number, and anticipated operating frequency, enter the column headed “Frequency Range” to verify the operating frequency falls within the acceptable range.

2. Determine the operating dynamic force by converting the rated dynamic force to the planned operating frequency.

3. Using the operating dynamic force, unsprung drum weight, and drum width determine the minimum compactive force per unit length of drum.

4. Enter the graph (Figure 203-3) in the Standard Specifications, Section 203-3.12, Compaction, with the minimum compactive force and horizontally project to the intersection of the appropriate curve for soils and select granular material or blasted or broken rock then vertically down to determine the maximum loose lift thickness.

5. If the Contractor wishes to change the number of passes or operating speed of the roller, a new corresponding operating speed or number of passes would need to be established.

Example:
The Contractor wishes to use a Dynapac CA141D at an operating frequency of 1475/ V.P.M. and 4 passes to compact granular fill. What is the maximum loose lift thickness and operating speed?

1. The proposed operating frequency, 1475v.p.m. is within the listed frequency range of 1447-1500 v.p.m.

2. Conversion of manufacturer’s published ratings, at a given frequency (see Exhibit 203-D), shall be made with the following equation:

3. Determine the minimum effective compactive force per unit length of drum.

4. Determine maximum loose lift thickness.

   From figure 203-3(B) 8 inches

5. Determine new operating speed for 4 passes of the roller.

Once determined, the compaction equipment, operating frequency, maximum and actual lift thickness, and number of passes shall be recorded on MURK-1, “INSPECTORS DAILY REPORT.”

For items which have density requirements, minimum densities shall be verified with compaction control tests performed on the job by the project’s earthwork inspection personnel. These tests shall be performed in conformance with the procedures contained in the appropriate Departmental publication in effect on the date of the advertisement for bids (References: STM-6, 9 or 10). The Regional Geotechnical Engineer can specify the appropriate test(s).

Test results shall be documented on MURK-1, "INSPECTOR'S DAILY REPORT," and Forms SM-384A,(Exhibit 203E)"COMPACTION CONTROL DATA SHEET," SM-417B, (Exhibit 203F) "FIELD COMPACTION DATA SHEET - SAND CONE OR VOLUMETER APPARATUS," AND/OR SM-418B, (Exhibit 203G) "FIELD COMPACTION DATA SHEET - NUCLEAR DIRECT TRANSMISSION." Retests of previously failing tests should be cross referenced to the original tests. A copy of the SM-417B shall
be submitted to the Regional Geotechnical Engineer for their files.

203-3.15 Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables
Controlled Low Strength Material (CLSM) is often an acceptable alternative to compacted soil backfill. CLSM consists of cement, water and, at the contractor's option, fly ash, aggregate or chemical admixtures in any proportions such that the final product meets the strength and flow consistency requirements included in the specification. The mix is proportioned to be self leveling and does not require compaction. It is much lower in strength than concrete, making future excavation possible. CLSM should be thought of as “liquid dirt.”

Guidelines for Placement and Inspection of Controlled Low Strength Material (CLSM):

A - Narrower trench widths can be employed when using CLSM instead of soil backfill due to the self-compacting properties of the material. Therefore, construction personnel and equipment are not required to be in the trench for compaction operations. Some installations, however, may require that construction personnel temporarily occupy the trench to make adjustments to the alignment of the pipe. In this case, all OSHA requirements will be followed.

B - In situations where CLSM is used as backfill around lightweight pipe, flotation of the pipe may occur. To counteract the buoyancy of the pipe as the CLSM is placed, partially fill the pipe with water as necessary for weight. Anchors, straps and gravel bags are also used to weight the pipe, but these methods are less desirable, as arching between the anchor points can occur.

C - When placing CLSM, pour the material onto the top of the pipe at the center. This will help hold the pipe down and ensure even placement rates of CLSM on opposite sides of the pipe.

D - Do not place CLSM in contact with aluminum pipe, including connections, fixtures, etc., unless the aluminum has been coated with an approved primer. Do not place CLSM containing fly ash in contact with cast iron pipes.

E - Once the depth of CLSM cover over the pipe is 150 mm and the remaining trench depth is less than 1.5 m, a 50 mm layer of crushed stone can be placed and tamped directly on the CLSM, allowing conventional backfill operations to continue during set-up of the material. If suitable, use the excavated soil as backfill material on top of the crushed stone to ensure uniform frost reaction.

F - Where the distance between the top of pipe elevation and the top of subgrade elevation is less than 0.6 m, use CLSM for the backfill material to top of subgrade elevation.

G - CLSM should be kept encapsulated with soil, as it is highly erodible and disintegrates when left exposed to the environment.

H - Refer to Special Specification Item 17203.80 and Standard Sheet Nos. 203-6 and 203-7 for additional construction details of CLSM.

203-3.16 Borrow
As per the specification, any offsite borrow source must be approved by the Engineer-in-Charge prior to its use. Permission to use construction and demolition (C&D) materials from off-site locations must be critically reviewed as existing NYSDEC regulations severely restrict the type of C&D material that can be allowed for embankment construction. Also, it may be necessary for a mining permit to be acquired by the contractor. The recognized danger is that crushed or shredded, and therefore, unrecognizable C&D material is an ideal medium to conceal the disposal of hazardous or toxic materials. Accordingly, only recognizable uncontaminated concrete, asphalt concrete pavement, brick, soil or stone can be legally placed in our embankments. The presence of any other material even in
minute amounts should be cause for rejection and requires the disposal by DEC, of all the material in a 
DEC approved C&D landfill. If this material is contaminated, it may not be acceptable for disposal in a 
DEC approved C&D landfill. In those instances the Engineer should defer to DEC so that the waste is 
properly disposed and does not create a problem.

203-3.17 Select Granular Materials
The control and test requirements of granular materials used on a project is covered in the appropriate 
Departmental publication in effect on the date of the bid advertisement (Reference: GCP-17).

Material for items in the 203 series do not require stockpiling. However, a Contractor may choose to 
stockpile these items, and if so, that material will be sampled, tested and evaluated as a stockpiled 
item. If the Contractor elects to stockpile 203 item materials, the EIC and Regional Geotechnical 
Engineer should inspect the construction of the stockpile(s) to assure that it is constructed according to 
Departmental requirements (Reference: GCP-17). Record the material source and stockpile 
construction features on MURK-1, "INSPECTOR'S DAILY REPORT." Final approval of the stockpile is 
requested and obtained from the Regional Geotechnical Engineer. The Regional Geotechnical 
Engineer will supervise the sampling and arrange for the testing of stockpiles. Test results will be 
reported on Form GE-454M (Exhibit 203H), "GRANULAR MATERIAL DOCUMENTATION FORM" and 
filed with project identification number and location of use with a copy to the Regional Geotechnical 
Engineer.

For items not stockpiled, which require soundness and plasticity index determinations, samples shall 
be taken by the Regional Geotechnical Engineer for testing in accordance with established 
Departmental procedures. Test results will be returned on Form GE-454M, "GRANULAR MATERIAL 
DOCUMENTATION FORM." A copy of this form shall be part of the project records. For projects that 
obtain material from sources which were tested under other projects, a copy of a letter approving 
transfer from the Regional Geotechnical Engineer, as well as a copy of the original GE-454M, shall be 
placed in the project file.

For items not stockpiled, which required conformance to a particular gradation, sieve tests shall be 
performed by earthwork inspection personnel in accordance with Departmental instructions 
(Reference: STM-20) and reported on Forms SM-15B (Exhibit 203I), "SIEVE ANALYSIS DATA" and 
SM-198C (Exhibit 203J), "FIELD SIEVE ANALYSIS SUMMARY SHEET - GRANULAR MATERIAL." 
For a guide to sampling frequency, refer to Exhibit 203-A.

203-3.18 Embankment Construction Control Devices
Facilities constructed on soft and compressible foundations sometimes require the installation of 
devices to determine settlement. The construction details and procedural requirements for these 
devices are given in a Departmental publication (Reference: GCP-15). Forms GE-435, 
"SETTLEMENT REPORT - MANOMETER GAGE (Exhibit 203K)," GE-436 (Exhibit 203L), 
"SETTLEMENT REPORT - ROD GAGE," and/or GE-437 (Exhibit 203M), "SETTLEMENT REPORT - 
PIPE GAGE," shall be completed.

Occasionally, piezometers are installed to monitor pore water pressures in embankments or slopes. 
Piezometer readings shall be recorded on Form GE-264 (Exhibit 203N), "PORE PRESSURE REPORT 
VIBRATING WIRE PIEZOMETER."

To monitor potential slope movements, slope indicator installations may be required. Form GE-422, 
(Exhibit 203O) "SLOPE INDICATOR DATA SHEET," shall be completed to record these readings.

203-4 Method of Measurement
A. Payment lines for all items of work with payment units in cubic meters encompassed by Section 
203 shall be computed from payment lines shown on the Plans or Standard Sheets, except where
SECTION 203 - EXCAVATION AND EMBANKMENT

revised payment lines are established by the Engineer, in writing, prior to performing the work.

B. Excavation of unsuitable material shall be permitted by the Engineer to the payment lines establishing the lateral and depth extent of the excavation as shown on the applicable cross sections. If such payment lines are not indicated on the cross sections, the Regional Geotechnical Engineer should be requested to acquire and furnish sufficient subsurface information that will permit the establishment of payment lines. Such payment lines shall be established and approved by the Regional Geotechnical Engineer before any excavation is done. The depth, extent and payment for unsuitable material excavation shall be based on predetermined payment lines and not on such criteria as the color of the water, the color of the muck in the bucket, or the color of the waste pile. Just prior to backfilling, the Engineer shall verify that the excavation has been completed to the payment lines. Also, payment shall not be made for excavation or backfill in excess of such predetermined payment lines.

203-4.01 General
Interim earthwork quantities are almost always estimated. Back-up calculations must be kept on file for all estimated quantities. Steps shall be taken to assure that progress estimates of such estimated quantities as earthwork are reasonably close to the actual quantities at the time of an estimate.

A number of methods can be used to check earthwork quantities as the job progresses. Because of the large number of variables, such as type of contract, operating procedure of the contractor and size of the inspection force, the choice of method employed for checking estimated earthwork quantities is left to each Engineer-in-Charge. A few of these methods are:

1. Load count by our inspector. When using a load count method the vehicle volume should be documented. Volumes (both heaped and level) should be available from manufacturers’ literature for most earthmoving equipment. If not, the vehicle should be measured. This theoretical volume can be factored to compensate for void space and, thereby, arrive at an adjusted compacted or in-place volume to use for loose measure truck counts. Continued periodic surveys of excavation or embankment should be made and truck volume factors adjusted as necessary.

2. Periodic surveys of cut areas at each estimate period. However, in most cases, time and personnel preclude the use of this method.

3. Computations of cut areas based on design cross sections and a sampling by survey of the elevations of excavations and/or embankment.

4. Proportioning of design earthwork workups utilizing a few actual interim survey elevations in cuts.

Periodic checks must be made and documented to substantiate earthwork quantities for which payment is made in progress estimates. The Engineer-in-Charge should select a method which best suits the particular job conditions, and, then, thoroughly document computations in the project records. Contractor’s load counts may be used as checks on the accuracy of volumes obtained by means of the methods described above, but never as the sole basis for payment. Estimates should be representative of the actual work accomplished by the Contractor during the estimate period and, at the same time, be within a reasonable degree of accuracy.

All the aforementioned difficulties in keeping track of interim quantities have been magnified by the composite item adjustment clause of §109-16. This clause allows adjusting the price for “major” unclassified excavation and embankment or unclassified excavation and embankment items if the rock quantity part of the item varies by more than 25% from the expected quantity stated in the earthwork
SECTION 203 - EXCAVATION AND EMBANKMENT

summary. The only way to know when this event occurs in order to keep cost records is to have accurate tracking of quantities. Given the strain placed on field personnel, it is strongly suggested that **each day** either estimated or measured rock quantities be agreed by both the inspector and Contractor. If a procedure is worked out between the two parties on quantity agreement, then cost adjustment if warranted will be subject to much less dispute.

**Benching**
Benching is the construction procedure of tying a new slope into an existing embankment (embankment widening) or construction a new embankment on, or adjacent to an existing earth slope by cutting “steps” into the existing slope as the new material is placed. An interlock of the two materials is created, preventing the new fill from sliding down the existing embankment or slope.

**Transition Foundation**
The longitudinal transition embankment foundation condition is encountered where the alignment places the embankment alongside a hillside or where an existing embankment is to be widened. The newly placed fill tends to slide down the slope of the hillside or the existing embankment. The standard sheet entitled “Earthwork Transitions and Benching Details” describes the preferred treatment for this condition. In effect, steps or benches are built into the existing slope to reduce the tendency of the new embankment to slide down the existing hillside or slope.

The same standard sheet (“Earthwork Transitions and Benching Details”) describes the proper treatment of the transverse transitional embankment foundation at the interface where the roadway changes from embankment to cut. When an embankment is placed against existing ground, such as occurs in a fill-cut situation, a bump may occur in the pavement at the interface. This occurs because the existing hillside is inherently different than the constructed embankment. The standard treatment provides a more gradual transition between the fill and the cut.

**Undercut**
Upon occasion unstable soil conditions are encountered at the subgrade surface. In this situation the soil is usually fine grained, inorganic and saturated. It is incapable of supporting normal construction operations and would result in poor pavement performance if the pavement could be constructed. Along with the ground water level that results in the saturate soil condition the instability may also be the result of liquefaction of the fine grained soils by the action of vibrating compaction equipment.

There are several methods of treating the unstable condition.

1. Drain the area by means of ditches or underdrains to reduce the degree of saturation of the soil. Unfortunately the terrain topography is frequently low and flat precluding this option which involves drainage by gravity.

2. Raise the profile to place the subgrade sufficiently above the unstable materials so that an adequate working platform can be constructed. Constraints such as design criteria and right of way may limit this option.

3. Horizontal realignment to avoid the site of the unstable soil is even more subject to the constraints of design criteria and right of way, and is rarely viable.

4. The most common treatment of an unstable subgrade is to undercut and replace some of the unstable material with granular material that will be stable in the wet environment. Undercuts of two feet are common. This depth of removal and replacement (determined by experience) may be reduced substantially by the use of geotextile.

The Engineer should request the opinion of the Regional Geotechnical Engineer concerning the need
and depth of undercut.

Weaving
The moisture content has a very important impact on compaction operations. At any compactive effort, the maximum density will be obtained at a particular degree of moisture called the Optimum Moisture Content. When the actual moisture content exceeds the optimum moisture content, the strength of the soil decreases rapidly. With increased moisture content the material becomes slop. This phenomenon may be observed on the grade. At moisture contents slightly over optimum, weaving of the embankment surface may occur.

That is, when a load such as a roller or heavy earthmoving equipment goes by, the embankment surfaces may depress. When the load has passed, the surface will spring back.

Rutting
At a greater moisture content, the embankment surface will not return to its original level and will leave ruts. These ruts are caused when the soil is too weak to support the roller and soil shears or the surface is punctured. Significant rutting under the action of the compactor on the final passes on a lift is not acceptable by the Specification. The degree of rutting that is significant rutting is up to the discretion of the Engineer. The Regional Geotechnical Engineer is available to advise the Engineer on the significance of the rutting.

Proof Rolling
Once the embankment is completed, and immediately prior to subbase placement, the subgrade surface must be proof rolled (See 203-3.13). The proof roller is a large box supported by four (4) pneumatic tires one axle. The weight of the roller is controlled by the load placed in the box and ranges from 30 to 50 tons. At 30 tons the box is empty, at 50 tons the box is filled to heaping. It is not the purpose of this proof rolling operation to cause rutting or failure of the embankment. If the roller is causing uniform excessive rutting, the stress level should be reduced as shown on Figure 203-4 of the Standard Specifications. If individual areas of distress are exposed by the proof rolling operation, the distressed area must be repaired or removed and replaced to the satisfaction of the Engineer at no additional cost to the State.

203-5 Basis of Payment
Both Items 203.01 and 203.02 are covered by the composite item adjustment clause under §109-16. If the requirements of the major item definition, a 25% change in the rock quantity from what is shown in the earthwork summary sheet, and proper notification and recordkeeping are satisfied the unit price can be adjusted. The suggested method for formulating a new price is in section 109-16 of CAM.

References
GCP-15, Settlement Gages and Settlement Rods
GCP-17, Procedure for the Control of Granular Materials
STM-6, Test Method for Rapid Earthwork Compaction Control
STM-9, Test Method for Earthwork Compaction Control by Sand Cone or Volumeter Apparatus
STM-10, Test Method for Earthwork Compaction Control by Nuclear Gauge
STM-20, Test Method for the Grain- Size Analysis of Granular Materials
Industrial Code Rule 53 (16 NYCRR PART 753)
Guidelines for Embankment Construction   SEM 12/87 - Official Issuance 7.14-6
New York Standard Sheet 203-2
Geotechnical Engineering Bureau Design Manual - Working Draft   Section 19.3
Contract Administration Manual (CAM)

Related Contract Provisions
SECTION 203 - EXCAVATION AND EMBANKMENT

§102-05, Subsurface Information
§106-01, Source of Supply and Quality Requirements
§106-02, Samples, Tests and Cited Specifications
§107-05 Safety and Health Requirements
§107-08, Restoration of Disturbed Areas
§107-12, Soil Erosion, Water and Air Pollution Abatement
### GUIDE TO FREQUENCY OF JOB CONTROL SAMPLING AND TESTING

<table>
<thead>
<tr>
<th>Material Description &amp; Placement</th>
<th>FREQUENCY COMPACTION</th>
<th>FREQUENCY GRADUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankment Construction Material</td>
<td>One/day/fill or One/7,646 cm *</td>
<td>NR</td>
</tr>
<tr>
<td>Select Granular Items</td>
<td>“</td>
<td>One/day/source or One/3,823 cm *</td>
</tr>
<tr>
<td>Granular Pipe Backfill Items</td>
<td>One/day/culvert, pipe, abutment, wall, etc... or One/382 cm *</td>
<td>One/day/source or One/382 cm *</td>
</tr>
<tr>
<td>Slope Protection Material</td>
<td>NR</td>
<td>One/day/source or One/3,823 cm *</td>
</tr>
<tr>
<td>Underdrain Filter Material</td>
<td>NR</td>
<td>See GCP</td>
</tr>
<tr>
<td>Structure Backfill</td>
<td>One/day/abutment, pier, wall, etc. or One/382 cm *</td>
<td>One/day/source or One/765 cm *</td>
</tr>
<tr>
<td>Subbase Course (Non-Stockpiled)</td>
<td>NR</td>
<td>GCP or 2/day/source or One/1,147 cm *</td>
</tr>
<tr>
<td>Subbase Course (Stockpiled)</td>
<td>NR</td>
<td>See GCP</td>
</tr>
<tr>
<td>Trench &amp; Culvert and Structure Excavation Backfill (Material backfilled under these items)</td>
<td>One/day/trench, abutment, pier or wall or One/382 cm *</td>
<td>NR</td>
</tr>
</tbody>
</table>

* = Whichever results in the greater frequency
NR = Not required
GCP = Geotechnical Control Procedure

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**Exhibit 203-A**
SECTION 205 – CONTAMINATED SOIL

I. GENERAL
Hazardous and non-hazardous contaminated soil handling and disposal are regulated activities in New York State. Project soil contamination may include petroleum products, volatile organic compounds (VOCs), heavy metals and/or other specialty contaminants that require regulated handling and disposal by the contractor. Department inspection of this work on NYSDOT Design-Bid-Build construction projects may be performed by in-house construction inspection, construction inspection consultant or hazardous waste environmental term agreement consultant staff. Environmental term agreement consultants are managed by the Consultant Management Bureau in Main Office. Use of the hazardous waste environmental term agreement services is requested through either the Regional Environmental Unit or Construction Environmental Coordinator (CEC) following contract award and prior to the pre-construction meeting. Additional guidance and information on handling contaminated soil during construction may be found in associated Special Notes for the project and The Environmental Manual (TEM) Section 4.4.20 Contaminated and Hazardous Materials which can be found at: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4_4_20.pdf

II. PROCEDURE
Construction inspection staff shall be responsible for reviewing and approving all required plans submitted by the contractor prior to starting any contaminated soil work. Required plans may include one or more of the following as described in the Standard Specifications:

- Contaminated Material Handling Plan (CMHP)
- Field Organic Vapor Monitoring Plan (FOVMP)
- Sampling Plan
- Disposal Plan

Assistance in review and/or approval of these plans can be provided by the Regional CEC and, if necessary, the hazardous waste environmental term agreement. The hazardous waste term agreement can also be utilized for technical assistance during excavation, segregation and material classification.

Approval of plans, based on level of contamination, may also require consultation with NYSDEC. The Regional CEC can assist with this determination and provide coordination for this consultation, if necessary.

Regional CEC will also be responsible for providing for coordination with the Regional NYSDEC Spills Engineer to arrange for NYSDEC Emergency Contractor to provide transport and disposal for any petroleum contaminated soil generated as part of the work. This coordination should be initiated following pre-construction and prior to excavation of any contaminated soil.

Refer to Section 629 Petroleum Storage Tank Closure for excavation work associated with the closure of petroleum bulk storage tanks.

III. DOCUMENTATION RETENTION
Retain all approved contractor plans on Site Manager as attachments to corresponding Daily Work Reports (DWRs). Also retain all data generated during any field organic vapor monitoring; laboratory results from any necessary site and waste characterization sampling; and waste transport and disposal documentation as attachments to corresponding DWRs.

IV. INSPECTION GUIDANCE AND ASSISTANCE DOCUMENTS/FORMS
SECTION 205 – CONTAMINATED SOIL

The following documents/forms have been developed to assist with the process, laboratory analysis payments and plan review/approval.

A. Petroleum Contaminated Soil Process Flow Chart (Exhibit 205A)
   This process flow chart can be followed as an overall inspector guideline in association with ensuring regulatory compliance.

B. Laboratory Analysis Payment Table (Exhibit 205B)
   This table can be used to track the various laboratory analyses that may be performed in association with onsite contaminated soil segregation and handling.

C. Plan Review Checklist (Exhibit 205C)
   This checklist can be used to ensure contractor plans are comprehensive and include all required component submissions.

EXHIBITS
A Petroleum Contaminated Soil Process Flow Chart
B Laboratory Analysis Payment Table
C Plan Review Checklist
SECTION 205 – CONTAMINATED SOIL

Exhibit 205A
## Laboratory Analysis Payment Table

**Gasoline, Diesel Fuel, Kerosene, Heating oil or Hydraulic oil (Only for waste oils)**

<table>
<thead>
<tr>
<th><strong>Item Number</strong></th>
<th><strong>NYSDOT Spec. Analysis Description</strong></th>
<th><strong>NYSDOT Spec. EPA Id #</strong></th>
<th><strong>Regulatory or Disposal</strong></th>
<th><strong>Laboratory Test Description</strong></th>
<th><strong>EPA Sample Method</strong></th>
<th><strong>Pay Unit</strong></th>
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<tbody>
<tr>
<td>x 205.0401</td>
<td>Petroleum Contamination Parameter Analysis CP-51</td>
<td>8260 8270</td>
<td>R</td>
<td>Totals – Volatiles &amp; MTBE</td>
<td>8260 MTBE</td>
<td>Ea.</td>
</tr>
<tr>
<td></td>
<td><strong>205.0402</strong> Hazardous Waste RCRA Toxicity Character Analysis** (Each payment based upon lab sample submitted)</td>
<td>TCLP 1311</td>
<td>D</td>
<td>TCLP – Semi-volatiles</td>
<td>8270C 3510C 1311</td>
<td>Ea.</td>
</tr>
<tr>
<td></td>
<td><strong>205.0403</strong> Laboratory Analysis for Ignitability</td>
<td>1030</td>
<td>D</td>
<td>Ignitability</td>
<td>1030</td>
<td>Ea.</td>
</tr>
<tr>
<td></td>
<td><strong>205.0404</strong> Laboratory Analysis for PH</td>
<td>9045</td>
<td>R/D</td>
<td>Laboratory Analysis for PH</td>
<td>9045</td>
<td>Ea.</td>
</tr>
<tr>
<td></td>
<td><strong>205.0405</strong> Laboratory Analysis for Polychlorinated Biphenyls (PCB's)</td>
<td>8082</td>
<td>R/D</td>
<td>Polychlorinated Biphenyls (PCB's)</td>
<td>8082</td>
<td>Ea.</td>
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<tr>
<td>xg 205.0406</td>
<td>Laboratory Analysis for Total Petroleum Hydrocarbons - Gas</td>
<td>8015 GRO</td>
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<td>8015 GRO</td>
<td>Ea.</td>
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<td>8015 DRO</td>
<td>R</td>
<td>Laboratory Analysis for Total Petroleum Hydrocarbons - Diesel</td>
<td>8015 DRO</td>
<td>Ea.</td>
</tr>
</tbody>
</table>

Required Disposal Laboratory Analysis for:  
x – all  
xg – gasoline  
xo - diesel fuel, heating oil or hydraulic oil

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**SECTION 205 – CONTAMINATED SOIL**

Exhibit 205B
PLAN REVIEW CHECKLIST

Date Received: __________

Contaminated Material Handling Plan  D __________
Field Organic Vapor Monitoring Plan
Sampling and Disposal Plan

1. Contaminated Material Handling Plan (CMHP). If the segregation and storage item is included in the contract, a CMHP shall be prepared. The CMHP shall describe the procedures to be used to segregate contaminated soil during excavation, soil storage/stockpile procedures, and safety and health issues. The following information shall be included in the CMHP:

☐ Name and address of the plan preparer;
☐ Contract name, contract number and description;
☐ Describe procedures to be used to segregate contaminated soil during excavation;
☐ Location of intended soil stockpile, trucks, roll-off container and other storage areas;
☐ Describe how contaminated soil will be moved to soil storage locations;
☐ Describe how soil storage/stockpile locations will be prepared and managed;
☐ Describe how potential air quality impacts such as creation of dust particulates and vapors will be minimized to protect air quality within, adjacent to or downwind from the project.
☐ Describe air monitoring procedures to be used during work, define action levels, and explain the response if action levels are exceeded; The protocol and procedures shall consider action levels for both work personnel and also perimeter/community action levels based on the nature of the contamination and activities conducted
☐ Hazardous substance evaluation - types of chemicals associated with the waste to be generated,
☐ Hazard assessment - physical and toxic effects associated with the waste to be generated; Personal protective clothing (PPC) and personal protective equipment (PPE) to be used or available on-site;
☐ Names of key personnel, emergency contacts and phone numbers;
☐ List the OSHA training each worker has received. At least one worker must have completed supervisor training per 29 CFR 1910.120(E)(4);
☐ General and site-specific safety rules, with emergency response procedures and directions to the nearest hospital (with map);
☐ Decontamination procedures for personnel and equipment; and
☐ Disposal of contaminated PPC and PPE;

2. Field Organic Vapor Monitoring Plan (FOVMP). If the field organic vapor monitoring item is included in the contract, a FOVMP shall be prepared. The following information shall be included in the FOVMP:

☐ Name and address of the plan preparer;
☐ Name, address, experience and qualifications of the independent firm performing the field organic vapor monitoring.
☐ Name, address, experience and qualifications of each individual who will conduct the field organic vapor monitoring. Each individual shall be thoroughly trained in sampling protocols, organic vapor monitoring procedures, and equipment calibration procedures.
☐ Type(s) of organic vapor monitoring equipment to be used —model, manufacturer and details of the PID or FID equipment that will be used to conduct field organic vapor monitoring; and
☐ Description of the field organic vapor monitoring and calibration procedures to be used.
SECTION 205 – CONTAMINATED SOIL

3. Sampling Plan. If a sampling and analysis item is included in the contract, a Sampling Plan must be prepared. The following information shall be included in the Sampling Plan:

- Name and address of the plan preparer;
- Name, address, telephone number, and ELAP certification number of the proposed NYSDOH ELAP accredited laboratory to be used;
- Name, address, experience and qualifications of each individual who will collect soil samples. Each individual shall be thoroughly trained in sampling protocols, handling and chain of custody procedures, and laboratory requirements.
- List of all laboratory tests required by the disposal/treatment facility
- Describe the sample collection and handling procedures to be used; and
- Sampling schedule or a description of the sampling frequency to be used to facilitate timely disposal of stored soil. If sampling and analysis items are not included in the contract, a separate Sampling Plan is not required, and the Contractor shall perform any soil sampling and analysis required under the disposal item.

4. Disposal Plan. If a disposal item(s) is included in the contract, a Disposal Plan shall be prepared. The following information shall be included in the Disposal Plan:

- Name and address of the plan preparer;
- Name of disposal/treatment facility, address, telephone number and contact person;
- Copy of applicable permits and/or licenses held by the disposal/treatment facility;
- EPA Identification Number and/or State Facility Identification Number issued to the disposal/treatment facility;
- Method(s) of disposal/treatment that will be used;
- Signed letter from the disposal/treatment facility stating it is authorized under law to accept the type of waste being generated, their intent to accept the contaminated waste generated by this contract, and a list of the laboratory tests required by the facility;
- Name of waste transporter, address, telephone number and contact person;
- EPA Identification Number and/or State Transporter Identification Number issued to waste transporter; and
- Copies of all waste transporter permits and/or license plate numbers for vehicles that will be used for transport of waste from the site to the intended disposal/treatment facility; If a sampling and analysis item(s) is not included in the contract, the following information shall be included in the Disposal Plan for any sampling and analysis that will be conducted:
- Name, address, telephone number, and ELAP certification number of the proposed NYSDOH ELAP accredited laboratory.
- Name, address, experience and qualifications of each individual who will collect soil samples. Each individual shall be thoroughly trained in sampling protocols, handling and chain of custody procedures, and laboratory requirements.
- List of all laboratory tests required by the disposal/treatment facility;
- Describe the sample collection and handling procedures to be used; and
- Sampling schedule or a description of the sampling frequency to be used to facilitate timely disposal of stored soil.

Exhibit 205C-02
5. **Advance Notification Letters (Letters).** At least 10 calendar days prior to commencing work in contaminated areas, the Contractor shall prepare and submit Advance Notification Letters to:

- The Engineer in Charge
- The appropriate NYSDEC Regional Office personnel (Environmental Remediation, Spill Prevention and Response),
- The local fire department.

The Letters shall include the dates that work will occur in contaminated areas, work locations, soil storage/stockpile locations, and the name, field office address and phone number of the Engineer. The Contractor shall provide the Engineer with a copy of the Letters sent to the NYSDEC and fire department.
SECTION 207 - GEOTEXTILE

General Requirements
The material supplied under this item shall be the type appropriate for the intended use as shown on the Approved List issued by the Department's Materials Bureau and visually approved by the Regional Geotechnical Engineer. Specific construction details are covered in the specifications.

Project Procedure
Contact and/or send a sample of the geotextile to the Regional Geotechnical Engineer for visual approval. Inspect the placement of the geotextile. Record the quantity of material used and the brand name indicated on the geotextile or the geotextile container on MURK-1, “INSPECTORS DAILY REPORT,” documenting that only approved material is used on the project.

Evidence of Acceptability
1. Each roll of material should be properly identified either by a label on the geosynthetic or the container. The container may be either the cover wrapping or the core around which the geosynthetic is rolled. If the material is not labeled, it shall be rejected immediately. No attempt should be made to identify unlabeled material.

2. Properly labeled material must then be verified as appearing on the Materials Bureau Approved List. If the style does not appear on the approved list, the material shall be rejected.

3. Project staff shall cut a 76 millimeter by 127 millimeter sample of material from a representative roll and deliver it to the Regional Geotechnical Engineer.

4. The Regional Geotechnical Engineer shall visually inspect the material in accordance with Geotechnical Engineering Bureau guidelines and notify the project of acceptance.

I. GENERAL REQUIREMENTS

Soil Erosion and Sediment Control is an integral part of protecting water quality during construction. Smaller contracts and those that do not require environmental permits are still required to protect water quality. Erosion and sediment control is required on all construction contracts with soil disturbance, including temporary disturbances from staging areas, storage areas, etc.

A. Erosion & Sediment Control Plan. Erosion and Sediment Control (E&SC) requirements are frequently based on environmental permits from various agencies. The permits should be reviewed in detail, as requirements may be stated in the permits that are not shown in the contract documents. Water Quality Protection is a JOINT RESPONSIBILITY of the Contractor and the Department. If the Contractor intends to change the sequence of operations or the E&SC Plan presented in the contract documents, the Contractor must modify the E&SC Plan and schedules in accordance with the Contractor’s intended sequence of operations for all excavation, stripping, embankment, fill, grading and other operations that create soil disturbance(s) in accordance with §203-3.01.B. Scheduling of Work to Minimize Soil Erosion and Water Pollution, and submit the modified E&SC Plan, schedule and location(s) of staging areas, offsite spoil areas, etc., to the Engineer-in-Charge (EIC), in accordance with §107-12 Water Quality Protection. This is now the Contractor’s E&SC Plan. Clearing & grubbing, earthwork and other operations that create soil disturbances should not begin until the Contractor’s E&SC Plan and associated schedule are approved by the EIC. The Contractor’s plan should indicate approximately what area of earth is exposed at any one time. The Contractor’s approved progress schedule in accordance with §108-01 is a valuable tool in managing time related exposure risks, and is typically far more detailed than an intended sequence of operations created by the Designer and included in the contract documents. The Construction Environmental Coordinator (CEC) should be contacted if the EIC has any questions or needs technical assistance. Significant plan revisions after construction starts should be reviewed by the CEC, and the Designer, if necessary.

B. Protection Prior to Disturbances. Erosion and sediment control measures (primarily sediment control) must be installed prior to grubbing, stripping or other operations that create soil disturbances. Only initial clearing (felling trees, etc.) that would damage or destroy E&SC measures should be allowed prior to installation of those measures. E&SC measures around the perimeter of a large area to be logged/cleared may be required to protect water quality. Subsequent E&SC measures should then be installed prior to grubbing or stripping of specific areas. Disturbed areas may be protected by mulching slopes, temporary seeding, installing silt fences, check dams, erosion control blankets, etc. The Contractor should not be allowed to routinely clear, grub and strip the entire site, but rather should grub and strip only those areas required to progress construction operations, in order to minimize the area and time of disturbances.

C. Limiting Disturbance. The specification no longer limits the area that the Contractor can disturb (though the State Pollutant Discharge Elimination System (SPDES) General Permit limits the acreage of disturbance at any one time), but the Contractor must have temporary seeding and mulching capability (mulcher or spreader) and materials (straw, rolled erosion control products, etc.) on the site in sufficient quantity to treat the disturbed areas and should not rely solely on a subcontractor for erosion and sediment control, unless the subcontractor is available on a daily basis. Disturbances should be limited whenever and wherever possible, in both area and in time. Earth material exposed by any construction activity must not be left inactive for more than 7 days without the application of temporary or permanent erosion controls. Slopes should be rapidly brought to final grade, stabilized and seeded as soon as practicable, and should not wait until just before winter, or until the entire project is ready for seeding. The Contractor should be encouraged to mulch disturbed areas as soon as practicable and whenever the construction sequencing warrants it, but should not be allowed to repeatedly expose temporarily mulched slopes with limited work progressed solely for the purpose of increasing contract pay items quantities, and then expect to be paid to re-mulch those slopes.
SECTION 209 - SOIL EROSION AND SEDIMENT CONTROL

D. Erosion Prevention. Emphasis must be placed on preventing erosion at the source, not on catching sediment at the bottom of the slope or in the channel. Slopes that are stabilized will reduce erosion significantly, and reduce the effort required for maintenance of control measures. Steep slopes require special attention, typically by the application of rolled erosion control products (RECP; e.g. mats or blankets). Steep slopes that cannot be stabilized quickly, due to weather or other constraints, may also require the use of pipe slope drains or diversions. The use of RECPs not specified in the contract documents will be considered extra work. The EIC and Contractor should limit the surface area of earth exposed and provide immediate permanent or temporary erosion and sediment control measures to minimize damage to adjacent property and to minimize contamination of adjacent waterways. The EIC will issue a Stop Work Order pursuant to §105-01 Engineer’s Authority if a Contractor fails to comply with provisions of this section and a water quality standard is violated or the potential of water quality standard violations exist.

E. Erosion and Sediment Control Supervisor
An Erosion and Sediment Control Supervisor must be designated by the Contractor; the individual must be trained and authorized to enact changes as needed. The Contractor’s Erosion and Sediment Control Supervisor must meet the qualifications of the “Trained Contractor,” including those working on projects that do not require coverage under the SPDES General Permit. One method to establish this individual’s qualifications is a certification from NYSDEC that he/she has attended NYSDEC endorsed 4-Hour Erosion and Sediment Control Training (unless the person is a Professional Engineer, Registered Landscape Architect, or Certified Professional in Erosion and Sediment Control [CPESC]). The individual should be knowledgeable in installation procedures, control measure application, and general construction issues that affect erosion and sediment control.

F. Contractor Inspection and Maintenance
Erosion and sediment control measures require frequent inspection to ensure effective performance. For projects with a SPDES General Permit, a Trained Contractor must be designated by the Contractor to inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. It is important to note that projects covered by a SPDES General Permit require each Prime Contractor and Subcontractor performing soil disturbing activity to have their own respective Trained Contractor inspecting the work area daily. If deficiencies are identified, the Contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

For non-SPDES General Permit projects, these daily inspections by the Contractor do not need to be conducted by a Trained Contractor. The Prime Contractor may conduct inspections on behalf of subcontractor, and written reports are not required. However, the inspections should be noted in the Engineer’s Diary.

Temporary erosion and sediment control measures must be maintained by the Contractor, including deficiencies found during winter shutdown inspections performed by the Qualified Inspector. Maintenance must continue until permanent stabilization is completed and the temporary control measures are ordered to be removed. Measures must be repaired and accumulated sediments removed within one business day from the date of inspection. Accumulated sediment should be disposed of as unsuitable material.

The Contractor can suspend the Contractor Daily Inspections when soil disturbance activities have been suspended (e.g., winter shutdown) and temporary stabilization measures have been implemented, but must resume inspections when soil disturbance activities recommence.

G. Qualified Inspector Inspection
For projects with a SPDES General Permit, the Department shall designate a Qualified Inspector to conduct site inspections at least every seven (7) calendar days. For sites with soil disturbance greater than 5 acres, sites directly discharging to impaired waterways or located in impaired watersheds identified in the SPDES General Permit, inspections shall be conducted at least twice every seven (7)
calendar days separated by at least two (2) calendar days. The Qualified Inspector shall file a MURK 6 SPDES Stormwater Inspection Report for every inspection, and maintain the report on site.

H. Final Stabilization
Erosion and sediment control inspections and maintenance must be performed until the entire contract site has undergone final stabilization. Final stabilization means that all activities that create soil disturbances have been completed, and that a uniform perennial vegetative cover has been established with a density of 80% for all pervious, unpaved areas, or all exposed soil is covered with a permanent erosion control practice. Once the site has undergone final stabilization, the EIC should direct the Contractor to remove all temporary erosion and sediment control measures within the Right of Way and ensure the Contractor has removed all temporary erosion and sediment control measures from stabilized off-site waste areas, borrow areas, haul roads and equipment/material storage areas.

I. Temporary Stabilization
Temporary stabilization is required on all exposed soil within the timeframes specified in the New York State Standards and Specifications for Erosion and Sediment Control, and SPDES General Permit, when applicable, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats, as indicated in the Standard Specifications, Section 209, Soil Erosion and Sediment Control.
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II. EROSION AND SEDIMENT CONTROL MEASURES

A. Area Measures

1. Mulch

Mulch may be applied without seed, particularly if the area will be disturbed again prior to turf establishment. Mulch application can reduce erosion by approximately 85% compared to a bare surface. Straw mulch should be applied at a minimum of 2 tons/Ac (0.8MT/Ha), which should be enough to cover the ground from view. Care should be taken to ensure that the use of mulch does not introduce invasive species onto the site.

Wood fiber mulch must be applied in accordance with the manufacturer’s recommendations. When no manufacturer’s recommendations are available, wood fiber mulch should be applied at approximately 1.5 tons/Ac (0.6MT/Ha).

2. Temporary Seed and Mulch

Areas where temporary seed is applied should also be mulched. Seed and mulch are paid for together; additional separate payment will not be made for mulch. If temporary seeding is not done within 24 hours of construction or disturbance, the soil must be scarified prior to seeding. Broadcasting, rolling with drill type seeder, or hydroseeding are acceptable methods of temporary seeding. Proper soil to seed contact is an important factor in successful seeding. In order to reduce the need for engineered solutions, seeding should be done as soon as practicable rather than waiting to do larger areas all at once. Seeded areas are watered immediately after mulching, and watering is continued until vegetation is established. Watering is not needed after rain events in order to reduce the potential for erosion and/or washing away seed and mulch.

3. Rolled Erosion Control Products

Rolled Erosion Control Products (RECPs) are commonly referred to as erosion control mats or blankets. They may be used to reduce soil erosion on critical areas such as steep slopes, channels or shorelines by assisting in the growth, establishment, and protection of vegetation and/or to provide immediate stabilization of sensitive areas. RECPs are available in three Classes: short-term, intermediate and permanent. §713-07 Rolled Erosion Control Products and Soil Stabilizers identifies the slopes for which different Classes and Types may be used, and what shear stresses they will withstand.

RECPs must be placed and firmly anchored as specified in the contract documents and/or according to manufacturer’s recommendations on areas that have been shaped, graded and compacted to the lines and grades shown in the contract documents to ensure good surface contact. RECPs should not be placed on frozen ground due to the difficulty associated with proper anchoring. However, if it is necessary to install RECPs on frozen ground due to unexpected freezing conditions, RECPs will provide some protection until the ground thaws and/or until a more appropriate solution can be installed. RECPs placed on frozen ground will likely require additional work when the ground thaws and conditions allow. The Contractor is responsible for caring for the areas where RECPs have been placed until disturbed by subsequent work operation or phase, acceptance of the contract or acceptance of the turf, whichever is later.

When RECPs are delivered to the contract site, check the label on the container to verify that the material appears on the Approved List. If the RECP is not labeled, reject it. The EIC must remove a sample approximately 3 in x 5 in (75 mm x 125 mm) and submit the sample to the CEC. The CEC will physically and visually compare the sample to a reference sample to verify that the materials provided are the materials that were tested and approved. If there is a visual or physical discrepancy, the materials are not to be accepted until it can be verified that the materials are on the Approved List. The Contractor must also provide a material certification that specifies the product conforms to the specification.

4. Soil Stabilizers

Class IV products (soil stabilizers) do not require submission of samples or labels. Soil stabilizers are sprayed-on products that bind soil particles together to prevent erosion, and should be applied
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in accordance with the manufacturer’s recommendations. The application of soil stabilizers on SPDES-permitted projects requires approval from the NYSDEC Regional Division of Water. Those that have already been approved by NYSDEC may be found in the List of Approved Dust Palliatives on the NYSDOT website. The material will be accepted on the basis of the manufacturer’s name and location appearing on the Approved List and the Contractor must also provide a material certification that specifies the product conforms to the specification.

5. Turf Reinforcement Mats (TRMs)

A Turf Reinforcement Mat (TRM) is a long term, non-degradable RECP composed of Ultra-Violet stabilized non-degradable, synthetic fibers, nettings, and/or filaments processed into three dimensional reinforcement matrices.

TRMs are typically used in applications such as high flow ditches and channels, steep slopes, stream banks, and shorelines where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated. To establish vegetation, the prepared seedbed and TRM should be protected using practices to divert the runoff away from the TRM, such as a top of slope berm or pipe slope drain. The material will be accepted on the basis of the manufacturer’s name and location appearing on the Approved List and the Contractor must also provide a material certification that specifies the product conforms to the specification.

B. Linear Measures (Standard Sheet 209-01)

When used near the toe of slope, the preferred location for a linear measure is 10 ft (3 m) out from the toe of slope. This provides a flat area for sediment to accumulate and room for a machine (dozer, bucket loader, etc) to operate behind the feature to remove accumulated sediment. Linear measures are not intended to be filters; they are intended to trap sediment by impounding water against the measure and allowing sediment to settle out.

1. Silt Fence

Silt fence geotextiles and silt fence assemblies are listed on the Approved List separately. Silt fence assemblies are supplied pre-assembled, and have a variable post spacing that takes into account the fabric and mesh strength. Silt fences may also be constructed from approved fabric, stakes, mesh and wire. The bottom edge of a silt fence must be buried a minimum of 6 in (150 mm) in the ground, backfilled and compacted. An effective technique to properly install silt fence is to cut a narrow trench with a trenching machine, drive the stakes through the ditch, and then backfill the edge of the fabric. The stakes must be on the downslope side of the fabric so that the stakes can support the silt fence when sediment or water push against the fence.

2. Sediment Filter Logs

Sediment Filter Logs are a temporary or permanent sediment control practice composed of a degradable geotextile or natural fiber mesh tube filled with wood, compost/mulch or coconut fiber media to trap sediment and other pollutants associated with construction activity to prevent their migration offsite. Sediment Filter Logs can be used in applications where erosion would occur in the form of sheet erosion and there is no concentrated flow of water to the practice. Soil conditions must be such that good continuous contact between the log and the soil is maintained throughout its length. The logs are anchored to the surface with wood stakes spaced no more than 10 feet apart. Soil is then placed and lightly compacted on the upslope side of the log to fill gaps between the log and the soil surface. Compost-filled logs may be filled after placement by blowing compost/mulch into the tube pneumatically, or filled at a staging location and moved into its designed location.

C. Check Dams (Standard Sheet 209-02)

Check dams are placed in a channel to reduce the hydraulic gradient, and therefore the velocity of water flowing down the ditch; the purpose is not to filter sediments out of the water. It is imperative to
the proper function of check dams that they be constructed so that water flows over the center of the
dam, and not around the check dam, (i.e. the center of the check dam must be lower than the outside
of the dam), thereby minimizing erosion. The crest elevation of a check dam should be equal to the
elevation of the toe of the upstream check dam (If the slope is so steep that the check dams are too
close together, then alternatives, such as stone-lined swales or pipe slope drains, should be
considered). Repairs should be made immediately to any damaged sections and accumulated
sediment should be removed if the depth is greater than 6 in (150 mm) or equal to one-half the height
of the control measure. Sediment should be placed in designated disposal areas and not allowed to
flow into streams or drainage ways during structure maintenance or removal. Replace stone or fabric
in check dams as needed to maintain the designed cross section.

Stone Check Dams are the most effective type, and are constructed of light stone fill and pea
gravel. Pea gravel is used on the upstream face of the dam to trap sediment. Stone check dams
must have a cutoff trench in the ditch center, and scour protection of geotextile or stone directly
downstream to prevent localized erosion from water running over the check dam crest.

Gravel Bag Check Dams are constructed of doubled sandbags filled with clean #1 or #2 stone,
inversely inserted one into the second. Gravel bag check dams are effective where access by
heavy equipment is not available. The bags can be placed by hand, and can be removed without
causing further disturbance. Gravel bags are treated as equipment and cleaned if transported to
another site for reuse.

Prefabricated Check Dams can be used like other types of check dams, but, due to the light
weight material, they can be used in remote or steep locations that are not accessible by
construction equipment. Similar to other check dams, prefabricated check dams need to be
properly installed and anchored, and can easily fail if water is allowed to run under or around the
check dam. In addition to manufactured silt dikes, which are limited to 10 inches in height, sediment
filter logs are available in diameters ranging from 12 inches to 32 inches for steeper applications.

Silt Fence Check Dams and Hay/Strawbale Check Dams are not effective and are not to be
used.

D. Drainage Structure Inlet Protection (Standard Sheet 209-03)
The primary purpose of inlet protection is to impound water around the inlet, allow sediment to fall out
of suspension, and pass clean water into the inlet. The silt fence inlet protection must have a solid
frame capable of holding water and sediment. The use of prefabricated silt fence assembly without
additional wood framing, particularly around the top, will not be strong enough. Close attention should
be given to the elevation of the top of the frame, as water will potentially pond to that elevation, and
may flow over on to adjacent roadways or private property beyond the Right-of-Way. When using
sediment filter logs or manufactured silt dikes as inlet protection on impervious surfaces such as road
pavement or parking areas, proper anchorage must be provided to prevent shifting of the log/dike or
separation of the contact between the log/dike and the pavement.

E. Pipe Slope Drains (Standard Sheet 209-04)
The primary purpose of a pipe slope drain is to convey clean water from the top of a slope to the
bottom without causing erosion. The pipes must be sufficiently water-tight to prevent leaking water
from causing erosion, and must be stable enough to prevent the force of flowing water from displacing
the pipe. The inlet may be constructed using a variety of temporary diversion methods suitable to the
traffic pattern above the slope, provided the diversion channels water into the pipe without eroding the
embankment or discharging water down the slope. The outlet of the pipe at the bottom must provide
for discharge of flowing water without localized erosion.

F. Construction Entrance/Exits (Standard Sheet 209-05)
Construction entrance/exits are constructed of crushed stone underlain by geotextile to minimize or eliminate sediment transport onto public roads. Maintenance is required if the stone has become clogged with sediment. Construction entrance/exits will typically be paid for if the entrance/exits are shown in the contract documents. Construction entrance/exits from Contractor staging areas and other locations selected by the Contractor or necessitated by operations at the Contractor’s discretion should be constructed in the same manner, but no direct payment will be made for those installations.

G. Turbidity Curtains (Standard Sheet 209-06)
A turbidity curtain is generally used when construction activities occur within a waterbody or along its shoreline and is of short duration, generally less than one month. Turbidity curtains are not to be used across flowing watercourses, or on the edge of a rapidly flowing watercourse. A turbidity curtain should be inspected daily and repaired or replaced immediately when damaged or not functioning properly. If the curtain is oriented in a manner that faces the prevailing winds, frequent checks of the anchorage should be made. A turbidity curtain should be used under constant head conditions (i.e. the water level must be the same on both sides of the curtain) and constant hydrostatic pressure conditions only. The use of turbidity curtain in tidal waters may require additional anchorage to prevent movement of the curtain with the tides.

H. Sediment Traps (Standard Sheet 209-07)
Sediment traps are constructed so that the basin excavation does not also contribute sediment to the discharge. The trap can be lined with rock, rolled erosion control materials, plastic or other methods to keep basin slopes from eroding. The basins are always dewatered from the surface so that settled sediment is not discharged. Periodic inspection and repair are required by the Contractor to correct damage. The Contractor is responsible for removal of accumulated sediment deposits. Repairs are made immediately to any damaged sections and accumulated sediment is removed if the depth is greater than or equal to the height of the control measure.

III. SPDES REGULATORY BACKGROUND
In response to the 1987 amendments to the Clean Water Act, the US Environmental Protection Agency (EPA) promulgated rules for stormwater discharge from large construction sites (larger than 5 Ac [2 Ha]) under the National Pollutant Discharge Elimination System (NPDES) Phase I, issued in 1990. The Final Rule for NPDES Phase II, which addresses stormwater discharge from small construction sites (involving soil disturbances of 1 Ac (0.4 Ha) or more) was issued in December 1999. The NPDES program is implemented in New York State by the NYS Department of Environmental Conservation (NYSDEC) under the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity.

Coverage under the current SPDES General Permit is required for any construction contract that causes a soil disturbance of more than 1 Ac (0.4 Ha), or more than 5,000 sq ft (465 sq m) in the New York City East of Hudson Watershed. Reconstruction of pavement is considered a disturbance if it reaches the bottom 6 in (150 mm) of granular base/subbase layer. The amount of disturbed area will be calculated during design and a Notice of Intent (NOI) will be submitted for coverage under a SPDES General Permit, if necessary. Because construction activities can often increase the amount of disturbance originally anticipated during design, the Department has the opportunity to gain coverage under the SPDES General Permit for projects with less than, but close to, the 1 Ac (0.4 Ha) threshold. In these cases, project designers do not need to address the permanent stormwater management components of a Stormwater Pollution Prevention Plan (SWPPP). This allows construction staff the opportunity to have minor, temporary impacts that increase the total disturbance limit over 1 Ac (0.4 Ha) (because coverage under the SPDES General Permit has already been obtained, a SWPPP has already been prepared) without changing the scope of the project. However, if an increase in the acreage of soil disturbance results in an increase in impervious surface, permanent stormwater management practices may be required. If contract modifications increase the soil disturbance to more than 1 Ac (0.4 Ha) within the right of way, the contract will require coverage under the SPDES General
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Permit, and operations that exceed the 1 Ac (0.4 Ha) limit shall not begin until coverage is obtained.

A. SPDES Construction General Permit Definitions:

1. **Owner or Operator.** The person, persons, or legal entity which owns or leases the property on which the construction activity is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

   This includes property within the contract limits, including that controlled by easement, occupancy and releases obtained by the Department to complete the contract work as designed in the contract documents. Examples include permanent easements for drainage, temporary occupancies for grading at a toe of slope, and driveway/planting releases.

2. **Qualified Professional.** A person knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other NYSDEC endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principle of hydraulics in order to prepare a SWPPP that conforms to the NYSDEC’s technical standard.

3. **Qualified Inspector.** A person employed by the Department or a Consultant Inspector, who conducts site inspections for compliance with the SPDES General Permit.

   This is defined as a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other NYSDEC endorsed individual(s).

   It also means someone working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect and at the same company as the PE or RLA, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every 3 years. Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

   A Qualified Inspector can also be an EIC, CEC, or Environmental Specialist, provided they are a licensed Professional Engineer, Registered Landscape Architect, or CPESC. Other NYSDOT titles may also be considered a Qualified Inspector, provided the individual has received the above-mentioned Training.

4. **Contractor/Subcontractor.** The SPDES General Permit is a generic statewide permit used by many parties, and encompassing many different circumstances. The permit does not recognize or address the legal differences and contractual relationships between the Department and Contractors, Subcontractors, Material Suppliers, Services, Utilities, etc.

5. **Trained Contractor.** The Trained Contractor conducts site inspections for maintenance of erosion and sediment control practices, in accordance with Section 209 of the Standard Specifications. The Contractor is responsible to ensure that a Trained Contractor is on site when soil disturbance activities occur.

   A Trained Contractor is an employee from a contracting (construction) firm that has received 4 hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil
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and Water Conservation District or other NYSDEC endorsed entity. After receiving the initial training, the Trained Contractor must receive four (4) hours of training every three (3) years.

A Trained Contractor can also be an employee from the contracting company, that meets the Qualified Inspector qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity.

The Trained Contractor is responsible for the day to day implementation of the SWPPP.

6. Utilities. Utility companies are required to obtain Highway Work Permits for activities within the ROW, even if those activities are related to DOT activities or projects. It is a condition of this permit that they are required to implement sound erosion and sediment control practices. Utility companies do not have a contractual relationship with NYSDOT, therefore they are not required to complete Form CONR 5 Contractor/Subcontractor SPDES Permit Certification. Failure to comply with the conditions of the Highway Work Permit can result in a STOP PERMIT WORK ORDER. In the context of applicability of the SPDES General Permit, disturbances created by the utility company should not be included in the disturbance calculations for the Department’s activities.
IV. CONTRACTS WITH NYSDEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITY

A. Contractor/Subcontractor Certifications. In accordance with the SPDES General Permit, the Owner (NYSDOT) must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for the construction of all post-construction stormwater management practices included in the SWPPP. The Owner or Operator must have each of these contractors and subcontractors identify at least one Trained Contractor from their company that will be responsible for implementation of the SWPPP. One Trained Contractor from each contractor and subcontractor company must be on site on a daily basis when soil disturbing activities are being performed by the respective company. Contract plans do not identify who will implement any given portion of the SWPPP, but that information is now included on Form CONR 5 Contractor/Subcontractor SPDES Permit Certification. The Contractor is responsible for completing the contract in accordance with the contract documents, including any work by a subcontractor. In order to comply with the conditions of the SPDES General Permit, the Contractor, as well as any subcontractor performing any activity that is a part of implementation of the SWPPP or any operation that causes a soil disturbance, must sign the CONR 5 prior to performing that activity.

B. Operations on Private Property. Contractor operations on private property, including spoil disposal areas, borrow areas, equipment staging areas and temporary batch plants are typically not included under the SPDES General Permit coverage obtained by the Department prior to letting because the Department does not meet the definition of “Owner or Operator” on these sites. Under the current definition of “Operator”, the Department may add coverage for areas abutting the right of way within the contract limits to the contract SPDES General Permit. For minor impacts (spoil areas, etc.) this should be considered.

For areas not abutting the right of way within the contract limits, or that have significant impacts, the Contractor must arrange for permit coverage for these areas through the landowner (the landowner must sign the NOI). If the impacts to the site are considered temporary, the required SWPPP will likely only include the Erosion and Sediment Control Plan for the site. The EIC should request a copy of the NOI submitted by the Contractor to NYSDEC and any other permits required (note that Contractors must comply with local land use regulations). The EIC need not receive nor review a copy of the SWPPP, and is not responsible to ensure periodic inspections have been performed. The EIC should receive a grading plan, if appropriate, and ensure that areas have been stabilized upon contract completion.

C. Borrow/Spoil/Staging Areas within the ROW. Areas within the right of way but outside the contract limits utilized for spoil areas will be included under the SPDES General Permit coverage obtained by the Department. If these areas are presented to NYSDEC during the permit review process as potential borrow/spoil/staging areas, with maximum limits, slopes, cover, etc., no further review by NYSDEC will be required. If these areas were not presented during the permit review, they may require notification and approval from NYSDEC. Contact the CEC for assistance with the need for permit review/notification.

D. Disturbance Limits. The SPDES General Permit limits the amount of disturbance at any one time to 5 Ac (2 Ha) without additional notification to NYSDEC. When total disturbance exceeds 5 Ac (2 Ha) the Regional NYSDEC office must be notified using Form HC 209 Notice to Disturb Greater Than 5 Ac of Soil (Exhibit 209F). Notification includes a phasing plan that shows the maximum amount of disturbance planned for each phase and the locations of the planned cuts and fills. The SPDES General Permit defines both Temporary Stabilization and Final Stabilization.
E. Periodic Inspections. The Department must have a Qualified Inspector conduct inspections at least once every 7 calendar days. When the amount of disturbance exceeds 5 Ac (2 Ha), or if the project directly discharges to impaired waterways or is located in impaired watersheds identified in the SPDES General Permit, the Qualified Inspector must inspect the project at least twice during a 7 calendar day period. When two inspections are done in any one week, the inspections should be separated by a minimum of 2 full calendar days (inspections can return to once per week when the soil disturbances are below 5 Ac). Inspection reports are recorded on Form MURK 6 SPDES Stormwater Inspection Report (Exhibit 209A).

When inspections are conducted that show corrections are required by the Contractor, the Department shall notify the Contractor, within one business day of the inspection, of any corrective actions that need to be taken. The Contractor shall begin implementing the corrective actions within one business day of this notification, and shall complete the corrective actions in a reasonable time frame.

Although coverage under the SPDES General Permit is required for projects in the New York City East of Hudson Watershed with disturbances greater than 5000 sq ft (465 sq m), inspections by Qualified Inspectors are not required for projects that have a total disturbance of greater than 5000 sq ft (465 sq m) but less than 1 Ac (0.4 Ha).

The frequency of inspections can be reduced when soil disturbances have been temporarily suspended (e.g., winter shutdown) and existing disturbed areas have been temporarily stabilized. In this case, the NYSDEC must be notified using the Form HC210 Notice to Reduce Frequency of SPDES Site Inspections (Exhibit 209G), and the Qualified Inspector must inspect the project site at least once every 30 calendar days.

F. Quality Assurance Inspections. When the Qualified Inspector is someone other than the CEC, it is recommended that the CEC or other knowledgeable staff periodically evaluate the quality of the inspections conducted by the Qualified Inspector to ensure that proper inspections are being conducted. These evaluations should occur one to three times per construction season, the frequency being dependent upon the experience/training of the inspector and the complexity or sensitivity of the site.

G. Documentation (Site Log Book). Although not required by the SPDES General Permit, the Operator (Department) must maintain a site log book in the field office. The site log book must be part of the Stormwater Pollution Prevention Plan (SWPPP), and should include Contractor/Subcontractor certifications, documented changes to the SWPPP approved by the Department, relevant notations from the Engineer’s Diary and Inspectors’ Daily Work Reports, periodic inspection reports, photographs, etc., as documentation of compliance with permit conditions. This documentation will be of particular importance if problems or water quality standard violations occur. This need not be a separate book, but rather may be a file of documentation already created. A list of pertinent documentation and where the information is contained may be helpful.

If NYSDEC requests a copy of the SWPPP, the Department must submit the SWPPP, in both electronic (PDF format only) and paper format, within 5 business days. The designer should provide the construction office with a PDF copy of the SWPPP, and if NYSDEC does make such a request, the construction office should make PDF copies of any subsequent additions or changes made to the SWPPP thereafter.

H. SWPPP Revisions. In order to stay in compliance with the SPDES General Permit, it is necessary to keep the SWPPP current. This is done by using the Form CONR 8 SPDES Stormwater Pollution Prevention Plan (SWPPP) Revision (Exhibit 209E).

There may be revisions to the SWPPP that will require that the Notice of Intent (NOI) be resubmitted to NYSDEC. Examples of such changes may include a significant increase in the amount of disturbed area or newly created impervious area, or a change in the type(s) or size(s) of post-construction stormwater management practices constructed.

If NYSDEC provides written notification to the Department that the SWPPP does not meet the
minimum requirements of the SPDES General Permit, the Department has 14 days (or as indicated by NYSDEC) to make such changes and submit written notification that the requested changes have been made.

I. Requests for Information. The Department must make the NOI, SWPPP and inspection reports available for review and copying by any person within 5 business days of receiving a written request. Copying of documents will be done at the requestor's expense.

J. Engineer’s Field Office. Each field office should be equipped with a rain gauge. A copy of the SPDES General Permit, NOI (which was prepared and submitted to the NYSDEC prior to contract letting and revised during construction, as necessary), inspection reports, and an updated SWPPP must be kept at the Engineer’s Field Office until the site has undergone final stabilization, and the Notice of Termination (NOT) has been submitted to NYSDEC. These documents must be accessible during normal working hours to authorized persons conducting compliance inspections.

K. Terminating a SPDES Permit. After the Qualified Inspector has determined that the site has undergone final stabilization, all temporary erosion and sediment control structures have been removed, and all post-construction stormwater management practices have been constructed in conformance with the SWPPP, a Notice of Termination (NOT) form must be submitted to the NYSDEC to cancel the SPDES permit coverage. The Qualified Inspector must sign the “Final Stabilization” certification, a Professional Engineer or Registered Landscape Architect must sign the “Post-Construction Stormwater Management Practice(s)” certifications, and the EIC or CEC must sign the “Owner or Operator Certification.”

The NOT Form, available from the NYSDEC web site, should be sent to the following address:

NYSDEC Division of Water
Notice of Termination
625 Broadway, 4th Floor
Albany, New York 12233-3505

V. INSPECTION/CERTIFICATION FORMS
A series of inspection/certification forms have been developed to facilitate permit compliance, which are available on the NYSDOT Office of Construction website under Environmental Forms.

A. Form MURK 6 SPDES Stormwater Inspection Report (Exhibit 209A)
This form is to be used when the Qualified Inspector evaluates the site, and compares the actual conditions to the SWPPP. The table is used to identify erosion and sediment control practices or stormwater management practices that require proper installation, maintenance, or replacement.

The lines on the reverse of this report form (“Describe Existing Deficiencies in the SWPPP”), are located on the form to describe components of the SWPPP that might not be in compliance, in addition to the practices found on site.

The form must be signed and dated by the Qualified Inspector. The EIC may fill in the date when a copy is provided to the Contractor. The SPDES General Permit requires that the Contractor be notified of any corrective actions within one business day from the time of the inspection, and that the Contractor begin corrective actions within one business day of the notification.

Reports shall include digital photographs with date stamp that show the condition of all practices that have been identified as needing corrective actions. The Qualified Inspector shall attach paper color copies of the digital photographs to the inspection report within 7 calendar days of the date of the inspection. The Qualified Inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The Qualified Inspector shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within 7 calendar days of that inspection.

The box(es) on the bottom of the form must be checked if continuation Forms MURK 6-1 or MURK
SECTION 209 - SOIL EROSION AND SEDIMENT CONTROL

6-2 are used.

B. Form MURK 6-1 SPDES Stormwater Inspection Report - Continuation (Exhibit 209B)
This form is to be used when the Qualified Inspector evaluates the site, and the table on Form MURK 6 is not large enough to identify all the necessary erosion and sediment control practices or stormwater management practices that require replacement or corrections to installation or maintenance.

The form must be initialed by the Qualified Inspector and attached to the Form MURK 6.

C. Form MURK 6-2 SPDES Stormwater Outlets to Waters of the US - Continuation (Exhibit 209C)
This form is to be used when the Qualified Inspector evaluates the site, and the table on Form MURK 6 is not large enough to identify all the Outlets to Waters of the US.

The form must be initialed by the Qualified Inspector and attached to the Form MURK 6.

D. Form CONR 5 Contractor/Subcontractor SPDES Permit Certification (Exhibit 209D)
This form is used to record the required certification of the contractor and subcontractors that disturb soil or implement a component of the SWPPP. The certification is required by the permit, which is a part of the contract, and no subcontractor should be allowed to work until they have signed the certification.

E. Form CONR 8 SPDES Stormwater Pollution Prevention Plan (SWPPP) Revision (Exhibit 209E)
If significant revisions to the SWPPP are made during construction, whether at the request of the Contractor, Department personnel, or as directed by NYSDEC, use Form CONR 8 to document who requested the revisions, the reasons the revisions were requested, what revisions were made, and by whom the revisions were made. Significant revisions include revisions that require a new or revised plan sheet, use of new or different control measures, or placement of control measures in new locations. Adjustment of control measure locations, addition of another check dam, or extension of a line of silt fence are not significant revisions. A copy of this form should be filed in the Site Log Book. If the changes were directed in writing by NYSDEC, a copy should be sent to the local NYSDEC office that requested the changes.

F. Form HC 209 Notice To Disturb Greater Than 5 Acres of Soil (Exhibit 209F)
The SPDES General Permit requires written authorization from NYSDEC prior to disturbing more than 5 Ac (2 Ha) of soil. Because NYSDOT and NYSDEC have agreed that prior authorization is not required for NYSDOT projects, provided adequate control measures are implemented and site inspections are conducted in accordance with the SPDES General Permit, this notice must be sent to the appropriate NYSDEC regional office when it is known that construction activities will disturb greater than 5 Ac (2 Ha) of soil at any one time. Although this information may already be in the SWPPP and was specially noted when the NOI was transmitted to the NYSDEC Central Office, it is not likely that NYSDEC regional staff will have knowledge of this information.

G. Form HC 210 Notice To Reduce Frequency of SPDES Site Inspections (Exhibit 209G)
The SPDES General Permit allows the frequency of inspections to be reduced when soil disturbances have been temporarily suspended (e.g. winter shutdown) and existing disturbed areas have been temporarily stabilized. This form can be used to notify the NYSDEC that work on the project will be temporarily suspended and temporary stabilization measures have been applied to all disturbed areas. The Qualified Inspector must conduct a site inspection at least once every 30 calendar days during this period. The standard site inspection frequency will resume when construction activities re-commence.
SECTION 209 - SOIL EROSION AND SEDIMENT CONTROL

EXHIBITS
A  Sample Form MURK 6 SPDES Stormwater Inspection Report
B  Sample Form MURK 6-1 SPDES Stormwater Inspection Report – Continuation
C  Sample Form MURK 6-2 SPDES Stormwater Outlets to Waters of the US – Continuation
D  Sample Form CONR 5 Contractor/Sub-contractor SPDES Permit Certification
E  Sample Form CONR 8 SPDES Stormwater Pollution Prevention Plan (SWPPP) Revision
F  Sample Form HC 209 Notice to Disturb Greater than 5 Acres of Soil
G  Sample Form HC 210 Notice to Reduce Frequency of SPDES Site Inspections
SPDES STORMWATER INSPECTION REPORT

Date: May 26, 2015
Day of Week: S M W T F S
Sheet No. 1 of 3

Weather AM PM
Rain 53 °F 62 °F
Cloudy

Temperature
Soil Condition Wet

This form is to be used on contracts covered by the SPDES General Permit for Stormwater Discharges from Construction Activity. The completed form must be filed in the Engineer's Field Office and distributed to contractors.

Reason for this Inspection:
☒ 7-calendar day inspection ☐ 30-day inspection (temporary shut-down)
☐  Second inspection in 7-calendar-day period due to soil disturbance exceeding 5 Acres

Codes for Erosion and Sediment control measures and Stormwater Management Practices to be inspected: (1) mulch, (2) seed and mulch, (3) check dams, (4) straw bales, (5) silt fence, (6) sediment trap, (7) turbidity curtains, (8) pipe slope drains, (9) drainage structure inlet protection, (10) rolled erosion control products, (11) soil stabilizers, (12) construction access/exit, (13) pipe inlet/outlet protection, (14) water diversion structures, (15) sedimentation basins, (16) coffer dams, (17) staging area, (18) stockpile stabilization, (19) Other ____________

List ONLY those practices that require repair, maintenance, reinstallation or replacement. Attach COLOR copies of photographs to this report with accurate date stamp that shows the condition of practices identified as needing corrective action within 7 calendar days of the inspection. Attach COLOR copies of photographs to this report with accurate date stamp showing the condition of the practice(s) after completion of the corrective actions that document the completion of the corrective actions within a reasonable timeframe after the inspection.

<table>
<thead>
<tr>
<th>ID</th>
<th>Location of Practice (Use stations or descriptions)</th>
<th>Practice</th>
<th>Code #</th>
<th>Temp or Perm? (T or P?)</th>
<th>Remarks (Describe Specific Maintenance Required) (Including sediment removal, replacement, replacement or installation of practice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1+000 10m RT</td>
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<td>Remove Sediment</td>
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<td>2</td>
<td>1+050 12m RT</td>
<td>1</td>
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<td>Replace Shredded Silt Fence with New Fence</td>
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### MURK 6 REVERSE

#### (11/14)

<table>
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<tr>
<th>ID</th>
<th>Location of Practice (Use stations or descriptions)</th>
<th>Practice</th>
<th>Remarks (Describe Specific Maintenance Required) (including sediment removal, replacement, replacement or installation of practice)</th>
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<td>If the table is filled</td>
<td>Use MURK 6-1 for continuation</td>
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</table>

Attach a location map showing all disturbed areas and areas stabilized since the last inspection.

Identify all locations where stormwater is discharged from the site to a Water of the U.S. (e.g. streams, lakes, wetlands, etc.) within or adjacent to the limits of construction, and all locations where stormwater exits the construction site. Describe the condition of the stormwater and the condition of the receiving waterbodies. Add Form MURK 6-2 for continuation as necessary.

<table>
<thead>
<tr>
<th>Location of Outlet (STA / OFFSET)</th>
<th>Type of Outlet (e.g. pipe, ditch, overland flow, etc.)</th>
<th>Does this discharge to a Water of the U.S.?</th>
<th>Describe Runoff (if any) (e.g. clear, turbid, oily)</th>
<th>Describe Receiving Water (if any) (e.g. clear, turbid, oily, unknown)</th>
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</thead>
<tbody>
<tr>
<td>1 1+300 18m RT</td>
<td>Pipe</td>
<td>Yes</td>
<td>Clear</td>
<td>Clear</td>
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<td>If the table is filled</td>
<td>Use MURK 6-2 for continuation</td>
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</table>

Number of Acres currently disturbed: **6.2**

If more than 5 Acres of soil disturbed at any one time, was NYSDEC advised? (Form HC209 may apply) **Yes**

Describe existing deficiencies in the SWPPP. Specify for each location using row ID number from front

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Were significant deficiencies identified that require the SWPPP to be revised? **☑ Yes ☐ No**

If Yes, complete a CONR-8 SWPPP Revision Form and file in the Engineer's Field Office.

**NOTE:** Within 1 business day of completion of this inspection, the Contractor(s) must be notified of any corrective actions required. The Contractor(s) or identified Sub-Contractor(s) shall begin corrective actions within 1 business day of notification, and shall complete corrective actions within 1 business day of notification or within a reasonable timeframe for complex corrective actions.

Qualified Inspector Name/Title: ____________________________

Company Name (if consultant): ____________________________

Eagle I. Inspector: ____________________________

Prepared: **05/26/15**

Copy to Contractor: **05/27/15**

**☑** Engineer-in-Charge

**☐** Resident Engineer

**☐** Area Supervisor

Reviewed By: ____________________________

**☑** MURK 6-1 SPDES Stormwater Inspection Report - Continuation attached

**☐** MURK 6-2 SPDES Stormwater Outlets to Waters of the U.S. - Continuation attached

**Date Reviewed: 05/27/15**

**Date Reviewed: 05/27/15**

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January 2017

New York State Department of Transportation

Construction Inspection Manual

Exhibit 209A2
SPDES STORMWATER INSPECTION REPORT - CONTINUATION

Date: May 26, 2015
Sheet No. 2 of 3

JOB STAMP
D123456 / PIN 123.45.6789
Rte 123 over the Hudson River
Village of Meadowfield
Albany County
I. M. Builder

Codes for Erosion and Sediment control measures and Stormwater Management Practices to be inspected:  (1) mulch,  (2) seed and mulch,  (3) check dams,  (4) straw bales,  (5) silt fence,  (6) sediment trap,  (7) turbidity curtains,  (8) pipe slope drains,  (9) drainage structure inlet protection,  (10) rolled erosion control products,  (11) soil stabilizers,  (12) construction access/exits,  (13) pipe inlet/outlet protection,  (14) water diversion structures,  (15) sedimentation basins,  (16) coffer dams,  (17) staging area,  (18) stockpile stabilization,  (19) Other

List ONLY those practices that require repair, maintenance, reinstallation or replacement.

<table>
<thead>
<tr>
<th>ID</th>
<th>Location of Practice (Use stations or descriptions)</th>
<th>Practice</th>
<th>Remarks (Describe Specific Maintenance Required) Including sediment removal, replacement, replacement or installation of practice</th>
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<td>Remove Sediment from Catch Basin</td>
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</tbody>
</table>

Qualified Inspector Initials: __________________

January 2017 New York State Department of Transportation Construction Inspection Manual Exhibit 209B2
SPDES STORMWATER OUTLETS TO WATERS OF THE U.S. - CONTINUATION

Identify all locations where stormwater is discharged from the site to a Water of the U.S. (e.g. streams, lakes, wetlands, etc.) within or adjacent to the limits of construction, and all locations where stormwater exits the construction site. Describe the condition of the stormwater and the condition of the receiving waterbodies.

<table>
<thead>
<tr>
<th>Location of Outlet (STA/OFFSET)</th>
<th>Type of Outlet (e.g. pipe, ditch, overland flow, etc.)</th>
<th>Does this discharge to a Water of the U.S.?</th>
<th>Describe Runoff (if any) (e.g. clear, turbid, oily)</th>
<th>Describe Receiving Water (if any) (e.g. clear, turbid, oily, unknown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2+000/24m RT</td>
<td>Pipe</td>
<td>Yes</td>
<td>Clear</td>
<td>Clear</td>
</tr>
<tr>
<td></td>
<td>Use this Table ONLY if MURK 6 is filled</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MURK 6-2 Reverse
(11/14)

Description of required maintenance and any existing deficiencies in the SWPPP. Specify each location using row ID number, if applicable

Use this area for additional narrative as needed.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Were significant deficiencies identified that require the SWPPP to be revised: ☐ Yes ☐ No

If Yes, complete a CCNR-8 SWPPP Revision Form and file in the Engineer's Field Office

Print Form
## Contractor / Subcontractor SPDES Permit Certification

<table>
<thead>
<tr>
<th>Contract No.</th>
<th>PIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>D123456</td>
<td>1234.56.78</td>
</tr>
</tbody>
</table>

### Description:
Rte 123 over Hudson River

### Town, Village, City:
Meadowfield

### County:
ALBANY

### Check Applicable Box:
- [x] Prime Contractor
- [ ] Subcontractor

### Name of Contractor/Subcontractor:
I.M. Builder

### Address:
987 Main Street

### City:
Meadowfield

### State:
NY

### ZIP:
12345

### Phone:
518-123-4567

### Fax:
518-999-1234

Core Pay Item Groups for which the Contractor/Subcontractor will be responsible (e.g., 203, 207, 209, etc.):
- 208
- 209
- 603
- 604

### Mandatory Certification:
The SPDES General Permit for Stormwater Discharges from Construction Activities requires the Prime Contractor and subcontractors to certify they understand the Stormwater Pollution Prevention Plan (SWPPP), the General Permit conditions, and their responsibilities for compliance. The certification must be signed prior to performing any contract work. The certification shall be signed by an Owner, Principal, President, Secretary or Treasurer of the firm in accordance with the signature requirements of 102-05 Proposal Submission of the Standard Specifications.

*I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations.*

### Signature:
I.M. Builder

### Date:
April 22, 2015

### Name:
I.M. Builder

### Title:
President

### Required Training:
Effective April 30, 2010, the SPDES General Permit also requires the Prime Contractor and all subcontractors performing earthwork or soil-disturbing activities to identify at least one trained individual from each company who will be responsible for implementing the SWPPP and who shall be on-site on a daily basis when the company is performing soil disturbance activities. These activities include clearing, grubbing, grading, filling, excavation, stockpiling, demolition, landscaping, and installation and maintenance of Erosion & Sediment Control practices. Training must consist of 4 hours of NYSDEC-endorsed Erosion & Sediment Control Training every 3 years. (Training is not required if the individual is a licensed Professional Engineer, registered licensed Landscape Architect, or CPESC.) Provide the information below for trained individuals who will be on-site and responsible for SWPPP implementation on this Contract (attach a separate sheet if needed for additional trained individuals):

<table>
<thead>
<tr>
<th>Trained Individual Name/Title</th>
<th>Name of Training Course</th>
<th>Date of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dozer O'Perator</td>
<td>DEC 4-Hour Erosion and Sediment Control Training</td>
<td>Jan. 1, 2015</td>
</tr>
<tr>
<td>E.X. Cavator</td>
<td>DEC 4-Hour Erosion and Sediment Control Training</td>
<td>Feb. 16, 2015</td>
</tr>
</tbody>
</table>

### Trainee Number:
1T-010815-999

### Date of Training:
Jan. 8, 2015
SPDES STORMWATER POLLUTION PREVENTION PLAN (SWPPP) REVISION

Date: April 22, 2015

Day of Week: S M T T F S

Sheet No. 1 of 1

This form is to be used when revisions to the current Stormwater Pollution Prevention Plan (SWPPP) are required by SPDES General Permit for Stormwater Discharges from Construction Activity. The completed form must be filed in the Engineer’s Field Office.

Reason for the Revision(s): Revision(s) were requested by NYSDEC: □ Yes ☒ No

Ditchline from STA 2+000 to 2+120 has no temporary check dams shown. Work to reshape disturbed surface in ditch and install check dams; rain is expected. To prevent erosion, check dams are needed to reduce runoff velocity in the ditch until vegetation has established.

Describe the Revision(s) to the SWPPP:
Additional check dams along ditchline from STA 2+000 to 2+120 +/- 10m RT

Engineer-in-Charge Signature: 

EICs Name & Title: I.M. InCharge

Date Completed: 04/22/15

Copy to Contractor: 04/23/15
NOTICE TO DISTURB GREATER THAN 5 ACRES OF SOIL
SPDES General Permit for Stormwater Discharges from Construction Activity

Part II.C.3 of the SPDES General Permit for Stormwater Discharges from Construction Activity, requires written authorization from the New York State Department of Environmental Conservation (NYSDEC) prior to disturbing more than 5 AC of soil. Executive management at the New York State Department of Transportation (NYSDOT) and NYSDEC have mutually agreed that prior authorization is not required for NYSDOT contracts, provided adequate control measures are implemented and site inspections are conducted in accordance with the SPDES General Permit. The NYSDOT hereby notifies NYSDEC that more than 5 AC of soil will be disturbed at this site.

A Qualified Inspector will conduct at least 2 site inspections every 7 calendar days whenever more than 5 AC of soil has been disturbed. Inspections during this period will be separated by a minimum of 2 full calendar days.

This notification will be filed with the Stormwater Pollution Prevention Plan (SWPPP).

Contract No.: D123456 PIN: 1234.56.789

Description: Rte 123 over the Hudson River
Town, Village, City: Meadowfield
County: ALBANY

Approximate date soil disturbance will exceed 5 AC: June 10, 2015
Total soil disturbance: 15 Ac

Signature

Name: I.M. InCharge
Title: EIC
Phone: 518-999-1234
E-Mail: IMI@dot.ny.gov
Date Submitted to NYSDEC: May 28, 2015
NOTICE TO REDUCE FREQUENCY OF SPDES SITE INSPECTIONS
SPDES General Permit for Stormwater Discharges from Construction Activity

In accordance with Part IV.C.2.c of the SPDES General Permit for Stormwater Discharges from Construction Activity, the New York State Department of Transportation hereby notifies the New York State Department of Environmental Conservation that work on this Contract will be temporarily suspended and temporary stabilization measures have been applied to all disturbed areas.

A Qualified Inspector will conduct a site inspection at least once every 30 calendar days during this period. The standard site inspection frequency will resume when construction activities recommence.

Contract No.: D123456

PIN: 1234.56.789

Description: Rte 123 over the Hudson River

Town, Village, City: Meadowfield

County: ALBANY

Reason for temporary suspension of work:

X Winter Shutdown

□ Other

Approximate date work will be suspended: November 30, 2015

Approximate date work will resume: April 01, 2016

Signature

Name: I.M. InCharge

Title: EIC

Phone: 518-999-1234

E-Mail: IMI@dot.ny.gov

Date Submitted to NYSDEC: November 30, 2015
SECTION 210 – REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIAL (BUILDINGS, BRIDGES AND HIGHWAYS)

I. GENERAL
Asbestos project assessment, design, abatement and project monitoring work are all regulated activities in New York State. Asbestos project monitoring during abatement work on NYSDOT Design-Bid-Build construction projects is performed by environmental term agreement consultants managed by the Consultant Management Bureau in Main Office (project monitoring on Design-Build projects is the responsibility of the Design Builder as a separate service, independent from the abatement contractor). Use of these term agreement services is requested through either the Regional Environmental Unit or Construction Environmental Coordinator following contract award and prior to pre-construction. Additional information on use of these agreements is provided in The Environmental Manual (TEM) Section 4.4.19 Asbestos Management, Subsection 4.4.19.7.5 Project Monitoring which can be found at https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/AsbestosTEM_2014Edits%20(2).pdf.

II. PROCEDURE
The project monitor acts as a separate construction inspector for only the asbestos abatement work. They are responsible for the following:
1. Reviewing and approving asbestos abatement contractor pre-abatement submittals
2. Maintaining daily asbestos abatement project records for the Engineer in Charge (EIC)
3. Ensuring regulatory compliance by the asbestos abatement contractor
4. Conducting any necessary compliance air monitoring (including associated laboratory analysis)
5. Conducting any bulk sampling and laboratory analysis associated with additional suspect Asbestos-Containing Materials (ACMs) discovered during the work.
6. Performing all work area final clearance visual inspections and signing off on work area tear down, non-abatement contractor re-occupation and notifying the EIC that 75% of the contract pay item can be released
7. Verifying and documenting removal quantities for the EIC
8. Reviewing and approving all asbestos abatement contractor post-abatement submittals
9. Compiling all asbestos abatement project documentation into a single electronic file for the EIC and notifying the EIC that the final 25% of the contract pay item can be released

III. DOCUMENTATION RETENTION
Retain all interim daily asbestos abatement project documentation generated during ongoing construction work on Site Manager as attachments to corresponding Daily Work Records (DWR). Together with pre-abatement submittals previously approved by the project monitor and retained by the EIC, this documentation shall represent the project record.

Final asbestos abatement close-out electronic project documentation received from the project monitor following the completion of asbestos abatement activities shall be retained for long-term storage and placed by the Regional Construction Environmental Coordinator (CEC) in the respective ProjectWise contract folder created and titled Asbestos Abatement/Project Monitoring Documentation. Any hard copies of this final asbestos abatement close-out documentation provided by the project monitor shall be retained by the Region with the contract record, after contract completion.
SECTION 302 - BITUMINOUS STABILIZED COURSE

General Requirements
Granular material supplied under Option A shall be stockpiled in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17).

Project Procedure
Inspect the construction of stockpiles. Record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer, in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17).

The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpiles. Test results will be reported on Form GE-454 (See Exhibit 203H), "GRANULAR MATERIAL DOCUMENTATION FORM."

In accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-16), the Geotechnical Engineering Bureau shall furnish a recommended application rate for Option A materials on Form GEB-344f, "BITUMINOUS STABILIZED COURSE - RECOMMENDED APPLICATION RATE." The Regional Geotechnical Engineer must submit an additional sample from each stockpile to the Geotechnical Engineering Bureau for lab testing to determine this application rate.

The Engineer is directed to Materials Method 8.2 for inspection and documentation of Bituminous Materials and to the Departmental publication (Reference: GCP-16) concerning calibration of pugmills. Form GEB 352b (Exhibit 302A), "PROJECT INSPECTION REPORT - BITUMINOUS STABILIZED COURSE," should be completed by the Regional Geotechnical Engineer.

Regional Geotechnical and/or Geotechnical Engineering Bureau personnel are available to assist in the calibration of the plant. Form GEB-423b (Exhibit 302B), "BITUMINOUS PUGMILL CALIBRATION FORM," shall be used for the documentation.

The following shall be documented by the Inspector on MURK-1d, "INSPECTOR'S DAILY REPORT":

1. Approved material incorporated into the project including source and stockpile.
2. Weather and time of year conditions are within specification limits (no material shall be placed on a surface that is below 7°C., and from the last Saturday of September to May 15, except with written permission from the Deputy Chief Engineer, Technical Services Division.
3. Placement and compaction are within specification limits (maximum compacted thickness of any layer shall not exceed 100 mm.)

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.
2. If variations to the stockpiling requirements are granted, a copy of the approval letter from the Director of the Geotechnical Engineering Bureau must be on file.
3. For granular materials furnished under Option A, copies of test results (Form GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM") and, when applicable, a copy of the letter approving stockpile transfer, as well as the original GE-454M.

Full payment shall be made after the bituminous stabilized course has been placed, properly cured, and compacted to the required tolerance, regardless of whether another item will be placed on top of the material.
References
GCP-16 Procedure for Determining Application Rates, Calibration and Inspection for Soil Stabilization Plants
GCP-17 Procedure for the Control of Granular Materials
GEB 344E Bituminous Stabilized Course - Recommended Application Rate Materials Method 8.2

Related Contract Provisions
§401, Plant Mix Pavements - General
SECTION 304 SUBBASE COURSE

General Requirements
Most material supplied for the subbase course must be stockpiled. See specifications for specific exceptions. Stockpile construction shall be in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17).

Project Procedure
The Engineer inspects the construction of stockpiles. Record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer, in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17). Inspection of the construction of stockpiles may also be performed by the Regional Geotechnical Engineer.

The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpiles. Test results will be reported on Form GE-454M (See Exhibit 203H), "GRANULAR MATERIAL DOCUMENTATION FORM." The Inspector shall document on MURK-1d, "INSPECTOR'S DAILY REPORT," that only material from an approved source or stockpile is incorporated into the project.

Processing of non-stockpiled material shall be completed at the source. Project gradation tests shall be performed in accordance with Departmental instructions (Reference: GCP-17 and STM-20) and reported on Form SM-15B (See Exhibit 203I), "SIEVE ANALYSIS DATA." See Section 203 of this manual for the recommended frequency for gradation testing. Form SM-198C (See Exhibit 203J), "FIELD SIEVE ANALYSIS SUMMARY SHEET - GRANULAR MATERIAL," should be completed on a weekly basis.

The Inspector shall document on MURK-1d "INSPECTOR'S DAILY REPORT," the equipment used for the compaction, the number of passes applied and the thickness of the lift prior to compaction, and if the Contractor applied water to the lift. Thickness of the subbase material placed should be in accordance with the specifications for the type of material placed, Type 1, 2, 3 or 4. Care must be taken not to contaminate subbase with construction equipment. Cost of placing water to attain the proper compaction is included in the subbase item, unless there is an item for placing water in the contract.

Placing
The upper course subbase material will be placed on the grade, in a manner to minimize segregation. Uncontrolled spreading from piles dumped on the grade resulting in segregation will not be permitted. The subbase course will not be placed in excess of 150 mm without being compacted.

Compaction
When placing and compacting subbase material we are striving for the use of uniform material, having a moisture content of slightly less than optimum, and uniformly compacted. The compaction process artificially densifies the soil by expelling air and water from the soil to provide uniform high bearing capacity. The compacted soil is more resistant to shear deformation, develops full load-bearing capacity and prevents further densification due to traffic.

Due to the high percentage of plus 3/4 inch material, erroneous results can be obtained from density tests. Therefore, that portion of section 203-2.01 of this manual, waiving earthwork compaction tests, is also applicable to subbase material.

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. For granular material, copies of test results (GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM").

CIM 2011
DOCUMENTATION FORM" or SM-15B, "SIEVE ANALYSIS DATA") and, when applicable, a copy of the letter approving stockpile transfer, as well as the original GE-454M.

3. If variations to the stockpiling requirements are granted, a copy of the letter from the Director of the Geotechnical Engineering Bureau must be on file.

4. For granular material used in temporary work, a letter of approval from the Regional Geotechnical Engineer shall be on file.

References
GCP-17, Procedure for the Control of Granular Materials
STM-20, Test Method for Grain-Size Analysis of Granular Soil Materials

Related Contract Provisions
§203-2.02, Select Materials and Subgrade Area Material Requirements
§203-3.01, Placing
§203-3.12, Compaction
SECTION 308 SOIL CEMENT COURSE

General Requirements
Soil and granular material used for this item shall be stockpiled. Stockpile construction shall be in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17).

Project Procedure
Inspect the construction of stockpiles. Record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer, in accordance with the appropriate Departmental publication current on the date of advertisement for bids (Reference: GCP-17) Inspection of the stockpile construction may be performed by the Regional Geotechnical Engineer.

The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpiles. Test results will be reported on GE-454M, (See Exhibit 203H) "GRANULAR MATERIAL DOCUMENTATION FORM."

The Geotechnical Engineering Bureau shall determine the suitability of the material. The required cement content shall be furnished in a letter from the Geotechnical Engineering Bureau.

The Engineer is directed to the Materials Inspection Manual, Part 2, Materials of Construction, Sub-part A, "Materials Under the Control of the Materials Bureau," and to the relevant sections of this CIM, for control of the portland cement, asphalt emulsion, crushed stone, water and calcium chloride.

Inspection personnel shall document on MURK-1d, "INSPECTOR'S DAILY REPORT," that the Soil Cement Course was mixed, placed, compacted and finished in accordance with the specifications. Compaction control tests shall be in accordance with the appropriate Departmental publication in effect on the date of the bid advertisement (References: STM-6, 9 or 10).

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. For granular material, copies of test results (Form GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM") and, when applicable, a copy of the letter approving stockpile transfer, as well as the original GE-454M.

3. If variations to the stockpiling requirements are granted, a copy of the letter from the Director of the Geotechnical Engineering Bureau must be on file.

4. A copy of the letter from the Geotechnical Engineering Bureau on the recommended cement content shall be on file.

References
GCP-17, Procedure for the Control of Granular Material
STM-6, Test Method for Rapid Earthwork Compaction Control
STM-9, Test Method for Earthwork Compaction Control by Sand Cone or Volumeter Apparatus
STM-10, Test Method for Earthwork Compaction Control by Nuclear Gauge
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I. HMA PRE-PAVE MEETING (§402-3)
   A. PURPOSE
   The purpose of the Pre-pave meeting is to have a “round table” discussion with all parties involved. This discussion will help develop a contract specific paving plan. Hold pre-pave meeting one to two weeks in advance of scheduled paving to leave enough time to make changes if necessary.

   The Engineer-in-Charge (EIC) or his designee will take written minutes of the meeting for the record and later distribution to all attendees. An attendance sheet is included.

   §402-3 “Construction Details” shall apply for all the pre-pave meetings.

   B. PRE-PAVE MEETING ISSUES – WORK ZONE TRAFFIC CONTROL (WZTC) / SAFETY

   1. Who will be handling WZTC? Prime/Sub? Has Traffic Operations Center been notified?
   2. Any night time paving planned? A separate meeting and additional submittals are required.
   3. Will night time paving be a noise concern? Further information on night time paving considerations can be found in Section III-C. “Nighttime Paving WZTC and Safety”.
   4. Review Traffic Control Procedures:
      • How will trucks enter and exit?
      • How will intersections be handled?
      • Reflectors are needed for night work on manpower and equipment.
      • Should there be a flagger at the paver?
      • Will there be a dedicated spotter for blind backing and overhead?
      • Will the trucks need to make U-Turns? Do you have/need permission? Flagger needed?
      • Do you need radios? Available? Spare batteries/radios?
      • Who will inform property owners in area of proposed paving?
   5. Further information on WZTC considerations can be found in Section III.
   6. Is a supply of “UNEVEN LANE” and “DO NOT PASS” signs on hand in case they are needed for an overnight drop-off or other short-term drop-off? (i.e. 1 or 2 days maximum).
   7. How will overhead hazards be marked out prior to any paving work? If overhead hazards are marked out on the pavement, each course must be marked except for the final course.
   8. Has contractor checked with utility companies for shallow pipes, gas mains, or fiber optics that might be damaged due to vibratory rollers?
   9. Has contractor checked for buildings that might be damaged due to vibratory rollers? (Antique Shops, Historic Buildings, High Water Table, or Rock Foundations). Survey with pictures for documentation if needed.
   10. Has the Radiation Safety plan been submitted? This must be done at least 14 days in advance of any paving.

   Further information on paving safety considerations can be found in Section II. “HMA Paving Safety Issues”.
C. PRE-PAVE MEETING ISSUES - MATERIALS

1. Where will the tack come from? How will it be placed? Is the truck calibrated? Remember that tack coat shall be applied between all hot mix asphalt (HMA) lifts (excluding the surface of permeable base material) and the tack must break before paving can commence! Is Subcontractor approved? This is not a service item. Provision of Section 407 shall be applied.

2. What plant will supply the asphalt? Will there be a backup plant? What is the plant delivery rate? Are there any special arrangements for nighttime paving? Note the delivery temperature shall be a maximum of 325°F or as recommended by the asphalt binder manufacturer and or as printed on the binder certification form.

3. Have the appropriate mix designs been submitted to and reviewed by the Regional Materials Engineer (RME)? Delivery ticket and mix code discussion. Further information on delivery tickets can be found in Section IV-B-1 “Delivery Trucks”.

4. Contractor is responsible for notifying Regional Materials through the plant notification process the business day before paving to ensure that the material will get quality assurance inspection or the material certified. Notification will be given by 3:00 P.M.

5. Who will deliver the cores and loose mix samples to the Regional Materials Laboratory? When? Exchange phone numbers. Inform Contractor of lab hours and location.

D. PRE-PAVE MEETING ISSUES – EQUIPMENT

1. All trucks will be covered by solid tarps that will hang over the sides and back of the body and be securely fastened. Who will monitor this? If a truck arrives uncovered, it will be rejected by project staff.

2. All haul units will obey the New York State Vehicle and Traffic Laws and carry only the loads permitted for their vehicle and axle configurations.

3. All haul units will be cleaned prior to loading. Any haul unit found to have foreign material in the body will not be allowed back on the project until the body has been cleaned to the satisfaction of a DOT representative.

4. The inside surface of the truck body may be lightly coated with an approved asphalt release agent. Approved asphalt release agents can be found in the Department's Approved List. Petroleum products such as fuel oil is not an approved release agent. If any truck utilized any petroleum products as a release agent, the truck will be rejected.

5. Where will trucks and paver clean out?

6. What make and model paver will be used? When will paver be on site? What will be used for grade and depth control? Marked fills on pavement? Is there a straight edge with the paver?

7. What type of the rollers will be used? How many?

8. Who will be operating the rollers? If Trainee; how much experience do they have? Who will be training them? Remember that if we are not achieving the desired results, it will be the EIC’s decision to have them kept in an observatory mode. Has training report been filed?

9. Will there be a spare roller on site? What will it be? How far away is it?

10. Arrange time for inspection staff to view and approve equipment. The equipment checklist can be found in Section VII. “Equipment”.

E. PRE-PAVE MEETING ISSUES – PAVING

1. Discuss chain of command, lines of communication, giving and receiving instructions.

2. What are the anticipated paving hours? Do these times conflict with any time or lane restrictions in the plans or proposal?

3. Overtime (OT) Dispensation - Generally what time should last load come to get equipment off road to be in compliance?

4. What about the weather? Temperature? Rain? When and by whom will the decision be
made to go or stop?

5. Where is test section planned? Refer to Section IX. “Compaction Issues”.

6. Review sequences and widths (paving vs. lane) on plans. Problem areas should be walked through in the field. Does planned paving and lane width impact striping guiderail or curb installation?

7. If paving over 16 feet wide, will a second reference line/point be required? Encourage the Contractor to add auger extension for this width paving.

8. Where will rebates be required? What will be used to cut them and who will do it? How long will rebates be? The minimum rebate length is 25 feet. (see Standard Sheet 402-01 for more detail). Remember that the bid price for driveways includes the cost of rebates.
   • Note: the HMA item required for driveways may be different than the HMA item required for mainline paving.

9. How many crews will be paving?

10. How and when will joint filler be removed, replaced, and pavement cleaning done?

11. What is the anticipated paving speed? Can the plant keep up? Can the rollers keep up? We want the paving to be as consistent as possible to produce a quality paving product. (We do not want the paver to speed up to get rid of trucks and stop to rest while you wait for more).

12. Discuss compaction patterns and equipment to be used to determine patterns. Who will be in control of compaction, paving foreman or density gauge operator? Compaction should always progress from the low side to the high side. A discussion of the tender zone and its associated problems should be conducted. Once a rolling pattern is established, it is important that it be maintained and monitored to ensure consistent density. How will compaction be addressed around catch basins, valve boxes, and along curbs? In areas where vibratory rollers can't be utilized, a static compaction may be required?

13. What method of longitudinal joint construction will be used? Follow §402-3.09 “Joints”. How will transverse joints be constructed? What will be used to cut the tapers back? Remember that at the end of each paving day, we want a smooth transition from our paving course to the existing pavement (typically 3.0 feet per 1.0 inch of pavement thickness).

14. What pavement markings are required to be replaced daily? How and by whom will they be replaced?

15. Discuss short term markings. When placing removable short-term pavement markings on top course, be sure to offset them from the permanent locations. One application of short term paint can be overlaid by permanent marking.

16. When will drainage structures and utility boxes be raised? Who will do this? How will the basins be raised? i.e., lifting rings or bricked up.
II. HMA PAVING SAFETY ISSUES

A. GENERAL
The Engineer should perform a review of the following contract resources to ensure that safety issues as they relate to HMA paving have been addressed by the contractor prior to commencing with paving operations:

- Contractor Site Specific Health and Safety Plan
- Safety Data Sheets
- Contract Plans, Proposal, Special Notes & Project Specifications
- Discussion as necessary with the Regional Construction Safety Coordinator
- Construction Program Employee Safety Manual (C.P.E.S.M)

B. PROJECT SPECIFIC PAVING HAZARDS
As part of HMA paving safety, consider the importance of emphasizing the benefits of a paving safety meeting. This meeting would be an appropriate time to discuss the specific hazards that relate to HMA paving. The following general safety issues apply to most paving operations and could be included in a pre-paving safety meeting:

1. Ensure that all required personal protection equipment is available.
2. Check equipment and delivery trucks for backup alarms.
3. Avoid pinch points and blind spots during paving operations. Use proper backing procedures at all times. See special contract proposal notes on dedicated spotter requirements.
4. Identify and clearly mark all overhead electrical hazards.
5. Discuss the requirement for Spotters and that delivery trucks must not pull away from the paving operation until the boxes are fully lowered.
6. Remind inexperienced workers and inspectors of the mix temperatures & burn hazard that exists. Also see Hot Mix Asphalt section of Construction Program Employee Safety Manual.
7. Ensure that the contractor identifies a competent person and they are available throughout the HMA paving.
8. Review & inform everyone of the WZTC plan and paving scheme that has been approved.
9. Remind everyone of the traffic hazard and the proximity of traffic to the paving operation.
10. Impact of dust from pavement cleaning on traffic.
11. Discuss the operating procedures for equipment and ensure that all equipment is operated as intended.
12. Time of tack coat application and impacts to traffic.

C. NUCLEAR DENSITY GAUGE SAFETY
Regulations from the US Nuclear Reg. Commission, USDOT and NYSDOH have established the safe procedures for the transportation, operation, and storage of low level radiation sources and have established acceptable radiation exposure levels for workers exposed to the equipment. Further information on the NYSDOH regulation can be found at:


All gauge owners, both contractors and NYSDOT, are required to adhere to the regulations, which include a NYSDOL license. All operators must also be trained and safety certified by a gauge manufacturer. Gauge operators must be provided with personal monitoring devices to measure their radiation exposure. See GEM-10 “SAFETY PROCEDURE MANUAL FOR USE WITH NUCLEAR MOISTURE-DENSITY GAUGES” (https://www.dot.ny.gov/divisions/engineering/technical-
A Radiation Safety Plan is required if nuclear density gauges are to be employed on a project.

D. CHECKLIST FOR NUCLEAR GAUGE SAFETY:

1. Ensure the Contractor has given a written Radiation Safety Plan to the Engineer. This plan will contain all the names and phone numbers that must be called in case of an emergency.

2. Make sure the gauge operator is certified to use the gauge.
   - Review a copy of their Nuclear Gauge Safety certificate
   - Check name against picture ID (Driver’s License)
   - Make sure they are wearing a Thermoluminescent Dosimeter (TLD)
   - Verify name on TLD.

3. Observe gauge operator for safe operation practices.
   - Gauge is in his immediate presence at all times or locked in a vehicle.
   - Gauge is kept a reasonable distance from traffic.
   - Gauge is not lifted off pavement when the radioactive source is in the backscatter position (the gauge handle is down).

4. Stay 15 feet away from gauge when the source rod is down. Only stand near gauge when the source rod is in the “safe position” (the gauge’s handle is all the way up) to confirm measurement values on the gauge’s display against values recorded on BR 340 (https://www.dot.ny.gov/divisions/engineering/technical-services/materials-bureau-repository/BR_340.pdf) and or BR 341 (https://www.dot.ny.gov/divisions/engineering/technical-services/materials-bureau-repository/BR_341.pdf).

5. Check gauge operator enough to confirm the numbers are properly calculated and recorded (5 locations per day minimum and in accordance with Materials Procedure 402-02, more if you suspect there may be problems.)

E. CHECKLIST IN THE EVENT OF A DAMAGED GAUGE:

1. The immediate area of 15 feet radius is cordoned off with tape and warning signs.
2. Appropriate phone calls are made. Paperwork is required to be kept with the gauge at all times and shall include all required phone numbers. The names and phone numbers should also be available in the Radiation Safety Plan on file with the Engineer. (Task 1 and 2 should be completed by the gauge operator unless he is not present or unable.)
3. The EIC must be notified.
III. WORK ZONE TRAFFIC CONTROL (WZTC)

A. GENERAL
The issue of WZTC during HMA paving operations is important not only to ensure that a sound plan for maintaining traffic is in place but also for providing a logical approach to accomplish the paving work. It remains a challenge to balance the traffic issues and concerns against the overwhelming desire to just pave the job as quickly as possible with minimal regard to traffic. In order to develop a WZTC plan that is sensitive to both the traveling public and the paving operation, considerations must be given to the following:

1. Can the technical paving-related issues that would enhance the pavement quality be addressed while minimizing the impacts to traffic?
2. What delays and or traffic movement closures should be considered as reasonable in an effort to provide the technical paving advantages?

The above issues cannot be properly addressed without giving due consideration to the requirements contained in the following resources and these other factors:

1. M.U.T.C.D.
2. Engineering Directives (Work Zone Counter Measures)
3. General requirements of the 619 Standard Specifications
4. Inclement weather conditions that may impact traffic safety (i.e. rain/steam = visibility issues)
5. Increases in traffic running speeds as a result of paving (will rumble strips become warranted?)
6. Standard Contract Paving Details
7. Longitudinal Joint Requirements
8. Pavement Marking Requirements
9. Placement of traffic onto a tack coated area

This discussion would not be complete without the specific mention of VPP (Vendor Placed Paving) & PM (Preventive Maintenance) paving contracts. A review of the contractual obligations is necessary to identify the differences that exist in these contracts versus a typical capital program project. One such difference worth noting is that VPP contracts require the submission of a WZTC plan, by the contractor, for approval and that the contracts require the minimum use of three flaggers at the paving operation (or an approved alternative such as the use of pilot vehicles).

B. PUBLIC OUTREACH
On projects where disruption to the traveling public will occur as a result of HMA paving operations or when direct benefits may result by keeping the traveling public informed of planned paving operations, public outreach should be considered. This outreach may include many levels. First and foremost, the Regional Public Information Officer should be kept informed of scheduled paving operations. The Regions could then inform the local media of the planned work and the delays and impacts that can be anticipated resulting from the HMA paving operations. Outreach may include the following: Local Press, Radio & Television, and Businesses & Residences impacted.

Inform emergency services such as 911, police, fire departments and ambulance companies. Where operations will have significant impacts to school busses or local transit vehicles it is also necessary to inform these groups. Finally, the notification of impacted agencies or groups will further help to build a relationship between the Department and the Public and for this reason it should not be overlooked.
C. NIGHTTIME PAVING WZTC AND SAFETY

§619-3.19 "NIGHTTIME OPERATIONS" describes the requirements for scheduled nighttime work. The following steps must be followed to prepare for nighttime work:

1. Preparation of nighttime work plan by the contractor.
2. Review of nighttime work plan in accordance with regional policy.
   - Approval.
   - Modifications, if necessary.
3. Meeting to plan for nighttime work.
   a. Attendees
      - Engineer-in-Charge
      - Inspector(s)
      - Contractor Superintendent
      - Subcontractor Superintendent
      - Nighttime Traffic Control Supervisor
      - Regional Construction Safety Coordinator
      - Density Gauge Operator
   b. Topics for Discussion
      - Workdays and Work hours
      - Plans for Nighttime Operations (Written)
        1) Detailed traffic control plan
        2) Lighting plans
        3) Contingency plan identifying and addressing foreseeable problems.
        4) Emergency contact telephone numbers
      - Project Site Patrol
      - Trained flaggers
      - Emergency flares
      - Worker protection (paving, inspection, & testing crews)
      - Vehicle protection
      - Material delivery
      - Staging and clean up areas
4. Preparation for nighttime work.
   - On site night work safety meeting prior to start.
   - Recommend mock run to insure all devices and measures are in place and adequate. This should be done at night with no other operations to allow for correction without impeding production.
5. Review of site on the first night of work, modifications, if necessary.
IV. HMA PRODUCTION ISSUES.
The Contractor must notify the HMA manufacturer of any intended paving operation the day prior to paving. The Contractor is required to notify the Regional Materials office by 3:00 PM of the day prior to any production. Quality Assurance testing is performed as determined by the RME. The following items apply to most HMA productions:

A. SPECIFYING HMA MIX TEMPERATURE (§402-3.06-C)
The PG Binder is heated at the plant so that it flows easily and coats the aggregate during the mixing process. If heated to higher than necessary temperatures, the binder will oxidize quickly and become brittle, resulting in premature pavement aging. The temperature of the HMA delivered to the contract is also critical in achieving proper pavement density. The specified temperature range is between 250°F and 325°F, or as otherwise recommended by the PG-Binder manufacturer.

B. PROCESS AND PAPER
Field inspection staff should be familiar with the following three documents which are prepared at the plant and provided to the project staff:

1. **Delivery tickets.**
   All HMA delivered to the project site must be accompanied by a delivery ticket prepared by the HMA manufacturer. §401-3.07 “Documentation” and section III-J “Delivery ticket” of the MP-401 shall apply for all the delivery tickets. Delivery tickets must contain the material description coding as shown in Table 2 “Delivery Ticket Mix Coding” of the MP-401. Check the delivery ticket for the mix code to ensure that the mix delivered is the one that was specified. One legible copy of the delivery ticket shall be made available to the paving inspector. The delivery ticket quantities must be in tons to the nearest 0.01 ton.

2. **BR 343a - Daily Hot Mix Asphalt Authorized Shipments.**
   (https://www.dot.ny.gov/divisions/engineering/technical-services/materials-bureau-repository/BR_343a.pdf) The Quality Assurance Technician (QAT) is responsible for the issuance of Form BR 343a - Daily Hot Mix Asphalt Authorized Shipments to each project served by the HMA plant. This form has the quantity of each mix type of HMA produced and shipped to each project. This quantity is determined from the plant automation system or the delivery vehicle weigh system. Also included on the BR 343a is the Quality Adjustment Factor (QAF) for each mix type produced and shipped.

3. **BR 307 - Quality Control Hot Mix Asphalt Certification.**
   (https://www.dot.ny.gov/divisions/engineering/technical-services/materials-bureau-repository/BR_307.pdf) The HMA manufacturer is allowed to certify, without testing, HMA plant lot production quantities of 150 tons or less. These certified quantities have a QAF of either 0.85 or 1.00. The conditions under which the HMA manufacturer is allowed to certify HMA production is determined by the RME. It is the responsibility of the HMA manufacturer to fill out and submit Form BR 307 QUALITY CONTROL HOT MIX ASPHALT CERTIFICATION. In addition, production records are maintained at the production facility site unless otherwise directed by the RME.

C. QUALITY ADJUSTMENT FACTOR (QAF)
QAFs are determined daily for plant production, pavement density, longitudinal joint density and Pavement Ride Quality (PRQ). The daily QAF is used to determine each day’s quality payment adjustment. The plant production daily QAF is included on form BR 343a. The pavement density daily QAF is provided by the RME. The Pavement Ride Quality (PRQ) test results shall be reported to the EIC. The longitudinal density specification is project by project basis. Pavement Density and Longitudinal Joint Density QAFs are reported daily to the EIC via SiteManager.
V. HMA PLACEMENT ISSUES

A. GENERAL
Most problems with asphalt paving have multiple possible causes. The Contractor should only be allowed to continue paving by trying to fix a probable cause of the HMA problem using a reasonable and rational method. If the Contractor’s reasonable methods used that day do not work, provide a written notice to the Contractor, describing the deficiencies, actions already taken, asking what future remedies will be utilized to prevent the problem from reoccurring, and when and how the past deficiencies will be corrected. Notify the Materials Engineer. If problems occur on the second day using reasonable solutions or If the Contractor fails to acknowledge the problem and/or provide a plausible method of correction, a written stop work order should be issued. At this time, notify the Construction Supervisor. A contract level meeting should be called as the next course of action.

B. SURFACE PREPARATION DETAILS
The performance of HMA pavement is affected by the condition of the underlying surface. Care should be taken to prepare the surface so the pavement's service life can be achieved. Ensure that the surface defects such as potholes, joints & cracks, wheel ruts, and other pavement defects are properly repaired prior to HMA placement.

Further information can be found in §402-3.05 “Conditioning of Existing Surface” and Section 633 “Conditioning Existing Pavement Prior to Hot Mix Asphalt (HMA) Overlay”.

C. PAVEMENT TERMINATION
During paving operations, the areas where the new paving meets the existing pavement must be terminated properly to provide a smooth transition. These areas usually include the beginning and end of a project and major intersecting side roads. A smooth termination is accomplished by providing an adequate transition length to take the new pavement elevation to the existing pavement elevation. The joint where the new pavement meets the existing pavement must be a sawed, keyed in, vertical joint.

Further information can be found in Standard Sheet 402-01 “HOT MIX ASPHALT OVERLAY SPLICE (PAVEMENT TERMINATION DETAIL)”

An important point to consider when paving a smooth termination, is how much the new mat will compact. The proper thickness of material must be placed so that when compacted it meets the existing pavement elevation and provides a smooth transition. A good rule of thumb to use is that the mat will compact approximately 20-25%. A mat placed at 1¾ – 2 inches will compact to 1½ inches. This is accomplished by putting the paver screed on starting blocks (usually wood) when the paver pulls off the joint. The starting blocks should be of adequate size to allow the additional thickness of material to be placed.

D. DRIVEWAY REBATES
Residential and commercial driveways must be terminated properly to provide a smooth transition. A smooth transition is accomplished by providing an adequate transition length to blend the new driveway with the existing driveway. The joint where the new driveway meets the existing driveway must be a sawn, keyed in, vertical joint.

E. TACK COAT
Whenever a TACK COAT item appears in a contract, the following construction guidelines are applicable.

1. Materials. Tack coats are produced by diluting a hard-base emulsion with a suitable emulsifier solution. At the time of its use, the tack coat must meet the material requirements listed in either TABLE 702-07 “Diluted Tack Coat” or TABLE 702-8 “Straight Tack Coat” Asphalt Emulsion Tack Coat.

The Asphalt Emulsion Certified Test Analysis Form is important to inspectors. This form includes the test results from the Primary Source who certifies that the material is from a certified lot. The Primary Source is the supplier on the Department’s Approved List. The Certified Test Analysis must accompany all shipments of material. Inspectors should verify that the form is properly filled out and represents the shipment delivered. Receipt of this form is the basis of acceptance for incorporating the material into the work.

3. **Preparing Tack Coat for Application.** The equipment shall be calibrated in accordance with §407-3.01. To prevent the emulsion (tack coat) from separating and to ensure that a uniform product is applied to the pavement surface, it is important that the tack coat be agitated thoroughly prior to its use. This agitation is imperative if the tack coat has been stored on the project in an auxiliary storage tank or haul vehicle. The liquid emulsion must be agitated in the storage tank or haul vehicle before it is loaded into the distributor vehicle. This agitation is normally accomplished by circulating the emulsion through a pump and back into the storage tank for a sufficient time to ensure complete remixing. One hour of circulation for each five thousand gallons of tack coat is normally sufficient to maintain a homogeneous emulsion. The circulation of stored tack coat should be done daily.

4. **Time to Break.** Paving Hot Mix Asphalt over a tack coat should not commence until the emulsion has broken (goes from brown to black in color). During normal paving weather, this requires approximately 15 minutes. If the weather is humid or damp, the time required for the emulsion to break is more than 15 minutes.

Curing (or breaking) of the tack coat can also be determined by touching it. A hard, tacky surface indicates that paving over the tack coat can commence. If the tack coat is not cured to a black, tacky condition and paving begins, the tack coat will act as a lubricant which defeats its original purpose of providing a bond between the existing surface and the new pavement.

5. **Maintenance of Traffic.** Keep traffic off the tack coated area. If traffic must use the tacked area, this should occur only after the emulsion has completely broken and the pavement has dried. Traffic speed should be controlled to 20 mph or less.

6. **Application.** No more tack coat should be applied than can be covered by the Hot Mix Asphalt mix in one day. It is recommended to apply tack coat in 1000-foot sections. This should prevent a large area of tacked pavement having to be open to traffic because of a plant stoppage or bad weather. If traffic has to use the tacked area overnight, the area should be sanded with a clean sand prior to allowing traffic on the area, and swept clean before the asphalt concrete is placed the next day.

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**F. MIX TEMPERATURE (§402-3.06-C)**

The mix temperature delivery shall be discussed at the pre-pave meeting. The Contractor is responsible for compacting the pavement within a specified density range. Mix temperature is one of the most important factors that affect compaction. Consistent mix temperatures help in achieving uniform compaction. To achieve proper pavement densities, a rolling pattern is developed based on the mix delivery temperature, ambient conditions, mix properties, and speed of paving. If a consistent
rolling pattern is used and the variables that affect the rate at which the mat cools (mat thickness, underlying pavement temperature, etc.) are consistent, then pavement densities should be consistent. When mix temperatures fluctuate significantly, it is very likely that the mat will not be uniformly compacted. This can also result in a poor riding pavement. Fluctuating mix temperatures can contribute to pavement surface irregularities such as cracking, tearing, shoving, areas of broken aggregate and closely spaced transverse roller depressions that lead to a poor ride. If surface irregularities are observed, notify the Contractor and work with the Contractor to prevent the problem from continuing. The Contractor may choose to order a different or more consistent mix temperature in an attempt to correct the problem.

G. CHECKING MIX TEMPERATURES
It is important to check mix temperatures. The temperatures listed in the specifications are not to be exceeded to prevent mix from being overheated. HMA with elevated temperatures above the maximum limits should be rejected.

The temperature should be taken in the paver hopper as this represents the point of delivery and avoids the need to climb onto the back of a delivery truck. There are two methods of checking mix temperatures, using an analog thermometer and an infrared temperature gun.

1. **Analog Thermometers.** Taking mix temperatures using analog (dial) thermometers is the most accurate method. When measuring temperature with these types of thermometers, the inspector should wear appropriate personal protection equipment and clothing (i.e. thermal gloves, long sleeve shirt, etc.) The HMA temperatures are typically in the area of 300°F and the stick (probe) should be inserted into the mix in the front of the hopper, away from the hopper wall and on the side of the paver that is away from traffic shortly after the haul vehicle begins dumping into the paver. When using an analog thermometer, a string should be tied around the dial so it can be retrieved easily and safely if it gets buried while the truck is dumping HMA into the hopper.

2. **Infrared Digital Thermometers.** Using an Infrared thermometer to take HMA temperatures is the safer method. However, care must be taken to make sure that the temperature that registers reasonably represents the temperature of the HMA. An infrared thermometer measures the temperature on the surface while the temperature below the surface better represents the temperature of the HMA. The surface of the mix is exposed to the much cooler ambient air and is cooled; therefore, an infrared thermometer should be used as a screening tool.

To get a representative mix temperature using an infrared thermometer, take the temperature in the middle of the hopper away from the hopper wall, while standing on the side of the paver which is not exposed to traffic, shortly after the haul vehicle begins dumping. Use a small but long piece of wood to push aside 2 to 3 inches of mix, quickly point the infrared thermometer at the area where the mix was pushed aside, and pull the trigger to register the temperature. The temperature registered should reasonably represent the mix temperature. Repeat at 4 different points in the hopper and average the readings. This should yield a temperature that reasonably represents the mix temperature. If the infrared thermometer indicates the temperature of the mix is out of specification, then an analog thermometer should be used to verify the mix temperature.
VI. WEATHER AND SEASONAL LIMITS (§402-3.01)

A. COLD WEATHER PAVING

Maintaining heat in the mix is critical to achieve density and construct a quality pavement. It is for this reason that seasonal and temperature limitations are included in the specifications under §402-3.01 TEMPERATURE AND SEASONAL LIMITATIONS. However, sometimes it is necessary for the Contractor to pave outside these limitations. Because of this factor, the Department has implemented a warranty procedure (see MP 402-01 “Warranty Requirements for Hot Mix Asphalt (HMA) Top Course”). An approved warranty is the only mechanism which allows the Contractor to place top course HMA outside the seasonal limitation. It must be emphasized that the Contractor is taking the gamble by warrantying the pavement and does not have to use any of these measures to achieve density and minimize the risk of premature pavement failure.

The following measures should be considered by the Contractor to help maintain heat in the mix and obtain the required pavement density during early or late paving season when the surface temperature is at its minimum requirement.

1. Produce and place mixes at the upper range of the mix temperature specifications.
2. Reduce paving speed.
3. Decrease the plant production rate.
4. Use covered and insulated haul vehicles.
5. Operate rollers as close to paver as possible.
6. Increase the number of rollers if practical.

B. HOT WEATHER PAVING

During hot weather periods, paving mats cool at a much slower rate. This fact must be taken into consideration by the Contractor given the temperature sensitive compaction behavior of today’s HMA mixes. The best way to monitor mat temperature is the use of infrared temperature guns. This information is the Contractor’s best tool to regulate the timing of the rolling operations to obtain the required density and pavement surface conditions. In addition, the following suggestions should be implemented when paving above 85°F.

1. Decrease the mix temperature by 15°F to 20°F.
2. Restrict the number of rolling passes only to that which is necessary to achieve compaction.
3. Any rollers not working are to be parked off the mat.
4. Vibratory compaction should occur when the mat has cooled enough that rolling does not cause surface tearing or shoving. This will vary for each individual mix.
5. Finish rolling is intended to remove roller marks and irregularities, not to provide additional compaction. Finish rolling should be conducted after the mat has cooled to 150°F (slightly hot to the touch).
6. Restrict traffic from the fresh mat until it has cooled to less than 140°F or cooler if possible.

C. RAIN

If paving is planned for the following day and the forecast calls for rain, the Contractor must understand the risks of paving. Unless the warranty provision has been previously requested in writing and approved, and the Contractor has notified the EIC prior to the start of paving, the warranty cannot be used to pave in the rain. The Contractor can plan to pave without the warranty with the understanding that the EIC controls whether or not paving takes place based upon weather conditions at that time.

The EIC’s decision on whether to proceed with paving when rain occurs and mix is still in the trucks is always difficult. Local radar images from internet weather services can be very helpful when making their decision. Depending on the forecast and the duration and severity of the rain, the following actions should be taken:
1. **Light continuing rain expected.** Notify the superintendent to stop asphalt delivery. Trucks already at the site or in transit can be placed if the pavement surface has been tacked and not puddled. Place the trucks as quickly as possible with rollers as close as possible.

2. **Heavy rain of short duration expected.** Notify the superintendent to stop paving. Hold further delivery and asphalt in trucks until rain passes. Once the rain has stopped, puddles must be swept from the pavement surface. After sweeping, the placement of HMA held in trucks can resume as long as specified temperature is met.

3. **Heavy continuing rain expected.** Notify the superintendent to stop asphalt paving and delivery. Inform the superintendent of the likelihood of HMA in trucks being rejected if rain is long in duration.
VII. EQUIPMENT
Asphalt paving is very important to local roads, streets, and interstate highways and proper inspection of the equipment is just as critical. You should become familiar with this equipment. The following steps must be followed to prepare for a paving operation:

A. INSPECTOR’S TOOLS/EQUIPMENT

1. Surface Thermometer
2. Two asphalt thermometers
3. Ruler
4. Tape or measuring wheel
5. Slope board or smart level
6. String line or straightedge
7. Tack sampling items

B. PAVER

1. Engine governor is working properly.
2. Tires are in good condition/proper pressure or tracks are snug.
3. The front rollers of the hopper move freely.
4. The hopper wings and flow gates set properly.
5. The side gates are free of worn, broken or missing parts.
6. The feed conveyor slats are clean and undamaged.
7. Center “back-feed” augers or agitators are in place.
8. Augers are in good condition and auger extensions are in place if needed.
10. Screed has proper crown adjustment.
11. Crank assembly bearings are in good condition.
12. Strike off is adjusted properly and undamaged.
13. Screed bottom is smooth, free of wear, pits or warps to ensure smooth surface. It should also be clean - not set down in mud the night before.
15. Vibrators operate properly.
16. Grade control works properly.
17. Slope control works properly.
18. Machine is clean and free of caked asphalt.
19. There are no oil/fluid leaks to contaminate the surface.

C. ROLLERS

1. A sticker or a plate shall be installed on each model rollers to provide the recommended settings for amplitude, frequency, and tire pressure (pneumatic).
2. The drum is straight and undamaged.
3. The drum is clean of hardened mix - Diesel is not permitted.
4. Water supply and nozzles are working.
5. Pads and scrapers are working and in good condition to keep drums/tires clean.
6. For pneumatic-tire rollers, the tires are inflated equally to the desired pressure and the tires are properly heated prior to and during use.
7. Diesel fuel may not be used on the tires. Only water or water mixed with small quantities of detergent or other approved material can be used. In no case will a solvent having an effect upon the bituminous pavement be used.
8. There are no oil or fluid leaks to contaminate the surface
9. For pneumatic-tire rollers, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar material to prevent pickup.
10. Every roller shall have an audible back-up alarm in working condition.
D. HAUL TRUCKS

1. All haul units will obey the New York State Vehicle and Traffic Laws and carry only the loads permitted for their vehicle and axle configurations.
2. The body of the truck is in good condition and clean of old mix and/or any other debris that might contaminate the fresh mix. Any haul unit found to have foreign material in the body will not be allowed back on the project until the body has been cleaned to the satisfaction of a DOT representative.
3. There are no oil or fluid leaks to contaminate the surface.
4. There is no fuel in the body - fuel is not an approved release agent.
5. There is not excessive release agent coming out of the body.
6. Every truck is equipped with a watertight solid tarp that covers the sides and back of the body and is securely fastened. If a truck arrives uncovered, it will be rejected.
7. Every truck must have an audible back-up alarm in working condition.

E. TACK DISTRIBUTOR

1. The nozzles on the spray bar or wand are clean and angled in the same direction.
2. The tank is self contained and heated to ensure proper application temperature.
3. Tachometer, metering device, or calibrated tank is present in order to determine application rate.
4. There is a working thermometer to check temperature.
5. There's a sampling valve.
6. There are no oil or fluid leaks to contaminate the surface.
VIII. HMA PLACEMENT RESPONSIBILITIES

The Contractor is responsible to safely construct a HMA pavement that meets density requirements and is free of “shallow ruts, ridges, other irregularities, or roller marks in the pavement.” The assignment of these responsibilities to the Contractor is logical because the Contractor and supplier have primary control of the quality of the asphalt mix, the traffic control, and the placement and compaction of the pavement.

The performance of HMA pavements is largely dependent on the in-place density achieved during construction. This is the reason in-place density is the measured quality parameter in NYSDOT’s performance related HMA specifications. Require the HMA be compacted within certain specified density limits, as determined by cores or Density Gauge monitoring. The Contractor is given wide discretion in how to compact the pavement to achieve the required density, including equipment selection, setup, and operation. Long term HMA pavement performance is also significantly impacted by cracking, segregation, and other surface irregularities which may occur during construction. Ensuring the finished pavement surface is free of these problems is also the responsibility of the Contractor.

The contractor must provide a finished pavement mat that is free of surface irregularities. If these imperfections are present, correct the imperfections or remove and replace the pavement at no additional cost to the Department. The specifications state “the loose mat should be checked, any irregularities adjusted, and all unsatisfactory material shall be removed and replaced,” and “remove any mixture that becomes loose and broken, mixed with dirt, or in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area.”

It is clearly the responsibility of the Contractor to obtain the required surface conditions as well as the specified density. NYSDOT inspection personnel will monitor these requirements on all projects. Specifically, inspection personnel should pay particular attention to the following:

1. HMA shoving which results in pavement cracking or tearing, even if the cracks or tears appear to heal during the compaction operation.
2. Mat spread resulting in an irregular longitudinal joint.
3. Segregation, especially segregation associated with the beginning and end of asphalt loading into the paver.
4. Surface irregularities, such as standing waves, longitudinal roller marks, closely spaced transverse roller depressions or areas of broken aggregate.

These non-density problems result in a poor riding surface and have a negative impact on the long-term pavement performance. Therefore, attention must be paid to the quality of the mat immediately behind the paver and quick action taken to correct problems.

If any significant areas or repeated smaller areas of a pavement exhibit any of these non-density problems, a progressive course of action should be taken. Common sense should be used when determining what is a significant area or repeated smaller areas. The key factor in judging what constitutes repeated smaller areas is that the defect continues to occur periodically or randomly more than several times in the HMA pavement. Examples of repeated smaller areas of defects would be persistent truck end segregation, or continuing random areas of any of the defects mentioned previously. The Construction Supervisor and RME should be consulted if there is any question as to determining if an area or areas require correction.
IX. HMA COMPACTION ISSUES

A. General
The performance of HMA pavements is largely dependent on the in-place density achieved during construction. This is the reason in-place density is the primary measured quality parameter in performance-related HMA specifications. The specifications require the HMA be compacted within certain density limits, as determined by cores or Density gauge monitoring (see TABLE CIM402-1 “HMA COMPACTION OVERVIEW”). The Contractor is given wide discretion in how to compact the pavement to achieve the required density, including equipment selection, setup, and operation. For further information on the HMA pavement density determination, see MP402-02.

<table>
<thead>
<tr>
<th>Measure of Density for Routine Paving</th>
<th>50 Series</th>
<th>60 Series</th>
<th>70 Series</th>
<th>80 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAF (Quality Adjustment Factor)</td>
<td>PTD (Project Target Density)</td>
<td>PTD (Project Target Density)</td>
<td>Acceptance of the mat is based on Required number of roller passes as shown on Table 402-6 of the §402-3.07-D</td>
<td></td>
</tr>
<tr>
<td>How Target Established</td>
<td>QAF set by RME based on lab analysis of cores &amp; loose mix samples</td>
<td>PTD set by RME based on lab analysis of cores &amp; loose mix samples</td>
<td>PTD set based on 'peak method' density gauge readings</td>
<td></td>
</tr>
<tr>
<td>First Day Mainline Paving’s Provisions</td>
<td>Option 1</td>
<td>Contractor constructs a Test Section on the Mainline. Routine paving operation shall not begin on the first day (See §402-3.07-A1).</td>
<td>Contractor shall construct a Test Section on the Mainline. Routine paving operation shall not begin on the first day (See §402-3.07-B1).</td>
<td>(Not Applicable)</td>
</tr>
<tr>
<td></td>
<td>Option 2</td>
<td>Contractor does not construct any Test Section. Routine paving begins on the first day of operation (See §402-3.07-A2 &amp; A3)</td>
<td>Contractor shall construct a Test Section on the Mainline and continue paving on the first day (See §402-3.07-B2).</td>
<td>(Not Applicable)</td>
</tr>
<tr>
<td></td>
<td>Option 3</td>
<td>(Not Applicable)</td>
<td>(Not Applicable)</td>
<td>Contractor shall construct a Test Section on the Mainline. Routine paving operation may begin after placing the Test Section (See §402-3.07-C1 and §402-3.07-E1 or E2)</td>
</tr>
<tr>
<td>Density Inspection Method for Test Section</td>
<td>Cores w/ Loose Mix samples</td>
<td>Cores w/ Loose Mix samples &amp; Density Gauge</td>
<td>Density Gauge (use 'peak method')</td>
<td>(Not Applicable)</td>
</tr>
</tbody>
</table>
### Density Inspection Method for Routine Paving

<table>
<thead>
<tr>
<th>Lot Size (Tons)</th>
<th># Of Req. Cores</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤200</td>
<td>0</td>
</tr>
<tr>
<td>&gt;200 but ≤2000</td>
<td>4</td>
</tr>
<tr>
<td>&gt;2000 but ≤2500</td>
<td>5</td>
</tr>
<tr>
<td>&gt;2500 but ≤3000</td>
<td>6</td>
</tr>
<tr>
<td>&gt;3000 but ≤3500</td>
<td>7</td>
</tr>
<tr>
<td>&gt;3500</td>
<td>8</td>
</tr>
</tbody>
</table>

Take a set of Cores (4) on the first day of paving. Extract additional set of cores on every third day after (day 1, 4, 7 & etc.).

No cores are required; however, the Engineer may request a set of cores to verify the PTD (Project Target Density) at any time.

Counting number of roller passes

### Test Section Payment Adjustments

**Option 1:**
- First 200 Tons for test section is paid at 1.5 x bid price as long as the mixture has been compacted uniformly within 92-97% of MMTD (Mixture's Maximum Theoretical Density).
- If MMTD is <88% (based on cores), the EIC shall determine if acceptable (leave it in place) or not (remove and replace).
- If acceptable it is paid at 0.6 x bid price.
- If not acceptable then the test section is removed and replaced at no additional cost.
- "1.5 x bid price" adjustment only paid in first two test sections.
- Do not apply QAF to first two test sections; apply QAF to subsequent test sections only if on mainline.

**Under Option 1:**
- First 200 Tons for test section is paid at 1.5 x bid price as long as the mixture has been compacted uniformly within 92-97% of MMTD.
- If MMTD is <88% (based on cores), the EIC shall determine if acceptable (leave it in place) or not (remove and replace).
- If acceptable, then it is paid at 0.6 x bid price.
- If not acceptable then the test section is removed and replaced and paid only at bid price.

**Option 2:**
- The "1.5 x bid price" adjustment does not apply.

**Option 2:**
- (Not Applicable)

**Option 2:**
- (Not Applicable)
TABLE CIM402-1 HMA COMPACTION OVERVIEW

<table>
<thead>
<tr>
<th></th>
<th>50 Series</th>
<th>60 Series</th>
<th>70 Series</th>
<th>80 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to Construct a New Test Section</td>
<td>Option 1: If the QAF from the test section is &lt;1.0</td>
<td>During Test Section: If avg. density of cores is &lt;88% of the max. theoretical density and the EIC chooses to have the pavement removed and replaced</td>
<td>• If 2 consecutive locations produce readings of &lt;96% or &gt;103% of the target PTD</td>
<td>(Not Applicable)</td>
</tr>
<tr>
<td></td>
<td>Option 2: • If on first day of paving the QAF is &lt;1.0 • If consecutive lots have a QAF &lt;0.85</td>
<td>Option 2: • If 2 consecutive locations produce readings of &lt;96% or &gt;103% of the interim PTD</td>
<td>• If the moving avg. of the last 10 readings is &lt;98% of the target PTD</td>
<td></td>
</tr>
<tr>
<td>Compaction Requirements for Shoulders, Ramps, Maintenance Widening, Crossovers &amp; Bridges</td>
<td>For 50, 60, 70 and 80 Series Compaction</td>
<td>• Target QAF does not apply • Payment based on satisfactory placement &amp; compaction • Try to compact similar to mainline, if signs of distress, decrease the compaction effort</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. MONITORING SHOULDERS
Monitor and record the density measurement and average gauge density per MP 402-02 on the “In-Place Pavement Density Data” (BR 340/341 Label it “shoulder” under the “Test no.” column.

C. MONITORING DENSITY GAUGE MEASUREMENTS
It is possible for a Density Gauge Operator to use the gauge in a manner that results in gauge readings that are dramatically higher than or lower than the actual density of the pavement. Therefore, it is necessary to watch the gauge operator to make sure that only proper techniques are being used. The following are a summary of techniques that can be used to influence Density gauge readings:

1. **Short Sticking.** When measuring pavement density, the gauge is operated in the “backscatter” mode. In this mode, the source rod is positioned so that it locks into place in the first notch below the top notch or the “safe” mode notch. The handle should click and lock into this backscatter position. In many gauges, it is possible to position the handle so that it locks in just above the notch. When the gauge takes measurement with the handle in this “short stick” position, the reading generally jumps approximately 8 to 10 lbs/ft³ or 6 percent. If a paving crew is having problems meeting the density specification, it is possible for a gauge operator to avoid having to perform a test strip by judiciously or accidently “short sticking” a measurement or two to increase a reading that would otherwise be less than 96% of the PTD or in danger of bringing the moving average to less than 98% of the PTD.

2. **Long Sticking.** This is when the operator takes a gauge reading with the handle locked just below the backscatter notch. This causes measurements to be dramatically lower than the pavement density. This may be detected by rocking the gauge. If the gauge rocks, the source rod is sticking out below the bottom of the gauge and the gauge is not sitting properly. "Long sticking" the readings at a test strip core location could lead to a lower and easier to achieve PTD. This could result in the pavement being compacted to actual densities that are less than what is required by the specification and subsequently a shorter service life.

3. **Wet Density Readings.** Some Nuclear Gauges can be used on soils as well as asphalt pavements. Wet density setting is to be used for monitoring density on asphalt pavements.
4. Other Situations That Can Adversely Affect Density Readings.

- Taking readings under a bridge.
- Taking readings with a truck or large piece of equipment nearby.
- Taking readings with another gauge nearby.
- Taking readings when the pavement is wet.
- Taking readings when the gauge bottom or source rod is dirty
- Taking readings on an uneven surface.

D. IMPROPER DENSITY READING LOCATIONS AND RECORDING

Other ways that the pavement density can be misrepresented include:

1. Taking readings in the middle of the mat where the mat gets a higher compactive effort and has the most lateral support. The object is to compact the entire mat, not just the center of the mat. For Further information, see Materials Procedure (MP) 402-02.

2. When no one is witnessing the readings, the gauge operator could record density measurements higher than the actual readings. This would enable the Contractor to continue paving despite achieving actual pavement densities that are less than what is required.

3. The way to prevent this from occurring is to require the gauge operator to mark the gauge reading locations with keel. This enables the paving inspector to walk back and easily see that the density reading locations are at variable offsets. It also enables the paving inspector to have the gauge operator go back to the location of an earlier density measurement and compare the new measurements to the old measurements. If there is a significant difference, then either the gauge is defective or the operator is not using it properly.

4. The gauge operator can record incorrect averages and moving averages to make it appear that the density requirements are being met when in fact they are not. To prevent this, check the gauge operator’s math at a random reading or two at each visit. A spot check for this type of error can also be performed when reviewing the completed BR 340/341 at the end of the paving day. It is also important to insist that the BR 340/341 is completed in ink so that the recorded measurements and calculations can’t be manipulated by the gauge operator.

5. The gauge operator should be doing all the necessary calculations, including moving averages as he or she progresses, not at the end of paving. Otherwise it may not become evident that the specification density requirements are not being met until it is too late.

E. CONSTRUCTION JOINTS (§402-3.09)

HMA paving results in construction joints in the pavement. Construction joints are comprised of longitudinal joints and transverse joints. Transverse joints are at the beginning and end of the project and at the end of each days paving. When lanes are placed adjacent to each other, a longitudinal joint is created between the lanes. Proper joint construction can extend the service life of the pavement and provide a smooth riding pavement.
X. CONTROL CHECKS OF ASPHALT QUANTITY

A. MAT THICKNESS CHECKS

During paving operation, the thickness of the mat being placed should be checked. The thickness of the uncompacted mat behind the paver should be 20% - 25% thicker than the desired final thickness to allow for compaction of the mat. If screed adjustments are made to change the thickness of the mat, allow the paver to travel four paver lengths so the screed can respond to the adjustment and correct the thickness. Mat thickness checks should be performed periodically.

B. YIELD CHECKS

In addition to the mat thickness, perform checks for yield during paving operations. The yield check determines the amount of material placed and compacted at a certain width, length and thickness. The calculated yield should match up with the amount of material delivered in the haul unit.

When the haul unit arrives at the paver, estimate when the material in the haul unit passes the screed and mark that spot on the pavement. When the truck is empty, estimate when the last of the material in the truck passes the screed and mark that spot on the pavement. The length between marks should be compared to the length determined from the yield check calculation. If the lengths do not compare, adjustments to the width or depth of pavement should be made.

C. EXAMPLE:

\[
\begin{align*}
M, \text{ Amount of material in the haul unit} & = 20 \text{ T(tons)} \\
W, \text{ Pavement Width} & = 12 \text{ Feet} \\
D, \text{ Pavement thickness} & = 1\frac{1}{2} \text{ Inches (0.125 FT)} \\
F, \text{ HMA yield factor}^{**} & = 0.0750 \text{ ton/ft}^3 \\
L, \text{ Estimated length of paving} \\
L \times W \times D \times F & = M \\
L \times 12 \text{ ft} \times 0.125 \text{ ft} \times 0.0750 \text{ ton/ft}^3 & = 20 \text{ T} \\
L & = 178 \text{ ft (compare to marks on pavement)}
\end{align*}
\]

**Yield Factor - contact your regional materials unit or HMA supplier for the maximum theoretical density (Rice Number) of the HMA you are using. The maximum theoretical density is specific to the mix type and supplier (i.e. all 12.5 HMA mixes do not have the same maximum theoretical density). Once you obtain the maximum theoretical density value, multiply it by the percent compaction, typically between 92% and 97%. If this number cannot be obtained from cores use 94%. The resulting value is the yield factor.

\[
\begin{align*}
\text{Maximum Theoretical Density} & = 0.0798 \text{ ton/ft}^3 \\
0.0798 \text{ ton/ft}^3 \times 0.94 & = 0.0750 \text{ ton/ft}^3
\end{align*}
\]
## XI. MAT PROBLEMS AND POSSIBLE SOLUTIONS

### NON-UNIFORM TEXTURE

| BLISTERS |
|------------------|------------------|
| **POSSIBLE PROBLEM** | **POSSIBLE SOLUTION** |
| Moisture in underlying mat or grade | Allow mat or grade to dry before paving |
| Moisture in HMA | Contact Regional Materials Unit and HMA supplier |

### POOR SURFACE TEXTURE

<table>
<thead>
<tr>
<th><strong>POSSIBLE PROBLEM</strong></th>
<th><strong>POSSIBLE SOLUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Worn screed plate</td>
<td>Replace screed plate</td>
</tr>
<tr>
<td>Cold screed plate</td>
<td>Check screed heaters</td>
</tr>
<tr>
<td>Screed vibration</td>
<td>Check if screed vibration is operating or needs adjusting</td>
</tr>
<tr>
<td>Change in HMA temperature</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Change in HMA mix proportions</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Aggregate size too large for thickness of mat</td>
<td>Increase mat thickness and contact materials to check for stockpile/bin contamination or a hole in a screen.</td>
</tr>
<tr>
<td>Excessive raking or walking on loose mat</td>
<td>Use proper paving procedures</td>
</tr>
<tr>
<td>Random segregation</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Centerline segregation</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Edge segregation</td>
<td>Check if reverse augers or kick back paddles at gear box are worn or need cleaning</td>
</tr>
<tr>
<td>End of truck segregation</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Surface shadows</td>
<td>Do not dump hopper wings after each truckload</td>
</tr>
<tr>
<td></td>
<td>Dump hopper wings when hopper is 1/3-1/2 full of HMA so segregated material gets re-mixed</td>
</tr>
<tr>
<td></td>
<td>Do not overload augers with HMA</td>
</tr>
<tr>
<td></td>
<td>HMA level should be at auger shaft during paving</td>
</tr>
</tbody>
</table>
## NON-UNIFORM TEXTURE

### TRANSVERSE

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucks bumping paver</td>
<td>Instruct truck drivers</td>
</tr>
<tr>
<td>Truck driver holding breaks</td>
<td>Instruct truck drivers</td>
</tr>
<tr>
<td>Mechanical problem with paver screed</td>
<td>Perform maintenance or replace paver screed</td>
</tr>
<tr>
<td>Paver screed set up incorrectly</td>
<td>Adjust tow point or angle of attack</td>
</tr>
</tbody>
</table>

### LONDONITUDINAL

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screed extensions set up incorrectly</td>
<td>Adjust angle of attack and vertical position of extension to match main screed</td>
</tr>
</tbody>
</table>

## MAT TEARING

### FULL WIDTH OF MAT

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable or tender HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Worn or warped screed plate</td>
<td>Replace screed plate</td>
</tr>
<tr>
<td>Cold screed plate</td>
<td>Check screed heaters</td>
</tr>
<tr>
<td>Paving speed is too fast</td>
<td>Reduce paving speed</td>
</tr>
<tr>
<td>Cold HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Aggregate size too large for thickness of mat</td>
<td>Increase mat thickness</td>
</tr>
</tbody>
</table>

### CENTER OF MAT

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of lead crown in paver screed</td>
<td>Increase lead crown</td>
</tr>
<tr>
<td>Cold screed plate</td>
<td>Check screed heaters</td>
</tr>
<tr>
<td>Worn screed plate</td>
<td>Replace screed plate</td>
</tr>
<tr>
<td>Cold HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Fluctuating head of material</td>
<td>Adjust pavers material delivery system</td>
</tr>
</tbody>
</table>
### MAT TEARING

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too much lead crown in paver screed</td>
<td>Decrease lead crown</td>
</tr>
<tr>
<td>Cold screed plate</td>
<td>Check screed heaters</td>
</tr>
<tr>
<td>Worn screed plate</td>
<td>Replace screed plate</td>
</tr>
<tr>
<td>End gate not square</td>
<td>Adjust end gate</td>
</tr>
<tr>
<td>Cold HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Cold HMA buildup at end of auger</td>
<td>Adjust paver’s material delivery system or auger</td>
</tr>
</tbody>
</table>

### CHECKING

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive deflection of underlying layer</td>
<td>For granular bases, improve density of base</td>
</tr>
<tr>
<td></td>
<td>Do not pave on a saturated base</td>
</tr>
<tr>
<td></td>
<td>For HMA layer, cut out and patch weak areas</td>
</tr>
<tr>
<td>Unstable or tender HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>HMA too hot</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Too much rolling</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Poor bond between layers</td>
<td>Use proper cleaning and tack coat procedures</td>
</tr>
</tbody>
</table>
# SHOVING

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor bond between layers</td>
<td>Use proper cleaning and tack coat procedures</td>
</tr>
<tr>
<td>Too much tack coat</td>
<td>Use less tack coat</td>
</tr>
<tr>
<td>Unstable or tender HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>HMA too hot</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>High asphalt cement content</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Rolling when mat is too hot</td>
<td>Delay compaction of mat</td>
</tr>
<tr>
<td>Reversing or turning roller too quickly</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Roller too heavy</td>
<td>Use lighter roller</td>
</tr>
<tr>
<td>Roller tire pressure too high</td>
<td>Reduce tire pressure</td>
</tr>
</tbody>
</table>

# ROLLER MARKS / BUMPS

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable or tender HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Rolling when mat is too hot</td>
<td>Delay compaction of mat</td>
</tr>
<tr>
<td>Too much rolling</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Inadequate / improper rolling techniques</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Improper roller settings</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Reversing or turning roller too quickly</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Stopping roller on hot mat</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Mechanical problems with roller</td>
<td>Replace roller</td>
</tr>
</tbody>
</table>
# Surface Waves

## Short / Ripples

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable or tender HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Change in HMA temperature</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Fluctuating head of material</td>
<td>Adjust pavers material delivery system</td>
</tr>
<tr>
<td>Erratic paver operation</td>
<td>Use proper paving procedures</td>
</tr>
<tr>
<td>Mechanical problems with paver screed</td>
<td>Perform maintenance or replace paver screed</td>
</tr>
<tr>
<td>Improper set up or malfunction of paver grade control system</td>
<td>Check grade control system</td>
</tr>
</tbody>
</table>

## Long

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>See “Short / Ripples” above</td>
<td></td>
</tr>
<tr>
<td>Running paver hopper empty between loads</td>
<td>Keep material in paver hopper between loads</td>
</tr>
<tr>
<td>Long waves in underlying surface</td>
<td>Use proper pavement preparation</td>
</tr>
</tbody>
</table>

## Bleeding / Fat Spots

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor quality HMA production</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>High asphalt cement content</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Moisture in HMA</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Too much tack coat</td>
<td>Use less tack coat</td>
</tr>
<tr>
<td>Release agent or fuel spilled on mat</td>
<td>Find and correct source of spill</td>
</tr>
<tr>
<td>Traffic allowed on mat at high temperature</td>
<td>Allow mat to cool before allowing traffic on it</td>
</tr>
</tbody>
</table>
### JOINTS

#### LONGITUDINAL

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor joint compaction</td>
<td>Roll joint before HMA cools</td>
</tr>
<tr>
<td></td>
<td>Check HMA temperature</td>
</tr>
<tr>
<td></td>
<td>Use proper overlap of joint</td>
</tr>
<tr>
<td></td>
<td>Check for edge segregation</td>
</tr>
<tr>
<td></td>
<td>Inadequate compaction effort</td>
</tr>
<tr>
<td>Poor vertical joint alignment</td>
<td>Check set up and operation of joint matching shoe</td>
</tr>
<tr>
<td></td>
<td>Provide proper loose mat thickness</td>
</tr>
<tr>
<td></td>
<td>Use proper overlap of joint</td>
</tr>
<tr>
<td></td>
<td>Check for edge segregation</td>
</tr>
<tr>
<td></td>
<td>Check for fluctuating head of material</td>
</tr>
<tr>
<td></td>
<td>Improper raking of joint</td>
</tr>
</tbody>
</table>

#### TRANSVERSE

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough or uneven joint</td>
<td>Incorrect joint preparation</td>
</tr>
<tr>
<td></td>
<td>Put paver screed on starting blocks and provide proper amount</td>
</tr>
<tr>
<td></td>
<td>of HMA in auger chamber when pulling off transverse joint</td>
</tr>
<tr>
<td></td>
<td>Check screed plate heaters</td>
</tr>
<tr>
<td></td>
<td>Improper raking of joint</td>
</tr>
<tr>
<td></td>
<td>Check for segregation</td>
</tr>
<tr>
<td></td>
<td>Roll joint transversely</td>
</tr>
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#### POOR COMPACTION

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor underlying layer</td>
<td>Use proper pavement preparation</td>
</tr>
<tr>
<td>Poor quality HMA production</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Change in HMA temperature</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>HMA segregation</td>
<td>Contact Regional Materials Unit and HMA supplier</td>
</tr>
<tr>
<td>Rolling too fast or not soon enough</td>
<td>Use proper paving practices</td>
</tr>
<tr>
<td>Improper number of rollers and/or choice of rollers</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Improper rolling pattern</td>
<td>Use proper rolling procedures</td>
</tr>
<tr>
<td>Improper operation of rollers</td>
<td>Use proper rolling procedures</td>
</tr>
</tbody>
</table>
XIII. PAYMENT
A. QUALITY UNITS
Quality payment adjustments are applicable for all HMA items in accordance with the specifications and provisions outlined in the contract documents. Quality payment adjustments are measured in Quality Units. Quality Units are calculated using the daily QAF and the appropriate accepted tons of HMA. Quality Units have a predetermined HMA Index Price. The HMA Index Price is based on weighted average bid prices and are assessed annually for each Region. One Index Price is used for all HMA quality adjustment items in a contract and applies for the contract duration. Regional Index Prices are established and updated annually by an Engineering Bulletin and are incorporated in the contract documents.

Separate quality payment items are used for each quality payment adjustment, i.e. plant production, pavement density, longitudinal joint density, test section, and ride quality. Quality adjustment items are paid using the appropriate pay item in the contract documents. Quality adjustments are calculated for each item using only the quantity eligible for that adjustment. The fifth digit to the right of the decimal of the quality pay item designates the appropriate quality adjustment. The sixth digit to the right of the decimal is reserved for revisions. The quality pay item for pay adjustments are linked to the core HMA pay item as shown below.

Quality Units must be calculated for each day's production by using the daily QAF for plant production, pavement density, longitudinal joint density and pavement smoothness. Quality Units are calculated as follows:

\[
\text{Quality Units for Plant Production} = (\text{Daily Quality Adjustment Factor} - 1.00) \times \text{HMA Placed (Tons)}
\]

When Quality Units are determined, it is possible to have positive or negative Quality Units. When the Quality Units have a positive value, the positive dollar amount must be entered using the appropriate quality adjustment item. When the Quality Units have a negative value, the negative dollar amount is a charge to the Contractor and must be entered against the appropriate quality adjustment item.

Example:
If a HMA quantity of 5645 tons (4000 tons for mainline and 1645 tons for shoulders) of Item 402.125 _ _ _ is placed, the calculation of the maximum number of Quality Units for the Plant Production and Pavement Density Items would be as follows:

**Plant Production**
\[
(1.05 - 1.00) \times 5645 \text{ Tons} = 282.25 \text{ rounded up to 283 Quality Units}
\]

**Pavement Density is only for the mainline quantities**
\[
(1.05 - 1.00) \times 4000 \text{ Tons} = 200 \text{ Quality Units}
\]

In the project documents, 283 Quality Units is allocated for the Plant Production Quality Adjustment Item and 200 Quality Units is allocated for the Pavement Density Quality Adjustment Item.
XIII. WARRANTY PAVING

A Contractor may request the use of a warrant provision against defects attributed to operations during construction of hot mix asphalt (HMA) surface course pavements, including shoulders placed outside the seasonal limits.

## XIV. QC/QA CHECKLIST FORM FOR HMA PAVING

### QUALITY CONTROL / QUALITY ASSURANCE CHECKLIST FORM FOR HMA PAVING

| PROJECT D#: |  |
| PROJECT DESCRIPTION: |  |

### Preliminary Review

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Review Contract Plans, Specifications and Standard Sheets for PAVING (Section 402).</td>
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<tr>
<td>Review Pay Items in Contract dealing with PAVING</td>
</tr>
<tr>
<td>Study Plans and Typ. Cross-Sections for all pavement locations. (cross slopes, sta. limits, etc.).</td>
</tr>
<tr>
<td>Study Material Specs. for all 4 pavement courses (Perm. Base, Base, Binder, Top) (§402-2).</td>
</tr>
</tbody>
</table>

### Equipment

<table>
<thead>
<tr>
<th>INITIAL</th>
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</thead>
<tbody>
<tr>
<td>Check HMA Pavers (Automatic transv. slope &amp; long. grade screed controls) (§402-3.02).</td>
</tr>
<tr>
<td>Check Haul Trucks (Tight metal beds, waterproof covers, release agents) (§402-3.03).</td>
</tr>
<tr>
<td>Check <strong>Plate or Sticker on</strong> Vibratory Rollers (Amplitude, Frequency, Tire Pressure, Width, Weight) (§402-3.04).</td>
</tr>
<tr>
<td>Check Tack Coat Distributor (Width, flow rate, thermometer, spray bar, sample valve) and <strong>get copy of calibration certification</strong> (§407-3.01).</td>
</tr>
<tr>
<td>Apply tack coat as per Table 407-1 (§407-3.02).</td>
</tr>
</tbody>
</table>

### Construction Details

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Assemble required inspector equipment (ruler, thermometers, level, rept. forms, clipboard, pens, computer, radio).</td>
</tr>
<tr>
<td>Check Table 402-1 of Standard Specification for air temperature requirements. (Take mix temperature every 5th truck).</td>
</tr>
<tr>
<td>Condition existing surfaces prior to T&amp;L course (§402-3.05). (Fill depressions, cracks, joints).</td>
</tr>
<tr>
<td>Repair damaged binder or base courses and clean as per Section 633.</td>
</tr>
<tr>
<td>Take sample of each new lot of tack coat.</td>
</tr>
<tr>
<td>Apply tack coat as per Section 407. Look for color change (brown to black) or tacky feel.</td>
</tr>
<tr>
<td>Spread and finish mixture with taut reference line or floating ski to guide paver (§402-3.06).</td>
</tr>
<tr>
<td>Compact HMA mixture using Table 402-4 of Standard Specification to achieve compaction for item placed (§402-3.07).</td>
</tr>
<tr>
<td>Check finished pavement at all joints for uniformity of texture and compaction (§402-3.09).</td>
</tr>
<tr>
<td>Stagger transverse joints in adjacent lanes 10' minimum.</td>
</tr>
<tr>
<td>Offset pavement joints of successive courses by 6&quot; maximum from lower course.</td>
</tr>
<tr>
<td>Check surface tolerance of pavement - 1/4&quot; using 15' straight edge or string line (§402-3.10).</td>
</tr>
<tr>
<td>Check that final compacted pavement is as close to nominal thickness as practical (§402-3.11).</td>
</tr>
</tbody>
</table>
SECTION 403 JOINT AND CRACK SEALING

Five types of pavement preventive maintenance joint and crack sealing projects are included in Engineering Instruction 97-030 (EI 97-030). These include:

1. Routing and Sealing Cracks in Hot Mix Asphalt Pavement
2. Sealing Cracks in Hot Mix Asphalt Pavement
3. Resealing Transverse and Longitudinal Joints in Portland Cement Concrete Pavement
4. Sealing Cracks in Portland Cement Concrete Pavement
5. Filling Joints Between Portland Cement Concrete Pavement and Hot Mix Asphalt Shoulders

Maintenance Resident Engineers are responsible for selecting projects and appropriate treatments as discussed in EI 97-030. The purpose of this instruction is to help inspectors enforce the specification items for joint and crack sealing projects.

The following specification items cover Pavement Preventive Maintenance Guidelines for Joint and Crack Filling:

HOT MIX ASPHALT PAVEMENT (HMA)
ITEM 18403.7601 M ROUTING, CLEANING, AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405

ITEM 18403.7603 M ROUTING, CLEANING, AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT, ASTM D3405 (PAYMENT BY LITER)

ITEM 18403.78 SELECTIVE ROUTING OF CRACKS IN HOT MIX ASPHALT PAVEMENT

PORTLAND CEMENT CONCRETE PAVEMENT (PCC)
ITEM 18502.701002 M - RESEALING TRANSVERSE JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT, 63 FT. PAVEMENT SLABS - SILICONE SEALANT

ITEM 18502.701002 - RESEALING TRANSVERSE JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT, 19 m PAVEMENT SLABS - SILICONE SEALANT

ITEM 18502.702002 M - RESEALING TRANSVERSE JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT
SECTION 403 JOINT AND CRACK SEALING

PAVEMENT, 20 FT. PAVEMENT SLABS - SILICONE SEALANT

ITEM 18502.702002 - RESEALING TRANSVERSE JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT, 6 m PAVEMENT SLABS - SILICONE SEALANT

ITEM 18502.7401 M - RESEALING LONGITUDINAL JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT

ITEM 18502.7401 - RESEALING LONGITUDINAL JOINTS IN PORTLAND CEMENT CONCRETE PAVEMENT

ITEM 18502.7601 M - SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

ITEM 18502.7601 - SEALING CRACKS IN PCC PAVEMENT - SILICONE SEALANT

JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS (SHOULDER JOINTS)

ITEM 18403.7507 M FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING FIBER REINFORCED ASPHALT CEMENT

ITEM 18403.7507 FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING FIBER REINFORCED ASPHALT CEMENT

ITEM 18403.7508 M FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405

ITEM 18403.7508 FILLING SHOULDER JOINTS BETWEEN PORTLAND CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE SHOULDERS USING ASTM D3405

BACKGROUND

These specifications became effective as of April 23, 1998 under Engineering Instruction 97-030, Pavement Preventive Maintenance Guidelines for Joint and Crack Sealing. EI 97-030 superseded EI 90-001, EI 94-034, EB 90-011 and EB 95-036 to consolidate new and existing sealing specifications, improved guidelines for project and treatment selection and to update bid price estimates.

EI 90-001 issued preventive maintenance guidelines and specifications that allowed cracks to be filled with liquid sealant material (silicone, D3405, AC-20 with fibers) and struck off with squeegees to a finished width of 100 mm (4 in.). Material applied in this manner resulted in inadequate lateral support for two wheeled vehicles (motorcycles) because of the low friction associated with the smooth surface particularly when it becomes wet. In 1995, the Department responded to complaints from motorcyclist regarding slippery pavement conditions by specifying a flush-fill, strike-off method of crack sealing.

Draft versions of the flush-fill, strike-off method specifications were refined during the 1996 construction season. The maximum overband width of sealants was reduced from 100 mm to 50 mm. Training seminars for regional personnel included sealing principles and techniques, selection and application of sealing materials and selection of projects for sealing. Seminars concluded with field demonstrations and were recorded on video tape that are available in each region for training purposes.

GENERAL REQUIREMENTS

Because the general requirements for the specifications in EI 97-030 are very similar, categorizing
SECTION 403 JOINT AND CRACK SEALING

them by wearing surface is appropriate. The three wearing surface categories are Hot Mix Asphalt (HMA), Portland Cement Concrete (PCC) and Shoulder Joints.

Three general requirements pertain to all treatments:

1. The maximum overband width of sealed cracks is 50 mm (2 in.)
2. Should more than 25% of pavement marking widths be obliterated by crack sealants the marking shall be replaced at the Contractor’s expense
3. All materials (D3405, Silicones and Backer Rod) used in any joint or crack sealing project shall appear on the Department’s approved list.

ITEMS IMPORTANT TO INSPECTORS
The following items are important to inspectors assigned to joint and crack sealing projects. Subtle differences between items are pointed out by wearing surface category, HMA, PCC and Shoulder Joints:

1. RESIDENT ENGINEERS (HMA, PCC and Shoulder Joints)
The EIC should give Resident Engineers an opportunity to review scheduled work to prevent conflicts between other maintenance and construction projects and allow them to inspect completed work.

2. EQUIPMENT (HMA, PCC and Shoulder Joints)

a) Air Compressor (HMA, PCC and Shoulder Joints)
Air compressors must be equipped with filters and traps to collect moisture and oil. Inspectors should conduct periodic checks for moisture and oil in the compressed air by placing either a clean cloth or paper in the air stream. Checks are especially important when there are ambient changes in temperature and/or humidity. Maintenance, including changing of traps and filters, is to be provided by the Contractor with no additional cost to the State.

b) Melters (HMA and Shoulder Joints)
Melters must be double boilers (indirect heating) using either a heat transfer liquid or tubes to carry sealants (HMA)/fillers (Shoulder Joints) through a heated oil bath. Separate working thermometers are required to record temperatures of the sealant/fillers and the heat transfer medium. The melter must maintain the pouring temperature for sealants/fillers as indicated on their containers. Positive temperature controls and mechanical agitation or recirculating pumps are also required to maintain homogeneous mixtures.

Inspectors should witness the loading of material into the melter to ensure that it appears on the Department’s Approved List and to record the amount of material being used. Samples may be taken by the inspector should the quality of the material be suspect.

c) Sealant Pump (PCC)
Sealant pumps must be capable of discharging moisture curing silicone sealants.

d) Saws and Routers (HMA, PCC)
Grooves (HMA) and reservoirs (PCC) must have vertical sides with minimal spalling at their edges. The Contractor must affect repairs or replace saws and routers to maintain vertical sides in grooves and/or reservoirs at no additional cost to the State.

e) Hot Air Lance (HMA, PCC and Shoulder Joints)
Hot air lances may be used by the Contractor to dry cracks. Care must be taken not to burn the existing HMA pavement as temperatures may reach 1,000°C (2,000°F).
3. CRACK/JOINT PREPARATION (HMA and Shoulder Joints)
Crack and joint preparation is most critical to ensure proper adhesion of sealants (D3405) and fillers (AC-20 with fibers). Only primary or well-defined cracks, 3 mm (⅛") to 25 mm (1") wide, are to be sealed especially when low severity secondary cracks (alligator cracks) exist to prevent over application. When cracks are routed, their finished dimensions are 16 mm (⅝") wide by 13 mm (½") deep. When shoulder cracks are sealed they shall be thoroughly cleaned to a minimum depth of 13 mm (½”). The maximum overband width of sealant shall not exceed 50 mm (2 in.).

Cracks and joints must be thoroughly clean and dry before sealing or filling and may require additional cleaning especially when nearby cracks are being routed. The Contractor should be instructed to allow for more drying time or may opt to use a hot air lance should there be more than a few isolated air bubbles appearing after the hot sealant is placed in the crack or joint.

4. JOINT PREPARATION (PCC)
Like HMA and Shoulder Joints, joint preparation is most critical in sealing PCC joints and requires the same level of attention to cleaning and drying joint surfaces. The main difference between PCC joints and those is HMA and Shoulder Joints is a joint reservoir as shown in EI 97-030 under items 18502.XXXXXX (M).

When replacing compression seals and previously sealed joints, inspectors should make sure that existing lubricants and sealants are completely removed. Abrasive blasting of all reservoir surfaces followed by cleaning with compressed air will leave the concrete with a rough finish to improve bonding. All joints must be sealed on the same day that they are prepared.

For PCC pavements, transverse joints are sealed with silicone only and longitudinal joints may be sealed with either silicone or ASTM D3405 sealant. In either case, backer rod or bond breaker tape is used to isolate the joint sealant from the substrate. Backer rod that is approximately 25% larger than the joint shall be installed to a depth that allows for the proper thickness of sealant and recess below the pavement surface as depicted in EI 97-030 under items 18502.XXXXXX (M).

5. DISCHARGE TEMPERATURES of D3405 and AC-20 WITH FIBERS
Discharge hoses must be insulated and capable of recirculating material through the melter. Discharge temperatures of the sealant material are checked by the inspector using thermometers supplied by the Contractor. Any method used in checking temperatures should be considered safe by the inspector to avoid burns from exposure to hot materials. Discharge temperatures must be above the manufacturer’s recommended pouring temperatures but never exceed 163°C (325°F) for fiber reinforced material.

Do not use sealants or fillers heated above their safety heating temperatures.

Sealants and fillers may be heated longer than six hours if the manufacturer’s recommendation allows it. Melters containing material heated more than six hours must be recharged with at least twenty percent more new material and provide a homogeneous mixture before being applied.

6. CURING OF D3405 and AC-20 WITH FIBERS
Traffic shall not be allowed on the sealant until it has cooled sufficiently and will not track. A low pressure, light spray of water may be used to accelerate cooling of the sealant and fillers. Blotting with fine aggregate is allowed when using filler material only but not when using D3405.

The cooled sealant shall produce a water tight seal and be approximately flush with the pavement surface. Sealants and fillers that are not satisfactory will be replaced by the Contractor at no additional charge to the State.

7. MEASURING QUANTITIES
SECTION 403 JOINT AND CRACK SEALING

a) Silicone Sealant
   Silicone sealant used by the Contractor is based on the linear meter or foot.

b) D3405 and Fiber Reinforced Asphalt (FRA)
   A volumetric (liters or gallons) method of measurement, corrected to 15°C (60°F) is used for D3405 and FRA. Correcting volumes to these temperatures is necessary because sealants and fillers expand when heated.

Determining corrected quantities of these materials are illustrated as follows:

1. Obtain the specific gravity of the material at 15°C (60°F) from the manufacturer or the Regional Materials Bureau.

2. Use the following formulas to convert to the volume measure:

   **Metric Units D3405**
   \[
   \text{Weight of D3405 used (kg)} = \frac{\text{liters of D3405 used}}{\text{Sp. Gr. of D3405 @ 15°C}}
   \]

   **English Units D3405**
   \[
   \text{Weight of D3405 used (lbs)} = \frac{\text{gal of D3405 used}}{\text{Sp. Gr. of D3405 @ 60°F} \times 8.345 \text{ lbs/gal}}
   \]

   **Metric Units (FRA)**
   \[
   \text{Weight of FRA used (kg)} = \frac{\text{liters of FRA used}}{\text{Sp. Gr. of FRA @ 15°C}}
   \]

   **English Units (FRA)**
   \[
   \text{Weight of FRA used (lbs)} = \frac{\text{gal of D3405 used}}{\text{Sp. Gr. of FRA @ 60°F} \times 8.345 \text{ lbs/gal}}
   \]
I. INTRODUCTION

Tack Coat is a sprayed application of an asphalt binder upon an existing asphalt or Portland Cement Concrete pavement prior to an overlay, or between layers of new asphalt concrete. This thin membrane of asphalt binder provides the glue between the layers, creating a monolithic structure which performs as a unit as opposed to unbound independent layers.

Poor bonding of a pavement surface layer is a direct result of inadequate tack coat practices resulting in slippage, shoving of the pavement and most notably pavement fatigue cracking.

A uniform application of a high-quality tack coat at the appropriate residual asphalt rate to a clean dry surface is key to successfully bond pavement layers together for peak long-term performance.


II. CONSTRUCTION GUIDELINES

Whenever a tack coat item appears in a contract, the following construction guidelines are applicable:

A. Surface Preparation. The existing surface to be sprayed by tack coat materials should be dry and free of foreign materials deemed detrimental by the Engineer.

B. Distributor. The distributor shall be equipped, maintained, and operated to provide uniform heating and application rates as specified. The distributor shall have a volume measuring device and a thermometer to monitor the asphalt material. Distributors shall also be equipped with a power unit for the pump and with a full circulation spray bar with vertical controls.

   o Key Items for Inspectors:
     □ Check truck setup
     □ Spray bar height should be around 12"
     □ Appropriate nozzles
     □ Nozzle Orientation (15-30°)
     □ Check application rate gauge in truck
     □ Check application temperature
     □ Collect samples - Sampling procedure should include the Contractor taking the sample. Sample should be done at the sampling valve, samples taken at spray may be contaminated by fuel oil. Suggest running through a gallon prior to sampling to avoid any contamination.
     □ Know the desired application rate
     □ Visually inspect application
     □ Verify application on the pavement


D. Documentation and Sampling. See CIM Section 402 V.E.2. The emulsions are only certified for 30 days from manufacture.
E. Preparing Tack Coat For Application. See CIM Section 402 V.E.3.

F. Time to Break. See CIM Section 402 V.E.4.

G. Maintenance of Traffic. See CIM Section 402 V.E.5.

H. Application. See CIM Section 402 V.E.6.

I. Control Checks of Tack Coat Quantity. It is recommended to perform checks for yield during application of the tack coat. The yield check determines the number of gallons of material placed at a certain width and length. Using a distance of one mile (5280 ft), perform a yield check at the beginning of each project to verify the application rate is correct. The Engineer may also require the Contractor to verify application rate by ASTM D 2995 Test Method. The Inspectors can check the gauge or automation on the truck or by using a dipstick on the vehicle. When using a dipstick, the pre and post measurements should be completed at the same level location. Volume can be calculated using scale weights and specific gravity. Consult RME for this method.

EXAMPLE:

\[ M, \text{ Amount of Tack Coat that should be applied (G)} \]
\[ L, \text{ Estimated length of applied Tack Coat (ft)} \]
\[ W, \text{ Pavement Width (ft)} \]
\[ R, \text{ Tack Coat Application Rate (G/SY)} \]

\[ M = \frac{1}{9} \times \frac{(SY)}{(ft)^2} \times L \times (ft) \times W \times (ft) \times R \times \frac{G}{SY} \]

\[ M = \frac{1}{9} \times 5280 \times 12 \times 0.06 = 422 \text{ Gallon} \]

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<th>APPLICATION RATE (G/SY)</th>
<th>LANE WIDTH (FEET)</th>
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<td>229</td>
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<tr>
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<td>739</td>
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<tr>
<td>0.15</td>
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</table>
Example of a Good Tack Coat Coverage

Example of a Poor Tack Coat Coverage

Tack Coat Application

Tack Coat Nozzle Coverage

Examples of Heavy/Unacceptable Tracking

Examples of Heavy/Unacceptable Tracking
Poor tack coat (shown in the left half of the photo) vs. a good tack coat (shown in the right half of the photo). Notice the streaky coverage of the poor tack coat and the near complete coverage of the good tack coat.

Examples of “Zebra Tack” or “Corn Rows”
**References**

Tack Coat Best Practices  

Pavement Interactive – Tack Coats  

Category: 407 Tack Coat  

Tack Coat Best Practices – Indiana Workshop  

**Related Contract Provisions**  
Standard Specification Section 407, Section 702 and Tables 702-7 & 702-8
<table>
<thead>
<tr>
<th>QUALITY CONTROL / QUALITY ASSURANCE CHECKLIST FORM FOR TACK COAT</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td><strong>PROJECT DESCRIPTION:</strong></td>
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</tr>
<tr>
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</tr>
<tr>
<td>Study Plans and Typ. Cross-Sections for all TACK COAT locations. (cross slopes, sta. limits, etc.).</td>
</tr>
<tr>
<td>Review the approved Bituminous Material Primary Sources list.</td>
</tr>
<tr>
<td>Ensure approved source with valid certification.</td>
</tr>
<tr>
<td>Study Material Method (MM) 702-2 for all Asphalt Emulsion - Quality Assurance</td>
</tr>
</tbody>
</table>

### Equipment

<table>
<thead>
<tr>
<th>INITIAL</th>
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<tr>
<td>Apply tack coat as per Table 407-1 (§407-3.02).</td>
</tr>
</tbody>
</table>

### Construction Details

<table>
<thead>
<tr>
<th>INITIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply tack coat as per Section 407. Look for color change (brown to black) or tacky feel.</td>
</tr>
</tbody>
</table>
Pavement Surface Treatments

A. Asphalt Emulsion. For asphalt emulsion quality assurance procedures, refer to Section B. Documentation and Sampling under Section 407-00 Tack Coat.

B. Aggregate. The aggregate to be used should be compatible with the emulsion being used. Before construction begins, the aggregate should be tested for gradation and from an approved source. During construction, if the EIC or inspector notice a change in the appearance of the aggregate, the stockpile should be tested again.

C. Application. An emulsion must "break" or set before the aggregate can adhere. "Breaking" is the reuniting of the asphalt globules from the emulsified phase, generally indicated by the color changing from brown to black. The rate of "breaking" is controlled by the specific type and concentration of emulsion and by the weather conditions. Therefore, weather should influence the Engineer's decision on how and when to run the job. The entire chipping operation should be as close together as possible. On warm breezy days, the emulsion will break quickly (3 to 5 minutes) and on overcast, damp, or humid days the break will be slower (10 to 15 minutes). Tracking by the roller can be minimized by using the tire watering system. Traffic should be kept off the section until the emulsion has broken and set.

D. Cleanup. One or two days after the surface has been treated, it should be lightly swept to remove any loose aggregate.

E. Technical Support

The Regional Materials Engineer and the Materials Bureau are available to provide assistance upon request.

Related Contract Provisions
§407, Tack Coat
§618, Bituminous Materials
SECTION 411 - STABILIZED GRAVEL SURFACE COURSE

General Requirements
Granular material supplied under this item shall be stockpiled in accordance with the appropriate Departmental publication in effect on the date of advertisement for bids (Reference: GCP-17).

Project Procedure
Inspect the construction of stockpiles. Record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer, in accordance with the appropriate Departmental publication in effect on the date of advertisement for bids (Reference: GCP-17).

The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpiles. Test results will be reported on Form-GE454M, (See Exhibit 203H) "GRANULAR MATERIAL DOCUMENTATION FORM."

The Engineer is directed to the Materials Inspection Manual, Part 2, Materials of Construction, Sub-part 2A, "Materials Under the Control of the Materials Bureau," and to the relevant sections of this manual, for control of the calcium chloride and sodium chloride.

The Inspector shall document on MURK-1d, "INSPECTOR'S DAILY REPORT," that the Stabilized Gravel Surface Course was mixed, placed, compacted and finished in accordance with the specifications.

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. If variations to the stockpiling requirements are granted, a copy of the approval letter from the Director of the Geotechnical Engineering Bureau must be on file.

3. For granular materials, copies of test results (Form GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM") and, when applicable, a copy of the letter approving stockpile transfer, as well as the original GE-454M.

References
GCP-17, Procedure for the Control of Granular Material
Material Inspection Manual, Part 2, Materials of Construction, Subpart A

Related Contract Provisions
§203-3.12, Compaction
§304-2.03, Stockpiling
Documentation

Department procedures for acceptance of portland cement concrete are dependent upon on-site inspection and testing at the plant and project. The procedures used for plant inspections are contained in Materials Method 9.1, PLANT INSPECTION OF PORTLAND CEMENT CONCRETE. Procedures used for project inspection are contained in Materials Method 9.2, Field Inspection of Portland Cement Concrete. These inspection operations are conducted through the Regional Materials Office. The Regional Materials Engineer should be contacted prior to all certified concrete placements to ascertain that the concrete producer is approved and has acceptable material sources.

Concrete plants normally fall into one of the following categories for documentation purposes:

- **Project Plant** - A plant located on the project site for the purpose of serving one project, or
- **Non-Project Plant** - A plant located off the project site. These are usually commercial plants capable of serving more than one project at a time.

In general, records from project plants are incorporated into the project files. Records from other than project plants are maintained at the plant during production and then periodically removed and filed by the Regional Materials Engineer in the Regional Office files.

The Plant Inspector is responsible for maintaining a diary and test records, along with the material certifications, mix designs and cement sample logs. These documents are kept on file at the plant in an orderly manner so they can be readily consulted. The diary is used to record miscellaneous test data and information and also to record conversations between the Plant Inspector and the Producer. Comments relevant to the concrete produced for a given project should be included on the BR 316 provided to the project.

Of importance to the field inspection staff are the following documents which are prepared at the plant and provided to the project staff:

- Delivery tickets, with or without batch recordation information
- BR 316 - Daily Concrete Batch Plant Report, with Materials Acceptance Records
- BR 342 - Materials certification, only for certified batches
- Concrete Mix Computations

The plant inspector's responsibilities relative to these documents are contained in MM 9.1 Section 3 titled "Administrative Procedures and Record Keeping".

The following section provides some background information concerning these documents and guidelines on their incorporation into the project records at the project site.

A. Delivery Tickets

Each vehicle delivering portland cement concrete, or its ingredients, to a project is accompanied by a delivery ticket prepared by the Producer. The following minimum information is included on delivery tickets:

1. Delivery Ticket Number
2. Plant Identification, with plant name and location and/or facility number
3. Contract Number
4. Concrete Class or Item Number
5. Quantity (Nominal Batch Size)
6. Truck Number
7. Batch Number
8. An Automatically Applied Time-Date Stamp Which May Consist of One of the Following:

- Time - date stamp by printing device on a regular ticket (when no recorded batch weights accompany the load).
- Time - date printed by a batch weight recorder on a printed ticket.
- Time - date printed by a batch weight recorder on a printed tape. A copy of the tape shall be affixed to the regular delivery ticket.

The plant inspector should review at least three daily delivery tickets for each project and sign each ticket reviewed. A copy of the printed delivery ticket should be given to the plant inspector (see MM 9.1).

The Inspector at the project receives the delivery tickets at the site of placement. At the end of the day, the number of tickets received, the first ticket number, the last ticket number and the total quantity of concrete on all delivery tickets accepted are entered on the IR. The delivery tickets are turned into the Project Engineer with the IR and filed with the project records.

**Delivery ticket waiver for project plants.**

When, in the opinions of both the Engineer in Charge and the Regional Materials Engineer, adequate control can be maintained over on-site project plants, the use of delivery tickets may be omitted for Cement Concrete Pavement and/or Cement Concrete Foundation for Pavement after such decision has been duly documented in the records. During such periods of non-use of delivery tickets, all plant and project inspection personnel monitor the delivery of concrete to assure that all specification requirements are being met and that all batched concrete is accounted for.

**B. Batch Recordation**

Recordation equipment is used to provide a visual record of the materials incorporated into the concrete mixture. Recordation records are always maintained by the Plant Inspector and are filed at the plant and/or Regional materials Office. Delivery tickets supplied to projects for each batch of concrete produced can be any of the following:

- Delivery Ticket (hand or mechanical) without batching information.
- Delivery Ticket (hand or mechanical) with separate batching information attached.
- Delivery Ticket (mechanical printing) including batching information.

The adoption of one of the above procedures is based on an agreement between the Regional Materials Engineer, Project Engineer and the Producer. If unusual conditions exist, an alternate procedure may be agreed upon by the above personnel and noted in the project records.

**C. BR 316 - Daily Concrete Batch Plant Report**

A concrete acceptance report, BR 316a, "DAILY CONCRETE BATCH PLANT REPORT," (Exhibit No. 501-A) for concrete produced and authorized to be shipped to each project is completed by the Plant Inspector at the end of the day. Inspectors at on-site project plants give the report to the Engineer in Charge at the end of the day. Inspectors at off-site plants issue a copy of the report to each project served by the plant and retain the original for the plant records. The report is forwarded to the projects as soon as possible after the report date. The reports are numbered consecutively by the Plant Inspector with Report 1 beginning on the first production day of any
calendar year.

When the BR 316a is received at the project, the job stamp shall be applied and the total yardage and type shown on the BR 316a checked against the quantity received (total of delivery tickets) and type shown on the IR. The quantity shown on form BR 316 may be greater than the quantity received, but may never be less. Any differences should be resolved with the plant inspector. If plant reports are not received within one week of placement, contact the Regional Materials Office.

After checking and cross referencing, the Daily Concrete Batch Plant reports (BR316) should be signed and filed in the Concrete Batch Plant Report folder or attached to the Inspector's Report. The E.I.C. shall select the option, but only one option shall be used on the project.

D. Plant Inspector's Materials Acceptance Records
Before it can be considered for acceptance at the project site, evidence must exist that the Portland cement concrete dispatched from the plant was made from approved materials and was properly proportioned. The evidence is in the form of records kept in accordance with Section 3 of Materials Methods 9.1.

The records that the Plant Inspector keeps on file at the plant during production relating to material acceptance are as follows:

1. Aggregate Records, including Approved List Source, test results, and any certification materials that may be available.

2. Cement shipment certifications or cement shipment authorization and cement sample logs.

3. Plant Inspector's Diary (showing admixtures and water source).

In the case of on-site project plants, the aggregate records and cement shipment certifications along with the mix designs shall be ultimately incorporated into project files. For off-site plants, all acceptance documents shall be maintained in the plant records.

E. BR 342 - Materials Certification
When the Regional Materials Engineer agrees it is not feasible to provide plant inspection for small quantities, concrete may be accepted from an approved plant on the basis of a Producer's certification stating that the concrete conforms to specification. The certification shall be Form BR 342 - MATERIALS CERTIFICATION completed by the Producer as shown in Exhibit 501-B. In addition, recordation for each batch shall be maintained at the plant unless otherwise directed by the Regional Materials Engineer. Small quantities of concrete 25 cubic yards or less may be certified.

When this procedure is used, the following shall accompany each delivery.

- The truck delivery ticket. (Same as for inspected deliveries.)
- The producer's certification, BR342, that the concrete was batched according to the contract specifications using accepted materials signed by a responsible employee of the company. This form is forwarded to the project as soon as possible after the report date, using the procedure established by the Regional Materials office.
- The recorded batch information (including time and date) for the batches delivered.

When the BR 342 is received at the project, the job stamp shall be applied. After checking and cross referencing, the BR342 should be filed in the Concrete Batch Plant Report folder (BR 316
F. Concrete Mix Computations

Standard class concrete mix designs are computer generated by the Department. Some adjusted standard class mix designs and special purpose mix designs are computed by the Regional Materials Engineer or by the Materials Bureau in Albany. Copies of the mix designs are filed at the plant with copies sometimes supplied to individual projects. The mix designs shall be in one or more of the following forms:

1. Copy of the computer mix design print-out sheet (standard mixes only).

2. Completed Form BR-329 (Exhibit 501-C) CONCRETE MIX DESIGN SHEET

3. Copy of mix design information and pertinent correspondence for mixes designed by the Materials Bureau in Albany (usually for special purpose mixes).

Any questions concerning validity of a mix design should be directed to the Regional Materials Engineer.

Field Documentation for Structural Concrete Inspection

A. Structural Concrete Inspector's Daily Report - MURK 5

The MURK 5, shown as Exhibit 501-D, was developed to facilitate the documentation of information during the inspection of structural concrete. The front of the form contains the same general information as is required on the MURK 1 as discussed in section 90 of the Contract Administration Manual. The back of the form contains entry fields specific to the inspection of structural concrete placements.

When an inspector's assignment is to a structural concrete operation, the structural concrete inspector's report (MURK 5) will be their daily IR and shall be completed during the course of the work. The inspector should review the truck’s delivery ticket before inspecting, sampling and testing portland cement concrete. Also prior to accepting portland cement concrete, check the truck for current inspection sticker from the Regional Materials Office. This sticker is located on the inside of the driver side door. Form MURK 5 is used for all structural concrete operations, regardless of mixer type. Refer to Materials Method 9.2, Field Inspection of Portland Cement Concrete, for specific procedures for inspecting, sampling and testing portland cement concrete.

The following guidelines apply to entries or entry fields required on the MURK 5. (Refer to Section 90 of the CAM for entries not covered here.)

1. High and low air temperature during placement.
2. Mixer type: Check appropriate box. Mixer type determines which columns will be filled in during concrete placement.
3. Truck or ticket number: From delivery ticket.
4. Load size: From delivery ticket.
5. End batch: End batch time is determined by the plant inspector and recorded on the delivery ticket.
6. Start mix: The time at which mixing begins for truck mix concrete. Determined by the project inspector in accordance with the specification.
7. End mix: The time at which mixing ends. The end mix time is determined by the project inspector for truck mix concrete. The end mix time is determined by the plant inspector for central mix concrete and recorded on the delivery ticket. Mix times must comply with the specification requirements.
8. Mixing revolutions: From counter (must be on Approved List) on truck. Mix revolutions must comply with specification requirements.

9. Start discharge: Time at which concrete is discharged. The start of discharge must comply with specification requirements. Start discharge times shall be recorded for all trucks delivering transit mix.

10. End discharge: Time at which concrete discharge ends. Required for all mixes. End of discharge times must comply with specification requirements.

11. Slump: Performed in accordance with Materials method 9.2., allowable values per Table 501-5 of the Standard Specifications. When slump is estimated and not measured, a note should be included, i.e., 51 millimeters EST.


13. Remarks: Indicate loads from which cylinder samples were taken. Indicate rejected loads.


15. Delivery tickets: The inspector shall retain a copy of the delivery ticket accompanying each vehicle. The first ticket no., last ticket no., and total no. of tickets shall be recorded in the appropriate boxes at the end of the day.

16. Quantity dispatched from plant (BR 316a): This information is supplied at a later date from the plant inspector using procedures established by the Regional Materials Office.

17. Quantity received: Total of all delivery ticket material quantities received during the inspection period.

18. Quantity used: Quantity received minus quantity wasted/rejected. Payment quantities shall be computed in accordance with the item specification and may not agree with the actual quantity used.

19. Quantity wasted/rejected: The quantity of any concrete not placed in the forms shall be shown with an explanation, such as "wasted," "rejected" or "over ordered."

At the end of the day, Form MURK 5, together with all delivery tickets, shall be turned in to the Project Engineer.

**Inspection Guidelines**

A. General - Placement and Curing Requirements

Various concrete pavement and structural items contain provisions for placement finishings and curing of concrete. In an attempt to summarize and create a quick reference to the placement temperature limitations and curing requirements for concrete pavements, structural concrete, bridge superstructures and various other related items, are presented as Exhibit 501-E. The tables are separated into three categories: Normal, Cold, and Hot Weather Curing Provisions. To use them, enter the correct table and refer to the concrete item number of interest. These tables also reference the user to applicable sections of the Standard Specifications for related provisions. Refer to MM 9.1, etc.
GENERAL - CURING

Various concrete pavement and structural items contain provisions for curing. In an attempt to summarize and create a quick reference to the curing requirements for concrete pavements, structural concrete, bridge superstructures and various other related items, the following curing tables are presented. The tables are separated into three categories: Normal, Cold, and Hot Weather Curing Provisions. To use them, enter the correct table and refer to the concrete item number of interest. These tables also reference the user to applicable sections of the Standard Specifications for related provisions.

CONCRETE CURING QUICK REFERENCE CHART

NORMAL WEATHER PROVISIONS

<table>
<thead>
<tr>
<th>CONCRETE ITEM (MINIMUM CURING TEMPS)</th>
<th>ALLOWABLE CURING METHODS</th>
<th>CURING DURATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM 502 CONCRETE PAVEMENTS (AIR TEMP 34° C)</td>
<td>-WHITE PIGMENTED CURING COMPOUND -POLYETHYLENE CURING COVERS -QUILTED COVERS</td>
<td>3-6 DAYS</td>
<td>§502-3.10 SEE TABLE 502-02</td>
</tr>
<tr>
<td>ITEM 555 STRUCTURAL CONCRETE - SUBSTRUCTURES (AIR TEMP 37° C)</td>
<td>-CURING COVERS -CLEAR MEMBRANE CURING COMPOUND -CONTINUOUS BURLAP WETTING -WET BURLAP &amp; CURING COVERS -FORMS</td>
<td>7 DAYS MINIMUM</td>
<td>§555-3.09A,B</td>
</tr>
<tr>
<td>ITEM 557 STRUCTURAL CONCRETE - SUPERSTRUCTURES (AIR TEMP 37° C)</td>
<td>-CONTINUOUS BURLAP WETTING -WET BURLAP AND CURING COVERS</td>
<td>14 DAYS</td>
<td>§557-3.12B</td>
</tr>
<tr>
<td>ITEM 557 APPROACH SLABS</td>
<td>-CONTINUOUS BURLAP WETTING</td>
<td>7 DAYS MINIMUM</td>
<td>§557-3.12</td>
</tr>
<tr>
<td>ITEM 578 BONDED CONCRETE WEARING SURFACE (AIR TEMP 37° C)</td>
<td>-CONTINUOUS BURLAP WETTING -WET BURLAP AND CURING COVERS</td>
<td>7 DAYS MINIMUM</td>
<td>§578-3J</td>
</tr>
<tr>
<td>ITEM 579 STRUCTURAL SLAB CONC. - FULL DEPTH REPAIRS (AIR TEMP 37° C)</td>
<td>-QUILTED COVERS -PLASTIC COATED FIBER BLANKETS</td>
<td>3 DAYS MINIMUM</td>
<td>§579-3.03</td>
</tr>
<tr>
<td>ITEM 582 STRUCTURAL SLAB RECONSTRUCTION CONC. (AIR TEMP 37° C)</td>
<td>-CURING COVERS -CLEAR MEMBRANE CURING COMPOUND -CONTINUOUS BURLAP WETTING -WET BURLAP &amp; CURING COVERS -FORMS</td>
<td>7 DAYS MINIMUM</td>
<td>§582-3.06</td>
</tr>
<tr>
<td>ITEM 583 SHOTCRETE (AIR TEMP 37° C)</td>
<td>-CURING COVERS -CLEAR MEMBRANE CURING COMPOUND -CONTINUOUS BURLAP WETTING -WET BURLAP &amp; CURING COVERS -FORMS</td>
<td>7 DAYS MINIMUM</td>
<td>§583-3.03E</td>
</tr>
</tbody>
</table>
### SECTION 501 - PORTLAND CEMENT CONCRETE – GENERAL

<table>
<thead>
<tr>
<th>CONCRETE ITEM (MINIMUM CURING TEMPS)</th>
<th>ALLOWABLE CURING METHODS</th>
<th>CURING DURATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM 584 SPECIALIZED OVERLAYS: (AIR TEMP ≥ 7°C)</td>
<td>- CONTINUOUS BURLAP WETTING</td>
<td>4 DAYS</td>
<td>$584-3.10A</td>
</tr>
<tr>
<td>- HIGH DENSITY</td>
<td>- WET BURLAP AND CURING COVERS - AIR CURE</td>
<td>1 DAY, 3 DAYS</td>
<td>$584-3.10B</td>
</tr>
<tr>
<td>- LATEX MODIFIED</td>
<td>- CONTINUOUS BURLAP WETTING</td>
<td>4 DAYS</td>
<td>$584-3.10C</td>
</tr>
<tr>
<td>- MICROsilica</td>
<td>- CONTINUOUS BURLAP WETTING</td>
<td>4 DAYS</td>
<td>$584-3.06B2</td>
</tr>
<tr>
<td>- CLASS DP</td>
<td>- CONTINUOUS BURLAP WETTING</td>
<td>7 DAYS</td>
<td></td>
</tr>
</tbody>
</table>

### CONCRETE CURING MATERIAL SPECIFICATIONS:

- 711-02 QUILTED COVERS
- 711-03 PLASTIC COATED FIBER BLANKETS
- 711-04 POLYETHYLENE CURING COVERS (WHITE OPAQUE)
- 711-05 MEMBRANE CURING COMPOUND
- 711-06 BURLAP
- 711-07 FORM INSULATION
# Concrete Curing Quick Reference Chart
## Cold Weather Provisions

<table>
<thead>
<tr>
<th>Concrete Item</th>
<th>Ambient Air Temperature Expected &gt;0°C But &lt;7°C</th>
<th>Ambient Air Temperature Expected to Fall Below 0°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 502 Concrete Pavement</td>
<td>No Requirements</td>
<td>Cover with straw, hay or blankets</td>
</tr>
<tr>
<td>Item 555 Structural Concrete - Substructures</td>
<td>§555-3.09D Applies</td>
<td>§555-3.06 Applies</td>
</tr>
<tr>
<td>Item 557 Structural Concrete - Superstructures</td>
<td>§555-3.09D Applies</td>
<td>§555-3.06 Applies - Heated Enclosure Required</td>
</tr>
<tr>
<td>Item 578 Bonded Concrete Wearing Surface</td>
<td>§578-3L Applies - Curing Covers Required</td>
<td>§578-3L Applies - Enclosure Required As Per 555-3.06</td>
</tr>
<tr>
<td>Item 579 Structural Slab Conc. - Full Depth Repairs</td>
<td>§555-3.09 Applies</td>
<td>§555-3.06 Applies - Heated Enclosure Required</td>
</tr>
<tr>
<td>Item 582 Structural Slab Reconstruction Concrete</td>
<td>§582-3.06 Refers to §555-3.09D</td>
<td>§555-3.06 Applies</td>
</tr>
<tr>
<td>Item 583 Shotcrete</td>
<td>§555-3.09D Applies</td>
<td>§555-3.06 Applies - Heated Enclosure Required</td>
</tr>
<tr>
<td>Item 584 Specialized Concrete Overlays</td>
<td>§584-3.14A Applies - Heated Enclosure Required</td>
<td></td>
</tr>
<tr>
<td>High Density</td>
<td>§584-3.14B Applies - Heated Enclosure Required</td>
<td></td>
</tr>
<tr>
<td>Latex</td>
<td>§584-3.14C Applies - Heated Enclosure Required</td>
<td></td>
</tr>
<tr>
<td>Microsilica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class DP</td>
<td>§§555-3.06B - Heated Enclosure Required</td>
<td></td>
</tr>
</tbody>
</table>

**In all cases if the curing temperature drops below 0°C, the concrete is rejected.**
## CONCRETE CURING QUICK REFERENCE CHART
### HOT WEATHER PROVISIONS

<table>
<thead>
<tr>
<th>CONCRETE ITEM</th>
<th>APPLICABILITY</th>
<th>CURING METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM 502</td>
<td>CONCRETE PAVEMENT</td>
<td>NO SPECIAL PROVISIONS</td>
</tr>
</tbody>
</table>
| ITEM 555      | STRUCTURAL CONCRETE - SUBSTRUCTURES | AIR TEMPERATURE >29°C | 7 DAY CONTINUOUS WETTING  
|               |                |               | WET BURLAP & CURING COVERS (3 DAYS ADDITIONAL CURE REQUIRED, 10 DAYS TOTAL CURE)  
|               |                |               | WET FORMS TO REDUCE SURFACE HEAT |
| ITEM 557      | STRUCTURAL CONCRETE - SUPERSTRUCTURES | AIR TEMPERATURE >29°C | 7 DAY CONTINUOUS WETTING  
|               |                |               | WET BURLAP & CURING COVERS, 14 DAYS TOTAL CURE)  
|               |                |               | WET FORMS TO REDUCE SURFACE HEAT |
| ITEM 557      | APPROACH SLABS | AIR TEMPERATURE >29°C | 7 DAY CONTINUOUS WETTING |
| ITEM 578      | BONDED CONCRETE WEARING SURFACE | AIR TEMPERATURE >24°C | §578-3N APPLIES |
|               |                | AIR TEMPERATURE >29°C | §578-3N APPLIES - NO PLACEMENT ALLOWED |
| ITEM 579      | STRUCTURAL SLAB CONC. - FULL DEPTH REPAIRS | AIR TEMPERATURE >29°C | §555-3.09 APPLIES |
| ITEM 582      | STRUCTURAL SLAB RECONSTRUCTION CONC. | AIR TEMPERATURE >29°C | §555-3.09 APPLIES |
| ITEM 583      | SHOTCRETE | AIR TEMPERATURE >29°C | §555-3.09 APPLIES |
| ITEM 584      | SPECIALIZED CONCRETE OVERLAYS | AIR TEMPERATURE >29°C | §584-3.12 APPLIES - REFERS TO §555-3.04 AND §555-3.09C |
|               | - HIGH DENSITY |               | |
|               | - LATEX |               | |
|               | - MICROSILICA |               | |
|               | - CLASS DP |               | |
SECTION 502 - PORTLAND CEMENT CONCRETE PAVEMENT

Field Documentation

A. Concrete Pavement Daily Field Inspection Report - MURK 3
The MURK 3, "CONCRETE PAVEMENT DAILY FIELD INSPECTION REPORT" shown as Exhibit 502-A, was developed to facilitate the documentation of information during the inspection of concrete pavement. Refer to Materials Method 9.2, Field Inspection of Portland Cement Concrete, for specific procedures for inspecting, sampling and testing portland cement concrete.

When an inspector's assignment is a concrete paving operation, the concrete pavement daily field inspection report (MURK 3) will be their daily IR. The MURK 3 should contain the same general information required on the MURK 1 as discussed in Section 90 of the Contract Administration Manual.

The following guidelines apply to entries or entry fields required on the MURK 3. (Refer to Section 90 of the CAM for entries not covered here.)

1. High and low air temperature during placement.
2. The top part of the form shall contain the information required to describe the work area.
3. Mixer type.
5. Air content: Performed in accordance with Materials Method 9.2.
7. Quantity dispatched from plant: From BR 316.
8. Quantity received: Total of all delivery ticket material quantities received during the inspection period.
9. Quantity used: Quantity received minus quantity wasted/rejected. Payment quantities shall be computed in accordance with the item specification and may not agree with the actual quantity used.
10. Quantity wasted / rejected: If any concrete is not placed in the forms, the Inspector shall make an estimate of the amount and note a brief explanation, such as "wasted," "rejected" or "over ordered."
11. Delivery tickets: The Inspector shall retain a copy of the delivery ticket accompanying each vehicle. The first ticket no., last ticket no., and total number of tickets shall be recorded in the appropriate boxes at the end of the day.
12. BR 316 Report number.

B. Concrete Mixing, Transporting, and Discharging Checks
The Inspector at the site of paving shall note on the delivery tickets the following information a minimum of five (5) times per full production day:

Central Mix - Time, End of Discharge,
Truck Mix - Time, Begin and End of Mixing, End of Discharge and Mixing Revolutions, and
Transit Mix - Time, Begin and End of Discharge and Mixing Revolutions.

At the end of the paving operation for the day, the Inspector shall complete Form MURK 3b, "CONCRETE PAVEMENT DAILY FIELD INSPECTION REPORT". This report shall be turned into the Project Engineer with all delivery tickets.

**Inspection Guidelines**

§502-3.09A Mechanical Finishing

Some Contractors have elected to use tube floats during finishing operations for the purpose of eliminating small surface irregularities and openings.

Research on the effects of the tube float when operated with a water fog spray has shown a significant lowering of compressive strength in the surface mortar with only a negligible improvement in pavement rideability.

In order to minimize this loss of surface strength, all applications of water, by any method in conjunction with the operation of the tube float, shall not be allowed by the Engineer. The Contractor may use the tube float without the addition of water to the concrete surface and/or tube. Test areas have shown that the tube float, when operated dry, will generally work up a surface layer of soft mortar that is adequate to close the surface.

§502-3.16 Thickness Tolerance

Section 502-3.16 of the standard specification, Thickness Tolerance, contains allowable tolerance limits for pavement thickness. On all projects, pavement "depth checks" are performed as part of the inspection process during placement to help ensure that the pavement will meet the required tolerances. In addition to this check, we can also verify the thickness by measurement of cores taken after the pavement is complete. The criteria used to select which projects will be cored is contained in Materials Method 11, METHOD FOR TAKING PAVEMENT AND FOUNDATION CORES. Regional Directors are authorized to waive or modify, at their discretion, the coring requirements of Materials Method 11 on small projects such as intersection TOPICS type, bridge rehabilitation and similar projects when the total quantity of materials is less than 1529 cubic meters of portland cement concrete pavement and foundation items.

Procedures for the identification of projects to be cored and the scheduling of coring are developed at each Region.

The procedures for taking cores, measurement of cores and the identification of rejected areas of pavement are contained in Materials Method 11.1 THICKNESS OF CONCRETE PAVEMENTS. Coring documentation procedures are contained in Materials Method 11.3, Form BR-166 - (See Exhibit 401E) PAVEMENT CORE RECORD.

If the core results show that the pavement meets the thickness tolerance, the Engineer can accept the pavement.

If short cores are found, the Materials Bureau and the Regional Materials Engineer determine if additional cores are required. If additional cores are not needed, the original results are sent to the Region, the Construction Division and, on Federal Aid projects, to FHWA. If additional cores are required, the Materials Bureau distributes final core results.

If the coring results identify an area of thin pavement, the deficient pavement must be removed and
replaced at the Contractor's expense at no cost to the State, unless the Regional Director agrees to permit the deficient pavement to remain in place. If the deficient pavement is allowed to remain, it is Department policy that payment deductions shall be confined to the applicable cement concrete pavement item only. Payment should be made for the associated items, such as metal reinforcement, joint supports and ties, and construction and sealing joints, provided that these items conform to specifications.

References
MATERIALS METHOD 11.0, METHOD FOR TAKING PAVEMENT AND FOUNDATION CORES
MATERIALS METHOD 11.1, THICKNESS OF CONCRETE PAVEMENTS
MATERIALS METHOD 11.3, FORM BR-166 - PAVEMENT CORE RECORD
STANDARD SPECIFICATION SECTION 500, TABLES 501-3, 501-4 & 501-5
SECTION 551 - PILES AND PILE DRIVING EQUIPMENT

Construction personnel involved in pile driving must pay close attention to the applicable sections of the Plans, Specifications, and the New York State Steel Construction Manual (NYS SCM). Construction Supervisors and Engineers-In-Charge (EIC’s) must assure that Inspection Staff are trained and knowledgeable regarding their assignment and that good supervision oversight practices are employed for these particularly critical structural items.

To insure that piles are installed in accordance with all contractual and procedural requirements, the following discussion of key requirements is provided:

\header{Submittal of Form BD 138M, Pile And Driving Equipment Data.}

The Contractor must submit to the Deputy Chief Engineer (Structures), D.C.E.S., Form BD 138M for approval. The form shown as Exhibit 551-A&B (reverse side) can be obtained from the Regional Office. All information listed on Form BD 138M shall be submitted as applicable to the D.C.E.S. Each separate combination of pile and pile driving equipment proposed by the Contractor shall require the submission of a corresponding Form BD 138M. Refer to Section 551-1.03 of the Standard Specification and Notes on the Contract Plans.

\header{Pile Points.}

Piles shall be furnished with prefabricated or commercial shoes, as detailed on the Contract Plans, or as approved by the D.C.E.S. Refer to Section 551-3.01.C.1.a&b. of the Standard Specifications and details on the Contract Plans. A Welding Procedure Specification (WPS) is required to be submitted to the D.C.E.S.

\header{Pile Splices.}

Full length piles shall always be used where practicable. When unavoidable, piles shall be spliced as detailed on the Contract Plans. The number, locations, and actual details shall be subject to the approval of the D.C.E.S. Refer to Section 551-3.01.C.2.a&b. and details on the Contract Plans.

\header{Welding.}

Pile welding shall be in accordance with the provisions of the New York State Steel Construction Manual (SCM). All procedural directives discussed in Section 564, Structural Steel for "Structural Welding-Field" of this Manual are applicable to welding of piles on site. If the Contractor chooses to subassemble any portion of the pile by welding off site, the Contractor should be directed to notify the Structures Division, Metals Engineering Unit (MEU) (518) 457-4525 of the type and location of work so that the appropriate Quality Control approvals are obtained and In-Process Quality Assurance (QA) inspection by the State can be arranged, when necessary.

Department personnel involved in QA inspection of welding in the field may use the "Punch List" at the end of the above-referenced Section in this Manual as a quick reference for approvals and inspection.

Refer to Section 551-3.01.C.2.a of the Standard Specifications; Subsections 302, 306, 704, and 811 of the SCM; and Section 564 of this Manual.

\header{Material Deliveries.}

Deliveries of all pile material are to be recorded on the Inspector’s Daily Report and Material Acceptance Record. Material Certifications must be referenced by the Manufacturer or Supplier to special project shipments. Payment quantities cannot exceed the quantity of acceptable material in the documented deliveries.
SECTION 551 - PILES AND PILE DRIVING EQUIPMENT

Pile Driving Records.
Copies of Pile Driving Records (Form BD-25M and Form BD-26M) should be transmitted to the Regional Office, the Geotechnical Engineering Bureau, and D.C.E.S. at the end of each driving day. Refer to Exhibits 551-C & D for samples of these forms.

When driving piles in or adjacent to a stream crossing, and the estimated length or minimum tip is not achieved, call D.C.E.S. at (518) 457-7677.

If a conflict occurs with existing piles or other conflicts arise, call D.C.E.S. at (518) 457-7677.

References
NYS STEEL CONSTRUCTION MANUAL, §302, §306, §704 & §811
STANDARD SPECIFICATION §564
CONSTRUCTION INSPECTION MANUAL §564-00, STRUCTURAL WELDING - FIELD
PILE DRIVING INSPECTION MANUAL
STATIC PILE LOAD TEST MANUAL, GCP-18
Standard Specification Section 554, Mechanically Stabilized Earth System (MSES), contains the contract requirements for constructing a mechanically stabilized earth system. MSES are wall systems that rely on the backfill behind the wall for their structural stability. Proper compaction of the backfill is of paramount importance in the construction of these walls.

**General Requirements**
See the Geotechnical Engineering Bureau, Soils Engineering Manual SEM-14, MECHANICALLY STABILIZED EARTH SYSTEM INSPECTION MANUAL, for guidance on installation and backfilling MSES.

**Project Procedure**
The following guidelines pertain to the inspection of backfill material.

1. The construction of stockpiles. Record the material source and stockpile construction features on MURK-1, "INSPECTOR'S DAILY REPORT." Regional Geotechnical Engineer may assist. The control and documentation of the materials and the construction of stockpiles for use in MSES are covered in the Geotechnical Engineering Bureau's Granular Control Procedure, GCP-17.

2. The Regional Geotechnical Engineer will supervise the sampling and arrange for testing of the stockpile. Results will be reported on GE-454M, (See Exhibit 203H) "GRANULAR MATERIAL DOCUMENTATION FORM." A copy of this form shall be on file.

3. Additionally, acceptance/rejection of the stockpile as MSES backfill will be reported in a letter from the Director of the Geotechnical Engineering Bureau. A copy of this letter shall also be on file.

4. The major controls of granular backfill placement are lift thickness, moisture content, compactive effort and density requirements. Maximum lift thickness and moisture content are stated in the specification.

5. Compactive effort depends on the compaction equipment supplied by the Contractor. A current list of evaluated compaction equipment is available from the Regional Geotechnical Engineer. For assistance in evaluating compaction equipment that is not on the current list, call the Geotechnical Engineering Bureau. Minimum effort, however, is also stated in the specification. Compaction equipment, lift thickness and number of passes shall be recorded on MURK-1, "INSPECTOR'S DAILY REPORT."

6. Moisture content is specified as being less than, or equal to, the Optimum Moisture Content. The Optimum Moisture Content shall be determined in accordance with the appropriate Departmental publication, in effect on the date of advertisement for bids, which incorporate moisture content determination (References: STM-9 & 10). The Regional Geotechnical Engineer can specify appropriate test(s).

7. Minimum densities shall be verified with compaction control tests performed on the job by the project's earthwork inspection personnel. These tests shall be performed in conformance with the procedures contained in the appropriate Departmental publication in effect on the date of the advertisement for bids (References: STM-9 & 10).

8. Test results shall be documented on MURK-1, "INSPECTOR'S DAILY REPORT," and Forms SM-384A,(See Exhibit 203E) "COMPACTION CONTROL DATA SHEET," SM-417B,(See Exhibit 203F) "FIELD COMPACTION SHEET - SAND CONE OR VOLUMETER APPARATUS," and/or SM-418B, (See Exhibit 203G) "FIELD COMPACTION DATA SHEET - NUCLEAR DIRECT TRANSMISSION." Retests of previously failing tests should be cross referenced to the original tests.
9. For rock backfill, the major controls are lift thickness and compaction. Maximum lift thickness is stated in the specification. The lift thickness shall be recorded on MURK-1, "INSPECTOR'S DAILY REPORT."

10. Compaction requirements will be determined by the specification.

Evidence of Acceptability

1. Compliance with all the specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement of bids.

2. For granular material, copies of test results (Form GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM") and, when applicable, a copy of the letter approving transfer, as well as the original GE-454M.

3. If variations to the stockpiling requirements are granted, a copy of the letter from the Director of the Geotechnical Engineering Bureau must be on file.

4. A copy of the letter from the Director of the Geotechnical Engineering Bureau specifying acceptance/rejection of the stockpile as MSES backfill.

Repair and Rejection
The Regional Materials Engineer should be contacted for guidance and recommendations regarding repair to the units. Table 14 of the Federal Highway Administration’s Reference Manual, page 310, lists out-of-tolerance conditions that may occur during wall construction and possible causes.

References
STM-9, Test Method for Earthwork Compaction Control by Sand Cone or Volumeter Apparatus
STM-10, Test Method for Earthwork Compaction Control by Nuclear Gauge
SEM-14, Mechanically Stabilized Earth System Inspection Manual
GCP-17, GEOTECHNICAL ENGINEERING BUREAU’S GRANULAR CONTROL PROCEDURE
Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines, FHWA Demonstration Project 82, Publication No. FHWA-SA-96-071.
Contact Geotechnical Engineering Bureau for copies of referenced material.

Related Contract Provisions
§203, Excavation and Disposal
§203-3.12, Compaction
§501, Class A Concrete
Adequate supervision of concrete construction is critical to insure a safe and durable product, particularly in view of its high cost for construction and maintenance. The following inspection guidelines should be studied carefully by E.I.C.’s and their inspectors well in advance of the work.

One of the more common failings of our concrete substructures has been improper placement of reinforcing resulting in insufficient cover. This can lead to early corrosion of the reinforcing if not epoxy coated, causing concrete delaminations and spalling. Maintaining proper air entrainment is another problem. Proper conveyance of the concrete from the truck discharge point to the placement location is critical in maintaining adequate air entrainment in the finished product. Another problem is cracking of structural elements. The method of placement and more commonly the effort exerted to ensure good consolidation and curing are critical in minimizing cracking. These, and other problems, can be minimized or eliminated by following proper construction practices and procedures.

I. General
Proper planning should be undertaken by both the Contractor and the Engineer and the inspection force in advance of actual construction. Such planning should include a job meeting to discuss in detail, the equipment and procedures that will be employed by the Contractor. A major point of discussion should be the provision of adequate delivery of concrete and sufficient placing equipment to insure that the placement can be effectively accomplished. This should include a contingency plan to handle unanticipated equipment breakdowns or interruptions in concrete supply.

The Engineer and the inspectors, must be completely familiar with the specifications for the work, including any special specifications, special notes, addenda to the specifications, appropriate Materials Methods, and all other related information.

II. Reinforcing Steel Operations
A. Handling and Storing Reinforcing Bars
Reinforcing bars must be properly handled, stored, and placed. Bars will normally be specified as being uncoated, or coated with a protective coating for corrosion resistance. Rebars with a fusion bonded, electrostatically applied epoxy protective coating (Materials Specification 709-04) are often specified for coated rebars.

Fusion bonded epoxy coatings are susceptible to damage if the bars are improperly stored and handled. Before shipment to the project site, epoxy coating applicators, and rebar fabricators are required to repair all damaged areas of coating. However, shipments of epoxy coated rebar should still be carefully inspected for coating damage after their arrival at the project site.

During unloading by the Contractor at the job site, careful handling procedures can reduce the potential for coating damage. Suitable lifting equipment and slings should be used to unload bundles of coated bars. Epoxy coated rebars should not be dropped or dragged during unloading or transfer for placement in the structure.

Coated bars that are stored before placement should be supported above the ground on wooden timbers or other suitable protective cribbing. The same protective measures should be used for stacking bundles of bars.

Extended periods of exposure to ultraviolet rays may result in deterioration of the protective epoxy coating. Storage outdoors requires that epoxy coated rebars be covered (top and sides) for protection from the weather. Provisions should be made for adequate air circulation to prevent condensation under the cover. Opaque (nontransparent) waterproof covers such as black polyethylene will serve to protect the coating from direct rays of sunlight. Also, the cover will prevent water or water vapor from penetrating the coating to the steel at damaged areas or "holidays" (pinholes in the coating not visible to the naked eye).
B. Installation of Reinforcing Bars

After placement in the structure, reinforcing steel should be free of grease, dirt, mortar, and other foreign substances. Uncoated steel should have loose mill scale and rust removed. Proper bar spacing should be maintained both horizontally and vertically. This means that all straight bars must be reasonably straight. The location and stability of the reinforcing steel must be carefully checked prior to placement of the concrete.

Epoxy coated reinforcement requires more detailed inspection before the concrete placement. Ends of the reinforcement exposed from field cutting will require touch-up with a patching material. The Contractor may also have to repair damage to the coating resulting from improper handling or field bending. The specifications require repair to a coated rebar which is determined to exhibit "major" damage. "Major" damage is defined as an area greater than 6mm by 6mm. Any 3 meter length of bar should not have more than five areas of "major" damage.

Areas of "minor" damage (< 6mm by 6mm) are not required to be repaired. The average number of unrepaired "minor" damaged areas should not exceed an average of 1.8 per meter on any individual bar.

When repairs are required, the coating manufacturer's recommended patching material, normally a two-component epoxy, should be used according to the manufacturer's instructions. Technical data sheets normally list various application requirements. Damaged surfaces need to be cleaned by wire brushing before patching. Proper adhesion and performance of the patching material is dependent upon the cleanliness of the surface. Any loose material and rust must be removed.

Miscellaneous items such as chairs, tie wires, and other devices that are used in connection with the placement of reinforcing steel should meet the specification requirements. For uncoated reinforcement, chairs should have high density, polyethylene tips. Stainless steel chairs or epoxy coated chairs without, plastic tips are also acceptable. Chairs, tie wires, and other devices used to fasten epoxy coated reinforcement should be coated with, or made of a dielectric material. Epoxy or plastic (vinyl) coated products are generally used for these items.

After epoxy coated rebars are placed in the structure, care should be taken so that construction equipment or worker operations do not damage the coating.

C. Plan Clearances

Make sure that plan clearances are maintained between bars, joint assemblies and side forms. This is particularly important near scuppers, rail supports, etc., where additional reinforcing is used and clearances are small.

III. Forming Operations
A. Forms

Forms should be properly supported and adequate to support the loads to be applied. Minor movements in forms can cause an unacceptable change in the dimensions of the final product; stability is essential to achieve proper reinforcement bar cover. The forms are the Contractor's responsibility, but the Engineer should be alert to any obvious weaknesses in the installation and call them to the Contractor's attention. The Engineer should compare commercially manufactured support system installations for conformance to the manufacturer's recommendations. Other support systems should be checked for good workmanship.
SECTION 555 - STRUCTURAL CONCRETE

B. Joints
Joints must be properly constructed in conjunction with form, reinforcement, and waterstop placement as required.

Joints are classified as construction, contraction, or expansion and are described by the following:

1. Construction Joints
   a. Definition
   Construction joints are interruptions in the concrete placement provided to facilitate construction. In some cases, vertical construction joints are introduced in abutment stems and backwalls to reduce the possibility of cracks forming due to shrinkage of the concrete during curing, thus performing the function of a contraction joint as well.
   
   b. Reinforcement
   Reinforcing steel will always pass through construction joints. All construction joints are provided with keyways, unless otherwise specified.
   
   c. Sealing
   All construction joints will be sealed with a waterstop as indicated on the plans, unless otherwise indicated. Waterstops are required where leakage through the joint is likely and staining due to that leakage would be objectionable.

2. Contraction Joints
   a. Definition
   Contraction joints are interruptions in the concrete placement introduced to reduce the possibility of cracks forming due to shrinkage of the concrete.
   
   b. Reinforcement
   Reinforcement will not extend through a contraction joint. The object of a contraction joint is to allow sections of a large placement to act independently. The continuation of reinforcement through the joint would bond the segments together and defeat the purpose of the joint. All contraction joints will be provided with a key way.
   
   c. Sealing
   All contraction joints are provided with a waterstop as indicated on the plans, except where leakage through the joint is unlikely or where staining due to leakage was deemed to be unobjectionable.

3. Expansion Joints
   a. Definition
   Expansion joints are interruptions in the concrete placement provided to allow for movements due to thermal expansion.
   
   b. Reinforcement
   No reinforcement extends through the expansion joint. Reinforcement would act to tie adjacent sections together and hinder the free movement of the joint. Expansion joints in walls and footings are provided with a keyway.
c. Sealing
All expansion joints are sealed with a waterstop as indicated on the plans.

d. Footings
The requirements for expansion joints in footings are the same as stated in 3b and 3c above, except waterstops are not required.

C. Wall Layout to Accommodate Waterstops
At locations where a waterstop is to be installed, the walls should be laid out so that the rear faces of the two adjoining walls are to be flush at the joint in order to accommodate the waterstop.

D. Construction Joints Shown on Plans
All joints required will be shown on the plans. In the event of omission, the Engineer should bring it to the attention of the Regional Construction Supervisor for advice from the Structures Division.

IV. Concrete Operations
A. Prior to Placing Concrete
Prior to commencing the placement of concrete, all the following conditions must be resolved in a pre-placement meeting:

1. Placing Sequence
Check the placing sequence, if any, on the plans and follow it. Don't deviate from it without prior approval from the Deputy Chief Engineer of the Structures Division (518) 457-7677. If changes are made, make sure that all interested parties are aware of them in advance.

2. Need for Personnel and Equipment
Make sure that enough personnel and adequate equipment are on hand to perform the work and meet emergencies. The Contractor is responsible for proper progress of the work, however, the Engineer must be satisfied that a sufficient work force will be present to complete the concrete placement. Backup equipment, including spare vibrators, should be at the site.

3. Concrete Supply
Prior to placement, discuss with the Contractor the need for an adequate and timely supply of concrete to meet the specification requirements.

4. Conveyance System
The conveyance system should be tested prior to the start of the placement. If belt conveyors are being used to deliver concrete to the placement site, they should be equipped with discharge hoods at transfer points to minimize segregation and reduce spillage. Scrapers should be utilized to keep the cement paste in the mix and off the conveyor belt. If pumps are used to deliver the concrete, hoses should be kept as level as possible. Extreme rises and falls in the hoses place greater pressures on the concrete and alter the air entrainment. Discharge of the concrete from pump hoses in a horizontal position is preferred. This will maintain a steady head of concrete and reduce the potential of air loss. Conveyance systems must be tested for their ability to deliver concrete, allowing for the established variances, within the required specification limits. Where conveyance systems cross areas ready for concrete placement, some form of protection (i.e. drop cloths, plywood) should be used to catch mortar leakage from transfer points, pipeline joints, etc.

5. Forms
Make sure that forms, and areas within the forms, are properly cleaned before allowing concrete to be placed. Compressed air or a vacuum cleaner should be used to clean them. All rubbish, sawdust, dirt, nails, and other foreign matter must be removed. Forms should be refaced regularly and coated with
the proper form release agent.

6. Curing Materials
An adequate supply of approved curing materials must be maintained at the project site. This should include not only the curing materials for the intended curing method, but suitable substitutes in case of malfunctions or inclement weather.

7. Admixtures
When admixtures are to be used, a careful review of their use with the Contractor should be made well in advance of any placement. Generally, admixture use is at the discretion of the Contractor, however, some placement conditions require certain admixture use. At the pre-placement meeting admixture use should be discussed to determine expected results and alleviate potential problems. The Regional Materials Engineer should be contacted to provide instructions and oversight of proper use of concrete admixtures.

a. Air Entraining Agents (AEA)

Air entrainment is required for all concrete placed on Department projects. Concrete will entrain approximately 2% air without any admixture. AEA is necessary to achieve the desired air content. To determine proper dosage, concrete should be tested prior to placement. Testing should be performed at regular intervals to assure consistent air contents in the concrete. How the concrete is handled will effect the air content, as previously discussed, and testing at various locations should also be performed.

b. Set Retarding Water Reducers
Retarders slow the setting of concrete, allowing the concrete to remain plastic for longer durations. Retarders, by nature, will increase slump and can also effect the air content of concrete. Hydraulic forces on forms may increase when using retarders, as the height of concrete placement increases.

c. Water Reducers
Two types of water reducers are used by the Department: Normal Range and High Range. Both can be used to reduce the mix water while achieving the same slump, resulting in somewhat higher compressive strengths, or they can be used to achieve higher slumps without reducing mix water, improving workability.

Normal range water reducers can be used in any concrete placement, but are required for Class I and J concrete. Also, Class HP used for substructures requires a normal range water reducer and/or a set retarding water reducer to achieve a workable slump while maintaining the desired water to cement ratio. The Regional Materials Engineer should be consulted to determine appropriate admixture dosages and determination of water to total cementitious ratio.

High Range Water Reducers, also known as Superplasticizers, are generally used only for substructure repairs. Other uses may be considered, and must be approved by the Regional Materials Engineer.

d. Other Admixtures
Other admixtures such as corrosion inhibitors, coloring agents, accelerators, and others may be considered for use. The Regional Materials Engineer must be consulted prior to use any of these special admixtures.

8. Engineer's Approval
No concrete should be placed until the Engineer gives approval to do so. All checking, other than a
few last minute checks, should be done the day before the placement. The entire section to be placed should be ready before allowing the concrete placement to commence.

9. Prewetting
Shrinkage cracking can result when fresh concrete is placed on a dry area. For instance, when an abutment backwall is placed on an abutment stem, the “dry concrete” from the abutment stem will draw away the “design mix water” from the fresh concrete and result in shrinkage cracks. Shrinkage cracking will typically occur at a point of weakness. In the abutment backwall this will be an vertical epoxy rebar, in an abutment stem on a footing this will typically occur at the weep hole and possibly other areas. When placing concrete barrier with the slip-forming method, cracking can be observed in the scored joints and other locations. This again, would typically occur at a point of weakness or at the vertical epoxy rebar. Sidewalks placed on a bridge deck would be another example. Good construction practice would be to prewet the area for a sufficient time when fresh concrete is to be placed on a dry surface in order to prevent the extraction of the mix design water. Cold weather conditions where heaters are used insure that previously placed concrete will really be dry. Providing a continually wetted area for a minimum of 12 hours prior to the start of the concrete placement will minimize shrinkage cracking.

B. Placing Concrete
All operations in the construction of structural concrete elements have an effect on the final product. Some of the most critical factors on the durability of structural concrete are

X proper concrete air entrainment
X proper concrete cover over the reinforcing steel
X proper consolidation of the concrete
X proper curing

Be sure that both the Contractor and material suppliers understand that the specifications will be followed. This includes testing of the concrete as per Materials Method 9.2. Be equally sure that, when the concrete placement is to commence, that the reinforcing steel is in its proper position. It should be adequately tied and anchored in accordance with the specifications, so that it will remain in the proper location throughout the concreting operations. It should be physically restrained from floating in the plastic concrete. **The placement of concrete shall not be allowed if the above conditions are not met.** Once placement of concrete has commenced, it must be handled in accordance with the specifications. The concrete should be placed as near its final position as possible. Internal vibration must be applied to achieve the proper consolidation. Vibrators should not be used to move concrete.

1. Concrete Acceptance
For concrete to be considered acceptable and function as intended, it must be placed within the proper slump and air content range. Visual inspection of the concrete should be performed as well to ensure there are no deviations in the mix and verify the proportioning of the mix. If a problem is found, the plant inspector should be notified and the mix checked. Air and slump tests should then be performed as required by the specifications and Materials Method 9.2. For a concrete to be durable, that is to withstand the weather through time, proper air entrainment and proportioning including water-cement ratio must be achieved.

Although workability is necessary, the addition of excessive amounts of water will reduce compressive strength, durability, and will increase the potential for shrinkage cracking. Water demand is increased in hot weather. Adjustments to the concrete should be made at the batch plant to ensure the concrete is produced to the desired mix criteria including water to total cementitious ratio.

2. Timing
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A steady, continuous supply of concrete that meets specifications should be maintained at all times. The slump and air content should be consistent from load to load. Concrete should be placed in a uniform pattern within the forms such that no cold joints are formed.

3. Moving concrete
Concrete should be deposited uniformly within the forms. If concrete has to be moved, it should be with a shovel, hoe, or similar means such that segregation does not occur. It should not be piled in one end of the forms and allowed to flow to the other end. Concrete should be placed in uniform layers and thoroughly consolidated prior to placing the next layer. **DO NOT ALLOW CONCRETE TO BE MOVED WITH A VIBRATOR.**

4. Vibration
All concrete placed needs to be properly consolidated by vibration techniques. Internal vibration is generally the method used. Proper vibration and a good practice would be a three step process of insertion, consolidation, and removal with each process taking 3 to 5 seconds to insure proper consolidation and avoiding air pockets or honeycombs. Vibrators are to be inserted vertically at all times. Do not allow vibrators to be dragged horizontally through the concrete. Although over vibration is a concern, most vibration is not performed in the proper 9 to 15 seconds per insertion. Due to the “stickiness” of certain classes of concrete such as Class HP from the use of pozzolons proper vibration is extremely important. It is important to note that the duration of vibration will depend upon the frequency of the vibration (impulses per minute), size of vibrators at the slump of the concrete. This length of time must be determined in the field.

5. Delays
Try to avoid delays in placing concrete, but if they do occur take steps to slow the drying of fresh, unfinished concrete. Wet curing blankets will help and should be readily available, but they shouldn’t be so wet that water drips from them onto the fresh, unfinished concrete. Remember the concrete must be placed, finished and have curing applied in the shortest possible time. Use good judgement and avoid the possibility of cold joints.

C. Finishing of Concrete
1. Depth of Cover
Check the depth of cover of reinforcing steel during the course of the placement to ensure reinforcing has not moved. Record these checks on the inspector's report. If the cover is found to be deficient, the Contractor should be immediately notified and appropriate remedial action taken.

2. Amount of Finishing
Try to keep hand finishing to a minimum. Over finishing of a concrete surface results in scaling. Do just enough to close up the small surface voids and secure a smooth surface within our tolerances. Try to **minimize or eliminate the use of bull floats** as they tend to build in ripples as a reflection of the reinforcing pattern when too much pressure is applied. Do not permit the application of water by the finishers. This changes the water/cement ratio of the surface layer and will result in a weaker concrete surface that will scale or wear early. The final goal is to achieve sound concrete throughout the entire structure.

D. Curing of Concrete
Curing is to commence as soon as possible after the finishing operation is complete. **Concrete curing materials and apparatus must be in place within 30 minutes from the time of placement.**

1. Considerations When Using Burlap
   a. Saturation
   It is important to ensure that the burlap is maintained uniformly wet over its entire surface area. Since burlap does not have sufficient wicking ability to transfer moisture to isolated areas, soaking hoses and
sprinklers used to keep the burlap wet should be positioned such that water is directly applied to all portions of the burlap.

b. If a steady supply of water is not available, covering the burlap with plastic will prevent the loss of moisture. Periodic checks must be made to ensure the burlap remains wet.

2. Timing
Apply approved curing methods at the proper times. Keep all covers properly overlapped. Rips or tears in the covers or loose fitting covers permit unwanted evaporation of moisture from the concrete. Keep wet type covers (burlap) wet at all times throughout the prescribed period of cure. Do not "tent" the covers.

3. Traffic
Another factor that contributes to the cracking of concrete is traffic on an adjacent stage. The vibrations produced by traffic during the initial set of concrete may cause cracking. Where vibrations are a problem, provide a smooth riding surface through the construction zone and reduce traffic speed for the first 24 hours.

V. Cold Weather Concrete Operations
A. Background
Portland cement concrete is a versatile material which can be successfully placed under a variety of weather conditions. However, the quality and durability of the finished product is greatly affected by the atmospheric conditions present during the placement, and especially during the curing period. Hot and dry weather poses particular concerns during summer, while cold weather causes different concerns in the late fall, winter or early spring.

Placing and curing of concrete during cold weather is of special concern, since the Standard Specifications require the rejection of any concrete should the curing temperature fall below 0°C at any time during the curing period. Although the Standard Specifications which address cold weather concreting have been interpreted differently by individuals, especially during periods of cool or cold but not freezing weather, often we find ourselves in the situation of needing to place concrete late in the construction season in order to complete work prior to the seasonal shutdown, and to minimize disruption and inconvenience to the traveling public. While attempting to accomplish this, Engineers should not allow exceptions to, or modifications of, the specifications, particularly regarding the requirements for cold weather concrete placements.

Commonly, the Contractor seems to rush to place concrete on a "nice" fall day, and then wait until some time during the curing period to decide if any additional measures are required to maintain adequate curing temperatures. However, in most cases, the method of cure and even the decision to place concrete should be determined before placement, based upon the expected or predicted temperatures during and after concrete placement.

The intent of this section is to reiterate the important provisions of the current specification requirements, and to clarify the application of the various cold weather provisions. All information provided in this section is based on current specifications, and we suggest that reference be made to the applicable specification section for further details. Although this section addresses all types of concrete, particular attention is called out to bridge deck placements and overlays which comprise a significant portion of our concrete work, the durability of which is of the utmost importance.

B. General Provisions for Cold Weather Concreting
1. Required Permission
Prior to placing concrete under the provisions of §555-3.06 of the NYSDOT "Standard Specifications," permission must be granted in writing by the Engineer. Curing temperatures must be maintained
between 7°C and 29°C. Continuously recording thermometers are required to document curing temperatures.

2. Temperature of Surroundings
When concrete is placed in contact with steel members, reinforcing steel or previously placed concrete, the temperature of the steel and concrete shall be raised to a temperature of approximately 7°C before concreting. When concrete is placed in contact with earth or rock, the temperature of the earth or rock shall be 2°C or greater. The earth or rock shall not have any snow, frost or standing water on its surface. Further, the aggregates and/or water may require heating prior to batching. Refer to the specifications for further details.

3. Maintaining a Uniform Temperature
When utilizing external heat, an effort should be given to maintain uniform heat throughout the enclosure. Localized "hot spots" can be more harmful to the concrete than cold areas. When placing thermometers to monitor temperatures, consideration should be given to areas where the most extreme temperatures may occur. When the specified curing period is complete, the heat shall be gradually reduced at a rate not to exceed ½°C per hour until the temperature within the enclosure equals the outside temperature. The Engineer shall use a continuously recording thermometer to maintain a temperature record to document compliance with this prescribed rate of heat reduction.

4. Safety Concerns
For all work employing heated enclosures, care must be given to provide sufficient ventilation to maintain adequate air quality for the safety of the workers. Additionally, adequate ventilation is needed to prevent surface disintegration of the fresh concrete from the build up of carbon dioxide gas. Further, adequate safeguards must be taken when placing heating equipment in the vicinity of flammable enclosures, materials or liquids.

5. Insulated Forms
When utilizing heat retention by insulated forms, the insulation requirements vary depending on air temperature, concrete thickness and cement content. The Standard Specifications provide details for insulation requirements. Insulated forms must be removed in a manner such that the drop in temperature of the concrete is gradual. Further details regarding insulated form removal are provided in the Specifications.

C. Critical Temperatures
Two temperatures are extremely important to cold weather concreting operations: the ambient air temperature and the curing temperature.

1. Ambient Air Temperature
The ambient air temperature is defined as the temperature of the environment at the project site. This is the temperature which determines whether or not a concrete placement should commence and what precautions the Contractor must take to protect the concrete from cold weather.

2. Curing Temperature
The curing temperature, defined as the air temperature at the concrete surface or between the concrete surface and its protective covering, typically is the same as the ambient air temperature. The curing temperature may be measured on any surface of the concrete. On deck slab pours, consideration should be given to checking curing temperatures on the bottom of the slab at the bottom forms, or at locations which represent the extreme temperature conditions.

D. Structural Concrete Placements
1. Circumstances Under Which the Cold Weather Provisions Apply
No concrete shall be placed when the ambient air temperature is below 7°C, unless the Engineer
grants permission in writing under the provisions of the Standard Specifications.

If the ambient air temperature is 7°C or greater during the placement, but is expected to fall below 0°C at any time during the curing period, the provisions of the Standard Specifications shall apply in accordance with the cold weather concreting provisions.

2. Curing Days
   a. Definition
   If the ambient air temperature is 7°C or greater during placement, and falls or is expected to fall below 7°C but remain at or above 0°C during the curing period, the provisions of the Standard Specifications, Temperatures Below 7°C, shall apply. Under curing temperatures, the Contractor shall propose a suitable method to maintain the curing temperature above 7°C. In order to assure the Contractor's method is adequate, the Contractor shall supply maximum-minimum thermometers, and the number and placement of the thermometers shall be as determined by the Engineer. The Engineer will maintain a temperature record during the curing period. Should the curing temperature drop below 7°C, that day shall not be considered a curing day and the curing period shall be so extended until the required number of days is accumulated. A curing day is defined as any day, starting with the time the placement is completed, during which the curing temperature is 7°C or greater.

   b. Aggregating Curing Time
   Conditions may occur which prevent an entire day from qualifying as a curing day, but do not prevent portions of that day from reaching the required curing temperature, such as when the curing temperature drops below 7°C for a short period of time. In such cases, with the Engineer's permission, the Contractor may aggregate curing hours. A curing hour is defined as any hour during which the curing temperature remains at or above 7°C. In order to determine curing hours, the Contractor must supply continuous recording thermometers. The number and placement of the thermometers will be determined by the Engineer, and the Engineer shall also maintain a record of the curing temperatures. The aggregation of 24 curing hours will be credited as one curing day.

3. Rejection of Concrete
   Should the curing temperature fall below 7°C for 24 consecutive hours, the remainder of the cure must then be accomplished in accordance with NYSDOT Standard Specifications §555-3.06. If the curing temperature falls below 0°C at any time during the curing period, the concrete shall be rejected. In addition, if the minimum curing temperature is not maintained for a continuous 24 hour period, the concrete shall be rejected.

E. External Heat and Enclosures
   1. When External Heat and Enclosures are Necessary
   Provisions for Concreting in Cold Weather, of the Standard Specifications, requires that curing temperature be maintained between 7°C and 29°C by either the provision of external heat, or the utilization of heat of hydration by insulated forms. The bottom of an enclosure shall be below the lowest portion of the superstructure. Therefore, the stay-in-place or bottom forms, or existing substrate concrete cannot be considered as the bottom of the enclosure. For Concreting in Cold Weather, the Contractor may supply maximum-minimum or continuously recording thermometers. External heat shall be applied for the required curing period, except that structural slabs must have external heat applied for 14 curing days.

   2. Permission
   The Standard Specifications are quite clear that if at time of placement, the weather prediction is for ambient air temperatures to drop below 0°C at any time during the curing period, the placement can only commence if permission to proceed is granted by the Engineer in writing.
3. Deciding What Steps are Necessary

However, confusion seems to occur when the ambient air temperature is above 7°C during placement, but may drop to near or below 0°C during the cure period. Simply stated, if the weather forecast is for temperatures below 7°C but above 32°F during the curing period, the Contractor shall propose a suitable method (such as protective covers or insulated curing blankets) to maintain curing temperatures above 7°C. Consideration should be given to providing protection for the top, bottom and sides of the slab. If the curing temperature remains above 7°C, no additional action is required. If the Contractor’s method to maintain heat fails and the curing temperature falls below 7°C, that day shall not be considered a curing day and the curing period shall be so extended. Should the curing temperature fall below 7°C for 24 consecutive hours, the remainder of the cure must than be accomplished in accordance with of the Standard Specifications. Therefore, when placing concrete during periods when the temperatures could drop to near 0°C, the Contractor must have available on the site, material and equipment so as to be prepared to enclose and heat the concrete already placed and in cure.

F. Chart
The Quick Reference Concrete Curing Chart for Cold Weather Provisions (Exhibit 501-E) should be helpful when making placement decisions and determining which provisions apply for the placement and curing of structural slab concrete during cold conditions.

VI. Hot Weather Concrete Operations

A. Problems
Particular attention must be paid to exposed concrete in flat work such as slabs, footings, etc. (Use the evaporation chart included in the Standard Specifications) Conditions of low humidity (under 10°C), high temperatures (over 29°C), and excessive wind velocity (over 24 kph) occurring together or alone will cause the evaporation rate to exceed the bleed rate. The bleed rate is the rate at which water rises to the surface of recently placed concrete by bleeding. This will cause a crust to form on the surface of the plastic concrete, even when retarders are used, and will result in screeding and finishing problems. Plastic shrinkage cracks will result when the bleed rate is excessive.

B. Solutions
When the previously noted conditions are unavoidable, curing procedures must be commenced as rapidly as possible. This must be discussed with the Contractor. The use of fog spray may be used but with caution. Water from fog sprays cannot be worked into the concrete surface during finishing. Windscreens are beneficial and should be considered if winds in excess of 24 kph are anticipated.

VII. Underwater Concrete Placements (TREMIE)
For underwater concrete placements, contact the Materials Bureau in Albany.

VIII. Contact
For any other concerns not covered here or questions dealing with portland cement concrete, please contact the Regional Materials Engineer, or the Materials Bureau in Albany at (518) 457-5956.

For general construction concerns, contact the Structures Division at (518) 457-7677.

References
Material Method 9.2, Field Inspection of Portland Cement Concrete
Construction Inspection Manual §502-00

Related Contract Provisions
Standard Specification §709-04, Epoxy Coated Bar Reinforcement Grade 400
I. General
Adequate supervision of bridge deck construction is critical to insure a durable product, particularly in view of its high cost for construction and maintenance. The following inspection guidelines, along with all provisions covered in Section 555 of this manual, should be studied carefully by the E.I.C. and all inspectors well in advance of the work.

A properly constructed bridge deck should be durable, safe and ride well. This means it should be of the best quality construction, true to line and grade, ride smoothly, and have the proper surface texture. The structure should perform its intended function throughout its design life with little or no maintenance. The construction phase is even more demanding when integral wearing course design is used, because you only get one chance.

Some of the more common failings of integral wearing course bridge decks have been cracking, delaminating and spalling. Often the riding surface is rough, with improper texturing. These problems can be minimized or eliminated by following proper construction practices and procedures.

All operations in the construction of a bridge deck have their effect on the final product. Before any concreting operation commences, proper preparation must be performed. This primarily relates to the organization and planning of the Contractor. Proper planning should be undertaken by both the Contractor and the inspection force in advance of actual construction (see Exhibit 557-D). Such planning includes a required Pre-Placement Meeting (see Exhibit 557-E) to discuss in detail, the equipment and procedures that will be employed by the Contractor. A major point of discussion should be the provision of adequate concrete delivery and sufficient placing equipment to insure that the placement be accomplished. In addition, an agreement should be reached on contingency plans to handle unanticipated equipment breakdowns or interruptions in concrete supply.

As an Engineer or inspector, make sure that you are completely familiar with the specifications for the work, including any special specifications, special notes, addenda to the specifications, appropriate Materials Methods, and all related information.

II. Structural Steel Welding Operations
A. The specifications and the Steel Construction Manual should be reviewed.

B. Tension Zones
Plans for steel bridges contain the following note: "No welding shall be allowed within the tension zones shown, unless specifically noted. The attachment of forming devices or other construction aids by welding within the tension areas shown is prohibited." (See CIM Section 557 IV - D. 2 Welding.)

Failure to comply with this requirement may lead to serious fatigue cracking of steel stringers, results in a shortened bridge life and/or high repair costs.

III. Reinforcing Steel Operations
A. Handling and Storage - See subsection 555-II.A of the "Construction Inspection Manual".

B. Installation of Reinforcing Bars - In addition to the following, see subsection 555-II.B of the "Construction Inspection Manual".

Use only approved chairs to support reinforcing steel as defined in the specification. They should be the proper height to provide the correct spacing, clearance and cover. The chairs should be coated or provided with a rubber tip at their end. They should be used in sufficient numbers to insure adequate and proper support, and to insure that proper clearance and spacing will be maintained when the concrete is placed. Bar mats should not
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sag excessively when walked on. Remember that at least four or five workers will be standing on the bar mat during placement operations. The reinforcing steel should be checked to confirm that it is adequately secured, to insure that it will follow the forms as the camber comes out of the beams, thereby insuring the proper cover on the bars. This is especially important in the area of maximum dead load camber (mid-span for simple beams). Mats should be tied together and may be tied to forms and/or structural steel or shear studs to achieve the above results.

C. Maintaining Proper Position of Reinforcement Bars
Make sure that bars are supported at transverse joints so they will not flex down into the end haunch area when walked upon. A plywood walkway placed over the reinforcing steel at joints and heavy traffic areas will prevent excessive sag. Chairs should be placed at points of cross slope change.

D. Plan Clearances
The Engineer should ensure that plan clearances are maintained between bars, joint assemblies and side forms. This is particularly important near scuppers, rail supports, etc., where additional reinforcing is used and clearances are small.

IV. Forming Operations
A. Forms
Forms should be adequately braced and provide sufficient support for the loads to be applied. Minor movements in forms or brackets can cause an unacceptable change in dimension X in Exhibit 557-A. The stability of dimension X is essential to the final riding quality and reinforcement bar cover of the finished deck. The forms are the Contractor’s responsibility, but be alert to any obvious weaknesses in the installation and call them to the Contractor’s attention. Other criteria are shown in Exhibit 557-A.

B. Support Systems
The Engineer should check commercially manufactured support system installations for conformance to the manufacturer’s recommendations. Support systems should be checked for good workmanship.

C. Haunch Depths
The Engineer and Contractor must be in agreement on haunch depths before setting forms. This is especially critical on stay-in-place forms since the support angles which control the haunch depth are permanently attached or clamped to the beams (See Section II.D). Check and record haunch depths on the As-Built Record Plans after installation of forms.

D. Permanent Corrugated Metal Forms For Concrete Bridge Slabs
1. Approval
The Contractor shall submit to the Engineer for acceptance the Manufacturer’s certification that all forms meet all design requirements stated in Specification Section 736-01 and all detail requirements shown on the Contract Plans.

2. Welding
Construction personnel involved in construction inspection shall insure that the Contractor is aware of the prohibition against welding in the area of stringers designated with "tension zones". Welding for the attachment of forms, ties, etc. shall not be permitted other than what is detailed on the Contract Plans. In those areas where welding is not permitted, strapping is commonly used over and around the flange, which is attached to angles used to adjust for the haunch. If the plans for any bridge being constructed under your direction appear ambiguous or incomplete with regard to the
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definition of the "tension zone", contact the Deputy Chief Engineer, Structures (D.C.E.S.) at (518) 457- 7677 for clarification or interpretation of the plans. Only welding for the purpose of repairing a steel stringer will be allowed in the "tension zone", and this welding will only be allowed in conjunction with a Repair Procedure and a Welding Procedure Specification (WPS) approved by the Deputy Chief Engineer, Structures (D.C.E.S.).

Welding and welds shall be in accordance with Specification Section 557-3.03B, Repair Procedure and the WPS. Welding shall be performed by a NYS Department of Transportation Certified Welder and in accordance with the provisions of the New York State Steel Construction Manual (NYS SCM).

Welding is required to tack down galvanized stay-in-place forms to their galvanized form supports prior to securing to form supports by self tapping screws. This welding usually produces a small whitish spot on the exposed side of the form and, occasionally, may even burn through leaving a minute deposit of weld material exposed. These imperfections are not a significant aesthetic consideration and do not worsen appreciably with time. Therefore, field touch-ups of this type of spot should not be required.

Form (strap) welding in "tension zones" shall be considered critical welding. This work shall be inspected as frequently as necessary to assure that burn through and arc strikes are not incorporated into the completed work. A burn through has the potential of fusing the strap to the flange. The Contractor shall be directed to repair these deficiencies by a procedure approved by the D.C.E.S. before progressing with any deck work. Exhibit 557-B outlines the "special inspection zone".

3. Lap in Corrugated Metal Forms
The direction of lap in the forms is governed by the direction of concrete placement (see CIM Section 557 V. - A. 2 and 3). The form section being loaded with concrete (if not securely fastened) should lap over the unloaded section of the form in order to prevent separation of the overlap.

E. Joints
At bridge joints, the forms at the end of the deck slab must be supported solely on the superstructure steel for the span being formed. There should be no form work support or connection across a joint between independent spans or between an abutment and the span, unless otherwise detailed. This allows the joint forms to move with the top of the girders through dead load application and temperature movement. Section 555-II.B "Joints" of the Construction Inspection Manual should be thoroughly reviewed.

F. Drainage
Weeps should exist, or be drilled, in corrugated metal form joints as required by the specifications.

V. Concreting Operations
A. Prior to Placing Concrete
See Exhibits 557-D & 557-G.

1. Finishing Machine Preparation - see Exhibits 557-I & 557-J
The finishing machine must be approved by the Regional Construction Engineer (R.C.E.) and it must be in satisfactory operating condition. It would be beneficial to obtain a list of at least 3 of the last jobs where the finishing machine was used, along
with the inspection personnel and their phone numbers. This would allow the Region to check on past performance of the machine.

The Engineer should obtain a copy of the machine's operating instructions and become familiar with it before making the dry run (see Exhibit 557-F) to ensure proper set up and operation. It is the Contractor's responsibility to adjust and operate the machine, but inspector familiarization is beneficial.

Screed rail positioning and support is one of the critical factors in deck construction. "Eyeball" the screed rail prior to the "dry run." Once the dry run is complete and proper clearances have been established, no adjustments to the rail supports should be made. Rails should not sag or wobble under the weight or action of the finishing machine. Use the recommended screed rail support spacing as shown in the manufacturer's manual or 600 mm whichever is less. It is recommended that rail cups be placed at shorter intervals. If screed rails are to be supported on the fascia forms, bracing should be supplied to properly resist both the deflection under the load of the finishing machine and the later movement caused by the oscillation of the machine. Check distance X (See Exhibit 557-A) before, during, and after the dry run of the machine.

The longitudinal wheelbase of the finishing machine must be considered when adjusting screed rails on multi-span structures. In setting the rails, take into account that, with a long wheelbase finishing machine, one end will be on the adjacent unloaded span while the other end will be on the loaded span (where the dead load camber has or will come out) as you load the span with fresh concrete.

In setting up the finishing machine and making the dry run, be sure possible differences in dead load deflection characteristics between the fascia girders and interior girders is considered. This is particularly important for deck replacements. It is recommended that finishing machines be oriented parallel to the skew of the bridge up to a skew of 35°. For greater skew angles, the machine should be operated at a skew angle of 35°.

Check clearances in a dry run over the entire span the day before the placement. It is recommended that the adjustment controls be locked or sealed in some manner so they will not be altered before placement begins. Some last minute clearance checks just before placing may be good insurance and reassuring to all involved. If it is necessary to raise the machine to back it off the span after the dry run, record this change so that the machine can be reset when moved back on the span for finishing.

If the finishing machine has hydraulically operated actions, take care to see that they do not leak fluid onto or into the concrete. The machine should be monitored for hydraulic fluid leaks throughout the placing and finishing operations as well. The same holds true for grease or fuel that may drip onto or into the concrete. See that gobs of excess grease are removed before they get into the concrete.

2. Placing Sequence
Check the placing sequence, if any, on the plans and follow it. Don't deviate from it without prior approval from the Deputy Chief Engineer (Structures). If changes are made, make sure that all interested parties are aware of them in advance. If there is no placing sequence shown for a continuous deck of two or more spans, the D.C.E.S. should be contacted at (518) 457-7677 for guidance.

3. Placing Direction
When grades exceed 3%, concrete is generally placed from the low point to the high point. When grades are less than 3%, concrete can be placed in either direction but, is
generally placed from the fixed end towards the expansion end.

4. Admixtures
   a. Set Retarding Water Reducers
      Set retarding water reducers are required to be used for all deck placements. Careful review of their use should be discussed with the Contractor, during the Pre-Placement Meeting. Retarders slow the setting of concrete, allowing the concrete to remain plastic for longer durations. Retarders, by nature, will increase slump and can also affect the air content of concrete. The first few batches of concrete delivered to the project should be checked for air content and water to total cementitious ratio, with adjustments made as necessary on subsequent loads at the batch plant. Often a Contractor will request to reduce the dosage of set retarding water reducer on a deck placement as the placement progresses and less retardation is required. Never reduce the amount of set retarding water reducer once the placement begins. Changes to admixture dosages will change the air content, slump, and consistency of the concrete, altering the workability. Class HP concrete requires a set retarding water reducer to achieve workability while maintaining the desired water to total cementitious ratio. Consult the Regional Materials Engineer for admixture dosages and determination of water to total cementitious ratio.

   b. Water Reducers
      Only normal range water reducers should be used on bridge decks to reduce the mix water while achieving the desired slump. Class HP concrete may need a normal range water reducer along with a set retarding water reducer to achieve a workable slump while maintaining the desired water to cement ratio. The Regional Materials Engineer should be consulted to determine appropriate admixture dosages and determination of water to total cementitious ratio.

5. Work Bridges
   Two work bridges are the minimum necessary to properly complete the work: one for finishers and one for cure application.

6. Expansion Bearings
   Prior to placing concrete, make sure that all expansion bearings are clear and free to move as the dead load camber comes out. Forms at the expansion end of a span or bridge shall be made to allow for expansion before, during, and after the placement.

7. Prestressed beams or girders-surface preparation (see also EB 97-040)
   Wet concrete placed over dry concrete beams cause shrinkage cracks. This results from the extraction of water from the wet concrete to the dry concrete, thereby reducing the design water requirements in the concrete mix. In order to minimize shrinkage and ensure proper bond prior to placing concrete the tops of the prestressed units must be:

   ☐ Thoroughly wetted
   ☐ Free from latence and dirt

   In order to be considered to be “thoroughly wetted” the tops of the prestressed units should be continuously wetted for a minimum of 12 hours prior to the start of a deck placement. Immediately prior to the deck placement the tops of the units must be visibly wet but without any standing water.

   Within 24 hours of the start of the deck placement the tops of the prestressed beams shall receive a high pressure water wash to "remove latence and dirt". The high
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pressure water wash shall be sufficiently strong to remove dirt and latence but not so strong that it damages the prestress beams, reinforcing mesh, or epoxy coating on the composite reinforcing. The pressure wash equipment shall be capable of providing pressure of 21-35MPa.

B. Placing Concrete
All operations in the construction of structural concrete elements have an effect on the final product. Refer to Section 555-IV.B of this manual for concrete placing recommendations. Placement may only commence when proper weather conditions exist. The placement and Curing Flow Chart (See Exhibit 584-A) should be helpful in determining if a placement should commence. Concrete placement may only begin after a Pre-Placement Meeting has been held, environmental conditions are favorable, and the Contractor has established means of protecting the concrete from adverse environmental conditions both during placement and curing. Additional recommendations for bridge decks follow.

1. General - see Exhibit 557-H
Deck slabs on continuous structures are subject to transverse cracking during construction. The cracking is found in areas where the deck has already been placed and is caused by tensile elongation of the extreme fibers of the beams supporting those areas. The elongation is in response to the downward deflection of the structural support system in the remaining deck areas as the deck is being placed there. The frequency of the cracking can be reduced if proper construction methods are used, and strict control over the timing and sequencing of the deck placement operation is exercised, specifically: proper consolidation, paving train remaining close and immediate texturing and curing.

2. Placement Rates
a. Effects of Slow Placements
When the concreting operation progresses slowly, some of the previously placed concrete may take its “initial set” prior to full deflection of the steel. As additional concrete is placed during the same placement operation, cracks will occur in concrete which has set. To prevent this from happening, either the duration of the placement should be decreased, or the time to initial set of the concrete should be lengthened.

b. Responsibility
The time required to complete a placement depends on its size, complexity, concrete delivery logistics, available rate of supply, and Contractor efficiency. Responsibility for attaining the highest practical rate of placement, and the shortest possible placement time, at any particular project location, rests with the Contractor.

c. Setting Time
The setting time for concrete can vary widely. It depends on many factors, such as mix design, use of admixtures, and atmospheric conditions. Retarding admixtures lengthen the initial set time of the concrete and are required in all bridge deck placements.

d. Avoiding Cracking - see Exhibit 557-H
To avoid cracking caused by the occurrence of initial set prior to completion of the placement, the duration of each placement shall be kept to a minimum, and no concrete shall be placed without sufficient retarding admixture.
To avoid shrinkage cracking, prewetting of existing concrete surface or prestressed units shall be performed. Also, timely placement of curing to prevent evaporation is
3. Loading Sequence - see Exhibit 557-H
   a. Importance
      Some continuous structures require a total volume of concrete too large to be placed
      prior to the occurrence of initial set at some point in the deck. The Contract Plans
      will divide the placement into a sequence of placements when the placement
      exceeds 275 cubic meters.
   b. Location of First Placement
      When a sequence of placements is used, the location of the first placement (positive
      moment areas) is critical. Concrete cannot be placed in negative moment areas
      first, because subsequent placements will impose tensile stresses on this concrete,
      resulting in transverse cracking.
   c. Avoid Upward Deflections
      If any placement results in the upward deflection of concrete previously placed in a
      positive moment area, the concrete in that area may crack. Consequently, it is
      necessary to place concrete in each positive moment area during the initial
      placement. If the volume of concrete required to fully place all positive moment
      areas is very large, this may be difficult. Initial set could occur before placement is
      completed. This shall be avoided. The placement rate can be modified. In some
      cases, the placement rate can be increased by the use of an additional finishing
      machine.
   d. Skewed Structures
      On skewed structures, placement of the concrete and operation of the finishing
      machine should parallel the skew angle up to a 35° skew. Loading the structure in
      this manner equalizes steel deflections. It may be necessary to operate the finishing
      machine at a reduced skew angle on certain very wide, highly skewed structures.
      For skews greater than 35°, the machine should be operated at a skew angle of 35°
      while the concrete is loaded parallel to the bridge skew, to ensure the stringers are
      loaded equally.

4. Early Application of Loads
   Immediately after initial set, concrete has little or no compressive strength. At this time,
   minor loads or deflections can cause serious cracking in the new deck. However,
   compressive strength increases rapidly to a point where moderate stresses (due to
   loads or deflections) can be resisted. For this reason, deck concrete or machine
   operation, which will have any measurable effect on recently placed concrete, shall not
   be placed until adequate early strength may be assumed. Thus, subsequent
   placements will require a minimum 72 hour cure time between placements.

C. Finishing Concrete
   1. Keep Off Finishing Machine
      Do not permit workers to walk on, or climb upon, the finishing machine during a
      placement (except for the necessary operators). The extra weight can increase the
      deflection of the finishing machine and rails, and cause insufficient cover and/or deck
      thickness as well as ripples in the deck.
   2. Concrete Roll in Front of Machine
      Make sure that the proper roll of concrete is maintained on the screed. For full width
      screeds that oscillate transversely, it should be more or less uniform across its full
      length. Don't let the roll disappear.
When a single operation (strike-off and finishing) machine of the revolving cylinder or cone type is employed, the manufacturer's recommendation should be followed as to the roll of concrete in front of the cylinder or cone. In general, it should probably extend about two-thirds of the length of the cylinder or cone, beginning at the front end. The roll should not reach the back end of the cylinder or cone.

3. Depth of Cover/Slab Thickness
   Again check the thickness of the concrete slab and the depth of cover on reinforcing steel after passage of the finishing machine. Record these checks on the inspector's report. If the cover or slab thickness is found to be deficient, the Contractor should be immediately notified and appropriate remedial action taken.

4. Deck Finishers
   a. Required Number
      An adequate number of finishers should be available, based on the contract plans, the deck width and amount of finishing required, to finish the deck.

   b. Timing of Work
      The finishers should be alert to the fact that the timing of their operation, relative to passage of the finishing machine, will change due to changes in weather conditions. On a hot summer day, excessive air temperature changes between early morning and early afternoon can occur, and together with changes in wind intensity, these affect the drying of the concrete surface. The finishers must adjust their operations to cope with these changes. Don't let the finishing lag far behind the concrete placement. This will result in a delay in the application of curing which is not acceptable. This also applies to placement during cold weather.

5. Amount of Finishing
   Try to keep hand finishing to a minimum. Do just enough to close up the small surface voids and secure a smooth surface within tolerances. Try to minimize or eliminate the use of bull floats as they tend to build in ripples as a reflection of the reinforcing pattern when too much pressure is applied. Furthermore, excessive finishing destroys proper air entrainment at the surface, resulting in scaling and poor freeze/thaw resistance. Do not permit the application of water by the finishers. This changes the water/cement ratio of the surface layer and will also result in weaker surface concrete that will probably scale or wear early. The goal is sound concrete from top to bottom over the full expanse of the deck. It is not desirable, but preferable, to have a rough deck rather than a watered down one. Remember the finished deck will have turf drag and saw cut grooving. A perfectly smooth floated surface is not necessary. Pay particular attention to the straight-edge checks at the beginning and end of placements and at end joints.

6. Surface Texturing
   Artificial turf drag texturing is to be applied immediately after finishing. The turf drag texturing is applied manually and cannot be attached to the finishing machine. The turf drag texture shall stop 0.3 meters from the curb. The artificial turf drag must be cleaned or replaced when dirty or clogged with hardened concrete.

   Difficulties can occur with the turf drag texturing application which has been known to tear the surface concrete, produce an excessively rough texture, and/or pull coarse aggregates up from the surface. Application of the turf drag texturing is somewhat of an “art form” and takes a certain amount of skill and practice to properly perform. With the use of “stickier mixes” such as microsilica concrete and high-performance (HP)
concretes, texturing has become more difficult but not impossible. To achieve the best results, texturing should:

a. Be applied as quickly as possible. Concrete which has been exposed to the environment and allowed to dry will not texture easily.

b. Be done with the artificial turf “attached loosely” to whatever is used as a handle. Wrapping the artificial turf tightly around a bullfloat will cause variations of pressure during placement to be evident in the surface.

c. Be applied using a uniform down pressure. Sometimes the weight from the artificial turf and attached handle are too heavy for the application and a slight uplift is required.

7. Delays in Placing/Finishing
If delays occur to placing and finishing of concrete, protection of placed but unfinished concrete must be performed. Cover in-place concrete with plastic to prevent evaporation. Class HP concrete is particularly sensitive to evaporation and cannot be easily finished if evaporation occurs.

D. Curing of Concrete
Curing is to commence as soon as possible after the finishing operation is complete, without causing any significant damage to the surface. The foregoing time period shall not exceed 30 minutes. The specifications require a minimum cure time of 14 days for superstructure slabs and 7 days for structural approach slabs. The Placement and Curing Flow Chart, Exhibit 557-C, should be helpful when making placement decisions and determining which provisions apply for the placement and curing of concrete during cold conditions. Many Engineers believe the texture of the wet burlap on the surface is cause for alarm. Beginning the curing process quickly is of greater concern than the burlap pattern being left on the deck. Curing should be achieved according to the methods allowed in the specifications.

1. Considerations When Using Burlap
a. Saturation
Burlap must be saturated just prior to its placement and it is important to ensure that the burlap is maintained uniformly wet over its entire surface area. Burlap does not have sufficient wicking ability to transfer moisture to isolated areas. Because of this, soaking hoses and sprinklers, used to keep the burlap wet, should be positioned such that water is directly applied to all portions of the burlap.

b. Potential Safety Hazards
When wet burlap is used on reconstruction projects, where traffic is maintained on the structure, the possibility exists that the travel lane may become continuously wet or, in cold weather, covered with ice as a result of the curing operation. You should be alert to such potential safety hazards and discontinue wet curing if it appears that a safety problem will be created. Also, if the ambient temperature falls to 0°C or below, and freezing water creates a safety hazard, wet curing should be discontinued. If wet curing must be discontinued, immediately cover the burlap with curing covers and continue the appropriate curing for the specified time interval. Follow winter concreting requirements.
2. Timing
Apply approved curing covers at the proper time. Keep all covers properly overlapped. Rips or tears in the covers or loose fitting covers permit unwanted evaporation of moisture from the concrete. Keep wet type covers (burlap) wet at all times throughout the period of cure. Do not "tent" the covers.

3. Exposed Reinforcing Steel
Special care should be given to insure proper curing of the deck concrete in the fascia area when the reinforcing steel protrudes. Fit wet burlap covers tightly in and around the protruding reinforcing steel and keep it properly wetted down. These covers should be in place within the first 30 minutes after placement (Ref. EI 98-037).

Other potential trouble spots are the cavities which result from the removal of the pipe sleeve screed rail supports. When filling these cavities, be aware that any water trapped in them, not removed, which may freeze, will damage the concrete. When the pipe sleeve screed rail support fits over a stud that is welded to the top of the girder, the annular space formed around the stud is particularly susceptible to entrapment of water and subsequent freezing damage.

4. Traffic
Another factor that contributes to the cracking of concrete, with stage construction particularly with respect to decks, is traffic. The vibrations produced by traffic on bridges during the initial set of concrete may cause cracking.

The work zone, its approaches and traffic controls, should be laid out with the intent to minimize acceleration and deceleration, and if practical, speed on the bridge. The lane shift, merge or two way traffic tapers should be far enough from the bridge section to allow traffic flow to stabilize before reaching the bridge. A smooth riding surface, particularly the approaches to the bridge, and a uniform cross section is also recommended to maintain stable, uniform traffic flow. Low operating speeds are desirable, but difficult to obtain. If operating speeds can be safely reduced to 56 kph or less on the approaches to the work zone, a narrowed but uniform section across the bridge may help maintain desirable lower speeds. Flaggers signaling traffic to slow down can also be used. Reduced speeds should be maintained for a minimum of 24 hours.

5. Saw Cut Grooving
The saw cut grooving can be performed after the required curing period, but not before 7 days have elapsed. The grooving must be cut according to all specifications and approved by the Engineer in Charge. Grooving is important for maintaining surface friction during wet weather. Engineers should ensure that the debris or slurry from the saw cuts is being controlled and disposed of in an environmentally safe manner. For further explanation and details on saw cut grooving see Section 558 of the Construction Inspection Manual.

6. Sealing
Sealer should be applied after sawcut grooving operations, but prior to allowing traffic on the deck. This is particularly important for late season placements to protect new concrete from chloride ingress of early salt applications.

VI. Cold Weather Concreting Operations
SECTION 557 - SUPERSTRUCTURE SLABS AND STRUCTURAL APPROACH SLABS

A. Background
All subjects covered in Section 555-V of the Construction Inspection Manual, apply to structural bridge decks. In addition to those general concerns, there are many concerns specific to structural bridge decks. The minimum cure time is 14 days. Remember if 3 days are required, for instance before a closure pour is placed, there must be 3 days of “acceptable” cure time.

B. Permission
The Standard Specifications are quite clear that if, at time of placement, the weather prediction is for ambient air temperatures to drop below 0°C at any time during the curing period, the placement can only commence if permission to proceed, under §555-3.06 of the New York State Department of Transportation Standard Specifications, is granted by the Engineer in writing. Regardless of written permission, curing and temperature must be maintained as required by the specifications.

C. Special Requirements for Structural Bridge Decks - see Exhibit 557-H
1. Thermometers
When the temperature for bridge slab placements is expected to drop below 7°C, the Contractor is required to supply continuously recording thermometers. The recordings of these thermometers will be used to determine the actual number of curing hours undergone by the concrete.

2. Enclosures
For bridge deck slab placements, curing temperatures shall be maintained through the use of a six-sided enclosure with external heat. Therefore, in this case, the application of insulated curing blankets alone to maintain adequate curing temperatures on a structural slab would not be acceptable. The bottom of the slab must be completely surrounded by the enclosure, as the bottoms of the forms can not be considered part of the enclosure. The forms must be considered as part of the slab.

VII. Hot Weather Concreting Operations
See Section 555-VI of the "Construction Inspection Manual" & Exhibit 557-H.

Contacts
For any other concerns not covered here or questions dealing with portland cement concrete, please contact the Regional Materials Engineer, or the Materials Bureau in Albany at (518) 457-5956. For general construction concerns, contact the Structures Division at (518) 457-7677.

References
NYS Steel Construction Manual
NYS Standard Specifications §555-3.06
EB 97-040, Surface Preparation of Prestressed Concrete Beams Prior to Deck Placement
EB 98-037, Bridge Deck Construction Specification Improvements-Implementation of Recommendations by the Bridge Deck Task Force

Related Contract Provisions
NYS Standard Specifications §736-01
Construction Inspection Manual §555
Construction Inspection Manual §558
The following should be checked by the inspection staff prior to the dry run of the concrete finishing machine.

- Forms have been installed with the correct haunch. Typically a 50 mm minimum haunch is required.

- Stay-in-place forms should be installed so that the form section being loaded with concrete first, laps over the unloaded section in order to prevent separation. Styrofoam inserts should be glued or taped in place. The pour direction is usually from fixed end to expansion end. When grades are greater than 3%, the pour should be from low end to high end.

- For concrete beams, check the elevations of the top of beam against the camber and deflection chart to determine high points which will be the control points for the minimum deck thickness.

- The lower mat of the reinforcing steel should be tied to shear studs. Both top and bottom mats should be supported to prevent sagging when walked on. Supports should be no more than 1.2 m apart, and no less than 150 mm from any finished edge. Bars should be properly supported at the transverse joints so that they will not flex down into the haunch area. The two mats should be tied together.

- The bridge rail anchor plates and posts are installed at proper locations. Threads of anchor bolts should be protected to prevent being spoiled by the concrete pour.

- Check the locations of all key ways, drip edges and utility brackets.

- Check the elevation and location of scuppers.

- All outer walkways should be adequately supported and safety railings installed. Walkways should be safely accessible from both sides of the span.

- Check the area round all of the bearings to ensure that they are clean of debris and free to move as the dead load camber comes out during the pour.
A Concrete Pre-Placement Meeting shall be held at least one week prior to the start of any concrete placement for superstructure slabs. All aspects of the proposed placement shall be reviewed and approved by the E.I.C. Minutes to this meeting shall be recorded and kept in the project files.

The following is a list of generic topics that should be addressed during the Pre-Placement Meeting. Project specific concerns should also be included.

1. **Attendance:** EIC, Resident, Inspector, Contractor, Concrete Plant Rep, Reg. Materials Engineer (RME).

2. **Concrete:** Quantity? Rate of placement? Number of trucks to be used? Is the plant approved? Will the Plant Rep be on site during the pour?

3. **Concrete Mix Design:** Allowable air content and slump. Type and quantity of admixtures to be used. (The RME should review the proposed dosage rates)
   
   **NO WATER IS TO BE ADDED TO THE MIX ON SITE!**

4. **M & PT:** Will lane closures be required? Flaggers? Where will trucks stage? Where will trucks wash out?

5. **Concrete Placement:** How will concrete be placed? (i.e. pumps, crane/bucket, mechanical buggies, etc.) What is the back up method?

6. **Finishing Machine:** Is the machine approved? When will the machine be dry run? Will mid-pour adjustment be required? Who will make them?

7. **Curing Procedures:** 14 day cure is required, except 7 days for structural approach slabs, curbs, sidewalks, and safety walks on bridges. Where will water supply come from? How will curing be monitored? Is cold temperatures anticipated? Are all materials on site? (Ref. EI 98-037)

8. **Weather Conditions:** No concrete shall be placed until environmental conditions are deemed favorable. The contractor shall provide the proper equipment to monitor air temp, humidity, and the evaporation rate. Table 555-3 of the Standard Specifications should also be used.

9. **Work Force:** Have the contractor supply a list of the work force for the day. Each person should be assigned to no more than one task.

10. **Safety:** Fall protection, overhead wires, vehicle backing, moving parts on the finishing machine, etc.
SECTION 557 - SUPERSTRUCTURE SLABS AND STRUCTURAL APPROACH SLABS

FINISHING MACHINE - DRY RUN

The dry run of the concrete finishing machine should be done the day before the pour.

1. Check the elevations of the end dams and bulkheads at all expansion joints.

2. Travel Rail: Typically 50 mm, schedule 80 pipe. Adjustable chairs (or cups) should be spaced no more than 600 mm inches apart. Each travel rail should maintain a constant height above the finished grade. Travel rails should always be parallel to each other.

3. Check the location of the crown, if any. A hinged joint of the finishing machine frame must be at the crown.

4. Carriage Rail: String line the carriage rail (both front and back) between breaks in grade. Any dip or bump in this rail will be reflected in the finished deck. Use a 1.2 m level or a slope board to check the pitch of the carriage rail. On skewed decks, the pitch may not be the same as the proposed pitch perpendicular to centerline.

5. Finishing Rollers: Visually inspect the rollers for cleanliness. Rollers should be parallel to each other, and to the finished grade. To check this, hold a 1.2 m level across the bottom of the rollers directly under the front carriage rail. Measure from the top of the level to the carriage rail, take measurements on both the left and the right side of the rollers. Both measurements should be identical. Repeat this under the rear carriage rail. The rear of the rollers should be 3 mm higher than the front.

6. Have the contractor start the machine. Let the carriage ride over the first end dam. The front of the finishing rollers should clear this form by less than 1.6 mm. As the machine is driven forward, this step should be repeated over all bulkheads. Deck thickness should be checked at a minimum 10 locations across the span. The cover above the top mat of steel should also be checked.

7. The carriage should be moved as close as possible to the longitudinal form. Use a straight edge across the bottom of the finishing rollers extended to the marked finish grade. The straight edge should line up with the grade mark.

8. Have the contractor set the carriage travel limits. Allow the carriage to run transversely across the deck. Watch that the carriage stops short of all forms and bridge rail supports.

9. While the machine is running, look for the following:
   - Does the travel rail sag between supports?
   - Does the travel rail wobble when the carriage changes direction?
     - Do the augers rotate in the correct direction?
     - Does the roller direction change when the carriage direction changes?
     - How far does the machine advance when the carriage direction changes? (5 to 150 mm is preferred)
   - Are there any signs of fuel leaks?
DAY OF THE POUR

• Inspectors should be equipped with and familiar with the following:
  • MURK 5 - Structural Concrete Report
  • Concrete thermometer
  • Slump cone
  • 2 Air meters
  • 2m Ruler
  • Adequate number of cylinder molds
  • Table 555-3 and worksheet

• Check that the following is on site:
  • Concrete pump and alternate
  • Backup power source for vibrators
  • Plastic and extra burlap to prevent a cold joint if the pour is delayed
  • Water supply for curing
  • Concrete supplier’s representative

• Check that the finishing machine has not been tampered with since the dry run.

• Document weather conditions and evaporation rate prior to the start of the pour, and hourly during the pour, using Table 555-3 of the Specifications. Make appropriate changes accordingly.

• All concrete trucks should have NYSDOT inspection stickers (usually inside the cab), and counters in working condition.

• Temperature, air content and slump should be tested on the first truck. Advise the plant representative of any deficiencies.

• Keep an adequate amount of concrete in front of the augers of the finishing machine, usually half the height of the auger. Do not allow laborers to try to “grade” the concrete.

• Ensure that proper vibrating techniques are being used. Do not permit laborers to use the vibrators to move the concrete.

• Watch that the drag pan is properly sealing the finished concrete. The pan may have to be weighed down to prevent “skipping”. Too much weight may cause ruts.

• Watch that finishers and laborers placing soaked burlap keep up with the concrete placement. If not, slow the machine and placement down.

• If the approach slab is to be poured continuously with the deck, construct the recess joint before placement of soaked burlap.
SPECIAL CIRCUMSTANCES

• Hot Weather: SIP forms should be cooled with water. Remove all excess water prior to concrete placement. Check evaporation rate often. Wet burlap should be placed as soon as concrete is finished and textured. Slow down the finishing machine if the laborers cannot keep up.

• Cold Weather: The ambient air temperature must be 7°C or higher. The surface temperature of all forms, steel, and existing concrete that will be in contact with fresh concrete shall be 7°C or higher. This may require insulating the area to be poured overnight prior to the pour. The contractor shall submit for approval by the E.I.C. a proposed curing procedure that will maintain the curing temperatures between 7°C and 30°C for the duration of the curing period. Refer to Specification Section 555-3.06.

• Continuous Structure Span: Remember, NO WELDING IN TENSION ZONES! This includes the installation of stay in place forms.

To minimize transverse cracking:

• The duration of each placement should be kept to a minimum and sufficient retarding admixture used to ensure initial set will not occur prior to the completion of the pour.

• If the volume of concrete is too large to be placed prior to the initial set, a pour sequence will be used. When a sequence of placement is used, the location of the first placement is very important. If any placement results in an upward deflection of concrete previously placed, the area of concrete will be prone to cracking. Generally a 72 hour waiting period between placements is required.

• On skewed bridge decks, it is important not only that the finishing machine be parallel to the skew, but the concrete placement should also parallel the skew.
PROCEDURE FOR APPROVAL OF
ALTERNATE DECK POUR SEQUENCE ON CONTINUOUS BRIDGES

The bridge deck pouring sequence that is indicated on the contract documents is determined by the Designer in accordance with the NYSDOT Bridge Manual. During design, this pouring sequence is developed taking into account aspects such as size of pour, configuration of the bridge, potential placement restrictions, direction of placement, deck tensile stresses, and any other special circumstances that might affect the bridge deck placement. A change to the bridge deck pouring sequence shall only be progressed when there is both a clear benefit for doing so and the Contractor/supplier’s technical capability exists to ensure a quality finished product.

When an alternate for the sequence shown on the documents is requested by the Contractor, the following procedure shall be followed:

The requested change must be submitted in writing to the Engineer-in-Charge. The Department will respond to any complete submission within 15 work days of receipt. The Engineer will determine if the submission is complete and promptly notify the Contractor. In order to be complete, the submission must contain the following, at a minimum:

- The benefits of the change.
- Description of the proposed pour procedure.
  - Number of placement crews.
  - Number of finishing machines.
  - Pump or conveyor description and capabilities.
  - Concrete-truck route including times.
- The effect of the proposed change on, but not limited to:
  - Personnel needs.
  - Alternate or additional equipment.
  - The concrete supplier’s capabilities and intended supply rate.
  - Estimated travel time.
- Other special circumstances that might affect the bridge deck placement.

BRIDGE DECK POURING SEQUENCE CALCULATION SHEET

- Retarder manufacturer and brand.
- Retarder dosage.
- Retardation duration.
- Direction of deck placement.
- Expected concrete placement rate.
- The Contractor’s experience with bridge deck pours.
SECTION 557 - SUPERSTRUCTURE SLABS AND STRUCTURAL APPROACH SLABS

The Engineer will evaluate the Contractor’s overall ability to alter the pouring sequence by reviewing the Contractor’s Bridge Deck Calculation Sheet. The Contractor’s proposal and supporting information is then forwarded to the Regional Construction Engineer (RCE) with the Engineer’s recommendation.

The RCE, in conjunction with the Regional Structures Engineer, the Regional Materials Engineer, and other appropriate Regional managers, will evaluate the overall acceptability of the Contractor’s proposal considering all appropriate information, including but not limited to: the intent of the pouring sequence shown on the plans, the benefits to the Department, and the Contractor/Supplier’s capabilities.

If the proposal is acceptable to the Region, the RCE shall forward the Contractor’s request to the DCES for review. That transmittal shall include all above referenced materials as well as the Region’s endorsement of the proposal.

If the proposal is unacceptable to the Region, the RCE shall so notify the Contractor, the Deputy Chief Engineer (Structures) (DCES), and the Engineer in writing. Proposals found unacceptable by the Region need not be sent to the DCES.

The DCES shall evaluate the structural acceptability of the Contractor’s proposal and provide the result of the review (concurrence/rejection) to the RCE. Included in the DCES response are any cautions that are appropriate for the placement of the concrete, if the proposal is deemed acceptable. The RCE will then notify the Contractor in writing of the Department’s decision on the proposal, with copies to the DCES and the Engineer.

If approved, the Contractor shall perform any necessary recalculations of the haunch and camber and also check for uplift. All recalculations and change sheets shall be signed by a Professional Engineer. The change in pouring procedure should be documented on the As-Built drawings.
The duration of the placement must be less than the retarder capabilities for the average high temperature conditions on the day of placement. This will make it possible for the deck placement to be completed before all of the concrete placed begins to set.

**CAUTION:** The review should consider potential delivery delays, equipment breakdowns, and the Contractor’s proposed backup plans before determining the acceptability of the placement proposal.
List Contractor’s and Concrete Supplier’s experience with sequential bridge deck pours by providing below their past completed bridge projects in New York with concrete deck pours that are similar in size and pour rates in chronological order starting with the most recent.

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SECTION 557 - SUPERSTRUCTURE SLABS AND STRUCTURAL APPROACH SLABS

New York State Department of Transportation
ALTERNATE BRIDGE DECK POURING SEQUENCE
REGIONAL EVALUATION SHEET

ACCEPTABILITY OF REQUEST TO CHANGE POURING SEQUENCE

1. ENGINEER-IN-CHARGE □ ACCEPTABLE □ NOT ACCEPTABLE

(Printed Name) (Signature) (Date)

Comments:

2. REGIONAL MATERIALS ENGINEER □ ACCEPTABLE □ NOT ACCEPTABLE

(Printed Name) (Signature) (Date)

Comments:

3. REGIONAL STRUCTURES ENGINEER □ ACCEPTABLE □ NOT ACCEPTABLE

(Printed Name) (Signature) (Date)

Comments:

4. REGIONAL CONSTRUCTION ENGINEER □ ACCEPTABLE □ NOT ACCEPTABLE

(Printed Name) (Signature) (Date)

Comments:
Related Instruction
The final surface texture on bridge deck slabs and overlays is to be obtained by transverse sawcut grooving. Grooving shall not begin until the proper curing period has elapsed. Grooving is done before the penetrating sealer is applied.

Establishing containment to protect under feature is an important procedure to be included when transverse sawcut grooving bridge deck slabs and overlays. Transverse grooving involves wet cutting concrete and creates a lot of slurry. Slurry must be channeled and contained.

1. Procedure
The grooving patterns shall be established as follows:
   a. Lay out a line 0.15 m from and parallel to all joint assemblies.
   b. Make the first full width pass which can be made near one end of the span.
   c. Fill in the skew areas and subsequent full width passes from the first full width pass (see Exhibit 558-A).
   d. Grooving shall terminate no closer than 0.30 m from curbs or drainage structures unless otherwise indicated on the contract plans.

2. Grooving in Sections
When grooving a deck in stage construction, grooves will not have to be lined up from one part to the next; i.e., adjacent lanes or in the skew areas. Grooving shall never be overlapped for any reason.

3. Curved Decks
Curved decks require special treatment. In general, the grooving passes should be made radial to the center of the curve with ungrooved gores at the outside of the curve (see Exhibit 558-B). If the radius of the curve is such that the width of the gores exceeds 0.10 m, the first pass shall be normal to the center line of the span at mid-span and subsequent passes shall parallel the initial pass (see Exhibit 558-C).

4. Inspection
A constant check shall be maintained on the geometry of the grooves. The width and spacing of the grooves are important to ensure that the grooves perform their intended function. The depth of the groove is also necessary for the functional performance of the grooves and, in addition, it determines the usable life of the grooved surface.

If the Contractor is not obtaining proper groove geometry as required by the specifications, the operation shall be stopped and the equipment adjusted to obtain proper groove geometry; i.e., adjust blade spacing and/or replace blades. Occasional areas with a depth shallower than specified shall be allowed if they result solely from unevenness of the deck surface and constitute no more than 10% of any single pass.

5. Traffic
When decks are overlaid in a "lane-at-a-time" configuration, traffic will be allowed to travel on a completed turf-dragged surface prior to sawcutting, if the Contractor chooses to apply the sawcutting full width.
Grooving is done before the penetrating sealer is applied.
RECEIVING UNITS AT THE JOB SITE

The Engineer shall review the specifications, the Prestressed Concrete Construction Manual, and the approved shop drawings for the precast concrete before receiving the units. Units shall be inspected by the Engineer upon arrival at the construction site for compliance with all provisions of the specifications in addition to the following:

1. Inspector’s Stamp of Approval on all units.

2. Receive Report of Acceptance of Structural Concrete from the transporter and check that the units meet the description. If any of the following conditions are not met, the chance of damage during shipment are increased:
   A. The units are properly supported.
   B. The units are adequately tied to prevent movement during shipping.
   C. Plastic guards or other devices are used to protect the concrete where anchor chains would otherwise be in direct contact with the unit.

3. Any damage during shipment (cracks, spalls, etc.).

4. All dimensional tolerances in the specifications for the unit.

5. Bugholes or other visual defects of fascia units or other visible components.

Report all non-compliance to the Concrete Engineering Unit.

The Contractor shall handle and store the concrete units with extreme care to prevent damage to the units.

REJECTION OF UNITS

Units which, as determined by the Engineer, are damaged beyond repair or which do not meet dimensional tolerances shall be rejected by the Engineer and replaced with acceptable units furnished by the Contractor.

Rejection of a unit shall be done only with the concurrence of the DCES.

ERECTION

ERECTION PLAN

A minimum 30 days prior to erection of the units, the Contractor shall furnish the erection procedure to the Regional Director, as required by Subsection 2.6 of the Prestressed Concrete Construction Manual, with detailed information concerning the proposed method of construction, including handling of the precast units, and the construction equipment the contractor plans to use. Any handling of the precast units at the job site shall be considered as part of the erection. Erection shall not begin until the required erection plan, including erection drawings, have been reviewed and approved by the Department. No extra payment will be made to the Contractor for any cost incurred in modifying the permanent structure due to temporary loadings induced by the Contractor’s handling and erection equipment or the erection scheme.

THREE SIDED FRAMES, FOOTINGS, INVERT SLABS, WINGWALLS, ETC.

The Contractor shall require the Manufacturer of the precast units to provide technical assistance and an on site representative during installation.
Lifting:
Check for the piece mark and compare it to the framing plan in the shop drawings. The pieces are often not symmetric and their orientation is important. Each piece has inserts for the purpose of lifting and may also contain inserts for framing, railing, post tensioning, and drawing the pieces together after placement. Observe the lifting and ascertain that it is done according to the erection drawings, using the correct lifting inserts.

Placing:
The pieces are placed on shims within a channel in the footing. Each piece should be placed according to the contract drawings such that the roof slabs are all in the same plane. Sometimes this is a horizontal plane, sometimes it is on a slope. Avoid placing pieces such that the roofs or legs are placed in a sawtooth fashion.

Shear Key Joints
Keyway Surface Cleaning:
The keyway surface shall be sandblast cleaned of any material which may prevent bonding (i.e. - oil, grease, water, dirt, etc.). This work may be done at the fabrication plant, or in the field. However, it shall be done prior to erection. If the sandblasting is to be done at the fabrication plant, the working drawings shall so indicate.

Preparation for Placement:
Prior to placing the grout, keyway surfaces shall be thoroughly wetted continuously with clean water during the preceding of 24 hours or as recommended by the grout material manufacturer. This wetting requirement will be waived if the keyway surfaces were coated with a penetrating sealer after the surface was blast cleaned.

After cleaning, the keyway shall be tightly sealed above the bottom of the shear key to prevent material loss. The work shall be done in such a manner that the sealing material shall be at least 5 mm above the shear key bottom. After sealing operations are completed, the Engineer shall inspect the work to ensure that the sealing material level is at least 5 mm above the shear key bottom. All sealed locations in violation of this requirement shall be corrected at no additional expense. No further work will be done to the shear key prior to the Engineer's inspection and approval of the sealing operations. The ends of the keyway shall also be sealed to prevent material loss.

Grout Mixing-General:
The following mixing requirements shall be adhered to:

1. Mixing shall be done as close as possible to the keyway to be filled.
2. All necessary equipment for mixing and placing shall be present at the work site prior to the start of mixing. All equipment shall be in good working order as determined by the Engineer.
3. Material which, in the Engineer's opinion is not pourable, exhibits signs of setting or hardening, prior to placement, shall not be incorporated in the work. It shall be removed from the work site.

   Placement:
   Placement of Cement Based Grout Material for Shear Keys.

1. The Grout manufacturer's instructions regarding mixing and placing shall be followed, except that:
   A. No aggregate shall be added to the grout.
   B. The actual water to cement (W/C) ratio used shall comply exactly with the value given for the specific product as published in the Department’s approved list titled: Cement Based Grout Materials for Shear Keys, §701-06.
   C. Grout shall not be placed during rainfalls.
   D. Grout shall not be placed if the ambient temperature is outside the range of 7°C to 35°C.
SECTION 562 - PRECAST CONCRETE

2. Only one shear key shall be filled at a time. Filling shall begin at one end of the key and proceed continuously to the opposite end. No placement interruptions will be permitted. Grout shall be thoroughly rodded as it is placed in the keyway. Grout shall be finished flush with the top of keyway. When a differential exists between top corners of adjacent beams at the shear key joint, the grout shall be filled to the higher beam and towel finished at a 1 on 4 slope to the lower beam.

3. Curing shall be in accordance with the Grout Manufacturer’s instructions unless otherwise required by the Engineer. The Contractor shall supply and place suitable curing blankets over the grout after placement. Such blankets shall be kept saturated damp, with clean water, for at least six (6) hours. Blankets shall be placed as soon as practicable after placement has been completed, but, under no circumstances, later than one (1) hour subsequent to placement.

Loading:
No loading of any span will be permitted until the following events have occurred, unless otherwise approved by the DCES:

1. All of the longitudinal shear keys of the span have been filled with shear key material.
2. At least 24 hours have elapsed from the time the last keyway was filled.
3. Tensioning of transverse ties is completed.

Tensioning of Transverse Ties:
These shall be tensioned to the force shown on the plans. Tensioning shall be done according to requirements of the specification. Tensioning shall be completed prior to performing any further work on the superstructure.

Grouting of ties shall be done according to requirements of the specification. Anchorage block-outs of fascia units shall be filled with anchorage block-out grout. Grout meeting the requirements of §701-05 or §701-06 shall be prepared and applied in accordance with the Manufacturer’s instructions. Epoxy grout systems shall be mixed and placed in accordance with the requirements of Subsection 502-3.15 of the Standard Specifications.

The temperature of the surface against which the grout is to be placed shall be at least 7°C. No placement of grout shall be permitted if the ambient temperature is less than 7°C. After the grout has been placed, it shall be dusted with the same brand and type of cement used in the production of the concrete units. Color to match the surrounding concrete surface.

Miscellaneous Repairs of Precast Concrete

General
Written repair procedures, together with sketches necessary to describe the deficiencies and the proposed repair, shall be prepared by the Contractor and submitted to the Engineer for approval.

Required Information
When written repair procedures are required for the repair of defects, repair procedure drawings shall be prepared to show the defects in the plan view, elevation and section as necessary to adequately locate and describe the defect and the proposed repair. The proposed repair procedure shall be described in detail including, where applicable, the following information, listed in a proposed sequence of operation.

1. The reason or probable reason why the defect occurred.
2. Color pictures and sketches showing plan views and sections indicating the size of the defect.
SECTION 562 - PRECAST CONCRETE

3. Removal of unsuitable material. Prior to beginning the repair, all spalled or disintegrated concrete shall be removed by chipping the unsuitable material away until sound concrete is reached. The type and size of tools and the depth at which sound concrete is reached shall be determined by the Engineer.

4. Blast Cleaning Surfaces. All surfaces to be repaired shall be thoroughly blast cleaned.

Repair

Repairs shall be made with one of the following materials: epoxy grout comprised of an epoxy resin system (721-01); epoxy polysulfide grout (721-03), mixed with fine aggregate or a (701 Series) cementitious grout. The grout shall be mixed and placed in accordance with the following:

1. Mixing:

   No mixing shall be started until all preparations have been made to use the grout. The Contractor shall be familiar with the working life limitations of the grout being used, and his operations shall be governed accordingly. Mixing shall be carried out in strict accordance with the Manufacturer’s instructions or directions contained in the Department’s Approved List manual and the following:

   a. Mixing shall be done as close as possible to the portion to be repaired.
   b. All necessary equipment for mixing and placing shall be present at the site, and in good working order, prior to the start of mixing.
   c. The epoxy grout shall be proportioned by volume in the approximate ratio of two (2) parts fine aggregate to one (1) part epoxy. The exact ratio of sand to epoxy resin system shall be determined on-site to produce a dense void-free grout.
   d. Dry, fine aggregate shall be placed in the mix container first. It shall be thoroughly agitated prior to the addition of the epoxy.
   e. The two components of the epoxy system shall be thoroughly mixed together before added to the fine aggregate.
   f. The epoxy shall be added to the fine aggregate slowly, but mixing time shall not exceed three minutes.
   g. All epoxy grout, in any individual batch, shall be used within 25 minutes after the start of mixing of the two components to create the epoxy system. All grout not used within the time limit shall be discarded.
   h. The grout shall not be retempered.
   i. No solvent, thinner or other foreign material shall be added directly to either the individual components or the epoxy mixture.

2. Placing:

   The grout shall be placed against a clean, primed receiving surface, in accordance with the following:

   a. The receiving surface shall be cleaned of all oil, grease or other material, which may prevent effective bond, immediately prior to priming the surface with neat epoxy (epoxy without aggregate) or cementitious paste.
   b. The priming of the receiving surface shall be done immediately prior to the placement of the grout.
   c. The grout shall be placed quickly and continuously. It shall not be overworked.
   d. The temperature of the receiving surface shall be above 70°C at the time of grout placement.
   e. Grout placement shall not be permitted when ambient temperatures are 70°C or lower, unless methods of protection, acceptable to the Inspector, are employed. Methods of protection, if permitted, shall be continued for a period of 15 hours following grout placement. The 15 hour period may be shortened, at the discretion of the Inspector, but, under no circumstances will it be less than 12 hours. Methods of protection, if permitted, are conveniences granted by the State. As such, they are not considered extra work, and, therefore, they are not entitled to extra compensation.
   f. Upon completion of grout placement, the new surface of the repaired area shall be flush with the
adjacent surfaces, unless the design of the unit specifically required otherwise.
g. On surfaces which will be exposed to view after installation, the repaired area shall be color
matched to the adjacent surfaces by use of cement dust, or other means acceptable to the Inspector.

3. Post Repair Inspection and Acceptance:
The Engineer shall inspect the whole unit especially the areas that have been repaired. The unit shall
comply with all requirements of the specifications before accepting the unit.
SECTION 563 - PRESTRESSED CONCRETE UNITS (STRUCTURAL)

I. Receiving Units at the Job Site
The Engineer shall review the specifications, the Prestressed Concrete Construction Manual, and the approved shop drawings for the prestressed concrete before receiving the units. Units shall be inspected by the Engineer upon arrival at the construction site for compliance with all provisions of the specifications in addition to the following:

1. Inspector’s Stamp of Approval on all units.

2. Receive Report of Acceptance of Structural Concrete, Exhibit 563-A, from the transporter and check that the units meet the description. If any of the following conditions are not met, the chance of damage having occurred during shipment are increased:

   A. The units are properly supported at the bearing points.
   B. The units are adequately tied to prevent movement during shipping.
   C. Plastic guards or other devices are used to protect the concrete where anchor chains would otherwise be in direct contact with the beam.

3. Damage during shipment (cracks, spalls, etc.).

4. Camber - within the tolerance of the camber shown on the contract drawings.
   Note: Measured camber in prestressed units can vary from the actual camber due to changes in atmospheric temperature, exposure to sunlight, variations in beam support location, etc.

5. All dimensional tolerances in the specifications for the unit.

6. Bugholes or other visual defects of fascia units or other visible components.

Report all non-compliance to the Concrete Engineering Unit.

The Contractor shall handle and store the concrete units with extreme care to prevent damage to the units.

II. Rejection of Units
Units which, as determined by the Engineer, are damaged beyond repair or which do not meet dimensional tolerances shall be rejected by the Engineer and replaced with acceptable units furnished by the Contractor.

Rejection of a unit shall be done only with the concurrence of the DCES.

III. Erection
A minimum 30 days prior to erection of the units, the Contractor shall furnish the erection procedure to the Regional Director, as required by Subsection 2.6 of the Prestressed Concrete Construction Manual, with detailed information concerning the proposed method of construction, including handling of the prestressed units, and the construction equipment the contractor plans to use. Any handling of the prestressed units at the job site shall be considered as part of the erection. Erection shall not begin until the required erection plan, including erection drawings, have been reviewed and approved by the Department. No extra payment will be made to the Contractor for any cost incurred in modifying the permanent structure due to temporary loadings induced by the Contractor’s handling and erection equipment or the erection scheme.

A. The bridge seat shall be formed and screeded such that the bridge seat is level in the direction of the longitudinal axis of the beams. Bearing surfaces shall be properly finished and formed to
SECTION 563 - PRESTRESSED CONCRETE UNITS (STRUCTURAL)

provide full and even supporting surfaces for bearings, bearing plates and concrete units.

B. Forms should be adequate to withstand the loads to be applied and they should be properly supported. The forms are the contractor’s responsibility but the state representative should be alert to any obvious weaknesses in the installation and call them to his attention.

C. Support systems should be checked for good workmanship. Compare insert locations with those shown on the shop drawings and contract drawings.

Adjacent Box Beams and Hollow Slab Units

Seating of Beams and Slabs:
Box beams and hollow slabs should be firmly seated and not rock during the preparation and pouring of the shear keys. If any beam rocks, the reason for such rocking shall be discovered and corrected.

Transverse Tie Rods, Strands and Anchor Rods:
The installation of the tie rods, strands and anchor dowels shall comply with the requirements shown on the plans. However, the shear keys shall be grouted and transverse post-tensioning completed prior to the placement of the anchor dowels. Stage construction may require a different sequence for post-tensioning.

Differential Camber:
When differential camber between units is more than 10 mm the contractor shall submit a corrective action plan to the Engineer. EIC’s are encouraged to contact the Concrete Engineering Unit of the Structures Division for guidance if necessary, before approving the plan.

Shear Key Joints

Keyway Surface Cleaning:
The keyway surface shall be sandblast cleaned of any material which may prevent bonding (i.e. - oil, grease, water, dirt, etc.). This work may be done at the fabrication plant, or in the field. However, it shall be done prior to erection. If the sandblasting is to be done at the fabrication plant, the working drawings shall so indicate.

Preparation for Placement:
Prior to placing the grout, keyway surfaces shall be thoroughly wetted continuously with clean water during the preceding of 24 hours or as recommended by the grout material manufacturer. This wetting requirement will be waived if the keyway surfaces were coated with a penetrating sealer after the surface was blast cleaned.

After cleaning, the keyway shall be tightly sealed above the bottom of the shear key to prevent material loss. The work shall be done in such a manner that the sealing material shall be at least 5 mm above the shear key bottom. After sealing operations are completed, the Engineer shall inspect the work to ensure that the sealing material level is at least 5 mm above the shear key bottom. All sealed locations in violation of this requirement shall be corrected at no additional expense. No further work will be done to the shear key prior to the Engineer’s inspection and approval of the sealing operations. The ends of the keyway shall also be sealed to prevent material loss.

Grout Mixing-General:
The following mixing requirements shall be adhered to:
SECTION 563 - PRESTRESSED CONCRETE UNITS (STRUCTURAL)

1. Mixing shall be done as close as possible to the keyway to be filled.

2. All necessary equipment for mixing and placing shall be present at the work site prior to the start of mixing. All equipment shall be in good working order as determined by the Engineer.

3. Material which, in the Engineer’s opinion is not pourable, exhibits signs of setting or hardening, prior to placement, shall not be incorporated in the work. It shall be removed from the work site.

Placement:
Placement of Cement Based Grout Material for Shear Keys.

1. The Grout manufacturer's instructions regarding mixing and placing shall be followed, except that:
   
   A. No aggregate shall be added to the grout.
   B. The actual water to cement (W/C) ratio used shall comply exactly with the value given for the specific product as published in the Department’s approved list titled: Cement Based Grout Materials for Shear Keys, §701-06.
   C. Grout shall not be placed during rainfalls.
   D. Grout shall not be placed if the ambient temperature is outside the range of 7°C to 35°C.

2. Only one shear key shall be filled at a time. Filling shall begin at one end of the key and proceed continuously to the opposite end. No placement interruptions will be permitted. Grout shall be thoroughly rodded as it is placed in the keyway. Grout shall be finished flush with the top of keyway. When a differential exists between top corners of adjacent beams at the shear key joint, the grout shall be filled to the higher beam and towel finished at a 1 on 4 slope to the lower beam.

3. Curing shall be in accordance with the Grout Manufacturer’s instructions unless otherwise required by the Engineer. The Contractor shall supply and place suitable curing blankets over the grout after placement. Such blankets shall be kept saturated damp, with clean water, for at least six (6) hours. Blankets shall be placed as soon as practicable after placement has been completed, but, under no circumstances, later than one (1) hour subsequent to placement.

Loading:
No loading of any span will be permitted until the following events have occurred, unless otherwise approved by the DCES:

1. All of the longitudinal shear keys of the span have been filled with shear key material.

2. At least 24 hours have elapsed from the time the last keyway was filled.

3. Tensioning of transverse ties is completed.

Tensioning of Transverse Ties:
These shall be tensioned to the force shown on the plans. Tensioning shall be done according to requirements of the specification. Tensioning shall be completed prior to performing any further work on the superstructure.
Grouting of ties shall be done according to requirements of the specification. Anchorage block-outs of fascia units shall be filled with anchorage block-out grout. Grout meeting the requirements of §701-05 or §701-06 shall be prepared and applied in accordance with the Manufacturer's instructions. Epoxy grout systems shall be prepared and applied in accordance with the Manufacturer's instructions. Epoxy grout systems shall be mixed and placed in accordance with the requirements of Subsection 502-3.15 of the Standard Specifications.

The temperature of the surface against which the grout is to be placed shall be at least 7°C. No placement of grout shall be permitted if the ambient temperature is less than 7°C. After the grout has been placed, it shall be dusted with the same brand and type of cement used in the production of the concrete units. Color to match the surrounding concrete surface.

Stage Construction Camber Differences (Adjacent Beam Structures)
On stage construction projects, particular attention shall be given to the camber of stage II beams. The Engineer shall ascertain that the required minimum slab thickness for stage II deck can be achieved. If the Engineer is not certain that the minimum slab thickness for stage II can be achieved, contact the Concrete Engineering Unit for direction.

Spread Box Beams, AASHTO I-Beams and Bulb Tees
A. Check the haunch depths before setting forms.
B. Diaphragms temporary or permanent shall be installed properly before pouring the deck concrete.

Miscellaneous Repairs of Prestressed Concrete
General
When the Engineer determines that a unit with minor damage can be repaired the contractor shall be asked to submit a written repair procedure, together with sketches necessary to describe the deficiencies and the proposed repair. The Contractor shall be allowed to proceed with the repair only after a thorough review of the submitted procedure and approval by the Engineer.

Required Information
When written repair procedures are required for the repair of defects, repair procedure drawings shall be prepared to show the defects in the plan view, elevation and section as necessary to adequately locate and describe the defect and the proposed repair. The proposed repair procedure shall be described in detail including, where applicable, the following information, listed in a proposed sequence of operation.

1. The reason or probable reason why the defect occurred.
2. Color pictures and sketches showing plan views and sections indicating the size of the defect.
3. Removal of unsuitable material. Prior to beginning the repair, all spalled or disintegrated concrete shall be removed by chipping the unsuitable material away until sound concrete is reached. The type and size of tools and the depth at which sound concrete is reached shall be determined by the Engineer.
4. Blast Cleaning Surfaces. All surfaces to be repaired shall be thoroughly blast cleaned.

Repair
Repairs shall be made with one of the following materials: epoxy grout comprised of an epoxy resin system (721-01); epoxy polysulfide grout (721-03), mixed with fine aggregate or a (701 Series) cementitious grout. The grout shall be mixed and placed in accordance with the following:
SECTION 563 - PRESTRESSED CONCRETE UNITS (STRUCTURAL)

1. Mixing:
No mixing shall be started until all preparations have been made to use the grout. The Contractor shall be familiar with the working life limitations of the grout being used, and his operations shall be governed accordingly. Mixing shall be carried out in strict accordance with the Manufacturer’s instructions or directions contained in the Department’s Approved List manual and the following:

   a. Mixing shall be done as close as possible to the portion to be repaired.
   b. All necessary equipment for mixing and placing shall be present at the site, and in good working order, prior to the start of mixing.
   c. The epoxy grout shall be proportioned by volume in the approximate ratio of two (2) parts fine aggregate to one (1) part epoxy. The exact ratio of sand to epoxy resin system shall be determined on-site to produce a dense void-free grout.
   d. Dry, fine aggregate shall be placed in the mix container first. It shall be thoroughly agitated prior to the addition of the epoxy.
   e. The two components of the epoxy system shall be thoroughly mixed together before added to the fine aggregate.
   f. The epoxy shall be added to the fine aggregate slowly, but mixing time shall not exceed three minutes.
   g. All epoxy grout, in any individual batch, shall be used within 25 minutes after the start of mixing of the two components to create the epoxy system. All grout not used within the time limit shall be discarded.
   h. The grout shall not be retempered.
   i. No solvent, thinner or other foreign material shall be added directly to either the individual components or the epoxy mixture.

2. Placing:
The grout shall be placed against a clean, primed receiving surface, in accordance with the following:

   a. The receiving surface shall be cleaned of all oil, grease or other material, which may prevent effective bond, immediately prior to priming the surface with neat epoxy (epoxy without aggregate) or cementitious paste.
   b. The priming of the receiving surface shall be done immediately prior to the placement of the grout.
   c. The grout shall be placed quickly and continuously. It shall not be overworked.
   d. The temperature of the receiving surface shall be above 7°C at the time of grout placement.
   e. Grout placement shall not be permitted when ambient temperatures are 7°C or lower, unless methods of protection, acceptable to the Inspector, are employed. Methods of protection, if permitted, shall be continued for a period of 15 hours following grout placement. The 15 hour period may be shortened, at the discretion of the Inspector, but, under no circumstances will it be less than 12 hours. Methods of protection, if permitted, are conveniences granted by the State. As such, they are not considered extra work, and, therefore, they are not entitled to extra compensation.
   f. Upon completion of grout placement, the new surface of the repaired area shall be flush with the adjacent surfaces, unless the design of the unit specifically required otherwise.
   g. On surfaces which will be exposed to view after installation, the repaired area shall be color matched to the adjacent surfaces by use of cement dust, or other means acceptable to the Inspector.

3. Post Repair Inspection and Acceptance:
The Engineer shall inspect the whole unit especially the areas that have been repaired. The unit shall comply with all requirements of the specifications before accepting the unit.
SECTION 564 - STRUCTURAL STEEL

Description
Under this section of the Specification, the contractor shall follow the requirements of Section 106-01, Source of Supply and Quality Requirements. Materials provided for the project have to be sampled and tested by groups within the Department. It is critical to the project that these notifications occur early in the project timeline. The State must have Quality Assurance oversight of the fabrication and approved welding procedures must be in place prior to the commencement of work.

Materials
Subsection 715-01 establishes the requirements for inspection and acceptance of steel plate and rolled shapes. The responsible person in the field should make certain that the material specified in the contract documents and approved shop drawings is that which is accepted at the site. The specification may call out steel with improved toughness requirements when the material is in tension or is used in a fracture critical application. These provisions should be clearly indicated in mill test reports (see Exhibit 564-C & D) submitted for acceptance.

Basis of Payment
Original shop drawings that are approved and distributed become the property of the State after project completion and must be submitted to the Deputy Chief Engineer Structures (DCES) prior to final payment. This is under the provisions of Section 202.8 of the New York State Steel Construction Manual (SCM).

Partial Payment
Under provisions of Section 100, the Contractor is eligible for partial payment for the percent of completed steel that is delivered but not erected. The Contractor requests the payment through the EIC. Upon confirming through the DCES that the steel has been fabricated in accordance with the SCM, partial payment can be issued for the stored steel.

Additional Work
Field Fabrication

Field Verification
In the case of rehabilitations, field measurements are critical to the proper reassembly or refabrication of the bridge superstructure. Often contractors will try to use “As Built” Drawings or existing Shop Drawings in lieu of field survey. This method assumes that no field modifications occurred during the original construction contract. Also, the plans may not consider remedial maintenance work that may have occurred on an interim basis. If the reconstruction notes direct the contractor to perform a field survey, this function should not be waived. This is especially true of riveted structures where the connections and splice patterns may be irregular or not meet current (SCM) guidelines for edge distance and center to center spacings.

Field Drilling
This operation may be done by either using a twist drill or a core drill. The core drill is usually preferred because of the speed of operation. The drill will have a magnetic base and use a press type arm to apply pressure while drilling through the steel. This allows the operator to make cylindrical holes free from burrs. Chapter 10 of the SCM controls tolerances for out of round and percentage of non uniform holes in any pattern.

Field Tolerances
Many of the shop and field dimensional tolerances for steel fabricated bridge components are listed in Chapter 12 of the SCM. These tolerances dictate the fabrication methods and controls that are in place in Chapter 11 under Assembly. These are most difficult to control when the fabrication is connecting main members such as an extension to a steel cap beam or extending floor beams. The methods allowed are full size drilling from the solid or drilling subsized holes and reaming to full size.

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SECTION 564 - STRUCTURAL STEEL

Field Welding

General
Department personnel involved in field welding of structural steel (new or existing) shall ensure that the Contractor is in compliance with all applicable provisions of the Standard Specifications, the New York State Steel Construction Manual (SCM), and any special contract provisions.

Subsection 564-3, Structural Steel, Construction Details of the Standard Specification, states: “... all structural steel work, including, but not limited to fabrication, inspection, transportation, and erection shall be done in accordance with the provisions of the SCM.” This establishes the SCM as part of the Contract and is applicable to both shop and field work.

The Construction Supervisor, Engineer-In-Charge, or Resident Engineer, as applicable, shall verify that the Contractor has designated a Quality Control (QC) Inspector to act on the contractor’s behalf as required under Subsection 302 of the SCM.

Under Subsection 306 of the SCM, the Contractor is responsible for performing fabrication/erection inspection and testing to ensure that materials and workmanship meet the requirements of the Contract Documents. The Contractor’s QC Inspector may be supported in this task by Assistant Inspectors who may perform specific inspection functions under his/her supervision. Assistant Inspectors may be qualified by training and experience to perform the specific function(s) to which they are assigned.

As NYSDOT projects are typically shop welded and field bolted, field welding of structural steel is unusual. Field welding typically encompasses pile foundation work, bridge bearings, form work and the like. However, the requirements for structural steel set an example of good practice for all field welding.

Approvals

Welding Procedure Specification (WPS)
Subsection 704, General, of the SCM, states: “... all welding shall be performed in accordance with the provisions of a written Procedure Specification, as shown in Figure 704.” The completed Form (Figure 704) is referred to as a Welding Procedure Specification (WPS). The contractor must complete a separate WPS for each Welding Process (e.g., Shielded Metal Arc Welding, SMAW) and joint type shown on the Shop Drawings, or shown on the Plans, and submit them to the Structures Division, Metals Engineering Unit, for approval. No welding shall be allowed without an approved WPS. For reference, a sample WPS is attached (See Exhibit 564-A). WPS’s are not transferable from project-to-project, unless a written waiver is provided by the Metals Engineering Unit.

Welding Processes - Procedure Qualification
Subsection 705, Approved Welding processes of the SCM, states: “... all welding processes, except Shielded Metal Arc Welding (SMAW), must be qualified by tests performed by the Contractor as required by Section 8, Qualification.”

In general, SMAW (stick welding) is the only process approved for field welding. Exceptions to this may be considered for certain applications (e.g., cover plates, ballast plate) in which case Submerged Arc Welding (SAW), or Flux-Cored Arc Welding (FCAW) may be approved. For either exception, a Procedure Qualification Test (Section 8, SCM) is required. Procedure Qualification Tests require the Contractor to weld a test plate with the process and welding parameters proposed to be used in production. Various specimens machined from the test plate are then tested by the Department. These tests need to be approved by the Metals Engineering Unit prior to processing WPS’s.
SECTION 564 - STRUCTURAL STEEL

SMAW (stick welding) is prequalified (Subsection 705, SCM) if the steel and electrodes are listed in Subsection 502 and Subsection 711.1 of the SCM, respectively. When these provisions are met, the Contractor may submit WPS’s for approval without performing a Procedure Qualification Test.

Welder Qualification
Subsection 809, General of the SCM states: “. . . each welder, welding operator, and tacker who performs work on Contracts for the State must be qualified for each process and position used by tests described in this Section.” (Welders not currently NYS Qualified may obtain testing program information by contacting the Metals Engineering Unit).

Qualified SMAW (stick) Field Welders are issued a NYS Qualification Certificate and Work Record Card which must accompany the certificate for it to be valid. The certification card carries a validating signature, the welder’s signature, positions qualified, and in the case of groove welds, the maximum thickness of steel the welder is qualified to weld. For the certificate to remain valid, the Work Record must be signed every six months from date of issuance by either a Region EIC or a Licensed P.E. (Any State). For reference, see Subsection 811.9b.

Prior to allowing a welder to work, the EIC, or Department Representative, must verify that the welder is qualified to weld in the position (Flat, Horizontal, Vertical, Overhead), thickness (groove welds only), and process indicated on the approved WPS’s. Position limitations are defined in Table 811.3 of the SCM.

NOTE: A welder reporting for work whose Work Record has minimally lapsed, but who otherwise is acceptable, may be granted a waiver of the six-month limit if the EIC requests a waiver from the Metals Engineering Unit. (This is an accommodation in recognition of the shortened construction season in the Northeast. The EIC should check his work quality more closely when he begins work.)

Workmanship and Technique

General
The provisions of Section 7, Part B of the SCM, cover the essential parameters for producing quality welds by low hydrogen practice. Many of these provisions are directly controlled and implemented by welding in accordance with the approved Welding Procedure Specification (WPS). Each entry on the WPS must be verified and/or monitored during any field welding operation.

Special Concerns
Below are special concerns related to producing sound welds in the field.

1. Subsection 711.1, Electrodes for Manual Shielded Metal Arc Welding (SMAW) requires that Electrodes be furnished in hermetically sealed containers and shall be dried in an Electrode Oven for a 2 to 4-hour period between 232°C and 260°C before use. After drying, the electrodes shall be placed in a storage oven held continuously at a temperature of at least 121°C until used in the work.

2. E70XX and E80XX Electrodes, once removed from the storage oven, shall be used within 2 hours and 1 hour, respectively, or discarded. If the humidity is known to be less than 70%, the time may be doubled.

   Electrodes may be redried once in lieu of discarding, if, and only if, the provisions of Subsection 711.1 are met. This requires an oven capable of reaching temperatures of 371°C to 426°C, which is not commonly available at the job site.

3. A Minimum Preheat and Interpass Temperature shall be maintained during all field welding. The
actual temperature to be used shall be in accordance with the approved WPS. Subsection 708.1 of the SCM specifies the minimum preheat/interpass temperature of 121°C for field welding. Higher temperatures can be anticipated for certain combinations of material and thickness.

Exceptions to the stated minimum preheat/interpass temperature are made when welding studs or when welding sole plates of non-steel type bearings where the temperature of the bearing material cannot exceed 93°C.

4. When field welding of FCM’s is required, welding shall be in accordance with Section 9 - Fracture Control Plan of the SCM. Implementation of the Fracture Control Plan shall be under the direction of the DCES, Metals Engineering Unit. All WPS’s used for welding FCM’s shall be so designated. No welding shall be allowed without the WPS so marked, regardless of approval. Field welding of FCM’s is rare, particularly on new construction.

Weld Quality Inspection Obligations
Contractor
Under Section 3 of the SCM, the Contractor is responsible for the acceptability of the product through Quality Control (QC) inspection and, when required by the Contract Documents, nondestructive testing. In general, the Contractor’s QC Inspector and Assistant Inspectors are required to make all necessary inspections to ensure weld quality is in compliance with the Contract Documents.

Under Subsection 724 of the SCM, Visual and other Non-Destructive inspection methods for determining weld quality and acceptance are described in detail.

“Visual inspection of welding shall be performed before, during, and after completion of the welding” as stated under Subsection 724-1 of the SCM. Non-Destructive Inspection of welds by means other than visual (i.e., DT, MT, UT, or RT) shall comply with Subsection 724.2 of the SCM when specified on the approved shop drawings, repair drawings, or ordered by the DCES/Metals Engineering Unit.

State (Department or Resident)
1. General. Under Section 3 of the SCM, is the prerogative of the State. The State may waive independent QA inspection or perform this function with Department representatives as deemed appropriate.

Normally, the waiving of QA inspection is not an option for metal elements with welded connections. However, it is considered acceptable for most field welding applications to perform QA inspection on a limited task-specific basis; i.e., verifying Contractor’s compliance with key functions of workmanship and technique that are essential to producing sound welds. (See QA Inspection Punch List for specific tasks.)

Department QA personnel need not be certified (i.e., AWS Certified Welding Inspector, CWI) unless required by the DCES, for a project-specific field welding operation. The Construction Supervisor, Engineer-In-Charge, or Resident Engineer, as applicable, shall verify that the Department’s QA Inspector(s) are qualified to perform the specific functions to which they are being assigned.

The Structures Division, Metals Engineering Unit will provide technical support to Region Staff involved in steel inspections and is available to provide training and on-site inspection support when necessary. Technical support may be arranged by contacting the Metals Engineering Unit at (518) 457-4525.

NOTE: QA inspection of field-welded Fracture Critical Members shall be under the direction of the DCES (Metals Engineering Unit).
SECTION 564 - STRUCTURAL STEEL

2. QA Inspection Activities - Field. QA inspection is not intended to supplement or replace inspection that is the responsibility of the Contractor, but rather to monitor that the Contractor’s QC program has been implemented and is producing results consistent with the Contract Documents. The QA Inspector’s schedule shall effectively determine that the Contractor’s QC in-process inspection and testing, where applicable, are insuring compliance with all material and workmanship provisions of the SCM. Any deficiencies in material or workmanship should be immediately reported to the Metals Engineering Unit for evaluation. Acceptance of structural steel welding in the field by the QA Inspector shall be based upon monitoring the Contractor’s QC program as implemented and selective detailed inspection of materials and workmanship.

3. QA Inspection Punch List. Listed below are key activities which may be used as a quick reference by Department personnel involved in QA inspection of welding in the field.

A) If welding structural steel (564 items), contractor’s QC Program has qualified and adequate staff.

B) Received from the Contractor: WPS’s approved by the DCES (Metals Engineering Unit) for each joint type and position to be welded.

NOTE: Valid WPS must display Project’s “D” Number.

C) Welders are NYS certified with current Work Record, and qualified for the process and position shown on the approved WPS.

D) Welding parameters shown on the approved WPS are being used, preheat monitored, and stick electrodes properly dried.

E) Visual inspection of welds. Include review of certified mill test reports (CMTRs), fitup, edge preparation and weld access holes or backing bars (welded pile splices) as appropriate prior to welding. During welding make sure slag is removed between passes, welding progression is per WPS (stringer beads, vertical up, etc.) and welds are free of cracks and porosity. After welding is complete, make sure slag is removed, weld profile is acceptable per SCM Figure 723, and free of defects per SCM Section 724. Pay particular attention to undercut/overlap, under fill and insufficient throat. Welds should be free of cracks and rejectable porosity.

F) Written report received from NYS qualified non-destructive testing (NDT) Technician documenting the results of weld joint testing, where required. Rejected welds repaired by a procedure approved by the Metals Engineering Unit.

G) Welding of fracture critical members must be approved by the DCES and directed by the Metals Engineering Unit.

Repairs
Field Repairs, Corrections of Cambers or Heat Straightening shall be done in accordance with the NYS Steel Construction Manual. The work shall be done following a repair procedure prepared by the contractor and approved by the DCES. No repair work involving heating, jacking or welding shall be allowed without an approved repair procedure.

Erection of Steel
The guidelines for erection of structural steel are in the Steel Construction Manual under Section 14. Close coordination is critical between field personnel and the approver. The site layout should match
the plan view shown of the approved erection drawing as the reviewer may not be familiar with the site.

The erection procedure drawing should be submitted for review 30 days prior to the scheduled day of lifting.

Maintenance and protection of traffic should be approved by the appropriate project staff member so that normal roadway traffic is maintained in accordance with the notes on the contract plans.

Safety and Health requirements are addressed in Section 107-05 of the Standard Specifications and MURK Part 1C.

Site Storage and Handling

Girder Delivery
The girders should be delivered and stored with webs vertical unless a special delivery procedure was approved by the DCES.

The minimum support that a standing girder requires is two supports at the points one-fifth of the span from the ends. Occasionally, because of stability concerns the supports can be required at intervals as small as tenth points along its length.

During temporary crane shutdowns, the Girder should be lowered and released so that no damage is done to the flanges.

Transportation Drawing
As specified in Section 206.1, transportation drawings may be required for girders that are unusual in terms of temporary stress conditions. Examples are curved girders with overhangs greater than 7.5 meters, girders that must be shipped with webs horizontal or those that could buckle unless stabilized. These drawings should be submitted to the DCES for approval.

Inspector’s Responsibility
The duties of the shop inspector are summarized in the Steel Construction Manual in Chapter 3. The inspector shall be responsible for Quality Assurance that ensures the bridge components meet all the standards and specifications required for its manufacture.

Shipping
B&GC4b - Report of Shipment of Structural Steel
This form documents that the fabrication was in accordance with contract requirements. The EIC can expect to receive the above form from the inspection agency about the same time as the material test reports (MTR). The materials test reports contain the mechanical properties, chemical analysis and the certification of domesticity. For contract items where the engineer is the approver for the State, the MTR’s will be delivered directly for him to issue the B&GC4b. (See Exhibit 564-B).

References
NEW YORK STATE STEEL CONSTRUCTION MANUAL
NYSDOT BRIDGE MANUAL
NYSDOT STANDARD SPECIFICATIONS
MURK PART 1C
**SECTION 565 - BRIDGE BEARINGS**

**General**

Bridge bearings transfer superstructure loads to the substructure while also providing for thermal movement and the deflection of the superstructure due to traffic loading. Although many different types of bridge bearings have been used by the NYSDOT, elastomeric and multi-rotational bearings are generally used on bridges of short to moderate length. Some examples of these are:

<table>
<thead>
<tr>
<th>Elastomeric Bearings (plain or laminated)</th>
<th>used with prestressed units or prestressed I-Beams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomeric Bearings (laminated) w/ external steel plates</td>
<td>used with steel stringers</td>
</tr>
<tr>
<td>Multi-Rotational Bearings (Pot Bearings &amp; Disc Bearings)</td>
<td>used with steel stringers (longer spans)</td>
</tr>
</tbody>
</table>

The elastomeric bearing is the most commonly used bearing. It performs well during a seismic event because of its dampening ability and low height. High steel rocker bearings and the low steel bearings are no longer being used on new bridges and are being replaced wherever possible.

Bearings are designed to be placed perpendicular to the longitudinal axis of the stringer. With skewed bridges this is of the utmost importance in order for the bearing to function as designed. Curved steel stringers require that the bearings be placed perpendicular to a chord between the fixed bearing and each expansion bearing on the curved girder. Circular elastomeric bearings and multi-rotational bearings are often used on curved steel girders.

Pedestals shall be placed prior to the bearing and girder. (In other words, the bearing shall not be welded to the girder, the girder supported and the pedestal placed under the bearing.) This will not allow proper consolidation of the concrete and will not provide any assurance that the masonry plate will have full bearing. The pedestals shall be placed, bearings set and the girders erected, in that order.

**Bearing Adjustments**

After being erected, steel stringers require the bearings to be temporarily welded to the stringer. The amount of camber to come out of the stringer dictates whether the bearing has to be adjusted. This involves jacking the superstructure, locating the bearing in the correct position and permanently welding the bearing to the stringer. A Welding Procedure Specification (WPS) is required to be approved by the DCES prior to welding. If the temporary weld is small enough, it can be incorporated into the permanent weld. If it is too large, it can be ground down and then incorporated. Any problems with the bearings being out of tolerance can be directed to the DCES at (518) 457-7677.

Prestressed boxes or slab units with elastomeric bearings receive no adjustments. The anchor rods are secured before the deck slab gets placed on the prestressed units, thereby denying any means to adjust the bearings. The amount of camber to come out of the prestressed units due to the deck slab loading is minimal and deformation of the bearing is not considered in their design.

Elastomeric Bearings (plain or laminated), Items 565.18XXM (Type E.P.) or 565.19XXM (Type E.L.)
SECTION 565 - BRIDGE BEARINGS

Elastomeric bearings (without external steel plates) are used with concrete prestressed box beams and prestressed slab units. The connection between the beam or slab and the bearing is made with an anchor rod through the unit and bearing and into the substructure.

The anchor rod holes are drilled in the substructure after the bearings and beams are in place. In order not to damage the bearing, the Engineer should ensure that the precast hole in the unit is aligned with the formed holes in the bearing before any drilling for the anchor rod is done.

Elastomeric Bearings (w/external plates), Item 565.20XXM (Type E.B.)

In order to make the connection of the steel stringers to the bearings, steel load plates are required. A tapered sole plate may be required by the Designer when the longitudinal grade is 1% or more or the required taper is 3mm or more. Careful attention must be paid to ensure that the tapered plate follows the profile grade.

The bearings are permanently connected to the substructure with anchor bolts into the pedestal. The attachment of the superstructure to the bearings is done by “field welding”. The amount of camber to come out of the steel stringers dictates that the bearings be temporarily welded after erecting the steel stringers. The Engineer should ensure that the Contractor does not cause debonding of the elastomer from the plate. This can result from overclamping by the Contractor in trying to draw the bearing and bottom flange together. The bearings may be permanently welded after the following is complete:

- the superstructure slab is placed
- at least 7 days of cure for the slab
- the necessary adjustments according to the plans and specifications.
- a Welding Procedure Specification (WPS) is approved by the Deputy Chief Engineer - Structures, (DCES)
- the welder is certified

The Engineer must ensure that the temperature is controlled (not to exceed 90°C as monitored with temperature crayons) in the vicinity of the elastomer during the welding process so as not to damage the elastomer or cause any debonding.

- The Engineer can check for damaged elastomer as follows: After the steel has cooled from welding, run your finger along the elastomer adjacent to the steel plate. If the elastomer was damaged from excessive heat during field welding, it will become soft and will adhere to your finger. Elastomer that was not overheated will be hard and will not rub off.

- The Engineer can check debonding by trying to insert a putty knife between the elastomer and the steel plate.

- If the Engineer suspects the elastomer was damaged or has become debonded as a result of field welding, they should contact the DCES.

Multi-Rotational Bearings, Item 565.15XXM (Type M.R.)

Multi-Rotational Bearings are commonly referred to as “pot bearings”. They are generally used in high load situations, or where the thermal movements are excessive for elastomeric bearings. Multi-Rotational bearings consist of a confined elastomeric element (pot design) or
an unconfined polyether urethane disc (disc design) to accommodate rotation, a piston and a sliding element to accommodate thermal movements. The confined elastomer does not compress and with the help of sealing rings, it acts as a fluid when subjected to the rotation due to superstructure and traffic loading. The bearing must not be taken apart as this can result in damage to the sliding surface and/or piston and associated sealing rings. Any banding straps or temporary straps should be left in place until the superstructure is ready to be placed.

The expansion bearings of this type may be guided to allow movement in only one direction. Expansion bearings may also be non-guided to allow movement in any direction. The “guide bar”, if used, is located in the upper portion of the bearing.

Caution still has to be taken in regard to field welding the bearing to the stringer. The use of temperature crayons should be used to monitor the welding process since the elastomer will not be visible for inspection purposes. Refer to the above section on “Elastomeric Bearings (w/external plates)” for the welding criteria.

**Shop Drawings**

Shop Drawings, if required, are approved by the Region. The Region determines which group will review and approve the Shop Drawings.

**Painting**

All bearings shall be painted, unless noted on the Contract Plans (see EI97-028). Areas not to receive paint include:

- Machine finished surfaces in contact (pins, pin holes, surfaces in sockets at the top of rocker bearings and bronze or copper plates in sliding contact). These surfaces receive a coat of automotive grease.

- The bottom of the masonry plate does not require a coat of paint.

**Arrival on the job site**

All bearings should be evaluated for verification of the evidence of acceptability upon delivery to the project site. The evidence of acceptability for each of the bridge bearing items is outlined in the Materials Inspection Manual (MIM) included in Part 2-A of the Manual for Uniform Record Keeping.

**Contact**

If there are questions or problems with the Contract Plans or construction problems call the Regional Office or the Structures Division @(518) 457-7677 for assistance. This may range from an understanding of the details on the Contract Plans or Specification to an error in the actual layout of the bearings during construction. For instance, it may seem like only a trivial matter to elongate the circular hole in the masonry plate to allow installation of the bearing, but there are other design considerations or required repair that may not be apparent to all concerned. It may only involve a phone call to be assured that what is being proposed by the Contractor to correct a situation is in fact the correct solution or that there may be another solution to consider that may be better, cheaper or preferred.
References

EI 97-028, BRIDGE DETAIL (BD) SHEETS BG1 THRU BG7 - BEARING DETAILS
MATERIALS INSPECTION MANUAL
BRIDGE MANUAL, SECTION 12
SPECIFICATION -ITEM 565
Description

There are various types of bridge deck expansion joint systems. The current systems are:

- 566-00 armored joint with compression seal,
- 566-00 armored joint with preformed elastic strip seal
- 567-00 modular joint systems.

The type and locations are shown on the Contract Plans.

Armored joints with compression seal consist of angles and a preformed compression seal and are supplied with different size seals. The system is installed into a blockout formed in the concrete structural deck.

Armored joints with preformed elastic strip seal consist of a steel extrusion and a molded gland and are used with concrete and asphalt overlays. On concrete overlays the joint is installed first and then the overlay is placed. On asphalt overlays the asphalt is placed first and compacted. The asphalt is then saw cut and removed to form a recess and the joint installed. The void between the steel extrusion and the cut asphalt is filled with elastomeric concrete.

Modular joints are manufactured in various sizes and are supplied with a series of steel separator beams and hollow type seals. The system is usually installed in a large blockout formed in the structural deck.

inspection

Joint systems are shop assembled and delivered to the work site ready for installation. They are accepted based on manufacturers certification that all materials and fabricating procedures used are in accordance with the requirements of the approved Shop Drawings and Specifications.

Field inspection shall include inspection for proper alignment with no bends or kinks, spacing and soundness of studs, and complete bond between the seal and the steel. A seal that is not completely bonded to the steel shall be rebonded with adhesive meeting the requirements of Section 567-2.02A6 of the Standard Specifications (a).

Shop Drawings

Shop Drawings are required for any joint system supplied and shall meet the various applicable requirements of Section 566-2.02 and 567-2.04 of the Standard Specifications (a) and the NYS Steel Construction Manual (b).

Approved Shop Drawings shall include a detailed installation procedure recommended by the manufacturer. E.I.C.’s and inspectors should familiarize themselves with the procedures for the particular type of joint being installed to ensure that all requirements are met.

Construction Details

Close adherence to the installation procedure provided by the manufacturer is essential to ensure a properly performing and watertight joint. The following operations are of particular concern:

- **Concrete Deck:**
  1. Dimensions of the blockout area should be checked against the dimensions shown in the Contract Plans and Shop Drawings.
  2. Once installed in the blockout, the armored joint system should be adjusted to the temperature for the opening and grade, such that the top of the angles are
approximately level with the surface of the surrounding deck. Joints set too high can result in the angles being clipped by the snowplows and damaged, so it is preferable to set the joints slightly low (0 to 3mm) rather than slightly high.

3. Before pouring the concrete header, all surfaces of the recess must be thoroughly cleaned by sandblasting around the joint and debris removed by subsequent air blasting with oil-free compressed air or vacuuming. Just prior to pouring, the surfaces of the recess shall be thoroughly coated with Material Section 721-03 Epoxy Polysulfide Grout or Standard Specification Material Section 705-22 Portland Cement Mortar Bonding Grout (a). No tape, placed on the angles for protection, shall cover the vent holes.

4. Slump and air tests shall be run on the header concrete, and close attention should be paid to placement, vibration, finishing, and curing. Header concrete is prone to developing shrinkage cracks because of the long length of concrete placed and the fact it is placed on dry concrete which will extract the design mix water from the concrete. Good construction practice would involve prewetting the area for a minimum of 12 hours prior to placement. As with all small placements, special care must be taken to avoid overworking the concrete. Concrete must be thoroughly worked under the angles with shovels or hoes not with vibrators. Vibration should be stopped as soon as the vent holes in the angles are completely filled with concrete. Hand finishing should be kept to a minimum, just enough to secure a smooth surface within tolerances, and the finishers should be watched carefully to insure they do not add water.

5. Curing the header concrete must be in accordance with Section 555-3.09 of the Standard Specifications (a).

6. Watertight Integrity Test shall be in accordance with Section 567-3.01H if required, see Standard Specification (a).

Asphalt Overlay with Elastomeric Concrete

1. Place asphalt on the entire structural deck including the joint area and compact to the specification.

2. Saw cut and remove asphalt to form a recess as indicated on the Contract Plans.

3. Set joint in recess. The steel extrusion opening should be adjusted to temperature at the time of installation and grade such that the top of the extrusions are level with the surface of the surrounding asphalt. Joints set too high can result in the steel extrusion being hit by a snowplow and damaged, so it is preferable to set the steel slightly low (0 to 3mm) rather than slightly high.

4. Before placing elastomeric concrete around the joint, all metal surfaces shall be abrasive blast cleaned to SSPC SP-6 Commercial Blast Cleaning (c). No visible rust will be permitted. All other surfaces coming in contact with the elastomeric concrete shall be abrasive blasted. The recess shall be vacuum or air-blown with oil-free compressed air.

5. Mix and place elastomeric concrete in accordance with the manufacturer’s instructions, the specification, and insure the material is on the Departments “Approved List” (d). The two part elastomeric concrete liquids, part A (resin) and part B (hardener), must be thoroughly mixed to ensure proper hardening. The mixing ratio shall be in accordance with that shown in the approved material detail sheets supplied with the material.
6. After the elastomeric concrete has been installed, cured and exposed to normal traffic for a minimum of five days, a Watertightness Integrity Test shall be performed in accordance with Section 567-3.01H of the Standard Specifications (a).

Stage Construction
Installation procedures are the same for concrete and asphalt overlays, the only difference with stage construction is the seals or rubber is installed in one piece or spliced at the stage line for the particular joint system being installed.

Splicing of the steel extrusion of modular expansion joint system shall be in accordance with the approved Shop Drawings.

The following operation shall be performed with “field installation” of the seal or rubber:

1. All cutting and bending of the seals shall be performed as shown on the approved shop drawings.

2. Field splicing of the seal or rubber shall be performed by a factory representative.

3. Sandblast the area in contact with the seal or rubber and remove all debris by subsequent air blasting with oil-free compressed air or vacuuming.

4. Apply adhesive to steel surfaces and install seal or rubber. Care shall be exercised as not to damage the seal or rubber. Damage to the seal or rubber is grounds for rejection.

5. Watertight Integrity Test shall be in accordance with Section 567-3.01H if required, see Standard Specifications (a).

References
(a) New York State Standard Specifications.
(b) New York State Steel Construction Manual, Section 2-Drawings and Section 7-Welding.
(c) Steel Structures Painting Council, SSPC-VIS 1-89, Visual Standard for Abrasive Blast Cleaned Steel.
(d) Current Materials Bureau’s “Approved List” (Material and Equipment for use on NYSDOT Projects). This list can also be found on the DOT Web Site.
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

I. GENERAL
Temporary project onsite storage, transport and disposal of paint removal waste are regulated activities in New York State that require container labelling and documented shipment tracking from point of generation to final disposal facility location(s).

Per Standard Specification § 571-3.03, the EIC is required to review and approve Contractor Preparedness and Prevention Plans, Contingency and Emergency Plans, and Personnel Hazardous Waste Training Records prior to any lead paint removal work.

II. TEMPORARY ONSITE STORAGE
Paint waste stored onsite shall be placed in appropriate clean, dry, weatherproof, watertight containers or roll-offs pre-approved by the intended disposal facility. Typical containers include either metal 55 gallon drums or roll-off containers.

Labeling of paint waste containers onsite in accordance with Standard Specification § 571-3.04 is required at the time paint waste is generated and placed in container(s) prior to storage. The Contractor is required to conduct weekly inspections of all temporarily stored hazardous waste containers and retain documented record of those inspections.

Hazardous paint wastes are allowed to be accumulated/stored at the site of generation (area pertaining to the EPA ID number) without requiring special hazardous waste facility permits. For hazardous paint waste, any temporary onsite storage must be located within the site of generation (i.e., the bridge area) until picked up for transport. If the site lacks adequate area to ensure secure and safe temporary storage of hazardous paint waste (i.e., urban environment, limited ROW, etc.), Regional Construction staff will coordinate with the Contractor and Regional NYSDEC staff to select and approve an alternative secure location that is in ROW controlled by the Department and as close to the site of origin as possible.

Hazardous paint wastes can be moved to different locations within the same site of generation without a 6 NYCRR Part 364 Waste Transporter Permit. This includes both labeled containerized hazardous paint waste and spent contaminated abrasive that remains in the recycling equipment. For prolonged recycler downtime and/or movement of the recycler offsite, any spent contaminated abrasive and paint waste in the collection bin requires removal, collection and management as hazardous waste. Any usable in-process abrasive can remain in the recycler and be moved for use at additional sites of generation.

Standard Specification 571 includes non-serialized pay items for both hazardous and non-hazardous paint waste. Initial NYSDOT designation of the waste during Design is based on the following criteria:

- Weathering Steel Bridges – Non-Hazardous
- Bridges Constructed Post 1988 – Non-Hazardous
- Bridges Previously 100% Abrasive Blasted to Surface Preparation Standard of SSPC SP-10 Near White Metal or SSPC SP 5 White Metal – Non-Hazardous
- All Other Painted Steel Bridges - Hazardous

In accordance with Standard Specification § 571-3.02 the contractor is responsible for all testing of the paint waste necessary to satisfy the requirements of the waste disposal facility or transporter once the waste has been generated and placed into containers. Any representative sampling of the waste needs to be performed from containerized material. Paint chip sampling
and testing from the structural steel is not considered representative for waste classification purposes.

III. TRANSPORT AND DISPOSAL
Transporters for both hazardous and non-hazardous paint waste are required to use vehicles that are permitted in accordance with 6 NYCRR Part 364 for the respective classification of waste being transported. Transport vehicle permits and identification of designated disposal facilities to be used by the contractor are required to be submitted by the contractor to the EIC prior to start of any paint waste generation.

Hazardous paint waste (lead-based paint) is required to be shipped using a hazardous waste manifest typically prepared by the transporter or contractor, which identifies the generator, describes the waste and includes a generator certification. The first shipment of hazardous waste to a designated facility also requires accompaniment by the Land Disposal Restriction Notification. Additional information regarding the hazardous waste manifest can be provided by the Regional Construction Environmental Coordinator (CEC).

When estimating hazardous or non-hazardous paint removal waste quantities, the following conversions are provided as guidance:

- One 55 gallon drum = 600 pounds of painted steel paint removal waste
- One 55 gallon drum = 1,000 pounds of unpainted weathering steel removal waste

The EIC will sign hazardous waste manifest forms presented by the Contractor for the Department, as the generator of the waste, and provide a photo copy to the CEC. If the signed receipt manifest is not received back to the Department from the disposal facility within 45 days (verbal communication to resolve within 35 days), an exception report is required to be prepared by the Region.

Any requests by the transporter or waste disposal facility for waste profile certification by NYSDOT can be approved and signed off by the contractor. As co-generator of the waste, the contractor is permitted to sign any necessary waste profile certification form required by the transporter or waste facility. If necessary and requested by the contractor, the EIC may provide either a formal letter or email authorizing the contractor to certify the waste profile.

Disposal facility receipt/weight tickets for shipments of non-hazardous paint waste (industrial solid waste) and hazardous paint waste are required to be returned to the EIC to verify quantities and confirm that the waste was disposed of at the facility identified by the contractor. The EIC will provide photo copies of all facility receipt/weight tickets to the CEC.

Annual reporting to NYSDEC associated with shipment of non-hazardous paint waste is the responsibility of the Part 364 permitted transporter.

IV. LEAD-BASED PAINT COATED SCRAP METAL
Lead-based paint is not required to be removed from scrap metal as long as the salvage yard or scrap dealer is equipped to manage lead-based paint as part of their operation. A “C7” notification to NYSDEC is required to document that the metal will be excluded as a solid waste under this recycling exemption.
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

6 NYCRR Part 371.1 (c) (7) covers metal components to be recycled or reused that are coated with lead-based paint. For metal components where the coated object (i.e., structural steel) could potentially meet the definition of a hazardous waste, the Contractor is required to provide a copy of the “C7” NOTIFICATION FOR GENERATORS (that was submitted to NYSDEC) to the EIC prior to shipment of the material.

V. INSPECTION GUIDANCE AND ASSISTANCE TABLE
See Disposal of Paint Removal Waste Guidance Table (Exhibit 571A) to assist with onsite management, transport and disposal of paint removal waste and ensure regulatory compliance.

EXHIBITS
A Disposal of Paint Removal Waste Guidance Table
B Storage Container and Label Inspection
C Hazardous Paint Waste Manifest
D NYSDOT TP 550 Form Instructions (Regional Hazardous Waste Coordinator)
<table>
<thead>
<tr>
<th>Item</th>
<th>Non-Hazardous Paint Waste</th>
<th>Hazardous Paint Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of waste</td>
<td>Self-weathering Steel. Bridges constructed Post 1988. Bridges previously 100% abrasive blasted to Surface Preparation Standard of SSPC SP-10 Near White Metal, or SSPC SP 5 White Metal.</td>
<td>All other painted steel bridges.</td>
</tr>
<tr>
<td>Waste Disposal Site</td>
<td>The contractor shall provide written documentation identifying the disposal facility prior to generating any waste.</td>
<td></td>
</tr>
<tr>
<td>Waste Transport</td>
<td>Written documentation is required verifying that the vehicle used for shipment is permitted to transport the designated paint waste in accordance with 6 NYCRR Part 364 for the type of waste being transported.</td>
<td></td>
</tr>
<tr>
<td>Paint Waste Testing</td>
<td>The contractor is responsible for testing paint waste to satisfy the requirements of the disposal facility or waste transporter, once the waste has been generated and placed into containers. Representative sampling needs to be performed from containerized material. Paint chip sampling and testing from the structural steel is not considered representative for waste classification purposes.</td>
<td></td>
</tr>
<tr>
<td>Waste Profile Certification</td>
<td>As a co-generator of the waste, the contractor is permitted to sign any necessary waste profile certification required by the transporter or waste facility. The EIC may provide a letter or email authorizing the contractor to certify the waste profile.</td>
<td></td>
</tr>
<tr>
<td>Storage Containers</td>
<td>Capacity of each container shall be clearly marked on the container. Containers shall be clean, dry, weatherproof and watertight. Containers must be able to be securely sealed.</td>
<td></td>
</tr>
<tr>
<td>Container Labeling</td>
<td>All containers shall be labeled in accordance with the specification prior to filling. Barrels containing non-hazardous waste shall also have a sticker stating the contents are non-hazardous. Barrels that include asbestos paint coatings shall also have a sticker stating the contents are asbestos.</td>
<td></td>
</tr>
<tr>
<td>Temporary on-site storage of waste</td>
<td>May be stored at the site of generation without special waste facility permits. Contractor inspections of hazardous waste containers required to be performed weekly and documented. Containers shall have adequate aisle space to allow for full inspection and access during an emergency response Storage must be at the bridge or site of origin, and located outside the clear zone or behind guiderail. If the project site lacks adequate storage areas, the NYSDOT CEC will coordinate with the NYSDEC to select an alternative location that is within the NYSDOT ROW, and as close to the bridge of origin as possible (may include nearby NYSDOT Maintenance facilities). Contract Special Note(s) may include additional onsite storage requirements. Per § 571-3.06, paint removal waste shall be in transit to the disposal site from the site of generation no later than 45 calendar days unless otherwise approved by the Engineer, but no longer than 90 days.</td>
<td></td>
</tr>
<tr>
<td>Shipping documents</td>
<td>Annual reporting to NYSDEC associated with shipment of non-hazardous paint waste is the responsibility of the Part 364 permitted transporter. Transporters may require a non-hazardous waste manifest.</td>
<td>A hazardous waste manifest is required. The contractor is responsible for completing the manifest, but the EIC is responsible for verifying information prior to signing.</td>
</tr>
<tr>
<td>Estimating waste quantities</td>
<td>One 55-gallon drum = 600 pounds of painted steel paint removal waste. One 55-gallon drum = 1,000 pounds of unpainted weathering steel removal waste.</td>
<td></td>
</tr>
<tr>
<td>Payment Documentation</td>
<td>Copies of disposal facility receipt/weight tickets are required to be returned to the EIC to verify quantities and confirm waste was properly disposed before final payment may be made.</td>
<td></td>
</tr>
</tbody>
</table>
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

SECTION 571 EXHIBIT B – STORAGE CONTAINER AND LABEL INSPECTION

Container Inspection
- Containers must be labeled per specification prior to use
- Capacity is clearly marked on each container
- Condition is good with no defects or damage, is weatherproof and watertight. Closure can be securely sealed
- Containers shall have adequate aisle space to allow for full inspection and access during an emergency response
- Contractor required to have written documentation of the weekly inspections of the containers containing hazardous waste

Label Inspection
- Container needs to be labeled with the words “Hazardous Waste”
- Hazardous lead paint containers require also require a “Toxic” hazard label for the characteristic that caused the waste to be classified as hazardous
- Barrels containing “Non-hazardous Waste” are also required to have the appropriate label
- Barrels that include asbestos paint coatings shall have a separate asbestos sticker
- Generator’s name and address, EPA Id Number AND the EPA Waste Manifest Number
- The first date of accumulation must be noted
- Label is legible and in good condition
**SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE**

**SECTION 571 EXHIBIT C – HAZARDOUS PAINT WASTE MANIFEST**

NOTE: The Transporter will usually have the manifest filled out before they arrive on-site. The NYSDOT Inspector or EIC must verify the information is correct.

**Box 1** Generator EPA ID Number:  *NYD__________,* Verify number provided.

**Box 2** Page Number: Verify “I” unless a manifest continuation sheet is required.

**Box 3** Emergency Response Phone: Verify “I-800-255-3924” (This is the number for Chem.-Tel, Inc.)

**Box 4** Manifest Tracking Number: This number is pre-printed on the manifest

**Box 5** Generator’s Address:  *

*NYSDOT Construction Office D______,

NYSDOT Regional Address

Attention: Regional Construction Environmental Coordinator

Generator Phone: Insert office phone number for Construction Environmental Coordinator
Generator’s Site Address: Verify, BIN #, State Rt. # and location and/or other site identifier

**Box 6** Transporter 1: Verify name of transporter and their unique EPA ID Number is present.

**Box 7** Transporter 2: Verify blank unless a second transporter will carry the waste. If so, insert name of second transporter and their unique EPA ID Number.

**Box 8** Disposal Facility: Verify name, address and phone number of disposal facility and their unique EPA ID Number is present

**Box 9a** Leave box blank unless you are shipping both hazardous waste and non-hazardous waste. Insert an “X” next to each hazardous waste.

**Box 9b** USDOT Description: Verify “RQ, NA3077, Hazardous Waste, Solid, N.O.S. (D008), Class 9, PG III”

**Box 10** Containers: Verify total number and appropriate abbreviation for type of containers being shipped. *DM* – Metal drum, (includes roll offs)

**Box 11** Total Quantity: Verify weight of waste based upon Item 571.03(EB 18-006), Estimates use 600lbs./55 gal barrel (DM). Do not include weight of container.

**Box 12** Unit of Weight: Verify appropriate weight abbreviation, such as “P” for pounds or “T” for tons.

**Box 13** Waste Code: Verify “D008” in first box.

**Box 14** Special Instructions: As necessary.

**Box 15** Generator’s Certification: *NYSDOT Inspector or EIC must sign and date manifest*

- After Boxes 1-15 are complete and the Transporter signs Box 17, the Transporter will leave one of the carbon copies of the manifest with you (GENERATOR’S INITIAL COPY). This manifest is to become part of the project records.
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

and should be submitted with the DWR for entry into the site manager system. **MAKE A LEGIBLE PHOTO COPY** of the generators initial manifests and send it to the regional hazardous waste coordinator.
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

SECTION 571 EXHIBIT D – NYSDOT TP 550 FORM INSTRUCTIONS

These instructions apply to typical bridge rehab/painting projects where structural steel paint is removed by abrasive blasting or other mechanical means without the use of solvents or chemical strippers. Keep in mind that this is separate from the Regulatory annual NYSDEC reporting. When to File:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Generation Period from manifest</th>
<th>Due Date NYSdot Accounting</th>
<th>Due Date NYSdot Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January, February &amp; March</td>
<td>April 20th</td>
<td>April 5th</td>
</tr>
<tr>
<td>2</td>
<td>April, May &amp; June</td>
<td>July 20th</td>
<td>July 5th</td>
</tr>
<tr>
<td>3</td>
<td>July, August &amp; September</td>
<td>October 20th</td>
<td>October 5th</td>
</tr>
<tr>
<td>4</td>
<td>October, November &amp; December</td>
<td>January 20th</td>
<td>January 5th</td>
</tr>
</tbody>
</table>

At NYSDOT there is a distinct advantage over the typical generator of hazardous waste, in terms of reporting. While the average generator may have many varieties of wastes and multiple disposal methods to deal with, NYSDOT has a USEPA ID # for each individual bridge/pair of bridges and typically uniform disposal information for the paint waste generated. For your convenience, use a spreadsheet (like Excel) to keep track of the USEPA ID#s of your bridges. USEPA ID#s are in the project proposal or the Regional Construction Environmental Coordinator (CEC) can be contacted.

The NYS Form TP-550’s are completed quarterly by the Regional Hazardous Waste Coordinator based upon final manifest date in Box 20. Use a different form for each bridge. Complete the top of the form (using the USEPA ID# listed on the manifests), then file it with your manifests (which should be segregated by bridge). Once weight tickets are received, complete the remainder of the form. To get a form, go to https://www.tax.ny.gov/pdf/current_forms/haz/tp550_fill_in.pdf

**LINE INSTRUCTIONS** – Computation of net tons of material subject to assessment fees for the quarter.

**Line 1** - Enter the total tonnage of waste disposed of from the subject bridge.

**Lines 2, 3, 4, & 5** - will likely remain blank. These items do not generally apply to NYSDOT.

**Line 6** - Usually, the number in line 6 will be the same as the number in line 1

**Line 7** - Will be blank. NYSDOT does not place hazardous wastes in on-site landfills.

**Line 8** - Check the management method code on the copy of the manifest(s) received from the facility against the NYSDEC conversion chart below.

- If the state handling code (box 19 on the manifest) is L, enter the total weight from line 6 into line 8.
- Multiply the tonnage by $27 rate listed and enter the total as the assessment number.

**OR**

**Line 9** - Check the management method code on the copy of the manifest(s) received from the facility against the NYSDEC conversion chart below.

- If your state handling code (box 19 on the manifest) is T, enter the total weight from line 6 into line 9.
- Multiply the tonnage by $16 rate listed and enter the total as the assessment number.

**Lines 10 & 11** - will usually remain blank (unless the waste is not bridge-paint waste).

**Line 12** - Should contain the totals of lines 7-11, which should also match the total in line 6.

**Line 13** - Enter the sum of dollar values from lines 7-11. If this is amount is $27 or less, then no payment is required for this bridge in this quarter.

**Lines 14, 15 and 16** - If the form is filed on time, there will be no interest or late fees. Because of the accounting process involved in getting these paid, there is no way to calculate late fees and/or interest. Accounting will adjust these if necessary, so leave those lines blank. Get your TP-550’s to MO Accounting Attn: John VanDeloo. No later than the 5th day of the month that they are due (January 5th, April 5th, July 5th, or October 5th) so that we don’t pay late fees and interest.
SECTION 571 – DISPOSAL OF PAINT REMOVAL WASTE

SECTION 571 EXHIBIT D – NYSDOT TP 550 FORM INSTRUCTIONS

Line 17 - Enter the total remittance into line 17. This should be the same amount as in line 13.

Final Steps -
1. Complete the certification section as the authorized person
2. Insert your official title
3. Date the completed form
4. Scan and email or send a copy of the form to accounting and to the Regional Hazardous waste coordinator.

Hazardous Waste Management Method Code Conversion Table (WWW.dec.ny.gov/chemical/23914.html)

<table>
<thead>
<tr>
<th>DEC Handling Code*</th>
<th>Management Method Code</th>
<th>Reclamation and Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Destruction or Treatment Prior to Disposal at Another Site</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>H040</td>
<td>Incineration - thermal destruction other than as a fuel (includes any preparation prior to burning)</td>
</tr>
<tr>
<td>T</td>
<td>H070</td>
<td>Chemical treatment (reduction/destruction/oxidation/ precipitation); do not include immediate treatment in an exempt wastewater treatment unit with discharge to a NPDES-POTW (unless required by state)</td>
</tr>
<tr>
<td>T</td>
<td>H081</td>
<td>Biological treatment; do not include immediate treatment in an exempted wastewater treatment unit with discharge to a NPDES-POTW (unless required by state)</td>
</tr>
<tr>
<td>T</td>
<td>H100</td>
<td>Physical treatment only (adsorption/absorption/separation/ stripping/dewatering); do not include immediate treatment in an exempted wastewater treatment unit with discharge to a NPDES-POTW (unless required by state)</td>
</tr>
<tr>
<td>T</td>
<td>H110</td>
<td>Stabilization prior to land disposal at another site (encapsulation/stabilization/fixation)</td>
</tr>
<tr>
<td>T</td>
<td>H120</td>
<td>Combination of chemical, biological, and/or physical treatment; do not include immediate treatment in an exempted wastewater treatment unit with discharge to a NPDES-POTW (unless required by state)</td>
</tr>
<tr>
<td>T</td>
<td>H121</td>
<td>Neutralization only (no other treatment)</td>
</tr>
<tr>
<td>T</td>
<td>H122</td>
<td>Evaporation (as the major component of treatment; not reportable as H070, H081, H100 or H120)</td>
</tr>
<tr>
<td>T</td>
<td>H129</td>
<td>Other treatment that does not include on-site disposal (specify in comments)</td>
</tr>
<tr>
<td><strong>Disposal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>H131</td>
<td>Land treatment or application (to include on-site treatment and/or stabilization)</td>
</tr>
<tr>
<td>L</td>
<td>H132</td>
<td>Landfill or surface impoundment that will be closed as landfill (to include on-site treatment and/or stabilization)</td>
</tr>
<tr>
<td>L</td>
<td>H134</td>
<td>Deepwell or underground injection (with or without treatment)</td>
</tr>
<tr>
<td>T</td>
<td>H135</td>
<td>Discharge to sewer/POTW or NPDES (with prior storage - with or without treatment)</td>
</tr>
<tr>
<td><strong>Storage and Transfer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>H141</td>
<td>Storage, bulking, and/or transfer off site - no treatment/recovery (H010-H129), fuel blending (H061), or disposal (H131-H135) at this site</td>
</tr>
</tbody>
</table>

* The Handling Codes provided in this conversion table reflect the disposal method for the Hazardous Waste Management Method Code provided in Box 19 of the Hazardous Waste Manifest Form. Note, the Management Method Code in Box 19 describes the way in which the waste is to be managed by the first Treatment, Storage, and Disposal Facility (TSDF) to receive the waste (as provide in Box 8 of the manifest form). However, further management of a hazardous waste may occur subsequently. The manifest form must provide the Handling Code for the ultimate disposal of a hazardous waste, and therefore may be other than those provided in the conversion table.
582-3.02 Removal of Unsound Concrete

Concrete is usually evaluated by “sounding” it with an approximately 1.36 KG (3 lb.) hammer. When struck, sound concrete will produce a “solid” sound, while unsound concrete will produce a “hollow” sound. A rough surface, however, makes this more difficult (the hammer hits and breaks protrusions, instead of hitting a flat surface), and thus more care is needed to detect unsound areas.

In many construction situations, it is too noisy to hear very well. Another technique to detect unsound areas is to place your hand flat on the concrete surface. Then, hit the surface close to your hand with a hammer. Vibrations from unsound areas will be readily felt by your fingers. No vibrations will be felt in sound areas. Move your hand along the surface as you hit the concrete to find the limits of delaminated areas. Closing your eyes forces you to concentrate on the vibrations and where they end. Of course, be careful you don’t accidently hit your fingers.

Unsound concrete is also characterized by the following:

1. After chipping, pieces can be pulled off with a finger or pried off with a knife.
2. After blast cleaning, pieces can still be pulled off with a finger or pried off with a knife.
3. Abrupt (right angle) recessed corners with visible lines at the bottom. These lines indicate fracture planes.
4. Fractured aggregate faces that contain discolorations or rings.
5. Discolored concrete or closely spaced visible cracks.
6. Any “hollow” sounding areas detected on a prepared surface. (Always resound areas ready for repair.)

Also see Exhibit 582-A, B, and C for guidance on concrete scaling, spalling and cracking.
SECTION 583 - SHOTCRETE

General
The most important aspect of shotcrete is surface preparation.
Shotcrete application is very dependent on three main factors: materials, equipment, and skill of the applicator. Only pre-approved materials are allowed for use in shotcrete. The best results are obtained from an experienced applicator using good equipment. Shotcrete characteristics (compressive strength, bond, durability, etc.) are significantly affected by application. Therefore, it is very important to be familiar with correct shotcrete practice to monitor the work.

The most comprehensive, up-to-date information, with detailed instructions, descriptions and problem solving suggestions, is included in A.C.I. 506R-90 “Guide to Shotcrete”. Copies of this manual are available through the Regional Materials Engineer and the Materials Bureau in Albany.

583-1.02 Definitions
There are two approved methods of shotcrete application: Dry Mix and Wet Mix, with Dry Mix being predominant. If Wet Mix is proposed for use, please contact the Materials Bureau in Albany at (518) 457-5956 for air and slump information, (never added to our Specification Books), or for other shotcrete related matters.

583-2 Materials
The addition of small quantities of Approved List pozzolans may also be approved by the Materials Bureau on a project by project basis, either individually or as blended cement. Microsilica enhances adhesion, especially for overhead work, and results in less waste. Fly ash and microsilica reduce permeability and shrinkage by making shotcrete denser.

Prebagged Shotcrete Material
If this material is proposed for use, please call the Materials Bureau in Albany at (518) 457-5956 as soon as possible, and submit a formal request.

583-2.02 Qualification Test
Qualification test panels may be cut or broken such that the interior of the panel and its reinforcement is exposed. Usually, the best face to examine is a clean, fractured one. Things to look for inside the panel are:

A. Voids: A prime concern is voids behind reinforcement. This is very detrimental and requires a re-evaluation of the placement procedure and applicator technique. Increased care, closer proximity and/or the use of a blowpipe, should rectify this problem.

Scattered voids are also a problem when numerous, large, or interconnected. This can be caused by overly dry material, poor equipment or applicator error.

B. Dry Pockets and Sand Lenses (Streaking): These problems are predominantly encountered in the Dry Mix procedure. A layered and streaked appearance could mean problems with the moisture content of the material (See C.I.M. Section 583-3.02, Preparation of Material), or operation of the equipment. If the equipment is inadequate, material propelled to the nozzle may not be a smooth, continuous flow, and slugging may occur in the hose. Also, the nozzle chamber should combine the cement and sand mixture with a constant flow of water to produce a uniform spray. The nozzle operator should recognize a too dry or wet spray, and be able to adjust the amount of water added. Work should not proceed until acceptable visual results are obtained. Additional qualification test panels should be requested whenever changes in conditions, personnel, location, equipment, etc. affect the quality of placement.

Also, when unusual shooting circumstances arise, such as shooting at an angle, in tight corners, in narrow slots, etc., have a qualification test panel made to duplicate that shape. After the operator
shoots that panel in circumstances similar to the actual site, remove the sides of the panel to inspect how well the shotcrete filled the panel area. Allow other tries if warranted. Then decide if that work should be done with shotcrete, another material or another method.

583-3.01 Surface Preparation
A. Concrete Structures:
   See C.I.M. Section 582-3.02 Removal of Unsound Concrete.

Wire Fabric Installation (All Locations):
Provide shotcrete as much space and the least impedance to the repair surface as possible. In most cases, position the wire fabric parallel to the finished grade. Minimize lapping and maximize the space between layers. Also, do not utilize more than 1 overlap. Cut away additional layers or make sure the wires line up with each other.

583-3.02 Preparation of Materials
A. General:
   It is very important that sand moisture content be maintained in the 3 to 6% range. If not, the cement may not stick to the sand, and be blown away. A quick test to determine adequate moisture content is to squeeze a ball of damp sand in your hand. If it is too dry, it falls apart. If it retains its shape and leaves no free moisture on your hand, it is okay.

B. Dry Mix Process:
   Wetting agents break down the surface tension of water and thus work as a water reducer. Air entraining agents also act as wetting agents, but in the case of dry mix shotcrete, little or no air is entrained.

C. Wet Mix Process:
   Wetting agents break down the surface tension of water and thus work as a water reducer. Air entraining agents also act as wetting agents, and in the case of wet mix shotcrete, a normal amount of air is entrained in the mixing process, but half or more is lost during the application process.

583-3.03-C. Quality Control
   Shotcrete application is an art. A simple suggestion for providing a quick way to monitor shotcrete quality and eliminate problems before proceeding further is as follows:

   When test panels are made, or whenever it is felt necessary, have the shotcrete applicator make an additional “sample” (smaller and unformed) on any suitable surface, including firm ground. Break this sample open as soon as practical and inspect it for deficiencies (as defined in C.I.M. Section 583-2.02 Qualification Test above). If problems exist, have the Contractor correct them, and check by having more samples made. When the deficiencies are corrected, have a quality control test panel made for laboratory evaluation.

1. Test Panels:
   All shotcrete quality control test panels sent to the Materials Bureau should arrive at the Laboratory within 14 days from date sampled. Each individual panel needs to be accompanied by one BR 240a form, filled out with the appropriate information as shown in Exhibit 583-A.

2. Test Results:
   At the Laboratory, 50 mm diameter cores will be drilled from the panels, tested for compression, and strengths reported to the Engineer. Additional information on the condition of the shotcrete, such as sand pockets, voids, and laminations, will also be reported with the strength results.

If the Contractor desires, and the Engineer approves, six 50 mm diameter cores may be taken from
each panel at the job site, under the direct supervision of the Engineer, and packaged for transmittal. The Engineer will fill out a BR 240 form for each set of cores (see test panels above), include it with the cores, and seal each package for transmittal to Albany for testing.

3. Coring:
If interconnected voids are found, the structural element represented by that core is rejected. Interconnected voids are defined the same as for the Qualification Panel; individual, isolated voids less than 25 mm in any direction, as determined by the Engineer.

If coring through in-place reinforcement would jeopardize the design integrity of any structural element, dummy rebars of the same size may be placed in the structure for coring purposes before shotcreting, and their locations carefully marked. One or more of these dummy areas may then be cored, as determined by the Engineer. Make sure that the shotcrete operator uses the same shotcreting shooting procedures everywhere.

Screed Finish - requires that the shotcrete be built up slightly over the guides and allowed to stiffen to the point where screening will not pull or crack the surface.

Broom Finish. Use a stiff bristle broom and keep it clean.

Flash Coat Finish. Details of this finish are in the A.C.I. Guide To Shotcrete.

583-3.03-E. Curing
Curing compound (or any other type of coating, sealer, etc.) should not be used between lifts or layers because they act as bond breakers. If inadvertently used, it must be totally removed before commencing to shotcrete.

Although shotcrete is a fairly dense, low slump concrete, it is still very susceptible to drying shrinkage due to its small particle size and extensive, exposed surface area. The best cure is a wet cure. Apply all cures quickly.

Reference
A.C.I. 506R-90, Guide to Shotcrete
## SECTION 583 - SHOTCRETE

### SHOTCRETE

<table>
<thead>
<tr>
<th>BR 240a Box Number and Title</th>
<th>Appropriate Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Material -</td>
<td>Shotcrete (Specify Dry or Wet Process)</td>
</tr>
<tr>
<td>2) Item No. -</td>
<td>583</td>
</tr>
<tr>
<td>3) Date Sampled No. -</td>
<td>Date Panel Was Shot</td>
</tr>
<tr>
<td>4) Contract No. -</td>
<td>DXXXXXX</td>
</tr>
<tr>
<td>5) Supplier and Location -</td>
<td>Cement Supplier and Location</td>
</tr>
<tr>
<td>6) Quantity in Lot -</td>
<td>One</td>
</tr>
<tr>
<td>7) Lot No. -</td>
<td>If Applicable</td>
</tr>
<tr>
<td>8) Manufacturer and Location -</td>
<td>Applicator's Company Name and Location</td>
</tr>
<tr>
<td>9) Batch No. -</td>
<td>If Applicable</td>
</tr>
<tr>
<td>10) Date of Manufacture -</td>
<td>Should be same as 3)</td>
</tr>
<tr>
<td>11) Sampled At -</td>
<td>Job</td>
</tr>
<tr>
<td>12) Type -</td>
<td>Control Sample</td>
</tr>
<tr>
<td>13) Sampled From -</td>
<td>Location of Application on Job Site</td>
</tr>
<tr>
<td>14) Sampled By -</td>
<td>Region No. and Inspector's Name</td>
</tr>
<tr>
<td>15) Contractor and Project Location</td>
<td>Contractor and Project Location</td>
</tr>
<tr>
<td>16) Additional Info -</td>
<td>Job Site Location</td>
</tr>
<tr>
<td></td>
<td>Cement Type No.</td>
</tr>
<tr>
<td></td>
<td>Approved Sand Source No. (From Current Approved List of</td>
</tr>
<tr>
<td></td>
<td>“Sources of Fine and Coarse Aggregate”)</td>
</tr>
<tr>
<td></td>
<td>Sand/Cementitious Material Ratio</td>
</tr>
<tr>
<td></td>
<td>Additives (Microsilica, Air Entrain., etc.)</td>
</tr>
<tr>
<td></td>
<td>Shooting Position (Vertical, Overhead or Horizontal)</td>
</tr>
</tbody>
</table>

Exhibit 583-A
Related Instruction

Specialized overlays play a key role in extending the life of a reconstructed structural slab. The purpose of such overlays is to create an impermeable layer of concrete to prevent chlorides from attacking the top mat of bar reinforcement. To ensure that this layer works effectively, it is very important that the overlay is placed in a careful and conscientious manner. When these specialized overlays are improperly placed and/or cured, the resulting layer offers no more, and possibly less, protection to the deck than a normal concrete overlay.

The two types of overlay material available are Microsilica Concrete and Class DP Concrete. Microsilica is the denser and less permeable of the two. Microsilica concrete is more susceptible to cracking especially in thicker placements. This is why Microsilica should be properly cured and not used in placements over 75 mm. Microsilica is also stickier and more difficult to finish. Microsilica concrete requires the use of a High Range Water Reducer (Type F Water Reducing Admixture) also known as a Superplastisizer.

Class DP Concrete is standard Class D concrete modified with flyash and microsilica. It is easier to finish and work with than the Microsilica Concrete. It makes a good substitute to microsilica on decks having 100% rebar mat exposure. Class DP concrete can be used in any situation where Class D concrete is applicable. The use of a High Range Water Reducer is not allowed nor necessary in Class DP concrete.

Three methods of placement are open to the Contractor depending on the material and existing conditions. The methods are as follows:

**Method 1 - Separate Placements:**

This has been the standard method. When any amount of the top mat of bar reinforcement is exposed, the Contractor will place a layer of slab reconstruction concrete, either Class D or DP, and after the proper curing period, apply a Microsilica Concrete overlay.

**Method 2 - Integral Placement of Microsilica Concrete:**

One placement of Microsilica Concrete is applied to the bridge deck. This is applicable when there is no exposure of the top mat of bar reinforcement and the overlay thickness is not over 75 mm. This method may also be used when the following conditions exist:

A. The area of the exposed top mat of bar reinforcement is 5% or less of the placement area, per span.

B. No individual area of the exposed top mat of bar reinforcement exceeds 2.5 m².

C. No dimension of any area of the exposed top mat of bar reinforcement exceeds 2 m.

When these conditions are met and this method used, the Microsilica Concrete will serve as the slab reconstruction concrete in the areas of exposed top mat of bar reinforcement. The noted restrictions are necessary due to the increased difficulty in consolidating Microsilica Concrete and increased probability of cracking, especially in deeper placements.

**Method 3 - Integral Placement of Class DP Concrete:**

One placement of Class DP concrete is applied. This method may be used when 100% of the top mat of bar reinforcement is exposed. This method provides the Contractor with the option of removing the entire top layer of concrete and replacing it with a single placement of Class DP concrete.
concrete which in many situations may be quicker and more cost effective than selective removal. This will also provide a more durable end product since the entire top layer of old concrete is replaced with new, more impermeable Class DP overlay concrete. Class DP requires an extended wet cure as compared to microsilica concrete, 7 days versus 4 days.

To ensure that the overlay is properly placed and cured, it is important that no details are overlooked, no matter how minute they may seem. These overlays are very sensitive and require conformance to all relevant specifications. Sections 555 and 557 of the Construction Inspection Manual should be thoroughly reviewed prior to beginning work on the project.

The following table outlines the sequence of events for the three methods of placement. Following the table are suggestions for improving the quality of the concrete overlay.

<table>
<thead>
<tr>
<th>METHOD 1</th>
<th>METHOD 2</th>
<th>METHOD 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overlay Thickness</strong></td>
<td><strong>Overlay Thickness</strong></td>
<td><strong>Overlay Thickness</strong></td>
</tr>
<tr>
<td>40 mm Min - 75 mm Max.</td>
<td>40 mm Min - 75 mm Max.</td>
<td>60 mm Min - 75 mm Max.</td>
</tr>
<tr>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
</tr>
<tr>
<td>All Conditions (This method is acceptable whenever re-bar is exposed)</td>
<td>Less Than 5% and No Individual Area &gt; 2.5 m² and No Individual Dimension &gt; 2.0 m</td>
<td>100% Exposure</td>
</tr>
<tr>
<td><strong>Construction Sequence</strong></td>
<td><strong>Construction Sequence</strong></td>
<td><strong>Construction Sequence</strong></td>
</tr>
<tr>
<td>1 Selective or total removal of old concrete top layer</td>
<td>Selective or no removal of old concrete top layer</td>
<td>Total removal of old concrete top layer</td>
</tr>
<tr>
<td>2 Blast Cleaning</td>
<td>Blast Cleaning</td>
<td>Blast Cleaning</td>
</tr>
<tr>
<td>3 Preplacement Wetting (12 hrs. Min.)</td>
<td>Preplacement Wetting (12 hrs. Min.)</td>
<td>Preplacement Wetting (12 hrs. Min.)</td>
</tr>
<tr>
<td>4 Bonding Grout Placement</td>
<td>Bonding Grout Placement</td>
<td>Bonding Grout Placement</td>
</tr>
<tr>
<td>5 Placement of Class D or DP Slab Reconstruction Concrete</td>
<td>Placement of Class D or DP Slab Reconstruction Concrete</td>
<td>Placement of Class D or DP Slab Reconstruction Concrete</td>
</tr>
<tr>
<td>6 Finishing and Texturing</td>
<td>Finishing and Texturing</td>
<td>Finishing and Texturing</td>
</tr>
<tr>
<td>7 3 Day Wet Cure</td>
<td>3 Day Wet Cure</td>
<td>3 Day Wet Cure</td>
</tr>
<tr>
<td>8 Blast Cleaning</td>
<td>Blast Cleaning</td>
<td>Blast Cleaning</td>
</tr>
<tr>
<td>9 Preplacement Wetting (12 hrs, Min)</td>
<td>Preplacement Wetting (12 hrs, Min)</td>
<td>Preplacement Wetting (12 hrs, Min)</td>
</tr>
<tr>
<td>10 Bonding Grout Placement</td>
<td>Bonding Grout Placement</td>
<td>Bonding Grout Placement</td>
</tr>
<tr>
<td>11 Placement of Microsilica Overlay Concrete</td>
<td>Placement of Class DP Overlay Concrete</td>
<td>Placement of Microsilica Overlay Concrete</td>
</tr>
<tr>
<td>12 Finishing and Texturing</td>
<td>Finishing and Texturing</td>
<td>Finishing and Texturing</td>
</tr>
<tr>
<td>13 4 Day Wet Cure</td>
<td>7 Day Wet Cure</td>
<td>4 Day Wet Cure</td>
</tr>
<tr>
<td>14 Saw Cut Grooving</td>
<td>Saw Cut Grooving</td>
<td>Saw Cut Grooving</td>
</tr>
<tr>
<td>15 Penetrating Sealer Application</td>
<td>Penetrating Sealer Application</td>
<td>Penetrating Sealer Application</td>
</tr>
</tbody>
</table>
I. Construction Operations

1. Removal of Old Concrete:
All deteriorated and unsound concrete (based on half-cell potentials, sounding, and/or chloride contents) should be removed to 25 mm around the top mat of bar reinforcement. Removal should be done using maximum 20 kg chipping hammers equipped with minimum 50 mm wide chisel tips. No pick tips should be used. Bush hammers should not be used due to the micro cracking caused by this type of equipment. For large areas of removal, hydro demolition has been found to be very cost effective.

2. Blast Cleaning
One of the most important factors affecting the performance of reconstruction and overlay concrete is the bond strength between new and existing concrete. After damaged, or unsound concrete has been removed, a fine layer of powder exists on the concrete substrate. This must be removed along with any residual dirt or grease. High pressure air will not always remove the entire layer of dust. Sand blasting, shot blasting, or high pressure water blasting will do a sufficient job. The substrate can be considered clean when 50% of the coarse aggregate can be seen. If the dust and dirt are not removed, the slab reconstruction concrete will not bond to the deck, which leads to delaminations.

   A. Blast Cleaning Checklist
   1. Make sure the surface is clean after blast cleaning.
   2. The surface must be free of grease, dirt, loose concrete, mortar and loose or injurious rust on the reinforcement.
   3. Additional blast cleaning may be required if more than 48 hours pass before bonding grout placement or if the prepared surface is contaminated.

   B. Position of the Top Mat of Bar Reinforcement
After all deteriorated concrete has been removed, care has to be taken to ensure that the top mat of bar reinforcement is in the correct position. If the reinforcement is out of position from being walked on, the new concrete will not encapsulate it and voids will form. These voids will reduce the bond strength and eventually lead to deterioration of the deck. To ensure that the steel mat is stationary, chairs and tie downs may be necessary.

3. Structural Slab Wetting
Care must be taken to make sure that overlay concrete will properly bond to the structural deck. If an inferior bond is formed, the deck will soon delaminate and require repairs. The slab must be thoroughly wet to a saturated-surface dry (SSD) condition. A minimum wetting period of 12 hours, immediately prior to placement of all concrete overlays is necessary. The soaking of the deck allows the bonding grout to better adhere to the structural concrete. If this step is not performed, the existing concrete will absorb water from the bonding grout and overlay concrete, causing the materials to dry out prematurely, creating a weak bond between the structural deck and the overlay concrete. There is also an increased potential for cracking in the overlay.

4. Bonding Grout
   A. Material - §705-22
Bonding grout is simply a 50/50 mix of cement and sand with enough water to form a slurry with the consistency of thick cream. The sand and cement should be thoroughly mixed for one minute before the water is added to the mortar mixer.

   B. Purpose
The grout acts as a glue between the new concrete and existing concrete. To assure a good bond, the
C. Application
There should be no standing water on the deck at the time of grout placement. Apply the grout in an even coat 3 mm ± 1.5 mm thick. Brushing on the grout with stiff brooms is an effective application procedure. If there is too much grout or not enough, the bond strength will be weaker.

D. Application Rate
In most cases the grout can be applied faster than the new concrete can be placed. Never allow the grout to be placed so far ahead of the new concrete that the grout dries out before the new concrete is placed over it. In most cases the grout placement should progress approximately 1 m - 1.5 m in front of the concrete placement. If the grout dries before placement of the new concrete, the new concrete will not bond to the deck. When this occurs the grout must be removed by blast cleaning and re-applied. **Under no circumstances should re-tempering the grout be allowed.**

5. Placement of Slab Reconstruction Concrete
A. Environmental conditions during placement.
It is essential that the new concrete properly bond to the existing concrete and reinforcement. If an adequate bond is not developed, cracking and delaminations will occur. Several simple things can be done to ensure that the concrete is being placed in the best possible environment.

1. Temperature and Evaporation
While the temperature is not something that can be controlled, it is important not to ignore it. The contractor must supply an adequate recording thermometer to keep track of the substrate surface temperature. Differences between the substrate temperature and the temperature of the new concrete overlay should be kept to a minimum. Excessive temperature variation can cause cracking and debonding.

The ambient temperature has a great effect on the properties of concrete as well. Ambient temperature affects the speed at which concrete "sets up" and cures. If the ambient temperature is high, the concrete will set up quickly. If the ambient temperature is low, the concrete may not set up fast enough and cold weather placement procedures may be necessary. Either of these conditions will have adverse effects on the quality of the hardened concrete.

Using the temperature readings in conjunction with the relative humidity and the wind speed, the EIC or Inspector should calculate the hourly evaporation rates using Table 555-3 from the Standard Specifications book. If the evaporation rate is high, even when the temperature is not, no concrete should be placed. High evaporation rates will greatly increase cracking of the deck by drawing water out of the plastic concrete, causing shrinkage cracks. Conditions of low humidity (below 50%), high temperatures (30°C and above), and excessive wind velocity (20 kph and up), can cause the evaporation rate to exceed the bleeding rate. This will cause a crust to form on the surface of the plastic concrete, even when retarders are used, and may result in screeding and finishing problems. When the above unfavorable conditions are unavoidable, the use of a fog spray may be used but with caution or a wind screen is recommended. Water from fog sprays cannot be worked into the concrete surface during finishing wind screen is recommended. Also, if high temperatures are expected during the day, it may be necessary to place concrete at night.

2. Traffic
Another factor that is believed to contribute to the cracking of concrete, particularly with respect to decks, is traffic. The vibrations caused by traffic on bridges during the concrete's initial set can cause cracking. To reduce the cracking associated with this, traffic should be provided a smooth riding surface through the construction zone. A smooth transition from pavement to approach slab to deck should be provided to reduce bouncing of vehicles. Acceleration or deceleration of vehicles on the
structure should be reduced as much as possible. The flow of traffic should be maintained at a constant rate. The operating speed of traffic should be reduced as much as possible; a speed limit below 55 kph is recommended for the first 24 hours. This will help to reduce vibrations during the most critical period.

B. Placement

In all cases, the Contractor has the option of placing slab reconstruction concrete separately from the specialized overlay as long as the procedures for separate placements are followed. This includes the additional surface preparation and cure times.

Method 1 - Separate Placements
Whenever possible, it is desirable to have a uniform overlay thickness. Variations in the concrete overlay thickness should be kept to a minimum. Overlay concrete is more difficult to consolidate and finish, especially in thicker placements. Variations in thickness increase the chance for cracking as well. In situations where the placement thickness varies to a high extent (over 25 mm) throughout the placement area, it is advisable to place a separate layer of slab reconstruction concrete first. In most cases this material will be either Class D or Class DP concrete. It is essential that the slab reconstruction concrete is properly vibrated to insure consolidation and encapsulation of the reinforcement.

Method 2 and 3 - Single Placements - See 11. Overlay Concrete Placement.

6. Finishing and Texturing of Slab Reconstruction Concrete
For areas of exposed reinforcement less than 2.5 m², hand finishing is allowed but excessive hand finishing should be avoided. For areas greater than 2.5 m², use either the same machine which will finish the overlay or a manually driven vibrator equipped power screed from the Department’s Approved List. Make sure that the equipment is in good working condition and properly set up.

The slab reconstruction concrete should be screeded to the level of the surrounding concrete or in cases where there is 100% exposure, to 10 mm minimum over the top mat of bar reinforcement.

This is essential in order to maintain the proper cover over the reinforcement. The surface should then be roughened with a tinning rake, broom or similar device to provide a good bonding surface for the overlay concrete.

7. Curing of Slab Reconstruction Concrete
The curing covers must be applied as soon as possible after texturing. The slab reconstruction concrete has to be continuously wet cured for a minimum period of 3 days. The wet burlap and curing cover option is not allowed.

8. Blast Cleaning of Concrete Slab
The bonding of the overlay to the concrete slab is essential for the overlay to reach its full life expectancy. Laitance, dirt and other contaminants will be present on the new slab reconstruction concrete and any pre-existing concrete surface. Follow the recommendations noted in 2. Blast Cleaning.

9. Prewetting for Overlay Placement
The deck must be prewet for at least 12 hours immediately before the application of the bonding grout. At the time of bonding grout application, the deck should be in a saturated surface dry condition (SSD) but there should not be any standing water (puddling) present. Sprinklers can be shut off just prior to the start of placement, however, excessive water will negatively affect the bond between the overlay, bonding grout and deck. Standing water can be removed with a broom or by air blasts.
10. Bonding Grout for Overlay Placement
Again proper placement of the bonding grout is essential to achieve good bond. The grout must not be applied too far ahead of the overlay placement. Follow the recommendations of 4. Bonding Grout of this section.

11. Overlay Concrete Placement
A pre-placement meeting must be held well in advance of the overlay placement in order to work out any details with the Contractor. Follow the recommendations of section 5. Placement of Slab Reconstruction Concrete, of this manual, in addition to the following.

Careful attention should be given to the water content of the overlay concrete mix. All water must be added at the plant, no additions of water are allowed at the job site or on-route. The performance of the specialized overlay concrete relies heavily on impermeability. High water contents compromise the impermeability of the concrete and will reduce service life. If there are problems achieving a workable consistency, up to 2 additions of the water reducing admixture may be added at the job site as long as the maximum dosage rate is not exceeded. High range water reducer is used with microsilica concrete and normal range water reducer is used with class DP. The additions must be of the same admixture used in the initial batching procedure.

Specialized concrete overlays need particular attention paid to the weather requirements. The necessary equipment and materials should be on hand to control placement and curing of the concrete, i.e. vibrators, wet burlap, turf drag, etc. The finishing operation should be reviewed and a dry run performed prior to the concrete placement. Placement of concrete must be performed in accordance with the specifications. Concrete should be placed as near to its final position as possible. The concrete placement should be performed so that there is an excess of concrete in front of the finishing machine across its entire width. The Contractor must place enough concrete at the parapets to prevent excessive shoveling of additional concrete and trowel finishing after the finishing machine has passed. Internal vibration must be used to achieve the proper consolidation. Vibrators should not be used to move concrete. Finishing of concrete should be performed in a timely manner. The concrete should not be overworked as this can cause tearing of the surface and increase the potential for scaling. When finishing concrete, adding water to the surface or "blessing" is not permitted. This process adds additional water to the concrete surface and greatly reduces its freeze/thaw resistance, resulting in scaling.

In situations where the overlay is used as the slab reconstruction concrete, and placed at the same time, it is very difficult to maintain a consistent consolidation. When the placement is of nonuniform depth, it is difficult to achieve maximum consolidation. Therefore, it is important to internally vibrate all slab reconstruction concrete. If this concrete is not properly vibrated, it will not encapsulate the reinforcement entirely, leaving voids.

A. Microsilica Concrete
Workers are often worried about over vibration of microsilica concrete. Because of the manner in which microsilica fills the voids in the concrete mix, over-consolidation is much more difficult than with other concrete mixes. In fact, under consolidation is more of a problem. The overlay should be well consolidated with internal vibrators throughout the entire placement and not just at construction joints or along bulkheads. The internal vibration will create a 1.5 mm to 3.0 mm layer of "cream" on top of the overlay. This layer also aids in the surface texturing of the overlay.

B. Class DP Concrete
This class of concrete handles the same way and is similar to another class of concrete you may be familiar with, Class HP. Due to the flyash in the mix, Class DP is easier to handle and finish than microsilica concrete, however, it does tend to have a slower set time and strength gain. It is very
SECTION 584 - SPECIALIZED CONCRETE OVERLAYS FOR STRUCTURAL SLABS

important when placing DP concrete in a single placement that sufficient consolidation is achieved through vibration. Class DP concrete should not be excessively hand finished because it will have a tendency to scale.

C. Placement Position and Timing
   1. Alignment of Deck Profile
   Along with all other concerns, deck rehabilitations require additional care. There should be no change in the depth of total concrete placement. That is, the placement thickness should be uniform. Since the overlay is the final riding surface of the bridge, surface irregularities should be kept to an absolute minimum. No irregularities can be greater than 3.0 mm. This should be checked often during finishing with the contractor supplied 3.0 meter straight edge. One common problem occurs when the rail cups, used to support the finishing machine, are placed more than 300 mm apart. This causes the rail to sag as the finishing machine passes.

   2. Time Requirements
   The placement must proceed in a timely manner. When a delay in the placement is unavoidable, precautionary measures should be taken to ensure the best possible quality overlay. If a placement is delayed for 30 minutes or less, wet burlap or plastic should be placed on all unfinished plastic concrete, both ahead and behind the finishing machine, to protect it from drying. Placement can then continue for delays between 30 and 60 minutes, the same procedure may be used only if initial set has not occurred.
   If a delay is for more than 60 minutes or if the concrete reaches initial set, all further placement must be discontinued for at least 48 hours, and the concrete bulkheaded. Further material may be placed provided a gap, of at least 3.0 meters, is left between the initially set and freshly placed concrete. This gap is to allow sufficient clearance for the finishing machine. If proper procedures are not followed, the joint between the initially set and fresh concrete will never bond correctly, resulting in early distress to the deck. When concrete is to be placed in the bulkheaded area, all preparation and placement procedures should be followed.

12. Finishing and Texturing of Overlay Concrete

   A. Basic Guidance for Operation of Finishing Machine.
   This is a check list of how to operate a finishing machine for best results. A dry run must be performed prior to the placement to ensure that nothing has been overlooked. An experienced machine operator should run the finishing machine. No one should attempt to finish overlay concrete on a bridge deck unless they have previous experience through other projects. Section 557 of the "Construction Inspection Manual" should be thoroughly reviewed prior to the start of the project.

   FINISHING MACHINE OPERATION CHECKLIST

   1. Is 100 mm of material being maintained in front of augers?
      Is there a golf ball size (50-75 mm diam.) roll maintained in front of the smooth wheel roller?
   2. Is the vibrator set between 3000 and 5000 VPM? Check this with a reed tachometer.
   3. Is the carriage travel speed between 14 meters and 18 meters per minute?
   4. Is the drag pan adjusted for best results?
   5. Is the automatic machine advance set to a minimum of 50 mm?
   6. On super-elevated decks, have the following been checked:
      a. Finishing rollers rotate uphill only.
      b. Finish will be done moving uphill.
      c. Do not reverse direction of rotation of finishing rollers.
      d. The machine will automatically advance on both sides.

   • Texturing
As soon as the finishing machine has formed a uniformly smooth, dense surface, the overlay must be textured with an approved turf drag in one pass only. Application of the texturing should not be done forcefully such that aggregate is pulled up by the drag. Make sure that the concrete is not overworked in the areas being trowel finished.

**Note:** It is not necessary that the concrete surface prior to texturing have all bug holes filled, or that the surface is smooth since texturing will be immediately applied and saw cut grooving will be done later. Irregularities (holes) < 6 mm do not need to be filled.

13. Curing of Overlay Concrete
When the entire job has gone well to this point, and all of the material was well consolidated, and properly textured, the bridge will still not last its expected life if the overlay is not properly cured. All requirements for normal concrete curing apply here, and the specifications should be stringently applied. Only wet burlap with continuous wetting is allowed on overlays. Along with the normal concrete procedures, specialized overlays require some extra effort. Review curing procedures in accordance with Section 557 of the "Construction Inspection Manual".

A. Burlap
The overlay must be covered with clean wet burlap within 10 minutes of being placed. Make sure that the burlap is wet before it is placed on the deck. If the burlap is dry when first put down, it will draw (wick) water from the concrete, resulting in shrinkage cracking. Make sure that all specifications concerning time and overlap of the burlap are strictly adhered to. Do not worry about the burlap pattern appearing on the concrete surface. **Timely application of curing is more important than the texture and aesthetics of the overlay.**

B. Slab wetting system
   1. Microsilica Concretes
   These overlays must be kept continually wet for a minimum of 96 hours (4 days). Make sure before placement that the wetting system will be operational when needed.

   2. Class DP Concrete
   DP concrete must be kept continuously wet cured for a minimum of 168 hours (7 days).

C. Ensuring Proper Curing Period
Curing temperatures are to be maintained per specifications during the curing period. Extremely high or low temperatures are detrimental to freshly placed concrete. Differentials in temperatures, such as change between day and night temperatures, are also detrimental to fresh concrete.

14. Saw Cut Grooving
The saw cut grooving should be performed as soon as possible after the required curing period, 4 days for Microsilica Overlay Concrete or 7 days for Class DP Overlay Concrete. Grooving should be done before allowing traffic on the overlay. The grooving must be cut according to all specifications and approved by the Engineer in Charge. Grooving is important for maintaining surface friction during wet weather. Engineers should ensure that the debris or slurry from the saw cuts is being controlled and disposed of in an environmentally safe manner. Follow the recommendations in Section 558 of the "Construction Inspection Manual".

15. Penetrating Sealer Application
The sealer used must be from the Department’s Approved List. Only a non-water based penetrating sealer may be used due to friction problems encountered with water based sealers.

II. Cold Weather Concrete Operations
All subjects covered in Sections 555 and 557 of the "Construction Inspection Manual" concerning cold
weather concreting, apply for specialized concrete overlays placed in cold weather. In addition to those requirements, specific requirements for specialized concrete overlays are as follows:

1. Minimum Temperature for Placement
   Specialized concrete overlays for structural slabs may be placed if the ambient air temperature is 7°C or greater, the temperature of the deck after prewet is no less than 7°C, and rising air temperatures are predicted. Further, the prediction must be for ambient air temperatures of over 7°C for the 8 hours immediately after placement.

   The temperature of the substrate must be as close as possible to the drop temperature of the overlay concrete in order to minimize thermal stresses between them. Excessive temperature variations can cause debonding and cracking.

2. Aggregation of Curing Hours
   The curing period for specialized concrete overlays is accumulated in curing hours. A curing hour is defined as any hour, after covering with wet burlap, during which the curing temperature remains at or above 7°C, as measured by a recording thermometer. The Contractor shall supply a continuous recording thermometer.

3. Requirements for Enclosures and External Heat
   A. Low Curing Temperature
      Should the 7°C minimum for placement be met, and subsequently the curing temperature drops below 7°C at any time during the curing period, the structure must be enclosed and external heat provided in accordance with §555 of the NYS Standard Specifications. There is no provision under Specification Section 584 to extend the curing period when the curing temperature falls below 7°C; once the curing temperature falls below 7°C, the application of external heat is required. If the curing temperature drops below 0°C at any time during the curing period, the concrete will be rejected.

   B. Low Placement Temperature
      Prior to concrete placement, if the temperature is less than the 7°C minimum, concrete placement may not begin unless the structure is enclosed on 6-sides and external heat is provided for the entire curing period. In accordance with §555 of the NYS Standard Specifications, the existing deck slab cannot be considered to be the bottom of the enclosure.

      The substrate should be uniformly heated.

   C. Removal of Enclosures and External Heaters
      Once external heat provisions are required, they shall remain on the structure until the curing is complete, regardless of the ambient temperature. The temperature of the structure must be reduced at a slow rate after the cure period so as not to shock the concrete. This will allow internal free moisture to expand and escape slowly (prevent rapid freeze).

4. Chart
   The Placement and Curing Flow Chart (Exhibit 584-A) should be helpful when making placement decisions and determining which provisions apply for the placement and curing of specialized concrete overlays during cold conditions.
Specialized Concrete Overlays for Structural Slabs
Placement & Curing Flow Chart
Section 584

CHECK AMB. TEMP

AMB. TEMP ≥ 7°C

CHECK PREDICTED AMB. TEMP FOR 8 HRS. AFTER PLACEMENT

PREDICTED 8 HR. AMB. TEMP ≥ 7°C

NORMAL PLACEMENT

COMPLETE CURE

PREDICTED 8 HR. AMB. TEMP < 7°C

CURLNG TEMP < 7°C AT ANY TIME

DO NOT PLACE

COMPLETE CURE

CURLNG UNDER §557

PLACE UNDER §557

NOTE: IF CURING TEMP FALLS BELOW 0°C AT ANY TIME, CONCRETE WILL BE REJECTED.

AMB. TEMP = AMBIENT TEMPERATURE
SECTION 586 - MISCELLANEOUS STRUCTURAL RECONSTRUCTION

586-1.01 Drilling and Grouting Bolts or Reinforcing Bars

Materials
These items allow only polymer grouts to ensure greater pullout strength. Not all approved grouts are compatible with all concretes. Therefore, certain specifications recommend that the contractor load test enough reinforcement bars and anchor bolts to ensure concrete/grout compatibility before production grouting begins. The contractor is responsible for performing this testing and determining compatibility.

Construction Details

Preparation
Improper preparation of the anchor hole is the principal reason for anchor failure. Care must be taken to ensure that the hole is cleaned, the walls scoured and all debris removed, and the hole is dried before grouting. The grout manufacturer should provide instructions for cleaning the hole, including a description as to how dry the hole must be to obtain maximum grout performance. The manufacturer shall also provide a method for determining when this degree of dryness has been reached. (Example: Place the compressed air “wand” to the bottom of the hole and release air for a minimum of two minutes.)

The typical cleaning procedure for a dry hole is to first blow out the dust and debris with compressed air using a "wand" placed at the bottom of the hole. This is followed by brushing the sides of the hole with a wire brush and then another compressed air cleaning similar to the first.

The EIC should check 30 percent of the holes in each lot to make sure the hole depth is in accordance with the contract documents. Because each size and type of anchor requires a different diameter drilled hole, the hole diameter should be carefully checked for each type of anchor specified. The contractor must use the hole diameter recommended by the grout manufacturer for the type and size of anchor being installed.

Grout Storage and Handling
Grout must be stored in accordance with the manufacturer’s instructions. The manufacturer should provide any information needed to safely handle the grout, and any required Material Safety Data Sheets.

Grout products requiring drill mixing must be thoroughly mixed to prevent incomplete material cure and substandard strength. The contractor should use the mixing time recommended by the manufacturer. For the products contained in caulking tubes using static mixers, sufficient material should be wasted before using material for anchor installation. This practice is necessary each time the material tubes are changed. The amount of material to be wasted should be the amount recommended by the manufacturer.

If capsule type materials are used, the manufacturer’s recommendation on spinning the anchor when mixing the grout materials should be followed. Care must be taken to prevent “overspinning”, which may result in no bond between the anchor and the adhesive material.

Load Testing When Required
Drilling and grouting of anchor bolts and reinforcing bars in portland cement concrete under these items include load testing as one of the requirements for acceptance. When load testing anchors, the jacking system is not specifically described in the contract documents. However, the contractor is provided the basic parameters for the jacking system. The object is to allow the contractor freedom to approach the task. The location of some anchors will require ingenuity in the design of the jacking systems.
The contractor determines the lot size of the anchor bolts to be load tested according to the requirements of the specification. When the lot has been selected, the Engineer chooses the location of the bolts to be tested in the lot by random selection. For all selection methods, the bolts must first be numbered, in a manner determined by the Engineer. Then, to identify the bolts for testing, the EIC can use either standard sampling procedures, such as random number tables found in statistics textbooks, or a computer program for selection of bolts to be load tested, obtainable from the Regional Construction Group Microcomputer Coordinator.

If the bolt pulls out before reaching load test level, it has failed. Failure cause is likely to be inadequate embedment length, insufficient concrete strength, grout incompatibility, or improper hole preparation. Also, if at any time during the load testing of an anchor, a crack(s) appears in the concrete within one foot (.3 meters) of the anchor, the test shall be considered a failure. In this case, failure is likely to be insufficient embedment length or inadequate concrete strength. If both are within the contract requirements, the designer should be contacted.

**Concrete Repair at a Failed Anchor**
The failed anchor must be pulled free from the concrete and the damaged concrete surface repaired. In many cases, a one-to-two-inch (25-50 mm) thick cone of concrete will be pulled from the surface. The outer edge of the cone will break off flush with the base concrete surface. The concrete grout cannot be effectively tapered out to a zero thickness. Therefore, the periphery of the area where the cone broke out must be bush hammered. The area should be bush hammered to the point that the minimum thickness of grout used to patch the area will be ¼ inch (6 mm). Sandblasting of the entire area must be done before grouting is begun. The contractor should use a grout meeting NYS Standard Specification 701-05 Concrete Grouting Material. When the grout is applied there is no need to fill the hole into which the anchor was grouted.

After the grout has cured to at least 3000 psi (25 MPa) (grout strengths obtained from the grout manufacturer’s instructions) the hole should be redrilled to at least the original diameter. After the hole is redrilled, the process originally prescribed for installing the anchor will be used to reinstall it. At this point it may be advisable to contact the grout manufacturer for advice about re-installation of the bolt.

**References**
1) Engineering Instruction 97-007 - Specification 16586.20XXYYM and 16586.20XXYY “Drilling and Grouting Anchor Bolts and Rebars in Concrete.”
2) NYSDOT Standard Specification 586.01
3) Special Specifications based on 1) or 2) above.
SECTION 603 - CULVERTS AND STORM DRAINS

A revision to the Standard Specifications for §603, Culverts and Storm Drains, was issued via Engineering Instruction 98-038. The effective date of the new specification is July 22, 1999. The revised specification addressed the following:

- Aluminum Coated Type 2 Pipe was added as an alternative culvert material
- Polymer Coated Steel was deleted from §602 and added to §603
- Polyethylene Pipe was added
- Clay Pipe was removed

§603-2 Materials
The acceptance criteria for the various culvert materials is identified in the corresponding §700, Materials Details, of the Standard Specifications. Materials Methods that describe the inspection techniques are MM-12 for metal culverts and MM-1 for concrete culverts.

§603-3 Construction Details
§603-3.02 Laying Pipe

Concrete: When lifting holes exist, lay pipe with the holes in the 12 o’clock position. If any pipe pieces have the word “top” marked on them, they should be oriented correctly. Typically, this occurs with elliptical pipe designs, but occasionally, round culverts with special steel reinforcements require these markings.

Metal Pipe: The thickness of the pipe must be verified with a micrometer caliper. Coating thickness should be verified with a Type 2 Fixed Probe Magnetic Gauge. The calipers and gauge are provided by the Contractor.

Polyethylene Pipe: The pipe after installation will have a maximum deflection of 5% of its nominal inside diameter. The Engineer may order the contractor to perform mandrel testing to determine the 5% specification compliance.

§603-3.03 Bedding and Backfilling Pipe
Adhere to the appropriate Standard Sheet for the proper procedures. Aluminum or aluminum-coated pipe must be coated with a zinc chromate primer or an approved alternative if it is to come in contact with portland cement.

Compaction: All pipes should be backfilled according to the appropriate Standard Sheets: Metal and Plastic 203-5R, Concrete 203-4R. In addition, lifts should not exceed 150 mm.

Controlled Low Strength Material (CLSM): If this material is specified, measures must be taken to assure that the pipe will maintain its line and grade during the placement of the CLSM. Depending on the pipe material, the Contractor must insure that the pipe does not float during the placement of the CLSM.

§603-3.04 Damaged Pipe and Repair
Concrete: The latest revision to the specification, §706-02, can be found in Engineering Instruction 98-019.

Repair of concrete pipe is discussed under Fabrication Requirements. Materials Method 1, Quality Assurance Procedure for Concrete Pipe Items, also covers quality assurance and repair procedures for concrete pipe items.

Metal: Damaged pipe coatings must be repaired according to Materials Method 12, Corrugated Metal Pipe and Corrugated Structural Plate for Pipe.
Polyethylene: Damaged polyethylene pipe may be acceptable provided the damaged section is removed. The remaining section may be incorporated at terminal locations only. The minimum length of a pipe section is 1 meter.

§603-3.06 Joints
The maximum allowable space at all joints, regardless of material type, is 13 mm.

Concrete: If the Contract requires an internal pressure test, follow the procedures indicated in §603-3.06 C.

Metal: The circumference of consecutive sections may not vary by more than 38 mm. Arched pipe may require matched ends with a numbering system to identify the construction sequence of the sections.

Polyethylene: Only manufactured ends may be used at joints. No field cuts are allowed in this location unless approved by the Engineer.

References
Materials Method 1
Materials Method 12
Granular Filter Material

General Requirements
Materials used for Underdrain Filter, Types I and II, must be stockpiled in accordance with the appropriate Departmental publication in effect at the time of advertisement for bids (Reference: GCP-17).

Underdrain Filter, Type III, shall meet the gradation and quality requirements of §703-07, Concrete Sand.

Project Procedure
Inspect the construction of stockpiles. Record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer.

The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpiles. Test results will be reported on GE-454M, (See Exhibit 203H) "GRANULAR MATERIAL DOCUMENTATION FORM." A copy of this form shall be part of the project records.

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. For granular material, copies of test results (Form GE-454M, "GRANULAR MATERIAL DOCUMENTATION FORM") and, when applicable, a copy of the letter approving stockpile transfer, as well as the original GE-454M.

3. If variations to the stockpiling requirements are granted, a copy of the letter from the Director of the Geotechnical Engineering Bureau must be on file.

References
GCP-17, Procedures for the Control of Granular Materials
GE-454M, Granular Material Documentation form

Related Contract Provisions
§203-1.01, Unclassified Excavation
§203-3.15, Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cable
§206-5.01, Trench, Culvert and Structure Excavation
§603-3.01, Excavation
§703-07, Concrete Sand
SECTION 608 - SIDEWALKS, DRIVEWAYS, BICYCLE PATHS, BRICK PAVING, GROUTED STONE BLOCK PAVING, AND PRECAST CONCRETE PAVING

Driveways
Field reports indicate a wide variance in the restoration of driveways. With respect to driveway restoration, the following guidelines shall apply:

1. Comply with the Department's "Policy and Standards For Entrances to State Highway" (M.A.P. Code 7.12-34) governing entrances to state highways. The location and geometrics of such entrances are shown in this policy. The current edition booklet is available from the NYSDOT Business Administration Plan Sales Office.

2. Restore driveways in kind. If the drive was a gravel drive, restore it as a gravel drive, NOT a bituminous drive. When necessary, provide an asphalt driveway apron to control gravel kickback from getting onto the travel lane.

3. Whenever possible try to maintain original profile grade of the driveway. Adjust driveway entrances so that a car does NOT drag on entering or leaving. Driveway's grades should be field tested prior to paving.

4. Adjusting or restoration of any driveway shall be limited to that length which is required for a reasonable transition from the highway to the driveway. A rule of thumb the driveway should be paved a minimum of 10' beyond the edge of the travel lane due to concerns of overwashing and tracking gravel onto the travel lane.

5. Where the driveway is not a paved driveway, bituminous paving of the drive may extend from the edge of the pavement to a point no farther than the back of the ditch line or the curb line as the case may be. Where there is a curb, it may be necessary to pave a relatively short distance in back of the curb to meet the sidewalk or sidewalk area.

6. Entrances into open fields, or entrances that have very infrequent use, are not to be paved. Let the stabilized shoulder suffice.

7. Where there is a concrete driveway that has to be restored, the restoration from the edge of the pavement to the extreme edge of the shoulder shall be bituminous pavement, NOT Portland Cement Concrete.

8. A release from the property owner is needed before adjustments are made on private property. Refer to Section 107-14 of the Contract Administration Manual for further information regarding a release.

Sidewalk Ramps
When inspecting the construction of sidewalk ramps, and any associated curb treatments, care must be taken to ensure that the dimensions, lines and grades shown on the plans are adhered to. The Contractor should establish the line and grade of the proposed sidewalk ramps prior to placement of the curb. Any adjustments to meet field conditions must consider the design standards for accessibility. Refer to the Highway Design Manual, Standard Sheets or Engineering Instructions before any changes are considered. Questions related to accessibility guidelines should be referred to the Regional Landscape Architect.

References
MAP 7.12-34, POLICY AND STANDARDS FOR ENTRANCES TO STATE HIGHWAYS
CAM, 107-14, FURNISHING RIGHT-OF-WAY
SECTION 610
GROUND VEGETATION – PREPARATION, ESTABLISHMENT AND MANAGEMENT

I. General
For any question regarding the intended use of 610 items, contact the Regional Landscape Architect or Project Designer.

Review contract documents to determine if Special Notes apply (e.g.: fertilizer ratio, mulch type, etc.).

SAFETY NOTES: Most fertilizers are made of chemicals that can be harmful to humans. The product(s) should be stored in a cool, dry area in a closed container. It also should be kept away from food storage areas and out of reach of children. Whenever working with fertilizer, be sure that appropriate personal protection equipment (PPE) is used (e.g. masks, safety gloves, long sleeves and long pants) to prevent inhalation and contact with the skin. Read all instructions that come with the product before it is applied. In general, soil amendments and compost meet strict guidelines set forth by Federal and State Agencies. It is important for users to abide by the directions and safety precautions listed on the product label and SDS (Safety Data Sheets) to avoid complications. At minimum you should wash your hands with soapy water after handling or applying the product(s).

II. Fertilizer (610.05xx)
Fertilizer products are formulations of plant nutrients, typically tilled or mixed into soils to improve their ability to support desirable vegetation. Some products may be directly applied to vegetation.

The fertilizer types in §713-03 are differentiated by the ratio of N (nitrogen) – P (phosphorus) – K (potassium) content by weight. These nutrients are typically identified on the container label with large bold numbers. For example, a Type A fertilizer with an N-P-K ratio of 2-1-1 may be labeled 20-10-10, 10-5-5 or 40-20-20. All of these are equivalent to the specified ratio for Type A fertilizer and are acceptable. A fertilizer labeled 10-6-4 would not meet the material requirements for Type A.

The specifications for Type A and Type B include references to “water insoluble nitrogen”. Water insoluble nitrogen means slow or controlled released nitrogen which may be:

- labeled as Water Insoluble Nitrogen (WIN) or controlled release;
- an organic product which naturally breaks down slowly (such as pelletized turkey manure);
- coated for slow release; or
- labeled IBDU (a manufactured product with slow release characteristics)

Type A fertilizer material specifications require a salt index of less 50. The information on the salt index is not readily available for all products. If the information is unavailable and the product meets all other aspects of the material specification the product is acceptable for use.

When a shipment of fertilizer is delivered, it shall be accompanied by documentation stating the quantity (e.g. net volume) of material delivered.

- Verify that the product is qualified for its intended use.
- Check that the manufacturer’s name, net weight and guaranteed analysis appears on each container or accompanies each bulk shipment, and that the guaranteed analysis meets the requirements of the specifications.
- Verify that all bags/containers are unopened prior to use.
- Photograph manufacturer’s label or certificate showing analysis and attach to DWR.

Check the product label to determine the manufacturer’s instruction for incorporating the product into the site and assure that it has been followed. May be by hand, drop spreader, hydraulic application. The key is even distribution.
SECTION 610
GROUND VEGETATION – PREPARATION, ESTABLISHMENT AND MANAGEMENT

Example: The Coast of Maine™ Eggamoggin Blend™ fertilizer meets the specifications outlined in §713-03 – Fertilizer, Type A (2-1-1). The manufacturer recommends that the product be applied at a rate of 16 pounds per 1000 square feet.

1. For an area of 50,000 sf.
   Divide the total number of square feet by 1000 sf and multiply by 16 to get the total number of pounds required.
   
   \[
   \frac{50,000}{1,000} = 50\\
   50 \times 16 \text{ pounds} = 800 \text{ pounds}
   \]

The contract documents call for 10 pounds of nitrogen to be added per acre:

1. For an area of 50,000 sf.
   Divide square feet by 43,560 to get the area in acres.
   
   \[
   \frac{50,000}{43,560} = 1.15 \text{ acres}
   \]

2. Calculate the number of pounds of fertilizer needed to achieve the recommended application rate.
   
   \[
   10 \text{ lbs N per acre} \div 4\% \text{ of N} = 250 \text{ lbs./acre of fertilizer}
   \]

3. Multiply the total number of acres by 250 lbs to get the total amount of fertilizer required.
   
   \[
   250 \text{ lbs/acre} \times 1.15 \text{ acres} = 287.5 \text{ lbs of fertilizer}
   \]

Figure 1: Sample label - note the ratio complies with Type A Fertilizer with a ratio of 2-1-1. Note that the percentage of water insoluble nitrogen is 3.6%, which is ninety percent (90%) of the total nitrogen content which falls within the requirements for §713-03.
III. LIMESTONE (610.06)
Typically Limestone will be a fine granular material delivered in bags.

Typically limestone is applied dry and mixed into the top 5 to 6 inches of soil. It is then watered so that the limestone will be available to the plant roots.

It is only slightly soluble in water, so incorporation in the soil is a must for lime reaction. Even when properly mixed with the soil, lime will have little effect on pH if the soil is dry. Moisture is essential for the lime-soil reaction to occur, so water needed per manufacturer’s recommendation is included in the pay item.

When possible the limestone should be applied prior to seeding.

When a shipment of limestone is delivered:

- Verify that the product is qualified for its intended use and that all containers or bags are unopened prior to use.
- Check that the manufacturer’s name, name of the material, net weight and guaranteed analysis appears on each container or accompanies each bulk shipment, and that the guaranteed analysis meets the requirements of the specifications.
- Photograph manufacturer’s label or certificate showing analysis and attach to DWR.

Follow the Manufacturer’s recommendation for application rates.

**Sample Calculations for Limestone**
For the example label in Figure 3, the application rate is:

4 lb to 5 lb per 100 square feet (sf)
0.04 lb per 1 sf or 0.05 lb per 1 sf.

To convert this to square yards (sy):
4 lb per 11 sy, or 0.36 lbs per sy
5 lb per 11 sy, or 0.45 lbs per sy

The application rate is 0.36 lbs/sy to 0.45 lbs/sy or 1742 lb/Acre to 2178 lb/Acre

**Figure 2:** Sample front label. Note it indicates bag weight.
Figure 3: Sample label - note that the label indicates that the material meets the Department’s specifications §713-02.
IV. MYCORRHIZAL FUNGI (610.07xx)

Mycorrhizal fungi are beneficial naturally occurring soil organisms.

Mycorrhizal fungi can be broadcast, worked into seed beds, placed under cuttings, blended into planting soil, applied as a root dip gel, probed into the root zone of existing plants, or sprinkled near roots at transplant time. The goal is for the mycorrhizal fungi to come in contact with the plant's roots.

The industry is evolving so expect labels and products will vary widely.

When a shipment of mycorrhizal fungi is delivered:

- Check that the manufacturer's name, name of the material, species, propagules counts, application rates, expiration date, and net weight appears on each container.

- Verify that the product is in fact qualified for its intended use and the product meets the material requirements of §713-09.

- Photograph the manufacturer's label or certificate showing analysis and attach to DWR.

- Verify that all containers are unopened and undamaged prior to use on the project. If the container is damaged, inspect that the material is not damaged or caked.

- **Reject any material that has expired, become caked or otherwise damaged.**

- Check the product label to determine the manufacturer's instruction for incorporating the product into the site and assure that it has been followed. The key is even soil distribution and contact with the plant roots.

- Verify that the mycorrhizal fungi were applied where shown in the contract documents.
Figure 4: Sample label for mycorrhizal fungi. Note the amount of endo and ecto fungi contained in the container which indicates the product meets the specifications in §713-09.
Mycorrhizal Fungi Sample Calculations for Turf:

1. 1,000,000 minimum propagules per acre when hydroseeding. Refer to Figure 4 for a sample calculation.

2. 100,000 minimum propagules (of Endomycorrhizal fungi only, as per §713-09) per acre when drill seeding turf. For the Endo/Ecto Myco Apply product:

   There are 60,000 endomycorrhizal propagules per pound of product. To get the quantity of propagules desired:
   100,000 propagules per acre / 60,000 propagules per lb. = 1.67 lbs/acre

   This is the quantity of product that needs to be applied. Turf is measured in square yards (sy). So the application rate is:
   1.67 lbs per acre / 4840 sy per acre or 0.00033 lbs. per sy.

   For a 1000 sy area, the total amount of product required is:
   1000 sy x 0.00033 lbs/sy = 0.33 lbs.

   Note that in this example the manufacturer’s recommendation (method described below in 3.) will meet the required number of propagules per acre for drill seeding turf and should be followed.

3. For other turf establishment methods, follow the manufacturer’s instructions.

   For example: “0.25 to 0.5 lbs per 1000 sq ft.”

   Turf is measured in square yards (sy). To determine the total quantity of mycorrhizal fungi required: Determine the application rate per one square yard (sy):
   0.25 lbs per thousand sf / 111.11 sy per thousand sf = 0.0023 lbs/sy
   0.50 lbs per thousand sf / 111.11 sy per thousand sf = 0.0045 lbs/sy

   Multiply the application rate range by the number of square yards of turf being established to get the total quantity of mycorrhizal fungi product required. For a 500 sy area of turf, the application rate would be:
   500 sy x 0.0023 lbs/sy = 1.2 lbs
   500 sy x 0.0045 lbs/sy = 2.3 lbs

Mycorrhizal fungi Sample Calculation for Planting:

Application rates are according to Manufacturer’s Rates (§713-09). For the Endo/Ecto Myco Apply product, the rates state the following:

“For B&B plants, use 0.5 – 1.5 oz per caliper inch”. So for a 2” caliper tree, use 1.0 oz. to 3.0 oz of product.

For container planting, the label states, “Use 1 to 2 tablespoons per gallon container size.” So, for a 3 gallon plant, use 3 to 6 tablespoons.
Figure 5: Sample Label – To determine whether this product meets the specification, convert the number of active ingredient/cc to lbs/acre.

For turf establishment: A 1 gal pail contains 3,785 cubic centimeters (cc). Each cubic centimeter contains 3 endo types at 33/cc each = 99 total/cc. 3,785 x 99 = 374,715 endo organisms per gallon. From the label, one gallon weighs 7 pounds. A minimum of 20 pounds is required per acre or approximately 3 gallons. 3 gallons x 374,715 endo organisms = 1,124,145 endo organisms. The product meets the minimum requirement per acre for hydro seeding.
V. MOISTURE RETENTION ADDITIVE (610.08)
Moisture retention additives are best used with new plants to aid in establishment.

Do not use more than the manufacturer’s recommended rate per container or planting area.

Expect to see dry crystals when the product is delivered. They are applied in their dry state and expand significantly when hydrated.

When a shipment of moisture retention additive is delivered:

- Verify that the product is in fact qualified for its intended use and the product meets the material requirements of §713-10.

- Check that the manufacturer’s name, name of the material, application rates, expiration date, and net weight appears on each container.

- Photograph manufacturer’s label or certificate showing analysis and attach to DWR.

- Verify that all containers are unopened prior to use.

- **Reject any material that has expired or arrives on the project site pre-hydrated.**

- Check the product label to determine the manufacturer’s instruction for incorporating the product into the site and assure that it has been followed.
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Commercial Applicati

SOL MOIST™ is a synthetic acrylic polyamide with a potassium salt base. It is a horticultural applications. When used according to the application rates, SOL MOIST™ 50% and last 3 - 5 years in the soil.

Figure 6: Sample Label - Note the name of the material is present, along with application rates and manufacturer's name. The inspector would also need the expiration date and net weight of the contents from the container, which are missing from this label, in order to determine whether this product would meet the standard specifications for §713-10.
VI. SULFUR (610.09xx)
Ammonia sulfate, iron sulfate, elemental sulfur, sulfuric acid or aluminum sulfate may all be used to lower soil alkalinity. To be most effective, sulfur materials should be tilled into existing soil in place. Sulfur materials that come into contact with plant leaves should be washed off immediately after application to prevent damaging leaf burn.

When a shipment of sulfate/sulfur product is delivered:
- Verify that the product is in fact qualified for its intended use and the product meets the material requirements of §713-17.
- Check that the manufacturer’s name, name of the material, application rates, guaranteed analysis, and net weight appears on each container or accompanies each bulk shipment.
- Photograph manufacturer’s label or certificate showing analysis and attach to DWR.
- Verify that all containers are unopened prior to use.

![Sample label - note the guaranteed analysis indicates that the active ingredient is sulfur, manufacturer’s name is present, and that the weight is less than 100 pounds. The label states this product should not be used with container grown plants. It can, however, be broadcast in a bed planted with containerized plants.](image)

**WARRANTY STATEMENT**
Voluntary Purchasing Groups, Inc. warrants that this product in its unopened package conforms to the chemical description on the label and is reasonably fit for the purposes set forth on the label. There are no other warranties, expressed or implied, concerning the use of this product other than indicated on the label. This warranty does not extend to the handling or use of this product contrary to label instructions or under abnormal conditions or conditions not reasonably foreseeable to Seller, and Buyer assumes all risk of any such use.

**SAMPLE CALCULATIONS FOR SULFUR**
According to §610-3.07, the Contractor should follow the Manufacturer’s recommendation for application rates. For the example label in Figure 7, the application rate is:

1 lb to 2 lb per 100 square feet (sf) is 0.01 lb per 1 sf or 0.02 lb per 1 sf.

To convert this to square yards (sy):

- 1 sy = 9 sf, OR 0.11 sy = 1 sf.
- 100 sf X 0.11 sy/sf = 11 sy per 100 sf
- 1 lb per 11 sy, or 0.09 lbs per sy
- 2 lb per 11 sy, or 0.18 lbs per sy

The application rate per sy is 0.09 to 0.18 lbs.
VII. Compost (610.10)
Compost is generally odor free, dark, crumbly humus produced by the biological and biochemical decomposition of organic material.

The standard specification allows the Contractor flexibility in choice of compost types.

Check to see if the Contractor is using compost that contains composted bio-solids or source separated organic waste. See §713-15 for the additional certification required prior to the delivery of these products.

Measure the areas to receive compost on slope to determine the area that, when multiplied by the depth of compost (as per the contract documents) placed, will provide the cubic yards for payment.

When a shipment of compost is delivered, it shall be accompanied by documentation stating the quantity of material delivered.

- Verify that the product is in fact qualified for its intended use and the product meets the material requirements under the appropriate §713-15.

- Photograph the producer’s label or certificate of analysis from certified laboratory and attach to the DWR.

Figure 8: Sample compost analysis report. Note the organic matter and pH analysis are present.
Bio-solid Compost

The Contractor must provide the EIC with the laboratory approved certification before the biosolid compost is delivered. An information label must be attached to a product bag, or, when delivered as loose yards, an information sheet or brochure must be provided to the user. According to 6 NYCRR Subpart 360-5.5, the product label or information sheet must contain the following information:

- the name and address of the generator of the product;
- the type of waste the product was derived from;
- the average metal content of the product and the allowable metal levels (or a mailing address, e-mail address, or phone number where this information can be obtained); and
- recommended safe uses, restrictions on use, application rates and storage practices intended to minimize the potential for nuisance conditions and negative surface and groundwater impacts emanating from the storage or use of the product (6 NYCRR Subpart 360-5.5 (c) Pollutant limits and product use (9)).

Regulated material includes any composted biosolids, topsoil containing composted sewage sludge or other proposed soil amendment materials containing regulated biosolids. Refer to §713-15 for additional information on material requirements for this product.

Figure 9 & 10 are examples of how the certification or lab analysis and label work together to indicate whether the product meets the standard specification.

NYSDEC keeps a list of Part 360 Permitted Composting Facilities the most recent list may be found on NYSDEC web site. Here is the link. http://www.dec.ny.gov/chemical/55447.html
Or http://esd.ny.gov/businessprograms/SecondaryMarketInfo.html
Figure 9: Sample Material Certification (Biosolids) - note the name and address of generator and analysis of metals are present on the certification. However the type of waste the product was derived from, the recommended safe uses, restrictions on use, application rates and storage practices are not included. In addition to this certification, the missing information would need to be provided for this product to be accepted (§713-15). The inspector should also note that the level of metals shown is not allowable under 6NYCRR subpart 360.5
SECTION 610
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General Use Practices:

- Use only the amount you need. Do not over apply.
- Apply compost to moist soil. Do not apply to frozen soil, saturated soil, or during a rain storm.
- Blend or till compost into soil during application to insure even distribution of organic matter and nutrients.
- Do not apply compost next to waterways, drains, or culverts where it can wash away during a rain storm.
- Test your soil and use an application rate to match your needs.
- Use compost for turf, lawns, flower beds, trees and shrubs.
- Not recommended for use on vegetable gardens.
- For more information visit:
  - www.compostingground.org
  - www.epa.gov/greenbuildings

Recommended Uses:
Oxbow Hollow Compost is intended for the following uses:

- Roadside Vegetation
- Tree and Shrub Backfill Mix
- Soil Remediation
- Lawn and Turf Establishment
- Erosion Control
- Soil Amendment
- Landscaping
- Turf and Topsoil Blends
- Top Dressing
- Potting Mix Component
- Mulch

Compost Provides:
Addition of compost to your soil improves overall soil health by providing organic matter. It also provides nutrients and enhances productivity of soil by increasing its ability to retain and convey moisture, oxygen, and nutrients to plants.

Our compost is NOT FERTILIZER and is not intended for use on vegetable gardens.

Oxbow Hollow Compost IS A SOIL SUPPLEMENT and SOIL CONDITIONER. Our compost is WEED and SEED FREE.

GET THE MOST OUT OF YOUR COMPOST

Application Instructions

| Manufactured Topsoil | Blend 20% to 50% compost to soil by volume | Blend 20% to 50% compost by volume with substrates soils and sands. Mix thoroughly. Clay content of soil should be minimal for best results, with a maximum clay content of 30%.
| Potting Soil | Blend 10% to 30% compost by volume | Blend 10% to 30% compost by volume with traditional potting soil mixes. Water thoroughly after planting.
| Establishing Nursery & Ornamental Plants | Use 1/8" to 2/8" compost | Mix with top 6" to 8" of soil. Do not use where plants that require acid soils are to be grown, such as azaleas or rhododendrons.
| Maintenance of Nursery & Ornamental Plants | Use 1/16" to 1/8" compost | Spread evenly on surface soil. Can be mixed into soil or used directly as mulch.
| Establishing New Lawns and Turf Roots | Use 1/8" to 2/8" compost | Mix with top 4" to 6" of existing soil. Use lesser amount on fertile soils, higher amount on less fertile soils.
| Lawn and Turf Maintenance | Use 1/16" to 1/8" compost | Spread compost evenly on turf surface. Apply either one time higher rate in fall season, or split applications for both the spring and fall seasons.

Figure 10: Sample Label (Biosolids) – This label includes only part of the information required by the standard specifications (§713-15). The contractor would need to provide the laboratory certification with the missing information for this product to be accepted.

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Source separated compost
The minimum labeling requirements for source separated compost are as follows:

- the name and address of the generator of the product;
- the type of waste the product was derived from; and recommended safe uses, application rates and storage practices (NYSDEC, 1999).
- The labeling information must be attached to the product bag, or, if delivered in loose yards, an information sheet or brochure must be provided by the Contractor to the EIC.

McENROE PREMIUM ORGANIC COMPOST

McEnroe Organic Farms Premium Organic Compost is the product of many years of organic farming and composting. Our extensive experience, combined with careful state-of-the-art monitoring of the compost production process creates a balanced organic compost suitable for all plant and soil types.

<table>
<thead>
<tr>
<th>Recommended Application Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established Lawns:</td>
</tr>
<tr>
<td>New Lawns:</td>
</tr>
<tr>
<td>Vegetables / Flowers:</td>
</tr>
<tr>
<td>Trees / Shrubs:</td>
</tr>
<tr>
<td>Potted Plants:</td>
</tr>
<tr>
<td>Mulching:</td>
</tr>
<tr>
<td>Compost Starter:</td>
</tr>
</tbody>
</table>

Ingredients: McEnroe Organic Farms Premium Organic Compost is made from horse and cow manure, food wastes and plant matter. We never use toxic additives or fumigants.

Figure 11: Sample Label for Source Separated Compost. This label includes only part of the information required by the standard specifications. For example pH, soluble salt concentration and minimum organic matter content are not included on this label. The contractor would need to provide this missing information (i.e. laboratory analysis) for the product to be accepted per §713-15.
VIII. MULCH FOR PLANTING (610.11xx)

Mulch should normally smell like freshly cut wood. Mulch should not smell like vinegar, ammonia, sulfur or silage—these odors indicate that the mulch has "soured". Do not accept mulch that has "soured".

Mulch Type C – APHIS Protocol Wood Chips should not be modified unless directed by NYS Agriculture and Markets or NYS DEC. Mulch Type C is only specified in contracts that include tree removal payment items. The removed trees are processed according to APHIS protocol to generate the Type C mulch. The most recent approved regulatory treatments for disposal are found in the Program Manual for the invasive pest related to the Federal and State quarantine orders. See reference below. Once the wood waste is treated according to approved USDA-APHIS protocol the wood chips or waste wood may be moved and is not subject to Federal or State quarantines.

Under contract pay item 610.1101 when the item is called out with no accompanying note the Contractor may choose from Type A, B or D.

Under the contract pay item 611.xy, mulch is included in the 611 pay item. When there is no accompanying note the Contractor may choose from Type A or B.

Typically §713- 05 Types A, B & D - wood chips and shredded bark will be delivered in loose yards and the quantity will be indicated on the Bill of Lading.

![Shredded Bark Mulch](image1)

**Figure 12:** Shredded Bark §713- 05 Type D typically looks similar to this photo

![Mulch Pile](image2)

**Figure 13:** Mulch for Planting §713- 05 Type C – USDA-APHIS Protocol Wood Chips are generated on site and measured by volume of stockpile(s).

Typically §713- 05 Type E, Pine Bark Chunks or Nuggets is a more expensive product and will be delivered in bags.

![Pine Bark Chunks or Nuggets](image3)

**Figure 14:** §713- 05 Type E Pine Bark Chunks or Nuggets
When a shipment of mulch is delivered, it shall be accompanied by Bill of Lading stating the quantity of material delivered.

- Visually inspect that mulch meets the material specification.
- Check description on label if label is available. Verify the label provides information that satisfies the §713-05 material requirements for the Type specified (e.g. pine bark).
- If Type B, bulk or bagged check for a certification of compliance per §713-05. Photograph applicable certification of compliance with 6 NYCRR Part 360 for Type B – recycled wood chips and attach to DWR.
- Photograph label/bill of lading and attach to DWR
- Ensure mulch is placed according to General Placement Requirements (§610-3.08)

§713-05 – Mulch for Planting – Material Specifications

Type A – Seasoned Wood Chips
- Check that mulch has been seasoned (aged) a minimum of one year. The bill of lading should indicate that the material is “Aged”. Aged wood chips are typically grey in appearance.
- Check that the mulch does not exceed 3” in the greatest dimension.
- Ensure mulch is free from, leaves/young growth; unchipped branches/twigs 1” or greater in diameter; wood shavings/sawdust; foreign material.

Type B – Recycled or Green Wood Chips  Uncontaminated (no paint/chemicals, asphalt shingles/nails, glass)
- Verify the mulch does not exceed 3” in the greatest dimension.

Type C – USDA-APHIS Protocol Wood Chips
- Verify that mulch is chipped according to USDA-APHIS protocol.

Type D - Shredded Bark Mulch
- Verify mulch is finely screened and uniform in size; composed of bark with a low wood content.

Type E – Pine Bark Chunks or Nuggets
- Check that the mulch is 100% pine bark and does not exceed 3” in any dimension

Figure 15: Mulch should be applied so as not to touch trunk of tree (§610-3.08).
The ground preparation for planting beds is completed prior to placement of Weed Control Fabric. This may include application of fertilizer, soil amendments, compost and/or pre-emergent herbicide.

**Materials §713-18**

**A. Type A (Permeable Landscape Fabric) –** Commercial product with the following characteristics:

- Permeable weed blocking geo-textile
- Resistant to rot, mold, chemicals and microorganisms
- Allows free flow of water, air, fertilizers and nutrients

**DeWitt Company, Inc.**

**WB Pro Black Specifications**

<table>
<thead>
<tr>
<th>Typical Properties</th>
<th>Test Method</th>
<th>Test Method</th>
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<tbody>
<tr>
<td>Basis Weight</td>
<td>ASTM D-3776</td>
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<td>Grab Tensile Strength (lbs/inch)</td>
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<td>Water Flow Rate (gal/min/ft²) (hydrophilic only)</td>
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</tr>
<tr>
<td>Fiber Content</td>
<td>PP</td>
<td></td>
</tr>
</tbody>
</table>

**Product Benefits**

- Hydrophilic treated / allows air and water to pass through.
- Minimizes light penetration to suppress weed growth.
- Fabric is treated to minimize degradation due to UV light exposure.
- Covered (pine straw, pine bark, wood chips, etc.) fabric offers extended use, strong, durable, and resistant to damage from temperature extremes.

*Figure 16: Permeable Landscape Fabric*

*Figure 17: Sample Material Cut Sheet (§713-18 Type A). Note the product allows air and water to pass through as required.*

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When permeable weed control fabric products are delivered, they shall be accompanied by documentation stating the quantity of material delivered. Typically the weed control fabric will be delivered on a roll.

- Verify that the product is qualified for its intended use and is commercially available.
- Photograph manufacturer’s label or certificate and attach to DWR.
- Verify that the product meets the requirements of §713-18 for the Type specified.
- Check that the Contractor has prepared the areas (§610-3.09).
- Verify that the weed control fabrics are installed as required by the manufacturer.

**Figure 19:** Unacceptable Installation of weed control fabric that girdled the tree

**Figure 20:** Typically §713-18 Type A Weed Control Barrier should be cut in an "x" to allow sufficient room for plant growth without strangling the plant's trunk or stems
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GROUND VEGETATION – PREPARATION, ESTABLISHMENT AND MANAGEMENT

C. Type C (Used with Special Specification “Weed Control Mat”)

*Note: This product is impermeable in nature.*

Commercial product with the following characteristics:

- Prevents sunlight, water or vegetation nutrients from reaching the soil underneath,
- Does not contain herbicide,
- Resists ultraviolet light, mildew and algae,
- Is self extinguishing when removed from flames,
- Is a minimum of 0.2 inches thick,
- Weighs 1.8 pounds per square yard, and
- Can support pedestrian traffic, commercial tractor’s mowing equipment wheel, and skid plates without displacement.

**Figure 21**: §713-18 Type C Weed Mat in place under guiderail

**Figure 22**: §713-18 Type C Weed Mat roll.
X. WEED REMOVAL (610.13)
This item is for use with newly established turf, sod, wildflower seeded areas, tree/shrub pits and planting beds.

Weeds may be controlled through selective herbicides or by physically removing them by hand or by a mechanical means that removes the root. Merely trimming weeds will not eradicate them. The inspector will see root mass in the debris pile or verify that the chemical method used is labeled to control the entire plant, including roots.

String trimmers used alone will not meet the requirements of the specifications as they do not remove the plant’s roots. String trimmers (weed wackers) used to cut stems of the weeds, immediately followed by an approved herbicide in accordance with manufacturer recommendations, could be acceptable.

Each occurrence of the pay item is intended to be a pass of weeding through the area; it is not intended to keep the area weed free. It is possible that the designer has provided for multiple occurrences over the duration of the contract, each paid separately.

- Ensure that weeds present are treated and removed.
- Verify that the weed removal method does not leave live roots (see figures 23 and 24).
- Ensure that reasonable care is taken to avoid damage to newly established and existing vegetation.
- Verify that an appropriately licensed applicator applies any chemical weed control.

Figure 23: Weed removal with deep “tap” roots attached.

Figure 24: Example of a Root Mass that should be extracted. Note how extensive roots can be.
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[Image of weed removal tools]

*Figure 25:* Weed Removal Tools

[Image of Roundup label]

*Figure 26:* Sample label for a weed product per §713-13 that kills live roots as required in §610-3.11.
XI. TOPSOIL – REUSE ON-SITE-MATERIALS (610.1401)
Pay item applies only to topsoil identified in the contract documents for re-use on site.

Note: The contractor may propose to use other on-site topsoil/material that is not designated in the contract documents, but they would be required to stockpile it for sampling and testing by the Department. Additional locations proposed by Contractor must comply with §610-3.01C and the material requirements of §713-01B Manufactured or Offsite Materials.

If the contract documents indicate a known established population of invasive species, the invasive species are to be removed and disposed as per §610-3.11 Weed Removal, in conjunction with Section 617. These items include handling and disposal methods unique to invasive species and meet state and federal regulations. The intent is that this work is to be done prior to stripping.

Topsoil must be stored on site, but storage piles do not need to meet the requirements of §713-01 Stockpiling, Sampling or Testing.
- Verify that topsoil to be stripped is from sites designated in the contract documents.
- Verify that the materials to be re-used as topsoil are stripped prior to starting general excavation.
- Ensure that weeds or invasive species present are treated and removed. Ensure that disposal of invasive species complies with Section 617 special specifications for the treatment and disposal of invasive species. Treatment of invasive species is to be paid for separately.
- Check that the topsoil has been stripped to the depth specified in the contract documents. If no depth is specified the topsoil is to be stripped to a depth of six inches.
- Ensure that the contractor takes reasonable care that the topsoil is not contaminated during the stripping and other handling operations.
- Verify that topsoil is in workable condition and free from refuse.
- Check whether topsoil requires screening.
- Refer to Section 209 for appropriate erosion and sediment control measures of stored material.
- Check that subsoil has been scarified to 6” depth prior to topsoil placement. If soil conditions do not allow equipment to reach the 6” depth, contact the EIC.
- Check that the topsoil has been placed to the approved lines and grade and to the depth specified in the contract documents. If no depth is shown, the topsoil depth shall be 4 inches for turf or 3 inches for sod.

Figure 27: Topsoil (§713-01)
XII. TOPSOIL – ROADSIDE, LAWN, SPECIAL PLANTING MIX AND ACIDIC (610.1402, 03, 04 & 05)

Topsoil may be naturally occurring from an off-site location, or manufactured. Manufactured topsoil may include: Compost (§713-15) and/or Limestone (§713-02). See §713-01B for specific pH, organic content and gradation requirements.

Topsoil shall be stockpiled, sampled, tested and approved prior to use on the project. Procedures for stockpiling, sampling and testing are according to Geotechnical Control Procedure GCP-21.

Invasive species and weeds are monitored and treated three separate times.

Ensure the approval of materials prior to use.
- Get samples EARLY. (Three (3) week turnaround, average.)
- Topsoil stockpile(s) that fail the gradation specification may not be used on NYSDOT projects.
- Topsoil stockpile(s) that fail the material specification for organic content and/or pH only may be amended in place (only the stockpile may be amended; topsoil is spread from the amended stockpile after the material is accepted). The cost of the materials (amendments) added to the stockpile to achieve the material specification shall be included in topsoil pay item.

Do not advise on how to amend topsoil, when tested topsoil samples fail.
- Check that the topsoil stockpile marked (D#, Item # and Pile #).
- Ensure topsoil is sampled by a representative of the Department in accordance with the Department’s “Geotechnical Control Procedure GCP-21”.
- Ensure that the relevant topsoil sample information is properly entered into Site Manager.
- Verify the topsoil is approved prior to placement.
- Verify that only approved topsoil has been placed, or that an amendment plan for failed topsoil has been approved by engineer prior to use.
- Verify that topsoil is in workable condition (loose and friable, not frozen or excessively moist) and free from refuse.
- Visually inspect that topsoil has been placed as specified in contract documents
  - Was the subsoil graded so that the finished grade (AFTER the topsoil is placed) conforms to the specified lines and grades?
  - Did the Contractor scarify or till the surface of the subsoil PARALLEL to the contours to a depth of six inches (6”) BEFORE the topsoil is placed?
- Ensure that roots and top growth of non-native weeds or invasive species on topsoil placement site(s) after placement are eradicated and disposed of.
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Topsoil Materials Checklist

General Material Requirements

- Check that the topsoil is free from refuse, toxic material or material that is deleterious to plant growth, subsoil, clay lumps, stones or similar material, sod clumps, seed or other viable propagules of invasive plants, woody vegetation, stumps, root or brush.

- Check placement site and topsoil stockpile for the presence of weeds and/or invasive plant species. Verify that roots and top growth of non-native weeds and/or invasive plant species are eradicated and disposed of appropriately.

Topsoil – Reuse of On-Site Materials (§713-01 A.)
Topsoil – On-Site Wetland Materials (§713-01 C.1.)

- Verify materials to be re-used as topsoil are stripped prior to starting general excavation.

- Check that topsoil to be stripped is from sites designated in the contract documents.

- Verify the depth of topsoil stripping.

- Verify the topsoil meets the screening criteria described under §713-01 A. material requirements. If NOT, ensure the topsoil is screened. (Note: Does not apply to On-Site Wetland Material)

Note: Re-used Topsoil must be stored on site, but storage piles do not need to meet the requirements of §713-01 Stockpiling, Sampling or Testing.

Topsoil – Manufactured or Offsite Materials (§713-01 B.)
Topsoil – Roadside (§713-01 B.1.)
Topsoil – Lawns (§713-01 B.2.)
Topsoil – Special Planting Mix (§713-01 B. 3.)
Topsoil – Acidic (§713-01 B. 4.)
Topsoil – Wetland Material (§713-01 C.2.)

- Check that the topsoil stockpile is marked per “Topsoil Identification” in GCP-21.

- Ensure topsoil is sampled by a representative of the Department in accordance with the Department’s “Geotechnical Control Procedure GCP-21”

- Ensure that the relevant topsoil sample information is properly entered into Site Manager.

- Verify the topsoil is approved prior to placement.

- Check that the topsoil stockpile met the appropriate gradation requirements.

- Check to see if the topsoil stockpile requires amending (pH and/or organic only).

- Verify that the Contractor’s plan for amending topsoil for pH and/or organic content is certified by a nationally recognized entity that provides laboratory testing.

Check whether the topsoil stockpile contains and/or was amended with:

- Bio-Solids
- Source Separated Organic Waste (SSOW)
- Other

For Topsoil with Bio-Solids or SSOW:

- Check that the required certifications are provided by the Contractor prior to the delivery of Bio-Solids or SSOW to the job site.

- Verify the required tests for Bio-Solids or SSOW were completed by a nationally recognized laboratory.
XIII. TOPSOIL – ON-SITE WETLAND MATERIALS (610.1406)

Applies only to wetland topsoil identified in the contract documents for re-use on site. This material is exempt from stockpiling, testing and sampling requirements. It does need to be stored on-site at an approved location within the contract limits. Erosion and sedimentation controls shall be utilized as necessary. Check the contract documents for the depth of material to be excavated for reuse.

Note: The Contractor may still propose to use other on-site topsoil/material that is not designated in the contract documents, but they would be required to stockpile it for sampling and testing by the Department. Additional locations proposed by the Contractor must comply with §610-3.01D. and the material requirements per §713-01C.2 Offsite or Manufactured Wetland Materials.

XIV. WETLAND MATERIALS (610.1407)

Allows impacted upland topsoil pre-identified in the contract documents to be used in the manufacture of wetland topsoil. This material has to meet the requirements of §713-01C.2. Get samples EARLY. (Three week turnaround is average.)

Material that exhibits presence of invasive plant species shall not be permitted.

Wetland materials coming from offsite will likely be dry enough to handle. On-Site Wetland Materials may be very moist, but not to the level of being a slurry. Consult the EIC if the material is excessively moist.

The area receiving the topsoil may be too wet to scarify and the work effort might be counter productive.

Do not advise on how to amend topsoil, when tested topsoil samples fail.

- Verify materials to be re-used as topsoil are stripped prior to starting general excavation.
- Check that topsoil to be stripped is from sites designated in the contract documents.
- Verify the depth of topsoil stripping.

Figure 28: Wetland and Stream bed Materials stored on Site.
Note the erosion and sediment control materials, some of which needs to be maintained.
XV. PREPARATION OF SUBSOIL FOR TURF ESTABLISHMENT (610.15)
This pay item is used in areas shown in the contract documents to be seeded where no topsoil is present or specified.

Refer to Section 209 for appropriate erosion and sediment control measures.

This pay item requires the use of compost in accordance with §610-3.07 B, paid for separately.

To effectively till the compost into the subsoil to a minimum depth of 4”, the Contractor may need to machine rototill or otherwise work the compost into the subsoil. A uniform blending of the two materials is desired.

- Check that loose stones greater than 2” in size to a depth of 4” have been removed.
- Verify that compost in accordance with §610-3.07 B has been applied and uniformly blended.

Note: Refer to §713-15 Compost for additional information on the certification slips, and documentation required for the Inspector Report and Contractor payment.

- Ensure that the surface is graded to finished lines and grades, with no visible stones, ruts or gullies.
- Ensure that the finished surface is maintained in an acceptable condition for subsequent contract work.

Figure 29: Not acceptable – note the track marks, ruts and that the surface does not appear to conform to finished lines and grades.
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XVI. TURF ESTABLISHMENT (610.1601 and 610.1602)
To prevent erosion of unprotected earth surfaces, it is important to establish a vegetative cover over areas disturbed by construction at the earliest opportunity. Seeding may be temporary or permanent. Turf establishment items 610.1601 and 610.1602 are permanent turf establishment pay items. Temporary seeding may be required under a SPDES permit. Temporary seeding is paid for separately under Section 209 and is often directly linked to regulatory permit requirements.

The acceptance of turf establishment includes mowing because by the time the area needs mowing permanent grasses are typically established.

Where the 610 Item is not included in the contract documents, check to see if the designer provided a note to use §107-08 for the restoration activities.

Any method of sowing that doesn’t injure the seed is acceptable. Typically a hydro-seeder is used for larger applications.

Labels, certificates and Bill(s) of Lading must be supplied by the contractor to document the acceptability of the kinds and amounts of materials delivered to the job.

Approval of materials is required prior to use. Refer to NTEP (National Turf Evaluation Program) list in Site Manager. Note: Tickle Grass, Annual Rye, Alkaligrass, and Redtop grass varieties are not evaluated by NTEP and therefore the NTEP requirement does not apply.

Straw is the default mulch for turf establishment. However, mulch types I, II, III IV or V may be specified. The Department does not allow the use of hay on its projects. The Department restricts the use of hay due to the evidence that hay directly contributes to the introduction and spread of invasive plants.

SEEDS

Seed is accepted for sowing upon delivery on the basis of the labeled kind of seed, provided that the label indicates compliance with the specifications. Labels and Bill of Lading(s) must be retained to document the acceptability of the kinds and amounts of seeds delivered.

The Contractor may propose an alternate range of a component in the standard seed mix based on regional and commercial availability. Verify with the Regional Landscape Architect that the proposed variation to the seed mix meets the material requirements of §713-04

When seeding in cold weather conditions the Contractor may propose a dormant, winter, nurse or cover grass such as winter rye to be added to the seed mix. This is at no extra cost to the State. Contact the Regional Landscape Architect for assistance.

Understanding a Seed Label

Other Crop Seed and Inert Matter may also be indicated on the seed label. This information is not applicable to the Department’s specifications and should be disregarded. Do not add this percentage into the percentage shown for weed seed or to other materials.
Figure 30: Note location of weed seed information on label. This is an acceptable percentage.

Seed Application Rate
A Rule of thumb check would be to take the manufactures rate per unit area and convert to square yards. Multiply the rate by the total area to be seeded. The result is the manufacturer’s recommendation for seeding the area. Take this quantity and multiply it by 1.5. This will give you the minimum weight of seed needed for the project. Ensure that the total quantity is used.

Figure 31: The rate of seeding is expressed in pounds of pure live seed per square foot and varies with the seed mix rates.
Measurement and Payment

The Contractor should be paid for establishing turf, after the turf establishment work has been completed, including initial watering, mulch and mulch anchorage.

Note: The standard specifications require one mowing cycle “unless conditions prevent mowing”. Examples of conditions that would prevent mowing are site conditions such as: slopes 1 on 3 or steeper, drainage ditches with flowing water, retention ponds or where specialized equipment would be required.

A temporary condition such as weather, (late season seeding where snow occurs before the permanent grasses come up) does not constitute a condition that prevents mowing.

Definitions:

Hay is grass, legumes or other herbaceous plants that have been cut, dried, and stored for use as animal fodder, particularly for grazing livestock. Hay contains seed heads and leaves from plants in the pastures/fields where the hay was cut.

Figure 32: Close up of Hay that does not meet §713-19

Healthy green color for turf means no brown spots on the various turf species and no sign of nutrient deficiency.

Propagules are any of the various (usually) vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop. A propagule may be a woody, semi-hardwood, or softwood cutting, leaf section, root, bud or any number of other plant parts.

Grass cultivars are a distinct subset of a species, often intentionally bred to behave uniformly and predictably when grown in an environment to which the species is adapted. A cultivar, also called a variety or a release, is given a unique trade name chosen by the breeder.

Legumes are plants in the Pea family. Legumes that may be found in Department seed mixes are clover, sweet pea, and lupine.

Straw is an agricultural by-product; the dry stalks of cereal plants, after the grain and chaff have been removed.
Figure 33: Straw, typically delivered in bales, is an acceptable mulch material.

Examples of turf areas demonstrating those not meeting the specifications and those that do meet the specifications.

Figure 34: Example of area not yet established. Bare areas exceeded the maximum size allowed.
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Figure 35: Example of slope with unacceptable turf establishment. Note the presence of Erosion Control Fabric.

Figure 36: Example of Acceptable Stand of Grass for Lawns. Note that the occasional weed is not a reason for rejection.
Figure 37: Comparison of an unacceptable stand of grass on left and an acceptable stand of grass on right. Although the grass on the left appears lush and green, permanent grasses are not yet established. The grass shown on the left is fine and uniform, an indication that only one species is present. The grass on the right shows a mix of leaf types, an indication that more than one species is present.

Figure 38: Example of insufficient straw mulch.
§713-04 – Seeds Material Requirements
- Check that the seed supplied meets the Material Requirements of §713-04 Seeds A. B. C. or D. as specified.
- Check to see if an alternate range for a component of the specified mix was approved.
- Check to see if a dormant seed additive for cold weather seeding was approved and added.
- Verify seeds were furnished and delivered in labeled and acceptably sealed or sewn tight containers or bags.
- Photograph manufacturer’s label or certificate showing analysis and attach to DWR.
- Verify containers or bags are labeled in accordance with NYS Ag&Mkts Law; labels remain affixed to container/bag until the time of sowing; NOT altered, obliterated or otherwise rendered illegible, and indicate:
  - only harmless inert matter and non-noxious, non-invasive weed species seed,
  - weed seed content does not exceed 1%, and
  - Test dates shown on the seed container label(s) within twelve months of the date the seeds are sown
- For Types A & B photograph certificate of pre-inoculation and attach to DWR or verify that sufficient inoculate has been provided and field applied.
- Verify that the seed is free from damage/mold/rot/deterioration, properly handled/stored (including during transit).
- Verify that the Seed species/cultivars/varieties are on the Approved Materials List.

§713-11 and §713-19 - Mulch for Turf Establishment and Erosion Control and Straw
Mulch type: Straw □ Type I □ Type II □ Type III □ Type IV □ Type V □
- Verify the straw meets the criteria established in §713-19? (If straw used, skip the next five bullets.)
- Verify the mulch is delivered in the manufacturer’s standard containers labeled in compliance with the specifications.
- Check that it is stored and handled in compliance with the manufacturer’s instructions and recommendations.
- Check Type I and/or Type V for contamination (e.g. paint, asphalt, non-wood shingles, etc.).
Check Type II and/or Type III for plastic netting

§713-12 Mulch Anchorage
- Check that the mulch anchorage is delivered in the manufacturer’s standard container, labeled in compliance with the specifications.
- Verify the mulch anchorage is stored & handled in compliance with the manufacturer’s instructions/recommendations.
- Verify that the mulch anchorage is NOT wet, caked, frozen, separated, or otherwise unfit for use.

Surface Preparation
- Verify the areas to be seeded at approved grades with no irregularities that will hold water. (Note: If repairs are necessary they are to be accomplished under the items for topsoil or preparation of subsoil for turf establishment.)
- Check that weed growth is removed or controlled prior to seeding. (Weed removal is paid for separately.)

Placement
- Check that the Contractor’s equipment is clean.
- Verify that the application rate no less than 1.5 to 2 times the manufacturer’s recommended rate.
- Check that mulch and mulch anchorage is applied as specified. (Note: The cost for the mulch and mulch anchorage is included in all seeding pay items.)

§610-3.03 Acceptance
- Verify that the turf establishment area complies with criteria described under §610-3.03 A or B (whichever applies). (Note: ALL of the criteria must be met for the turf to be accepted.)
XVII. WILDFLOWER SEEDING (610.17)
The Department does not have required seeding dates for the Wildflower Seeding item.

The Department does not allow the use of hay, due to the concern that the use of hay directly contributes to the introduction and spread of invasive plant seeds or other propagules.

Preparing sites for wildflower plantings normally involve breaking up only the top 2 inches of soil. Sites that have been tilled too deeply could induce the growth of broadleaf weeds or unwanted grasses. Weeds could overcrowd or choke out the wildflowers and prevent seed germination.

Any method of sowing that doesn’t injure the seed is acceptable. Commonly used techniques for planting wildflowers include drill seeding, hydro mulching and broadcasting. All techniques can result in a successful wildflower planting.

When seeds, such as legumes, require inoculation on-site, the inoculants shall be applied in accordance with the accompanying instructions. The seeds must then be allowed to dry sufficiently for proper handling.

DEFINITIONS:
Inoculants are agricultural amendments that use beneficial microbes to promote plant health, growth and seed germination. They are typically solid, but may also be liquid and are applied directly to the seed.

Propagules are any of the various (usually) vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop. A propagule may be a woody, semi-hardwood, or softwood cutting, leaf section, root, bud or any number of other plant parts.

Legumes are plants in the Pea family. Examples of legumes that may be found in Department wildflower seed mixes are clover, sweet pea, partridge pea, indigo, and lupine. Typically, plants in this family require pre-treatment (scarification or stratification), and inoculation in order to germinate and grow. Check the label on the seed mix bag to ensure that the seeds have been pre-treated.

Scarification is the physical or chemical treatment/removal of the outer seed coat.

Stratification is a cold and/or warm treatment for germination, There are typically six (6) methods of cold, moist stratification to choose from; cold water soaking, refrigeration, fall planting, winter solstice sowing, outdoor treatment and snow planting. Alternatively, seeds can be germinated in the fall.

Straw is an agricultural by-product; the dry stalks of cereal plants, after the grain and chaff have been removed.

Hay is grass, legumes or other herbaceous plants that have been cut, dried, and stored for use as animal fodder, particularly for grazing livestock. Hay contains seed heads and leaves from plants in the pastures/fields where the hay was cut.
Figure 40: Close up of Hay which does not comply with §713-19 Straw

Note: seed head and leaves

Figure 41: Example of Wildflower Seeds. They will look very different from turf grass seed.

Figure 41: Emerging wildflower plants
### Northeastern U.S. Roadside Native Mix

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<thead>
<tr>
<th>Item</th>
<th>Botanical Name</th>
<th>Purity</th>
<th>Germ</th>
<th>Hard</th>
<th>Dorm</th>
<th>Origin</th>
<th>Genetic Origin</th>
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<td>Little Bluetsm, Albany</td>
<td><em>Schizachyrium scoparium, Alba</em></td>
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<td>90.0%</td>
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<td><em>Sorghastrum nutans, 'Southlow'</em></td>
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<td>11.0%</td>
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<td>86.0%</td>
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<td>Virginia Wildrye, PA Ecotype</td>
<td><em>Elymus virginicus, PA Ecyope</em></td>
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<td>Canada Wildrye</td>
<td><em>Elymus canadensis</em></td>
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<td>82.0%</td>
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<td>15.0%</td>
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<td>Partridge Pea, PA Ecotype</td>
<td><em>Chamaecrista fasciculata (Cass)</em></td>
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<td>26.0%</td>
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<td><em>Tradescantia ohiensis, PA Ecyope</em></td>
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<td><em>Rudbeckia hirta</em></td>
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<td><em>Echinacea purpurea</em></td>
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<td>Golden Alexanders</td>
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<td><em>Senecio helenioides (Cassia sp)</em></td>
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<td>Blue False Indigo,</td>
<td><em>Baptisia australis, Southern W</em></td>
<td>1.99%</td>
<td>54.0%</td>
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<td>PA</td>
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<td>43.0%</td>
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<tr>
<td>Marsh (Dense) Blazing Star (Spiked Gayfeather), PA</td>
<td><em>Liatis spicata, PA Ecyope</em></td>
<td>1.77%</td>
<td>1.0%</td>
<td></td>
<td>82.0%</td>
<td>PA</td>
<td></td>
</tr>
<tr>
<td>Smooth Blue Aster, MN Ecotype</td>
<td><em>Aster laevis</em> (Symphyotrichum l)</td>
<td>1.00%</td>
<td>23.0%</td>
<td></td>
<td>29.0%</td>
<td>MN</td>
<td></td>
</tr>
<tr>
<td>Wild Bergamot</td>
<td><em>Monarda fistulosa</em></td>
<td>1.00%</td>
<td>96.0%</td>
<td></td>
<td></td>
<td>IA</td>
<td></td>
</tr>
<tr>
<td>Maryland Senna</td>
<td><em>Senecio marilandica</em> (Cassia sp)*</td>
<td>1.00%</td>
<td>1.0%</td>
<td>24.0%</td>
<td>50.0%</td>
<td>PA</td>
<td></td>
</tr>
<tr>
<td>Oseeye Sunflower, PA Ecotype</td>
<td><em>Helianthus helianthoides, PA Ec</em></td>
<td>0.97%</td>
<td>85.0%</td>
<td></td>
<td></td>
<td>PA</td>
<td></td>
</tr>
<tr>
<td>Early Goldenrod, VA Ecotype</td>
<td><em>Solidago juncea, VA Ec</em></td>
<td>0.58%</td>
<td>31.0%</td>
<td></td>
<td>64.0%</td>
<td>NC</td>
<td></td>
</tr>
</tbody>
</table>

**Other Crop:** 0.35%  
**Inert Matter:** 3.67%  
**Weed Seed:** 0.04%  

**Net Weight:** 7 LB  
**Lot Number:** ERNMX-105-120523  
**Date Tested:** March 2012

A perennial mix suitable for areas ranging from full sun to shade, with variable soil conditions.

**Figure 42:** Sample Label for Wildflowers - Part 1. Note the seeding rate; weed seed percentage and net weight of bag.
§713-04 – Seeds Material Requirements

- Check that the seeds are furnished and delivered in labeled containers or bags that are acceptably sealed or sewn tight.
- Verify the containers or bags are labeled in accordance with NYS Agriculture and Markets Law.
  - Verify the labels were affixed to the container/bag at the time of sowing, and NOT altered, obliterated or otherwise rendered illegible.
  - Check that inert material includes only harmless inert matter and non-noxious, non-invasive weed species seed.
  - Check that the weed seed content not exceed 1%.
  - Verify the test dates shown on the seed container label(s) are within twelve months of the date the seeds are to be sown.
- Verify that inoculants were pre-applied and/or provided and field applied (if the seed mix includes clover or other legumes).
- Verify seeds are damage free, mold, rot or deterioration free, properly handled, including during transit, and properly stored.
- Check as appropriate, that seeds in the wildflower seed mix were treated prior to sowing.
- Photograph manufacturer’s label or certificate and attach to DWR.

§713-11 and §713-19 - Mulch for Turf Establishment and Erosion Control and Straw

- If straw is selected, Check that the straw meets the criteria established in §713-19. *(Note: If straw was the mulch type used, skip the next five bullets.)*
  - Photograph the material certification indicating compliance with the specifications and attach to DWR.
  - Check that the material delivered in the manufacturer's standard containers and the standard containers are labeled in compliance with the specifications.
  - Verify the mulch is stored and handled in compliance with the manufacturer’s instructions and recommendations.
  - Check wood fiber mulch (Type I) and/or pelletized hydro mulch (Type V) for detrimental contamination such as paint, asphalt, non-wood shingles and other foreign materials.
  - Check the cellulose mulch (Type II) and/or cellulose and wood fiber blend mulch (Type III) for plastic netting.

§713-12 Mulch Anchorage

- Photograph the material label/product literature (cut-sheet) or certification indicating compliance with the specifications and attach to DWR.
  - Check that the material was delivered in the manufacturer's standard containers and labeled in compliance with the specifications.
  - Verify the mulch anchorage is stored and handled in compliance with the manufacturer’s instructions and recommendations.
  - Verify the material is NOT wet, caked, frozen, separated, or otherwise unfit for use.

Placement

- Check the contract documents to see if any special notes apply.
- Check the contract documents to determine if Rolled Erosion Control products are specified.
- Verify that the Contractor’s equipment is clean.
- Verify the seed application method ensures an even coverage in the process of spreading.
- Verify the seed application rate is no less than 2 times manufacturer’s recommended rate.
- Verify mulch and mulch anchorage is applied as specified.
- When straw is used, check it is applied according to the contract documents.
- Verify the Contractor performs the initial watering.
XVIII. SODDING (610.18)
Sod is cut fresh to order. Sod is a live, perishable product and requires proper handling and prompt installation to ensure the sod will establish into a permanent stand of grass.

Sod that appears yellowish brown or is not a uniform green is not acceptable. The best indication of the sod’s freshness is soil that is moist and grass blades that are dark green and cool to the touch.

Sod is typically 1-3 inches thick (exclusive of grass) but a minimum of ¾ inches thick is required by the standard specifications. It should not be discolored or cut inconsistent with specifications.

Sod should contain a mixture of at least three (3) permanent grasses such as bluegrass, fine-leaved fescue and perennial ryegrass.

A particular method of installation is not specified; however the Contractor is required to install the sod within 48 hours of being cut. When the sod resists being lifted by hand, it has firmly rooted into the soil.

Sod may be accepted after one mowing cycle if all other performance measures are met; however the Contractor is to continue to mow accepted sodded areas until contract final acceptance

Weeds are usually not a problem in sod, and most herbicides are not labeled for application to sod until it is well established.

Watering and other measures to care for sod during temporary storage are the Contractor’s responsibility and part of the pay item for sodding.

When fertilizer is not included in the contract documents but the Contractor wishes to amend the topsoil base to ensure sod acceptance, the Contractor may provide soil amendments at their own expense and in accordance with federal, state and local regulations.

Because of all of the nitrogen in the plant, sod will heat up and begin to ferment if left rolled up for an extended period of time. If it feels warm to the touch (especially in the middle of the pile) then it has been sitting around too long and decomposition has started. Sod that has fermented or started to decompose is not acceptable.

Signs of heat damage or fermenting include:
- Sod feels warm to the touch (especially in the middle of the pile)
- Dry and cracked edges and soil surfaces
- Decomposition of grasses started
- Sod will have a foul odor
Figure 43: Fermented sod will be yellow to transparent, limp and smell rancid and is not acceptable.

The finished sod’s soil surface is flush with the surface of the adjacent structures or soil.

Figure 44: Sod Block in relation to finished grade.
**Figure 45:** Typical Sod installation on a slope.

*Typically the inspector should expect to see installation similar to the description below:*

The sod is laid smoothly, edge to edge and all openings plugged with sod. In drainage ways and where continuous or solid sodding is indicated and/or specified in the contract documents, the sod is usually laid with the longest dimension parallel to the contours. Sod placement starts at the base of slopes and progress upwards in continuous parallel rows. Vertical joints between sides are staggered. Immediately after laying, sod is pressed firmly into contact with the sod bed to eliminate air pockets, provide true and even surfaces, ensure knitting and protect all exposed sod edges, but without damaging or displacing the sod or deforming the finished sod surface.

Grades should be formed with special care at the junction of drainage ways.

Sod should be firmly anchored in all drainage ways and on slopes 1 on 2 or steeper. Sod is usually anchored immediately after tamping. All anchors driven flush to the ground.

A steep slope (10% or more) may require pegging or stapling the sod in place. Wooden pegs can be pulled out later after the sod is rooted down, but biodegradable sod staples do not have to be removed.

Excess soil should not be left to form a ridge adjacent to the sodded area or sodded strips.
Caring for Sod

Watering

Initial watering is included in sod installation. Subsequent watering is paid for separately (§610-3.10) and be maintained to contract final acceptance.

Inspection

§713-14 – Material Requirements

- Verify that the Department knew the source(s) of the sod at least five days before it was cut.
- Check that the sod was cut within 24 hours of being delivered to the job and that the maximum time between harvesting and planting the sod is less than forty-eight (48) hours.
- Check that the sod meets the material requirements of §713-14.
- Verify the sod is commercially grown, cut into manageable sizes, the grass height less than three inches (3”), a minimum thickness ¾”, and reasonably weed free.
- Ensure the sod is handled properly: Existing soil retained on roots during all operations, not dumped/dropped, delivered/maintained in good condition (NOT heat damaged/fermented/frozen).

§610-3.05 - Surface Preparation

- Check the surface is undamaged and ready for sodding. If repairs needed shall be done under topsoil item.
- Check that topsoil is moist and water it if necessary.

§610-3.05 – Placement

- Check that the ground is not frozen.
- Ensure sod’s finished soil surface is flush with the surface of adjacent structures or soil.
- Verify that the initial watering is performed after placement of the sod.

Verify acceptance is according to §610-3.05
Figure 47: Acceptable Installation of Sod.

Figure 48: Unacceptable Sod Installation.
Note the brown spots greater than 6 inches in diameter.
XIX. WATERING VEGETATION (610.19)
Watering is critical for the establishment of newly planted vegetation. This is particularly true during the months of June, July, and August, when natural precipitation may not provide plants’ root systems with sufficient moisture to sustain healthy plant growth.

Watering is not required if a total of 1” of rainfall occurs within 5 consecutive calendar days. For example, two ½ inch rain events within the 5 consecutive calendar days would qualify as 1” of rainfall.

The Contractor may request additional watering during drought conditions. Additional watering is paid for under the watering pay item.

The most common watering method is use of a watering truck. However, an irrigation system or Portable Drip Irrigation System (PDIS), if not already specified in the contract, may be proposed by the Contractor at no additional cost to the state.

Figure 49: Possible watering scenario
Figure 50: Possible Watering Scenario for July and August.

**Materials**

Water used must comply with § 712-01. Water applied to seeded or sodded areas, plants or planted areas shall be:

- Free from oil,
- Have a pH not less than 6.0 nor greater than 8.0 and
- Shall be free from impurities injurious to vegetation.

Municipal water supplies are considered acceptable sources.
Measurement and Payment
The application rate of one inch means one inch of water is applied, as measured by a rain gauge, water meter or other suitable method. Generically:

\[
\text{Gallons} = (\text{Area} \times \text{depth of water}) \times 7.48 \text{ gal/ft}^3 \\
\text{MGal} = \frac{\text{Gal}}{1000}
\]

- To calculate the quantity needed, in square feet, per application:
  - determine the area (sf) to be watered, then multiply by 0.083 ft (one inch) to get the volume in cubic feet.

- To calculate the quantity needed, in square yards, per application:
  - Determine the area (sy) to be watered, then multiply by 0.0278 yd (one inch) to get the volume of water needed in cubic yards.

For example, when watering a 1000 sy area of turf:
- 1000 sy X 0.0278 yd = 27.8 cubic yard
- 27.8 cy X 202 gallons/cy = 5615.6 gallons.
- 5615.6 gal/1000 gal/Mgal = 5.6 Mgal.

Watering Turf
Initial watering is included in turf establishment pay item. Subsequent watering(s) is paid for separately (§610-3.10).

Watering Wildflowers
Adequate moisture is required for the establishment of wildflowers. Even species classified as drought tolerant must receive sufficient water in order to germinate and become established.

Initial watering is included in wildflower seeding pay item. Subsequent watering(s) is paid for separately (§610-3.10).

Watering Sod
Initial watering is included in sod pay item. Subsequent watering(s) is paid for separately (§610-3.10) and continue to be watered until contract final acceptance.

Watering Trees and Planting Pits
Watering required prior to acceptance of newly planted material shall be included in §611 Planting Items. After acceptance, watering shall be paid for under Item 610.19

Inspection
- Verify water is in compliance with §712-01.
- Check that watering was applied in accordance with:
  - §610-3.03 (Turf Establishment)
  - §610-3.04 (Wildflower Seeding)
  - §610-3.05 (Sod)
  - §611-3.01 (Planting)
  - Special Notes (as specified)
- Verify water was applied at the rate indicated in §610-3.10.
**Figure 52:** Water should fill the tree pit up to the level of the soil berm.

**Portable Drip Irrigation Systems (PDIS)**

Verify that the Contractor has filled the PDIS (§610-3.10).

**Figure 53:** Fill the PDIS to capacity.
XX. MOWING (610.21)
This item is intended for newly established seeded or sodded areas.

Mowing equipment is to be cleaned per §107-01 A prior to all mowing activities.

Based on site activities or weather conditions the EIC may decide to modify the mowing schedule. This may result in either lengthening or shortening the time between mowing. For instance, mowing when turf is saturated or significantly wet results in rutting and damage to roadside turf.

The Department has a policy to curtail roadside mowing and similar activities by Department employees or contractors on Air Quality Action Days, consistent with safety, operational needs or contractual requirements.

Contractors may at their own expense and as approved by the EIC, remove the lower branches of major trees within the ROW that interfere with safe mowing. Such pruning shall be consistent with ANSI A300 Part 1 Standard Practices and only be on plant material where the removal of the branches is consistent with the plant material's typical habit.

The mowing height requirements apply to areas around sign posts, mailboxes, etc.

- Verify that the Contractor has removed and disposed of any debris or litter prior to mowing.
- Check to see that the Contractor is adhering to any mowing restrictions that apply to the contract area due to environmental regulations or permits.
- Check to see if Mowing Limit markers are included in the Contract. If so verify that the Contractor has installed the markers; if not verify that the areas are temporarily marked prior to the first mowing.
- Ensure that the Contractor has mowed to the fence line, to the face of shrub or tree beds, to visible established mowing limits, and/or as specified on the plans.
- Verify that the Contractor has mowed all turf establishment areas in compliance with §610-3.12:
  - Roadside: Mow to 5" height after growth reaches 8".
  - Lawns & Sod: Mow to 3" height after initial growth reaches 5"
- Verify that the Contractor has neatly trimmed newly established areas including around trees and other plant materials, sign supports, delineators, light poles, guide rail and other miscellaneous objects, and the areas adjacent to the fence line, during each mowing.
- Verify that the Contractor treated the clippings as indicated:
  - Roadside: Left in Place
  - Lawns & Sod Areas: Mulched in Place
- Verify that the Contractor removed mowing operation debris from site.
- Verify that any damage to lawn, vegetation and/or other property from mowing is repaired.
Figure 54: Example of mowing damage.
SECTION 611
PLANTING, TRANSPLANTING AND POST-PLANTING CARE

I. General for Planting and Transplanting
For any question regarding the intended use of these items, contact the Regional Landscape Architect or Designer. The Regional Landscape Architect typically assigns a designee to assist with the inspections. The majority of inspection tasks do not require a Landscape Architect.

Note: A “licensed” Landscape Architect or an individual working under the direction of a licensed Landscape Architect is required for certain tasks as described below. A licensed Landscape Architect means an individual licensed to practice Landscape Architecture in New York State.

Note: In cases where insect damage and diseases are suspected, contact the NY State Agriculture and Markets Inspector.

- Verify that the Contractor’s progress schedule shows the estimated beginning and completion dates for the work included in the contract.
  - Seasons are limited in the standard specifications (611-3.01) and the Inspector needs to verify that the Contractor is including realistic dates in the project schedule.
  - The timeframe for planting may have an impact on the overall project schedule.

- Check that all materials are approved prior to use.

- Ensure all plants are protected from damage and drying out, including during transporting (See Figure 1), handling or while in temporary storage. Tarpaulins or other covers shall be placed over plants transported by open vehicles.

Figure 1: An example of a plant delivery. Note the wrap on tree trunks to protect them from damage. The tarp that covered the trees has been removed but was in place as trees were transported to protect the trees from wind damage. The plant material is slanted to further protect the material from transport damage and drying out.
Unless the vehicle is well ventilated, delivering or storing plant material in enclosed trucks or vans is generally not a good idea. The heat that may develop in the enclosed vehicle will dry out and in some cases “bake” or kill the plant material.

A. Temporary On-Site Storage for Planting and Transplanting
   Following inspection, all accepted plant materials shall be stored (carefully), as required, until planted. Plants held more than 48 hours without care have a poor chance of survival.
   - Ensure the Contractor is caring for plant materials (including watering) placed in temporary storage. This care is included in the pay items.
   - Ensure that Balled and Burlapped (B&B) and transplanted plants are handled carefully to avoid cracking or breaking the root ball and that they are protected against drying out.
   - Check that plants are handled appropriately and not by the trunk or stems. Handling a plant in this manner may damage the trunk/stem and/or affect the integrity of the rootball or root mass.
   - Check for damaged balls, leaders, major branches, and/or roots. If any plants are damaged during storage, the Contractor is not in compliance with the 611 pay items and the work may not be accepted for payment.
   - Verify pruning is to remove dead, conflicting and broken branches and in accordance with ANSI A300 Part 1.
   - Ensure plants are not damaged during transport from the storage area to the planting site.

Typical plant storage may include the following:
   - Outside storage that is shaded and protected from the wind.
   - Plants covered with burlap, tarpaulin, or mulching material to protect against freezing or drying.
   - Plants that are “heeled-in” (recommended for plants not planted within 2 days of delivery). “Heeling-in” involves covering the bare root or root balls with moist sawdust, wood chips, shredded bark, peat moss, or other approved mulching material(s).
     - Place plants in a trench or group plants together on ground surface
     - Fill around all roots and root balls with mulch
     - Water (as needed)

B. Layout for Planting and Transplanting
   - Ensure the proposed locations are staked or marked out by the Contractor, then approved by the Department before plant pits or beds are dug. The Contractor shall coordinate with all utilities as necessary (§107-07).
   - Verify the layout reflects exact dimensions when required by the contract documents (e.g. offset from built features, mowing clearances, tree stem centered in tree pit, etc).
   - Check that adjustment of planting areas and pits are done at this time to respond to unanticipated conditions:
     - Avoid rock outcrops,
     - Avoid drainage ditches and/or drains,
     - Meet clear recovery area requirements,
     - Allow for room to mow (especially when the tree is fully grown),
     - Avoid placement over or under utilities (See Figure 2), or
Avoid impervious or wet soil conditions.
Other adjustments (field changes affecting offsets from built features, etc.)

Notes:
1. When laying out shrub and groundcover beds, the appearance of the perimeter may be critical to the context of the area (e.g. a flowing line that clearly outlines the bed border in a highly visible setting). Concerns should have been communicated by the designer.

2. The layout of plants in wetlands is critically important to their success. Many plants have exact water requirements and will not thrive or even survive if planted in water too deep or too shallow. Adjustments may be required to the planting layout due to final grading.

3. If excessive moisture is encountered, planting may need to be adjusted, species substitution may be considered, or if adjustments are not possible the planting in this location may need to be eliminated.

Figure 2: Do not place trees where they can interfere with underground or overhead utilities.

C. Site Preparation for Planting and Transplanting
- Ensure that prior to installing plant materials, the following preparation is completed according to the contract documents.
  - Planting pits or beds are excavated to the required size, depth and spacing. Measure root ball depth and width for accurate plant pit sizing. Check the 611 Standard Sheets; in general the depth will be the same measurement as the depth of the root ball.
  - Existing vegetation is removed from the entire bed area.
SECTION 611
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- Verify the soil removed from the plant pits and beds is re-used (this is the default) or removed from the contract site. The Contractor may need to plan for stockpiling the planting soil until needed.

- Check that no planting holes have been left open without properly securing them for public safety. An option may be to backfill with the specified planting soil. There is no separate payment for this operation; it is part of the 611 item.

- Ensure the sides and bottoms of the plant pits and beds are shaped according to the Standard Sheet (especially in drilled holes). This means that the faces of pit walls will be friable and loosened to break all “glazing”. This promotes moisture transfer between different soils (existing and backfill).

D. Installation for Planting and Transplanting

1. Plant installation
   - Verify that planting installation is completed in conformance with contract documents, including ANSI A300.
     - A good practice in mixed planting areas is to plant trees first followed by the larger shrubs, low shrubs and finally with ground cover plants. This prevents damage to the smaller plants; however the Contractor is responsible for sequencing.

   - Check that plants are moist at the time of planting.

   - Verify that trees or shrubs if marked with compass orientation are planted in the same compass orientation. If not marked, aesthetics may be considered, especially if in a viewer sensitive location (e.g.: rotate plant for best appearance prior to placing in ground).

   - Check that the root flare (point where the first structural roots emerge from the trunk) is visible and level with the surrounding soil. (See Figure 3)

   ![Figure 3: Root flare begins at the bottom of the tape. Note excess soil in this picture. Often excess soil will be present at the top of the root ball. This soil should be brushed away to make sure that the tree is planted at the right height to ground level. Look for the flare of the trunk of the tree to be at ground level. forestkeepersofcapecod.com](image-url)
2. Backfilling
   - Verify planting soil is per the contract documents (default is un-amended existing soil excavated from plant pit or bed).
   - Ensure that frozen or saturated backfill is not used.
   - Check that planting pits are carefully backfilled in layered sections and each layer watered to limit future settling and prevent air pockets.
   - Check that enough water is applied to bring the backfill to “field capacity”, which means all voids in the soil are filled with water but not to the point of soil saturation and standing water. When water stops draining freely field capacity has been reached. Soil turns to mud above field capacity and is unworkable. After the drainage has stopped, the large soil pores are filled with both air and water while the smaller pores are still full of water. At this stage, the soil is said to be at field capacity. At field capacity, the water and air contents of the soil are considered to be ideal for growth.
   - This initial watering is included in the pay items.

3. Staking, Guying or Anchoring
   Staking, guying or anchoring the plants is not required unless specified. Installation is included in the pay item for planting. Check 611 Standard Sheet for details. (See Figure 4)
   - Ensure that commercial tree support systems are installed per the manufacture’s specifications.
   - Check when staking is specified, that the stakes are driven solidly into the ground and oriented as shown on Standard Sheets.

4. Soil Planting Saucer
   - Ensure that a berm of soil is formed around the perimeter of the pit. The berm creates a saucer to facilitate watering and retention of rain water as shown on the 611 Standard Sheets.

5. Mulching
   - Verify that plants are mulched per the contract documents and in accordance with the Standard Sheets (See Figure 5).
     - Check that the mulch is to the specified depth with approved mulch material.
     - Ensure care is given to mulching ground covers; plants are not to be buried with mulch.
     - Verify mulch completely covers the designated area to the depth specified, tapering down to leave the root flare of trees exposed. Check that mulch is not in contact with tree trunks, low branches and plant stems. Improper mulching can vector disease and/or cause root rot, which in turn may stunt the tree growth or result in tree mortality.
E. Care Until Acceptance for Planting and Transplanting
   - Verify the Contractor waters, weeds and maintains mulch at no cost to the State until plants are accepted for payment. (Once accepted, separate pay items are required to water or care for the material.)

F. Conditions of Acceptance for Planting and Transplanting
   - Accept plants when all plants meet the following conditions:
     - Plant species has been verified and plant is in its designated location.
     - Planted or transplanted in accordance with ANSI A300, Part 1, 2, 3 and 6.
     - Planted or transplanted in accordance with 611 Standard Sheets.
     - The plant is in a living, healthy, unimpaired and undamaged condition.
       Healthy growing condition means an absence of:
       - Disease, insects, eggs, larvae,
       - Sun-scald, wind-burn,
       - Cuts, bruises, abrasions, punctures, holes,
       - Dead or broken leader or major branches,
       - Visible wilting.

   - The standard specifications call for all plants to be accepted at one time. Reasons include:
     - Contractual efficiencies
     - One start and end date for any included Post-Planting Care
     - Community expectations
     - Permitting Conditions
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- Contract schedule or safety concerns may necessitate a phased acceptance of plant material. For example:
  - A portion of the material is planted in the fall and spring only plants can not be planted at the same time. The Engineer may accept the fall planting provided all conditions of acceptance are met.
  - The majority of the planting is completed, but the schedule prohibits the planting in an area (e.g. staging area) phased acceptance would be appropriate.
  - Other situations may occur and the Regional Landscape Architect is available to assist.
  (Note: Phased acceptance of the planting may affect the Post Planting Care item).

- Ensure that plants that die after acceptance are removed by the Contractor and the surface area restored at no additional cost to the State. Questions concerning the health or vigor of plants should be referred to the Regional Landscape Architect.

- Damage caused by animals (i.e., deer, rodents) should be brought to the attention of the Regional Landscape Architect.

G. Payment
The four conditions of acceptance are part of “satisfactory completion of the work”.

Materials
A. Water
Water used must comply with § 712-01. Water applied to plants or planted areas shall:
- Be free from oil,
- Have a pH not less than 6.0 nor greater than 8.0 and
- Be free from impurities injurious to vegetation.

Municipal water supplies are considered acceptable sources. Other sources of water require sampling by Department representatives and a determination by the Materials Bureau as to suitability for use.

B. Topsoil
The contract documents may indicate the use of topsoil (§713-01). See CIM 610 for additional information.

C. Mulch for Landscape Bedding
Type A Seasoned Wood Chips or B Recycled or Green Wood Chips (§713-05) shall be used unless otherwise specified in the contract documents. See CIM 610 VIII Mulch for Planting for additional information.

D. Protection of Plants (§713-08)
1. Staking is only required when specified in the contract documents. Check 611 Standard Sheet for details.
   - Above ground support/stakes: Wooden stakes or a commercially available product/system developed and labeled for supporting trees.
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- Wooden stakes:
  - 8 – 10 feet long – minimum diameter of 2 – 2 ½ inches
  - 12 feet long – minimum diameter of 3 inches
  - Maximum diameter shall not exceed 4 inches
  - Pointed at one end
  - Sound and free from insects

- Underground support – commercially available product or system developed and labeled for supporting trees (See Figure 6)

2. Wire, Hose and/or Straps for protecting Tree Bark:
   Use with stakes or other tree support systems/products. See Planting Standard Sheets.
   Gauge for annealed steel wire is as shown on Standard Sheet 611-01

3. Anti-Desiccants:
   May be specified in the contract documents. The typical anti-desiccant spray creates a barrier on leaves that helps slow the loss of water. Anti-desiccants shall be labeled for vegetation (See Figure 7); with instructions for use. The directions on the label should be followed.

E. Compost
   The contract documents may indicate the use of compost (§713-15). See CIM 610 for additional information.
II. PLANTING

A. Plant Stock Inspection (§713-06)

The Department’s material requirement standard for trees, shrubs, vines and other plants is ANSI Z60.1 – American Standard for Nursery Stock.

Plant materials delivered to the construction site shall be accompanied by a Bill of Lading stating the species, size and quantity of plants delivered.

1. Inspection at the Nursery or Source

In general NYSDOT does not inspect planting stock at the nursery or other approved source. The contractor is required to provide quality planting stock that meets the standard specifications. However if requested the Department may provide an inspection at the nursery. Since all expenses related to this activity are the responsibility of the NYSDOT such inspections should only occur when approved by the EIC. Such inspection is for general acceptability of the stock and does not eliminate or take the place of inspection at the Construction Site.

2. Inspection at the Construction Site

Plants are inspected upon delivery to the project site for conformance with ANSI Z60.1 (e.g. growth habitat, size, etc.) and any other requirements in the contract documents (e.g.: street trees).

Inspection of stock includes ensuring that the plants are from an approved source, are in a healthy and undamaged condition, and conform to sizes, quantities, and standards called for in the specifications.

The Regional Landscape Architect or their designee typically assists with the inspections; however note that a licensed landscape architect is required by the Department to assess plant material for signs of disease and insect damage.

**Before unloading** the inspection at the construction site should include the following checks:

a. **Transportation:**
   - Check for the evidence of proper handling procedures such as:
     - On open vehicles tarpaulins or other covers are present and secured over plants upon delivery.
     - For closed vehicles ventilation system present; doors shut to prevent plants from drying out.
     - Heads of trees tied/wrapped carefully to prevent damage to branches and leaders.
     - Trunks and branches supported and padded to avoid scraping or bruising the plant.
     - Plants and rootballs protected from drying out and injury.

b. **Documentation (Bill of Lading/Certificates):**
   - Obtain Bill of Lading from the Contractor stating the point of origin, quantity, sizes and kinds (genus and species) of plants delivered. Bill of Lading must accompany the shipment.
   - Check that the plants have been grown in similar climatic conditions to the planting location.
   - Check that the Bill of Lading matches the contract documents. (e.g. correct species, quantity, etc).
   - Obtain from the Contractor all necessary current, valid quarantine or Federal, State, and/or Provincial nursery inspection certificates should accompany each shipment.

*Note: Have the Contractor remove tarp prior to the cursory check of the plants.*
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c. Quality:
   • Each shipment of plants must be free of disease and insect infestation/damage. The Landscape Architect or their designee will perform a cursory check for obvious signs of disease and insect damage. The Landscape Architect will provide the results to the Inspector.

d. Cold storage plants: (e.g. plants arriving in a refrigerated truck, cooler or freezer) are unacceptable without prior written approval. Typically, cold storage plants would be a special specification.

Unloading: Individual plants are inspected as the material is being unloaded, or immediately thereafter. Unacceptable plants are set aside for removal from the project site.

e. Verification and labeling:
   • Verify the plant material is consistent with the shipment documentation (e.g.: Bill of Lading).
   • Check that plants are labeled in accordance with currently accepted nursery labeling practice.
     – All trees and a representative sample of shrubs should be legibly tagged with the correct botanical name, common name, and size to agree with the specifications and plant list. Bare-root plants should be shipped in bundles with each bundle properly tagged.
   • Prevent discarded plants from being submitted for acceptance on other Department projects by removing nursery flags, ribbons or other markers and by non-injurious means (e.g. paint dot on burlap, etc.).
   • Discarded plants are to be removed from the project site.
     – Do not permanently mark or mistreat discarded plants, as they are the property of the Contractor.

Note: Have the Contractor remove crown wrap/ties and any trunk protection material prior to final inspection of the plants.

f. Disease and Insect Damage:
   • The Landscape Architect will perform a final inspection for signs of disease and insect damage. The Landscape Architect will provide the results to the Inspector.

g. Quality, size, defects and plant problems:
   • Check individual plants for quality, size, defects, and plant problems.

1) General:
   – Plants including root spread and ball size shall be in accordance with ANSI Z60.1.
   – Growth habit (shape or form -- e.g. upright, multi-stem, weeping, etc.) typical of the species. Refer to ANSI Z60.1 for plant silhouettes.
   – Plants of like species from the same grower should have similar silhouettes. (See Figure 8)
Figure 8: Plants of like species have similar silhouettes.

- Minimum size allowed: from the minimum size up to but not including the next larger size.
- No fresh pruning cuts. No cut back of crowns or leaders.
- Healthy growing condition:
  - Not wilted
  - Tops of good quality
  - Adequately hardened off before shipment. (Typically no soft shoots or soft buds. Thicker outer leaves and no early leaf out.)
  - No obvious damage to visible roots

2) Ball and Burlap (B&B):
- Processed balls are not to be accepted. A processed ball is a plant that is dug bare root while dormant and to which a growing medium is mechanically or manually formed around the roots to form a ball. A processed ball will lack a fibrous root system that has developed so that the root ball is firm and will retain its shape and hold together when removed from the burlap or container.
- Stem to rootstock grafts are healed.
- A good fibrous root system. Do not accept a plant with circling roots at the base of the trunk. (See Figure 9) Girdling roots will decrease the vigor of the tree and ultimately the tree will decline and die.

Figure 9: Pull away the burlap from the top of the root ball to inspect for circling roots.
• Firm soil ball, with trunk securely tied. Do not accept a plant with a cracked or broken ball. There may be some minor natural cracking however cracks large enough to cause ball to be unstable or fall apart are not acceptable.
• Ball is wrapped and tied with approved materials. Burlap or other suitable biodegradable material.
• Trunk or stem of the plant should be in the center of the root ball. A tolerance of 10% of the diameter is the maximum deviation allowed.
• Ball supporting devices, such as wire baskets, shall hold the ball in a firm, rigid condition.
• Root ball depth is measured from the top of the ball, which in all cases shall begin at the root flare. Soil above the root flare is to be removed.

3) Container Grown:
• Height and container size according to ANSI Z60.1
• Container sufficiently rigid to hold their shape and protect the root ball during handling and shipping.
• Plant grown in container long enough for new fibrous roots to have developed so that the root ball holds its shape when removed from the container.
• Plants are not rootbound, with no excessive root growth encircling the inside of the container.

4) Bare Root Material:
• Root spread in accordance with ANSI Z60.1.
• Well branched root system.
• Roots protected from injury and drying out.

5) Herbaceous Perennials, Ornamental Grasses, Groundcovers, & Vines
• Vigorous, well-developed plants with container and minimum plant size as specified in ANSI Z60.1, Section 13.
• Established in pots with sufficient roots to hold earth intact after removal from container. Roots should reach the side of the container.
• Plants are not rootbound, with no excessive root growth encircling the inside of the container.

6) Bulbs, Corms, Tubers & Rhizomes
• Sold under grade names related to size, see ANSI Z60.1, Section 12.

B. Planting Installation Inspection

1. Planting
   • Check that all nursery tags have been removed from plant material.

2. Balled & Burlap
   • Ensure that all twine, wire basket and burlap is cut away from the upper half and top of the root ball (the bottom portion may remain intact) and removed from planting pit. (See Figure 10)
3. Container Grown
   - Ensure that the container is not removed by pulling or leveraging the trunk of the plant. See ANSI A300 Part 6 – Planting and Transplanting for addition information on removing the plant material from container.

   - Verify that the container root ball has been “managed” according to ANSI A300 Part 6 prior to planting. Methods include but are not limited to slicing, shaving or re-directing. (See Figure 12)

   ![Figure 10: Note that this planting hole is under size and not in conformance with Standard Sheets. Also it appears that the burlap and twine are being pushed down into the hole rather than removed as the specifications require.]

   ![Figure 11: Removing the wire basket from the upper half of the rootball]

   ![Figure 12: Slicing and shaving a root ball with a shovel on left and with a saw on right.]
4. Bare Root Stock

- Check for proper pit diameter and positioning of the plants per the 611 Standard Sheets (e.g. spread of the bare root system, depth, root flare relationship, etc.). When the plant’s root flare is lower than the finished grade it will decrease survival potential of the plant. This is not acceptable and should be corrected prior to placing backfill.

- Ensure that roots of bare root plants are properly spread out in a radial position and planting soil is carefully worked in among them. All dead, broken, frayed roots should be cleanly cut off and twisted roots should be straightened.
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III. TRANSPLANTING (611.10 -611.16)

Transplanting involves the careful extraction of a tree or shrub, re-locating the plant to a new location, and replanting. Transplanting is in accordance with ANSI A300 Part 1, 2, 3 and 6 Standard Practices.

The most critical step in this process, and the step that requires the most experience, is the extraction, as preserving the plant’s critical root system intact is difficult.

Transplanting may occur close to the beginning of the project as the plants will need to be moved prior to other construction activities. The plants may be moved to their permanent location or temporarily stored until re-planting can occur.

The Department’s material specification for transplanting is based on the guidance for “Collected Plants” detailed in ANSI Z60.1. Inspection for transplanting includes:

- Check that the minimum ball sizes are equal to those specified in Table 6 for the next larger size nursery grown stock. (E.g. ball size for a two inch nursery grown tree is 24 inches, but for a two inch transplant tree, use 28 inches which would be the ball size for a two and one-half inch nursery grown tree.)

- Verify that the compass orientation is considered when extracting and replanting.

- Check that all broken, torn, or damaged roots greater than one inch in diameter are pruned, leaving a clean cut surface to help prevent rot and disease.

- Ensure that once a plant has been extracted from the ground, it receives the same treatment and care as a nursery-supplied plant.

A special specification is used to transplant material greater than 12 inches DBH, as it requires special measures for a tree of that size.

Figure 13: When transplanting smaller trees hand digging is common. Photo from buybigtrees.net

Figure 14: Example of tree spade. forestry.about.com
IV. PORTABLE DRIP IRRIGATION SYSTEM & REMOVAL (611.17 & 611.18)

Portable Drip Irrigations Systems (PDIS) provide a slow and deep application of water directly to plant roots.

Watering is performed according to §610-3.10 Watering Vegetation and is paid for separately.

PDIS may be reinstalled in spring for multi-season construction contracts.

The PDIS remains the property of the Contractor.

*Note: Contractor is paid for each installation and each removal of PDIS.*

- Verify that the product meets the Materials Specifications (§713-08)
  - Slow release watering system with accommodation for even watering.
  - Accommodate a standard hose.
  - Can be attached to trees.
  - Provide water from two (2) drip points (minimum).
  - Have a zipper or similar method to securely attach to tree. (See Figure 15)
  - UV treated reinforced polyethylene material.
  - Sized according to manufacturer’s recommendation for plant size and type.

- Check that the Contractor has furnished and installed the number of PDIS(s) indicated in the contract documents.
  - At the locations indicated in the contract documents.

- Verify that damaged or missing PDISs are replaced (no added cost to the State).

- Verify that they are removed prior to first frost or at end of specified watering period, which ever is sooner.

*Figure 15: PDIS with zipper that attaches the system to the tree.*
Note: Be aware that leaving PDISs past the first frost can result in damage to the plant material.

Figure 16: The above pictures show potential problems to watch for with PDIS installations. Clockwise from top left: 1. and 2. Mold and damage to trunk; 3. Insect Infestation; and 4. Damage from frozen PDIS.
V. POST-PLANTING CARE (611.19 & 611.20)

Notes:
Replacement plants are not included in the standard pay item for Post-Planting Care.
“Watering Vegetation” is a separate pay item

- Verify that the Contractor has submitted a post-planting care work schedule and that it has been approved by the Department. This may require an Uncompleted Work Agreement (UWA) or a contract time extension.

- Check that the Contractor is following the work schedule and work is performed according to the contract documents.

The specification requires the Contractor to:
1. Mulch twice according to the approved schedule.
   a. Mulch used is to match that used in the initial planting.
      Note: It is unlikely tree removals will be occurring during the Post-Planting Care time period. The Inspector may allow the Contractor to provide Type B Recycled or Green Wood Chips or Type A Seasoned Wood Chips mulch.
   b. Mulch should be added to keep the depth at 3 inches.

2. Weed twice according to the approved schedule.
   a. Tree pits and planting beds should be reasonably free of weeds including their live roots.
   b. No specific weeding method is specified.
   c. § 713-13 has been included in the Material Section of these items because the Contractor may choose to use herbicides (though no separate payment is made).

3. Perform integrated vegetation and pest management.
   a. This includes:
      ▪ Looking for signs of insect infestations or plant disease during scheduled plant care.
      ▪ Selecting and undertaking control methods in the event of problems.
      ▪ Evaluating performance of all implemented Integrated Pest Management (IPM) measures and adjusting if necessary.
   b. § 713-13 has been included in the Material Section of these items because the Contractor may choose to use pesticides (though no separate payment is made).

4. Prune once according to the approved schedule.
   a. Performed according to ANSI A300 Part 1.
   b. Prune dead or damaged branches.

5. Maintain tree support system (if present) once every six months. This duration should be shown on the approved schedule.

And at the end of the post-planting care

6. Remove tree support system (if present).

7. Remove rodent guards (if present).
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Notes:
• Repositioning as a result of settlement, wind action, vandalism, etc. is beyond the scope of post-planting care.
• Damage caused by animals (i.e., deer, rodents) should be brought to the attention of the Regional Landscape Architect.
• Dead plants are removed under the §611 planting item.

Progress payment

A progress payment of up to 40% of the unit price bid may be paid at mid-point if the work is satisfactorily performed.

Figure 17: Properly cared for trees
VI. RODENT GUARD (611.21)

The item is intended to place rodent guards around newly planted trees and other vegetation when indicated in the contract documents.

There are two common types of tree guards — tubes and those made of spiraling plastic. Both keep pests away from young trees.

Note: Tree shelters and rodent guards should be monitored and removed if insects infest or disease occurs.

- Verify the products (§713-13) are commercially available and labeled as rodent guards for vegetation.
- Check that rodent guards are installed according to the contract documents and/or manufacturer’s recommendations.
- Ensure that the rodent guards are installed at the locations indicated in the contract documents.

Figure 18: Spiral type rodent guard.  
Figure 19: Grow tubes also provide rodent protection
Figure 20: Plastic sleeve type rodent guard.

Figure 21: Rodent Guard

Figure 22: Rodent guard products should indicate that they are for horticultural use.

Fits Trees up to 4” Across
Expands with Tree Growth
SECTION 612 SODDING

I. GENERAL.
Sod is used to quickly establish turf and prevent soil erosion. Sod is much more expensive than seeding, and is frequently used when roadsides in urban/suburban areas are residential or commercial lawns, public spaces, etc. Supplemental landscape development requirements may be specified in the contract proposal.

II. INSTALLATION.
Sources of sod must be made known to the Engineer at least 5 days before cutting and are subject to inspection and approval by the Engineer before cutting. Shipments of sod that arriving at a contract site must be accompanied by a certificate indicating compliance with the regulations of the NYS Department of Agriculture and Markets. The Contractor must exercise care to retain the soil existing on the roots of the sod during transporting, handling and transplanting operations.

Sod should be a mixture of permanent grasses; such as blends of bluegrasses, perennial ryegrasses and fescues. Monocultures are not acceptable unless so specified.

Sod installation begins with fine grading of the surfaces and scarification, if necessary, to loosen and aerate the soil. A minimum of 2 inches (50 mm) of topsoil under all sod is required unless otherwise specified. Verify that the soil on which sod will be laid is moist to a depth of 2 - 3 inches (50 - 75 mm). If the soil is not moist, the soil must be watered prior to placing sod, which is included in the cost of the sod item. Fertilizer must be applied at the stated rate. Refer to the fertilizer labels for percentage of nitrogen or other elements in order to determine the amount of fertilizer that should be applied.

Ensure that the sod which is not immediately planted is tightly rolled, or stored roots-to-roots. All sod in stacks must be kept moist and protected from the sun and from freezing. The maximum period of time from harvesting to planting shall not exceed 48 hours. Sod that is stored prior to planting shall meet the moisture requirements of §713-14 at the time of planting. Sod must not be placed if the sod is frozen, or if the topsoil under it is frozen.

After placement, sod must be pressed into the soil to ensure firm contact with the topsoil and eliminate air pockets, typically performed with a roller weighted with water. Sod placed on steep slopes must be anchored, typically with metal or plastic stakes. Ensure that stakes are driven flush to prevent damage to mowing equipment.

Ensure that the sod is watered after planting and remains watered until it is well established. Watering rate may be verified by measuring the total amount of water applied to a given area, or if water is applied uniformly via a static application or sprinkler, by placing and anchoring a plastic cup or rain gauge in the center of an area and measuring the depth in the cup. Lawn areas typically need approximately 1 inch (25 mm) of water per week, preferably in a single application. Overwatering is unnecessary, and potentially expensive.

Watering weekly for a minimum of 4 weeks after installation is included in the sod item. When the contract quantity exceeds 500 sq yds (400 sq m) watering, other than at the initial installation, is paid for separately. If contract quantities do not include the watering item, or the quantities are insufficient, additional watering should be considered extra work, in order to prevent expensive sod from dying out and having to be replaced. Once sod has become well established, additional watering should be unnecessary.
SECTION 613 TOPSOIL

General Requirements
If no preapproved sites are designated in the contract documents, topsoil shall be stockpiled. Topsoil shall be sampled by a representative of the Department in accordance with the Department's "SAMPLING PROCEDURE FOR STOCKPILED TOPSOIL."

Project Procedure
For stockpiled topsoil, record the material source and stockpile construction features on MURK-1d, "INSPECTOR'S DAILY REPORT." Request sampling from the Regional Landscape Architect. Form SM-449-1-5, (Exhibits 613 A-E) "TOPSOIL SAMPLE INFORMATION," shall be completed and submitted to the Geotechnical Engineering Bureau with the topsoil sample(s). A copy of the form shall be placed in the project file.

When stockpiling is required, the topsoil shall be tested and approved prior to use on the project.

Inspection
Inspectors should be aware that when seeding lawn areas, the seeding requirement mandates that the topsoil be screened. Without screening the topsoil is very difficult to rake.

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. For sources requiring stockpiling, a copy of test results on Form SM-449-1-5, "TOPSOIL ANALYSIS REPORT," shall be on file.
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PRUNING, IMPROVING AND REMOVING EXISTING VEGETATION

I. General
For any question regarding the intended use of these items, contact the Regional Landscape Architect or Designer.

Review contract documents to determine if special notes apply. Check the “Hand-off Memo” (the transfer of project information to Construction, HDM Chapter 21, a.k.a. Notes to EIC) to see if the Designer has included additional information on the objectives for Section 614 pay items.

The Contractor shall coordinate with all utilities as necessary (§107-07).

The following discussions of DBH and stump treatment provide information needed to complete inspection for Section 614 pay items.

DBH – Diameter at Breast Height
DBH is a standard method of expressing the diameter of the trunk of a standing tree. DBH is the outside bark diameter at breast height. Breast height is defined as four and a half (4.5) feet above the ground on the uphill side of the tree. For the purposes of determining breast height, the ground includes the leaf layer that may be present, but does not include loose woody debris that may rise above the ground line.

The two most common instruments used to measure DBH are a D-tape (diameter or girth tape) and calipers.

Measuring diameter using a D-tape: Stand next to the trunk of the tree and measure at four and a half feet (4.5 ft.) above ground. Wrap the diameter tape around trunk and make sure tape is level. Record the DBH as taken from the “diameter” side of the tape.

![Figure 1: Example of a D-tape's front and back sides.](image1.png)

![Figure 2: Make sure to measure DBH at four and a half (4.5) feet from ground level.](image2.png)

![Figure 3: For an accurate measurement ensure the D-tape is taut and level.](image3.png)
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The caliper is a measuring tool that looks like the letter "F", with increments on the long arm of the tool. One of the cross arms slides across the long arm to measure the diameter of the tree. The caliper tool is opened wide and placed up to the tree trunk, and the cross arm is slid closed until it rests snugly against the bark. A tree is rarely symmetrical in cross section, so in order to obtain a more accurate measurement; the inspector should take three (3) measurements moving around the circumference of the tree and average them.

![Figure 4: Caliper for measuring tree size](image)

![Figure 5: Electronic caliper](image)

Factors that affect DBH measurement

- **If there is some irregularity about the tree**, such as a protruding knot or ring of knots, swelling, or other deformity then DBH must be taken at another point. Generally, the point of measurement is moved higher on the tree trunk, to a point where the deformity is no longer affecting the measurement or estimate of DBH.

- **Tree has branches or bumps which interfere with DBH measurement.** Measure DBH below the branch or bump.

- **Tree leans.** Measure four and a half feet (4.5 ft) up the stem in the direction of the lean.

- **Tree forks AT four and a half feet (4.5 ft.) height.** The measurement is recorded at the narrowest part of the main stem below the fork. The height of the DBH measurement AND the fork should be noted on the DWR for record keeping purposes.
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- **Tree forks BELOW four and a half feet (4.5 ft.).** Measure each fork individually at 4.5 feet and treat each as a separate pay item.

- **Tree forks ABOVE four and a half feet (4.5 ft.).** Measure the tree as a whole at 4.5 feet.

- **Tree splits into several trunks close to ground level.** Measure DBH of each trunk separately at four and a half feet (4.5 ft.).

**Tree Removal Equipment**
Tree removals may include the use of chain saws, skidders, forwarders, chippers or other tree removal equipment.

**Stump Treatment**
- **Stumps Cut to Above Grade**
  The phrase “Stumps cut to above grade” is usually applied to trees in wooded areas. Stumps are typically cut to six (6) inches above grade. However, the contract documents may specify a different height or leave the stump “as is” for use as wildlife trees.

- **Stumps Cut Flush**
  Cut flush is an approximation and can be difficult to achieve on large trees. The intent is to leave nothing hazardous in the rights-of-way that could be struck or caught by a vehicle. A “flush” cut stump shall be cut as close to the surface of the surrounding soil as practicable, but no more than two (2) inches above the surrounding terrain.
**Stumps Cut to Below Grade**

“Cut to below grade” typically requires stump grinding and the default depth is six (6) inches below grade. This treatment is used where it is desirable to leave the roots for soil stability, where it is not cost effective to remove the entire stump and/or where visible stumps will detract from the landscape aesthetic.

**Stumps Grubbed**

“Grubbed” applies to areas where heavy equipment can be used to do the stump removal and all tree parts are excavated. This type of removal is recommended when:

- the site’s proposed use is roadway pavement,
- grading is required
- it’s cheaper to grub than to grind.

**Safety Message:** In general, bleach, pesticides and compost meet strict guidelines set forth by Federal and State Agencies. It is important for users to read all instructions and abide by safety precautions listed on the product label and SDS (Safety Data Sheet) to avoid complications. At a minimum, wash your hands with soapy water after handling or applying the product(s). Users should avoid inhaling or ingesting the product(s), and limit exposure to skin, eyes and clothing. The product(s) should be stored in a cool, dry area in a closed container, kept away from food storage areas and out of reach of children.
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II. CARE OF TREES – PRUNING (614.04xy)
The most common reasons for pruning are safety, plant health, appearance, structural integrity, storm or physical damage, and maintenance of views. Pruning can remove hazards to transportation users. Pruning items are often included when construction activities are anticipated to damage existing trees and shrubs that are scheduled to remain.

When the Care of Trees - Pruning item is used on a contract in which Section 201, Clearing and Grubbing, also appears, the removal of branches interfering with clearance over the roadway or sight distance, as well as the removal of branches which have been broken or injured during construction, should be accomplished under Section 201, Clearing and Grubbing, and not included under Item 614.01, Care of Trees.

Do not prune unless there is a good reason to do so. Random pruning cuts can lead to the injury or death, rather than encouraging the intended growth or healing, and can create future hazardous trees.

Accepted Tree Climbing Methods means safe methods that will not cause injury or spread diseases to tree. (e.g. no climbing spurs)

Tools and Methods
Tools and methods shall be in accordance with the specification and ANSI A300. Do not allow other pruning methods. Examples of pruning methods not allowed include “anvil” pruning shears, “brush hogs”, rotary brush cutters, over the rail cutters, etc.

![Figure 7: Bypass pruning shears are acceptable for pruning.](image)

![Figure 8: Tree climbing spurs such as those shown in the picture are not allowed. Note also the work boots appear to have a build up of sap and debris. Photo from bangordailynews.com](image)

![Figure 9: Anvil pruning shears are not an acceptable tool for pruning.](image)

Tree climbing spurs can cause damage to the tree, allowing insects and disease to attack.
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The cutting surfaces of all tools and all other objects (soles of workers shoes, ropes, etc.) shall be disinfected before the start of any work on a tree. A 2 % bleach solution is required by the specifications, to prevent the spread of plant diseases. Look for clean blades with no build up of sap or debris.

Figure 10: Disinfecting tools before work begins. Photo from hgtv.com

A 2 % bleach solution is a mild disinfectant. Chlorine and Chlorine Compounds have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, and have a low incidence of serious toxicity.

Safety Notes: CAUTION: When working with bleach, at a minimum, wear the appropriate PPE (Personal Protective Equipment) and use in a well ventilated area. The concentration used in household bleach (5.25-6.15%) may cause burns of the mouth, throat and gastro-intestinal tract if swallowed. Inhaled vapors may also be harmful (bleach can give off toxic chlorine gas fumes which can be deadly). If contact or splash back occurs, bleach may also burn eyes or skin.

NEVER mix bleach with any of the following: ammonia, some cleaners, rust removers, lye, or vinegar.

The Contractor may propose to use another mild disinfectant. Carefully read the SDS sheets and the Manufacturer’s label (of the proposed material) to ensure the product is appropriate for the intended use and applied efficiently.

Pruning
ANSI A300 Part 1 Standard Practices is the Department’s reference for pruning practices.

Growth habit of the tree species means the natural "habit" or shape of that particular tree. The specification is referring to the general mode of plant growth. Growth habit is used to describe the overall shape of a tree.

Do not allow pruning to occur within the branch bark ridge or branch collar; refer to ANSI A300 Part 1 (Branch Attachment)
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Figure 11: A Branch Bark Ridge is the raised strip of bark at the top of a branch where it joins the trunk. This zone stops the natural decay of the dead/diseased branch from extending into the tree trunk.
traversotree.com (Photo by Gary R. Johnson)

Figure 12: Note that the overall shape or growth habit of this tree is single leader/stem and a generally upright pattern of branches. When pruning the dead branches from the left side of the tree the Inspector should expect to see the right side of the tree pruned also to result in a naturally shaped tree.

Figure 13: A woody branch collar appears as a swollen area where the branch joins the trunk. Leaving the branch collar promotes healing. (Photo by T. Hale)

Inspection
- Check that the diameter field measurement of the trees to be pruned corresponds to the contract documents (field measured at 4.5 ft. above the ground (DBH)).

- Verify that cutting surfaces of all tools, all other objects (soles of workers shoes, ropes, etc.) and all equipment coming into contact with the trees are disinfected and dried before the start of any work.

- Ensure that pruning tools, methods and objectives are in accordance with ANSI A300 Part 1 Standard Practices. Check that cuts were cleanly made with sharp tools.

- Ensure that the Contractor takes reasonable care to avoid damage to newly established and existing vegetation.
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III. IMPROVEMENT OF VEGETATED AREAS (614.05)
The work for this item will be described in the contract documents by special note. This information is the base information for the marking requirements.

§614-3.02 calls for the vegetation to be removed to be designated by “separate marking” or “marking sample areas”. Marking can be by painting or flagging the individual trees or shrubs or by marking off the area to be treated. If the marking or sample areas were completed by the Designers before the contract was advertised for bidding, all areas should be verified prior to the commencement of work.

Stumps shall be cut six inches (6”) above the ground unless otherwise specified. Begin the measurement from the ground surface and do not measure from the top of a root flare.

Unless otherwise specified in the contract documents, an approved herbicide shall be applied to all live stumps. The herbicide shall meet the requirements of §713-13 Pesticides and shall be applied according to the manufacturer’s recommendations. When an herbicide is delivered, it shall be accompanied by a Bill of Lading stating the quantity.

Verify that the material:
- has been supplied in the manufacturer's standard containers,
- the containers are marked with:
  - the name of the material,
  - the name of the manufacturer,
  - the net quantity contained therein, and
- meets all the other requirements of the specifications.

An approved dye in this context means one that is compatible for use with the herbicide and meant for marking vegetation. The dye makes it easier to tell which stumps have received the application. The dyes may be various colors. The herbicide inhibits sprouting and is usually applied at the time of cutting. Refer to the product labeling.

Figure 14: Small stumps treated with herbicide; the entire cut surface should be saturated.
theadventitiousroot.blogspot.com
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PRUNING, IMPROVING AND REMOVING EXISTING VEGETATION

Figure 15: Larger tree stump with outer cambial layer treated with herbicide.

The method of herbicide application may vary according to the size of the stump. Follow the manufacturer’s label for application instructions.

**Inspection**
- Review the contract documents for a description of the work required (e.g.: all poison ivy to be removed from designated area(s)).
- Ensure that individual plants, work area(s) or sample area(s) are clearly designated.
- Verify that the area has been satisfactorily treated as per the contract documents.
- Verify that the Contractor has removed or treated any stumps as per the specifications.
- When stump removal is specified:
  - Verify that the Contractor has backfilled the stump hole(s) with topsoil, unless otherwise specified in the contract documents. The topsoil type shall be as specified in the contract documents.
  - Verify that the Contractor has compacted and graded the backfill.
- Verify that the Contractor has established turf or applied alternative surface treatments, as specified. Turf establishment is paid for separately.
- Ensure that any plants to remain that are damaged are repaired in accordance w/ ANSI A300 Standard Practices Pruning & ANSI Z133.1 Arboricultural Operations Safety.

**IV. TREE REMOVAL (614.06xynn)**
Trees shown in the contract documents or listed for removal must be approved by the EIC prior to cutting. The Contractor field measures all trees for removal before they are cut. The Department uses these measurements to field check tree removal items. Any discrepancies should be resolved by the EIC prior to tree removal. Some trees may have grown and moved from one size range to another since the initial survey.

Trees less than four inches (4") in size will be paid under Clearing and Grubbing.
Tree removal is a dangerous operation. Unnecessary personnel; including inspection staff should be completely out of the work area.

Figure 16: Tree Removal with chain saw. Note operator wearing PPE.
www.picturenation.co.uk

The last two digits of the pay item indicate the stump treatment for each tree removed under this item. Four options are available:

- 01 – stumps cut to above grade
- 02 – stumps cut flush
- 03 – stumps cut to 6 inches below grade
- 04 – stumps grubbed

Ruts, or stump holes, should be backfilled with topsoil and compacted, unless special notes in the contract documents indicate a different treatment. Topsoil is included in the tree removal pay item.

Grass is typically established on the stump holes but the contract documents could specify another treatment. Turf establishment is paid for separately.

Definitions
Felling is the process of downing individual trees. The Contractor may hand fell, chainsaw or use a mechanized method.

Topping reduces the tree size by cutting the upper portion of a standing tree. This limits the area of impact of the felling operation.

Limbing means cutting branches off downed or standing trees.
SECTION 614
PRUNING, IMPROVING AND REMOVING EXISTING VEGETATION

Inspection

- Verify that the trees to be removed have been field measured at four and a half feet (4.5 ft.) above the ground (DBH) and that this information is verified by the EIC.

- Check that the field measurement of the trees to be removed corresponds to the contract documents. Any discrepancies should be referred to the EIC for resolution prior to tree removal work.

- Check that trees have been topped & limbed prior to felling, unless the Contractor has approval from the EIC for another method of removal.

- Ensure that any plants to remain that are damaged are repaired in accordance w/ ANSI A300 Standard Practices Pruning & ANSI Z133.1 Arboricultural Operations Safety.

- Verify that the Contractor has removed or treated the stump.

- Verify that the Contractor has backfilled the stump hole with topsoil, unless otherwise specified in the contract documents. Topsoil type shall be as specified in contract documents.

- Verify that the Contractor has compacted and graded the stump hole and that turf has been established, unless otherwise specified. Turf establishment is paid for separately.

V. PRE-EXISTING STUMP REMOVAL (614.070x)
Stumps include all roots and wood visible above grade.

Stumps shall be ground to six inches (6”) below grade unless otherwise indicated in the contract documents. Notes in the contract document may require the stump to be grubbed. This work would be part of the pay item.

Ruts, or stump holes, should be backfilled with topsoil and compacted, unless special notes in the contract documents indicate a different treatment. Topsoil is included in the cost of the stump removal pay item.

Grass is typically established on the stump holes but the contract documents could specify another treatment. Turf establishment is paid for separately.

*Figure 18:* Measure six inches (6") up from ground level.

*Figure 17:* Measure the height of the stump from the ground level, not from the top of a root flare.
Figure 19: If the stump is less than six inches (6") in height, measure the largest two diameters and take the average.

Inspection

- Ensure stumps were measured 6" above grade (or if less than 6" in height, see figure 19 above)
- Verify the stump has been removed as specified in the contract documents.
- Verify the Contractor has backfilled the stump hole with topsoil, unless otherwise specified in the contract documents. Topsoil type shall be as specified in contract documents.
- Verify the Contractor has compacted and graded the stump hole and that turf has been established, unless otherwise specified. Turf establishment is paid for separately.

VI. TREE ROOT ZONE TREATMENT - VERTICAL MULCHING/AERATION (614.08)

This specification calls for holes on a grid starting three (3) feet from the trunk of the specified tree and extending to the tree’s drip line or root zone as specified in the contract documents. The depth should be at least twelve (12) inches.

Tree dripline, the area defined by the outermost circumference of a tree canopy where water drips from and onto the ground.

Root zone refers to an approximate circumference from the tree trunk/stem where the tree’s roots grow. Tree roots extend beyond the longest branches a distance equal to two or more times the height of the tree.

The specification includes four methods for filling holes that include various combinations of mortar/coarse sand, compost and/or mycorrhizal fungi.
Figure 21: Note the detail shows work beyond the dripline, extending into the wider root zone of the specified tree.

Mycorrhizal Fungi used for tree root zone treatment is a dry granular powder specifically designed for vertical mulching. Application rate is specified in the standard specifications; follow all other Manufacturer’s recommendations.

Safety Note Mycorrhizal Fungi: Read the Safety Data Sheets and wear PPE. In general, handle with nonporous gloves; wear dust mask and safety glasses. Avoid breathing dust. Avoid contact with eyes, mouth and open wounds. Follow good hygiene practices.

Inspection

- Verify that materials meet §703-03 Mortar Sand, §713-09 Mycorrhizal Fungi and §713-15 Compost, as appropriate.
- Check that holes are drilled starting three feet (3’) from trunk and in a two foot by two foot (2’ X 2’) grid.
- Ensure the holes extend out to the dripline or wider root zone (as specified in contract documents).
- Check that the holes are approximately two inches (2”) in diameter by twelve inches (12”) deep (min.) and are backfilled to grade using the method indicated in the contract documents.

Figure 22: Example label of a commercially available product suited to tree root zone treatment/ vertical mulching application.
Figure 23: Sample Label. Note information regarding: suited to purpose, appropriate ingredients, expiration date and safety information

VII. TREE ROOT PRUNING (614.09)
Because of their location, roots are easily wounded. Fifty percent (50%) of the root system is in the top one foot of soil and over ninety percent (90%) of the root system is in the top three (3) feet. The root system extends well beyond the tree’s dripline, often extending a distance equaling two to three times the tree’s height.

Roots of the trees designated in the contract documents shall be pruned within 24 hours of the time they have been damaged by construction activity.

Root pruning must be done with sharp tools or blades.

The cutting surfaces of all tools and all other objects (soles of workers shoes, ropes, etc.) that come in contact with the tree roots shall be disinfected and completely dried before the start of any work. Some of the disinfectants commonly used are:

- Denatured alcohol or rubbing (isopropyl) alcohol
- Listerine
- Diluted bleach solution
- Lysol
- Commercial disinfectant marketed for tree root pruning

Prune all severed roots greater than one inch showing at the edge of excavation. The Contractor may need to go just slightly beyond the face of excavation area (approximately one inch) into undisturbed soil in order to prune past the damaged root section.

If the Contractor proposes a method of cleanly pruning roots prior to the excavation, the EIC may consider it.

Pruning with a backhoe or trenching machine is unacceptable and will cause extensive ripping and tearing damage to the roots of the affected tree(s) because these tools are not designed for the purpose and will not cleanly cut the roots.

If the area is not backfilled within 24 hours of the excavation, the roots must be kept moist until backfill can occur.

**Inspection**

- Check that existing tree roots, greater than one inch (1”) in diameter, are pruned within 24 hours of the time they have been damaged by construction activity.

- Check that roots have been pruned at the edge of excavation, or one inch (1”) beyond if necessary.

- Verify that pruning is in accordance with ANSI A300 Part 1 Standard Practices Pruning and ANSI Z133.1 Arboricultural Operations Safety.

- Ensure that the excavated area around the existing tree roots is backfilled as soon as construction activities permit with the specified or approved materials.

- Ensure that all roots not backfilled within 24 hours are kept moist.
Measurement

- Along the edge of excavation where live roots are being pruned.

Payment

- Tree roots have been measured by linear feet to the nearest whole foot along the excavation line.

**Figure 24:** Note that for the example on the left only one pay line is needed as only one side of the trench requires pruning of live roots. The example on the right needs pay lines on both sides of the trench as there are live trees & roots remaining on both sides of the excavation.

**Figure 25:** Note that the face of excavation is typically ragged and the roots to be pruned are at varying setbacks. Pruning only required on left side (one payment line) where the live roots exist.
SECTION 620 BANK AND CHANNEL PROTECTION

Standard Specifications Section 620, BANK AND CHANNEL PROTECTION, contains the contract requirements for constructing blankets and walls of erosion resistant materials to prevent undesirable erosion of earth exposed to flowing water. Unchecked erosion can damage and destroy highways, bridges, culverts and other facilities. Therefore, it is important to construct the protective works such that they will fulfill their mission.

General Requirements

Stone Filling and Rip-Rap Items
The material used for these items shall be stockpiled. Stone is accepted for quality characteristics (soundness and durability) on the basis of a geologic evaluation of the material source or stockpile by a Departmental Engineering Geologist. Such evaluation may require a field evaluation and laboratory tests on samples of stone selected by the Engineering Geologist. Gradation shall meet the specification requirements and shall be accepted, or rejected, based on a visual examination of the material by the Engineer.

A Table relating dimensions and weight of stones having various shapes is included in Section 620 of the Standard Specifications to aid the Engineer in determining whether the specified gradation requirements have been met.

Control of stone filling and rip-rap items is covered in the appropriate Departmental publication in effect on the date of the bid advertisement GCP-14, PROCEDURE FOR CONTROL OF STONE FILLING AND RIP-RAP ITEMS.

Bedding Material
Material used for Bedding Material must be stockpiled in accordance with the appropriate Departmental publication GCP-17, PROCEDURE FOR CONTROL OF GRANULAR MATERIALS in effect at the time of advertisement for bids. The material must be free of soft, nondurable particles, organic material, and thin or elongated particles.

Concrete Block Paving
The concrete paving blocks shall comply to the specifications and tests set forth under Section 704-04. The blocks shall be sampled in accordance with procedural directives of the Department for entire stock lot quantities at the manufacturing location.

Gabions
The materials used for fabricating the gabion shall comply to the specifications and tests set forth under Section 712-15. The gabion filling material shall be stockpiled in accordance with the appropriate Departmental Publication (Procedure for the Control of Stone Filling and Rip Rap Items) Gabion fill is accepted for quality characteristics (soundness and durability) on the basis of a geologic evaluation of the material source or stockpile by a Departmental Engineering Geologist.

Project Procedure

Stone Filling and Rip-Rap Items
The Engineer shall furnish, in writing, to the Regional Geotechnical Engineer, gradation approval and an estimated quantity of material in stockpile. The Regional Geotechnical Engineer shall request geologic evaluation of the source from the Director of the Geotechnical Engineering Bureau when appropriate. The request may be either by letter or fax machine and shall indicate the project, source location and item(s).

The Engineer shall take action necessary to ensure that the requirements of the specifications and plans regarding weight, size, thickness, placement, etc. are complied with. The visual acceptance or rejection of gradation, required by the specification shall be documented on “ENGINEER'S DAILY PROJECT DIARY,” including identification of the individual making the determination.
SECTION 620 BANK AND CHANNEL PROTECTION

The limits of stone filling and rip-rap bank and channel protection should extend to bedrock outcrops, boulders or other stable features when they don’t significantly increase the quantities. In small drainage channels, extend the lining to a point where the grade of the channel becomes noticeably flatter.

Where Rip-Rap, Stone Filling (Medium) or Stone Filling (Heavy) is placed on Geotextile, do not permit stone to be dropped on the Geotextile from a height greater than one foot. Do not permit smaller sizes of stone filling to be dropped on Geotextile from a height greater than three feet.

**Bedding Material**
Inspect the construction of stockpiles. Record the material source and stockpile construction features on "INSPECTOR'S DAILY REPORT." Request approval of the stockpile from the Regional Geotechnical Engineer. The Regional Geotechnical Engineer will supervise the sampling and arrange for the testing of the stockpile. Test results will be reported on GE-454M (See Exhibit 203 H) “GRANULAR MATERIAL DOCUMENTATION FORM.” A copy of this form shall be part of the project records.

If the soil over which bedding material is to be placed contains a substantial portion of coarse gravel-size particles and/or is plastic, it may be possible to delete the bedding material. Contact the Regional Geotechnical Engineer to aid in this determination.

**Concrete Block Paving**
Request approval of the lot quantity from the Regional Materials Engineer. The blocks shall be sampled by the Department's representative. Test results must accompany either the “shipment authorization form” or “shipment certification form”. A copy of this form shall be part of the project records.

**Gabions**
Inspect gabion forms for compliance with plans and specifications and document decisions on the Inspectors Daily Report and the Engineers Daily Project Diary.

The Engineer shall furnish, in writing, to the Department Geotechnical Engineer, gradation approval and an estimate of quantity of material in the stockpile. The Department Geotechnical Engineer shall request geologic evaluation of the source from the Director of the Geotechnical Engineering Bureau when appropriate. The Engineer shall take action necessary to ensure that the requirements of the specification and plans regarding size, placement, etc. are met. The visual acceptance or rejection of gradation required by the specifications shall be documented on the “Inspectors Daily Report” and the “Engineers Daily Project Diary” including the identity of the individual making the determination.

**Evidence of Acceptability**

**Stone Filling and Rip-Rap Items**
1. Compliance with all specification requirements for the item(s) involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. A letter of evaluation from the Departmental Geotechnical Engineer stating that the stockpile is acceptable or a letter approving transfer, when applicable.

**Bedding Material**
1. Compliance with all specification requirements for the Item involved, as well as conformance to the pertinent Departmental procedures in effect on the date of advertisement for bids.

2. For granular material, copies of the test results GE-454M (GRANULAR MATERIAL DOCUMENTATION FORM”) and when applicable, a copy of the letter approving transfer, as well as the original "GRANULAR MATERIALS DOCUMENTATION FORM".
3. If variations to the stockpiling requirements are granted, a copy of the letter from the Director of the Geotechnical Engineering Bureau must be on file.

Concrete Block Paving
1. Compliance with all specification requirements for the item involved, as well as conformance with the pertinent Departmental procedure in effect on the date of the advertisement for bids.

2. Copy of the test results on “shipment authorization form” or the “shipment certification form”.

Gabions
1. Compliance with all specification requirements for the items involved, as well as conformance to the pertinent Departmental procedures in effect on the date of the advertisement for bids.

2. A letter of evaluation from the Departmental Geotechnical Engineer stating the stockpile is acceptable, or a letter approving transfer of an approved stockpile indicating original quantity along with the remaining quantity to be used.

3. A letter stating that the material of the gabion form (baskets) conform to the requirements of the specification provided by the manufacturer on their letterhead and signed by an officer of the company.

References
GCP-17, GEOTECHNICAL ENGINEERING BUREAU’S GRANULAR CONTROL PROCEDURE
GCP-14, GEOTECHNICAL ENGINEERING BUREAU’S CONTROL OF STONE FILLING AND RIP-RAP ITEMS PROCEDURE
GEOTECHNICAL ENGINEERING BUREAU’S BANK AND CHANNEL PROTECTIVE LINING DESIGN PROCEDURES

Related Contract Provisions
203-3.12, Compaction
701-01, Portland Cement
703-03, Mortar Sand
703-06, Cushion Sand
703-07, Concrete Sand
704-04, Concrete Block (Slope Paving)
712-15, Gabions
SECTION 625  SURVEY OPERATIONS, ROW MARKERS AND PERMANENT SURVEY MARKERS

I. GENERAL

All work associated with establishing or setting horizontal or vertical survey control, collecting survey field data or staking out field positions of proposed construction work, and preserving or stake out of land boundary markers is included under Survey Operations.

All work associated with the various types of Right of Way (ROW) Markers and the Permanent Survey Markers (PSM) includes providing the markers as specified to the site, installation, and certification of the location(s).

In accordance with NYS State Education Law, all work associated with boundary determinations or boundary monumentation can only be performed by or under the direction of a Licensed Professional Land Surveyor. Therefore, all locations of ROW Markers or PSMs can only be certified by a Licensed Professional Land Surveyor. (Certifications can also be submitted by exempt Licensed Professional Engineers as permitted under Article 145 of the NYS Education Law, but there are very few Engineers who still qualify under this exemption.)

II. INSTALLATION/CERTIFICATION

1. The Contractor installs the ROW Markers as per the standard sheet and to the required accuracy. PSMs are installed in accordance with the standard sheet at a location specified in the contract documents and the Acquisition Maps.

2. Inspectors should visually check the relative locations of the markers to other topographic features to verify their relative locations, such as proximity to ROW fencing, other ROW Markers, drainage structures, roadway pavement or sidewalks, or to adjacent property lines. If there seems to be a discrepancy with the location, ask the Surveyor to verify the location.

3. Within 30 days of installation, the Contractor submits to the Engineer, the appropriate marker certification form (See Exhibits 625A and 625B) which has been signed and sealed by a NYS Licensed Land Surveyor. The Engineer must forward the forms to the Regional Land Surveyor for approval of appropriate information. The Regional Land Surveyor must initial the approved certification form and return a copy to the Engineer. Upon receipt of the approved certification form, the Contractor will then be eligible to receive final payment for the markers.

4. The Engineer is responsible for placing the survey marker locations on the as-built drawings.

5. The Contractor must submit survey notes and calculations to the Engineer, prior to contract acceptance. (Transmittal of the notes and calculations may be in an electronic format.)

EXHIBITS

A  Sample Form HC 125  Permanent Survey Marker - Surveyor’s Certification
B  Sample Form HC 126  Right Of Way Markers - Surveyor’s Certification
PERMANENT SURVEY MARKER - SURVEYOR'S CERTIFICATION

D123456 PIN z987.65.321
Rte 123 Over the Hudson River
Village of Sulzfeld
Albany County
I.M. BUILDER

CERTIFICATION
I hereby certify that the Permanent Survey Marker listed herein was installed in accordance with and to the degree of accuracy required by Section 625 of the Standard Specifications.

Name: G. Washington
Signature: G. Washington
Date: 11/01/08

STATE HWY (SH) NO: 123
NYS ROUTE NO: 7
CITY/TOWN/VILLAGE: East Oshkosh
COUNTY: Albany

N = 43804.978
E = 222511.345
HORIZ. DATUM: NAD 1983 / (CORS 96)
COMBINED FACTOR: 0.999961314.046

DISTANCES & DIRECTIONS TO
PRECEDING AND SUCCEEDING MARKERS

ELEV. = 164.466 meters DATUM: NAVD 1988
BASELINE STA/RESH: 14+758.005 - 5.153 R
CENTERLINE STA/RESH: 5+456.391 - 2.261 R

DESCRIPTION (TO FIND MARKER):
BEHIND GUIDE RAIL SOUTH OF ROUTE 7 ±1 METER OFF EDGE OF PAVEMENT.
APPROXIMATELY 14 METERS SOUTHEAST OF ENTRANCE TO GOLF COURSE.
APPROXIMATELY 55 METERS NORTHWEST OF MILE MARKER 7 1325 2047

SKETCH OF MARKER (INCLUDING TIES)

NOTES: 1) THE FORM WILL BE MARKED WITH THE JOB STAMP.
2) SHOW NORTH ARROW AND DISTANCE TO NEAREST MILEPOST REFERENCE MARKER.
3) COORDINATES, DISTANCES AND ELEVATIONS SHALL BE CALCULATED AND NOTED TO NEAREST MILLIMETER.
4) ALL TIES ARE TO BE MEASURED HORIZONTALLY WITH A STEEL TAPE, UNLESS OTHERWISE NOTED.
5) SUBMIT FORM MARKED WITH AN ORIGINAL SIGNATURE AND STAMP OF THE LAND SURVEYOR'S SEAL.

ORIGINAL ACCEPTED BY REGIONAL LAND SURVEYOR AJS INITIALED COPY RETURNED TO ENGINEER FSC
right of way markers - surveyor's certification

job stamp
D123456  PIN z987.65.321
Rte 123 Over the Hudson River
Village of Sulzfled
Albany County
I.M. BUILDER

land surveyor or exempt p.e. seal

license no. __654321__

Certification
I hereby certify that the Right of Way Markers listed herein were installed in accordance with and to the degree of accuracy required by Section 625 of the Standard Specifications.

<table>
<thead>
<tr>
<th>State Hwy (SH) No.</th>
<th>NYS Route No.</th>
<th>City/Town/Village</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>1234</td>
<td>321</td>
<td>East Oshkosh</td>
<td>Albany</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed</th>
<th>Actual (As Built)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map No. 123</td>
<td>345+679.901</td>
</tr>
<tr>
<td>Baseline Station</td>
<td>Offset</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

Notes:
1) The form will be marked with the job stamp.
2) As built stations and offsets shall be located and dimensioned to nearest millimeter.
3) Use separate certification form for each state highway.
4) Submit form marked with an original signature and ink stamp of the land surveyor's seal.

Original accepted by regional land surveyor __L.S__ Initialed copy returned to engineer __E.F.C__

Name: __G. Washington__
Signature: __G. Washington__
Date: __11/01/08__
SECTION 629 PETROLEUM STORAGE TANK CLOSURE

I. GENERAL
Petroleum storage tank closure involves emptying, purging/inerting, cleaning, removal and disposal of petroleum storage tanks; potential removal of contaminated soil; endpoint sample collection and analysis (if determined to be necessary); proper documentation of the work; and the submission of a tank closure report to NYSDEC. Incomplete tank closure often results in additional work and expense, particularly when closure must be obtained well after construction has been complete.

If a previously-unreported petroleum spill is discovered during construction, the contractor shall call the NYSDEC Spills Hotline (1-800-457-7362) within two hours of discovery of the spill.

II. SAFETY AND HEALTH
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, (HAZWOPER) requires that all persons directly involved in tank closure activities have 40-hour HAZWOPER training, updated annually with an 8-hour refresher, and at least one person on site is required to have supervisor training as per 29 CFR 1910.120(E)(4). Tank closure activities require a Project Safety and Health Plan (PSHP) that complies with both §107-05B. and 29 CFR 1910.120(b)(4).

III. MONITORING:
All tank closures will involve tank atmosphere monitoring. The atmosphere in the tank must be continually monitored for levels of explosive gas and oxygen. If contaminated soil is present; there is a potential for nuisance petroleum odors; or if the work is being performed in close proximity to residences, schools, or other sensitive receptors the work requires field organic vapor monitoring in accordance with §205-3.03.

Figure 1 – Fire Triangle

IV. TANK PURGING/INERTING
The atmosphere within the tank must be made inert (incapable of supporting combustion); otherwise the possibility of a violent explosion exists. The tank may be made inert by removing the fuel and/or oxygen sides of the “fire triangle” (Fig. 1, above). The third side (ignition source) should be minimized to the greatest extent possible before tank removal work can begin. Fuel vapors and oxygen are to be purged out of the tank by using dry ice, carbon dioxide or nitrogen. Positive ventilation is another option available to the contractor, providing that the engineer has given prior written approval. The positive ventilation option can be dangerous if it is performed improperly, and is not suited for dense urban areas.

When purging/inerting the tank, it is imperative that the tank’s vents be positioned at the top of the tank (the “12 o’clock position”). If the vents are not located at the 12 o’clock position, the portion of the tank located above the vents may contain an explosive atmosphere, even after purging/inerting has been performed.
SECTION 629 PETROLEUM STORAGE TANK CLOSURE

V. ENDPOINT SAMPLE COLLECTION/LABORATORY ANALYSIS
Endpoint samples from the sidewalls and base of the tank pit are generally necessary in order to confirm the presence or absence of contamination from the tank, to confirm that contaminated soils have been satisfactorily removed, or to document the level of contamination that was left in place (e.g., because contamination extended beyond the limits of State-owned ROW, beyond project limits, because of structural concerns, etc.) Samples should not be collected until the intended limits of excavation have been reached.

Safety is paramount in the collection of endpoint samples. Sample collectors must exercise caution when entering the tank pit (which requires the Engineer’s authorization) or when standing next to the tank pit to collect samples with a shovel. The preferred method for collecting Endpoint samples is to direct the backhoe/excavator operator to pull soil from the sample location, place the bucket so that it rests on the ground, and allow the collector to sample from soil within the bucket.

In order to select the appropriate laboratory analyses for endpoint samples, the current/former tank contents must be determined. To the extent practical, this determination should be made during design and the appropriate analyses should be specified in the contract documents. In instances when the appropriate analyses have not been determined during design, a determination can be made in the field, preferably through consultation with on-site NYSDEC personnel. If NYSDEC personnel are not present, the endpoint samples should be analyzed according to the #2 fuel oil/diesel tank parameters.

Samples should be collected into laboratory provided glassware using dedicated latex or nitrile gloves to prevent cross contamination. After the sample jars are sealed, they should be placed into re-sealable plastic bags, keeping samples exhibiting signs of obvious contamination in separate bags from those exhibiting no signs of contamination. The samples should then be stored in a cooler with ice and delivered to a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory in accordance with sample hold-times and laboratory chain of custody procedures. Obtain a copy of the completed chain-of-custody form before the samples are taken off-site for delivery to the laboratory.

VI. NOTIFICATION OF NYSDEC
NYSDEC field personnel are often able to provide advice as to whether or not endpoint samples are necessary, or when significantly contaminated soil has been satisfactorily removed; therefore, every reasonable effort should be made to encourage NYSDEC to be on-site during tank removal activities. Appropriate NYSDEC personnel should be notified at least thirty (30) days prior to tank closure activities. For instances where tanks that are not identified during the design process are discovered during construction, NYSDEC should be called as soon as possible after discovery of the tank(s).

VII. DOCUMENTATION
All tank closure activities must be documented in order to demonstrate that the tank closure was conducted properly, and that all essential components of tank closure were performed. Complete a Tank Closure Form for each tank that is encountered during construction, and photograph each stage of closure activities. For each tank that is closed, the Department will submit a completed tank closure form, photographs, copies of analytical results, and documentation detailing the disposition of any removed tanks and contaminated soil to NYSDEC in order to obtain “official closure.” Incomplete documentation may result in additional work being required to obtain official closure and cause significant construction delays.

VIII. BACKFILLING
A significant portion of documentation activities require the tank pit to be open, therefore it is critical that the Engineer authorizes backfilling of the tank pit only after those documentation activities have been completed.

EXHIBITS
A  Sample Tank Closure Form
TANK CLOSURE FORM

CONTRACT INFORMATION

D #: D123456  Contractor Name: I. M. Builder

Site Address: 798 Route 123

City/Town: Albany  County: ALBANY

TANK INFORMATION

Tank #: 001

Depth to Top of Tank: 4.0 Feet

Depth to Invert (bottom) of tank: 10.0 Feet

Tank Capacity: 5,000 Gallons

Tank Type: ☒ Steel  ☐ Fiberglass - Reinforced Plastic  ☐ Other

Product: ☐ Gasoline  ☐ #2 Fuel Oil / Diesel  ☐ Waste Oil  ☐ Other

Volume of Product Removed from Tank: 300 Gallons

Volume of Water Removed from Tank: 700 Gallons

Liquid Disposal Facility: Liquids R Us, Troy, NY

Condition of Tank: ☐ Sound  ☐ Corroded / Damaged but Intact  ☒ Not Intact

Method used to Inert Tank: ☒ Dry Ice  ☐ CO₂ Gas  ☐ N₂ Gas  ☐ Positive Ventilation

Make / Model of Explosion Meter / CGI Used: RAE Systems QRAE Plus Oxygen Meter/CGI

Make / Model of O₂ Meter Used: RAE Systems QRAE Plus Oxygen Meter/CGI

Inspector's Signature: _______________________________ Date Prepared: December 08, 2008
TANK CLOSURE FORM

REMOVAL INFORMATION

Was there a Leak / Spill?  ☒ Yes  ☐ No

If Yes, Provide NYSDEC Spill #:  0812345

If Yes, How Much Soil was Removed?:  250  ☒ CY  ☐ Ton

Soil Disposal Facility:  The Dirt Merchant, Schenectady, NY

Was Groundwater (GW) Encountered?  ☒ Yes  ☐ No

If Yes, Provide Depth to GW:  7.0  Feet

If Yes, and There Was a Spill / Leak, Did Groundwater Appear Contaminated?:  ☒ Yes  ☐ No

Were NYSDEC Personnel On-Site During Tank Closure?:  ☒ Yes  ☐ No

Name(s) of NYSDEC Field Personnel:  Tom Conservation

Were Endpoint Samples Collected?:  ☒ Yes  ☐ No

Analytical Parameters Requested (Check All That Apply):

☒ VOCs (8021 STARS List)  ☐ VOCs (8260 Full List)  ☒ PAHs / BNs (8270)
☐ SVOCs / BNAs (8270)  ☐ RCRA Metals  ☐ PCBs (8082)
☐ Other

Laboratory:  Retriever Labs

ELAP Certification #:  12345

Was Tank Cleaned On Site Prior to Disposal?:  ☒ Yes  ☐ No

If No, Name of Permitted Hauler Transporting Tank:

Was Wastewater, Waste Solvent or Other Regulated Waste Generated During Cleaning?:  ☒ Yes  ☐ No

If Yes, Disposal Facility:  Liquids R Us, Troy, NY

Ultimate Disposition of Tank:  Bob’s Scrap Yard, E. Greenbush, NY

(Name of Facility / Firm)
SECTION 645 - SIGNS

645-3.04 Sign Face Construction
The signs shall be of the specified traffic sign color or colors. Signs manufactured with more than one piece of reflective sheeting shall exhibit color uniformly between pieces sufficient to provide overall uniform color for the entire device. Minor color streaks or color differences will be acceptable if they are judged not to be unsightly or distracting to the motorist. It will be the judgement of the inspector as to whether or not the noted color difference is unsightly or distracting.

645-3.07 Sign Locations
The Contractor's stake out of the signs will be checked for proper location, lateral clearance and orientation. (For Type A Sign Supports, see soil and embankment considerations in Section 645-3.08, below.)

645-3.08 Erection
Posts, supports, and sign panels will be inspected prior to installation. All signs shall be of the type and design specified. For Type A Sign Supports, post size, corrosion coating, splice hardware and assembly, sign area, spacing within a 2.13 m (7 ft) path, and embedment should be checked against the appropriate Materials Detail sheets. For Type B Sign Posts, post size, hinge and breakaway base dimensions should be checked against the Standard Sheets. Breakaway base welds will be checked for size and type against the Standard Sheets. Vertical alignment of the posts with breakaway bases shall be adjusted using the shims shown on the standard sheets and checked using a level.

Type A Sign Supports rely on a relatively shallow soil embedment depth to provide resistance to wind loads, and to firmly hold the support in place for proper breaking or slip-release when struck by an errant vehicle. Three factors can affect the soil's ability to provide the proper reaction forces to accomplish this: soil type, ground water, and slope. These are referred to in the Materials Details, as follows:

S - 1 Soils. Most soil conditions in New York state fit under the S - 1 category. This includes sands, gravels, and silts (and their mixtures.) All compacted shoulders fall into this category.

S - 2 Soils. Uniform-sized sand particles which are difficult to compact. Soil plates may be required for installations. Maximum number of supports allowed in a 2.13 m (7 ft) path may be reduced. (See requirements in the Materials Details.)

Plastic Soils. Soft clays or organic deposits should be avoided, if possible. If sign supports must be placed in this type of area, contact the Geotechnical Engineering Bureau for assistance with a foundation design.

Ground Water. Ground water in the soil embedment zone greatly reduces the ability of the soil to provide proper support. Sign support locations in areas with high ground water, should be avoided. If sign supports must be placed in this type of area, contact the Geotechnical Engineering Bureau for assistance with a foundation design.

Slope. Slopes steeper than 1 on 5 have a reduced ability to provide the required resistance to overturning of a sign support. This is compensated for by using a deeper minimum embedment. (See requirements in the Materials Details.)

Type B Sign Posts footing requirements are shown on the Standard Sheets.

On Type A Sign Support Systems and Type B Sign Posts, the lower portion of the splice, hinge plate, or slip base shall not extend more than 100 mm (4") above ground line as shown on the appropriate Materials Details or Standard Sheets. This is to prevent snagging of errant vehicles should they impact the breakaway device. Breakaway systems installed with the lower portion greater than 100 mm (4")
For Type B Sign Posts, tensioning of the galvanized high strength bolts in the hinge assembly can only be done properly by the "turn-of-the-nut" method as detailed on the Standard Sheets. The inspecting torque performed with a torque wrench in the presence of an inspector is only intended to reveal or locate bolts that either did not receive "turn-of-the-nut" tightening or did not receive the tensioning procedure properly. Any movement experienced when checking with the torque wrench would indicate that the "turn-of-the-nut" method was improperly performed. That bolt and nut should then be loosened and retightened by the "turn-of-the-nut method. Bolts, nuts and washers loosened and retightened more than once shall be replaced.

645-3.11 Sign Posts and Support Systems
A. Type A Sign Support Systems.
Type A Sign Supports limit the energy transferred to a striking, errant vehicle by means of a brittle (frangible) cross section or a breakaway splice system, or a combination of both. (Newer designs may use a frangible post combined with a slip plate system.) The number of supports allowed in a path wide enough for a passenger vehicle, 2.13 m (7 ft), is limited by the amount of energy the particular support configuration transmits to a test vehicle, as determined by crash testing. Materials Details show a table of allowable sign areas based on the two wind zones that are used throughout the State; however, if the centroid of the sign area is more than 4.27 m (14 ft) above the surrounding terrain, higher wind pressures (and consequently, smaller allowable sign areas) are required.

B. Type B Sign Posts.
Type B Posts limit the energy transferred to a striking, errant vehicle by means of a hinge assembly or slip plate system. The number of posts allowed in a path wide enough for a passenger vehicle, 2.13 m (7 ft), is limited by the amount of energy the particular post configuration transmits to a test vehicle, as determined by crash testing. Allowable sign area tables are found on the appropriate Standard Sheet.
SECTION 648 - SUBSURFACE EXPLORATIONS

General Requirements
Subsurface explorations are progressed for the purpose of gathering detailed information about soil, rock and groundwater. Soil samples are taken using specific test methods and are retained for engineering analysis. Rock and boulders are cored and the samples are made available to engineers for design purposes. Methods used to progress the boring, and conditions encountered during sampling and between the samples must be recorded on the log.

Project Procedure
At the start of the project, the equipment must be inspected. The Engineer usually does this inspection with the assistance of the Regional Geotechnical Engineer or a Drill Supervisor from the Geotechnical Engineering Bureau (GEB) because of the specialized nature of the contract work.

Notes in the proposal frequently give specific direction on the following subjects:

☐ To what location(s) must the Contractor deliver the samples, and under what time restrictions?

☐ Who has the responsibility to perform the utility clearance and obtain permits prior to the start of the borings?

☐ Who has the responsibility to perform the visual descriptions and moisture content on the samples?

☐ Who has the responsibility to complete the final boring logs? (The pre-qualified inspector on each drill rig keeps a log of the borings regardless of who has the responsibility to complete the logs).

☐ What are the acceptable working hours for the specific contract?

Evidence of Acceptability
1. Compliance with all specification requirements for the item(s) involved.

2. Thin-walled tube samples require inspection by the GEB Soil Mechanics Laboratory before they can be approved for payment.

3. The percent recovery of soil and rock core samples should meet or exceed minimum requirements, using the best possible drilling methods, before they will be considered acceptable.

Contact
The Regional Geotechnical Engineer and/or the Director of the Geotechnical Engineering Bureau are available to assist.
SECTION 655 FRAMES AND GRATES

I. GENERAL
The Contractor shall provide Manufacturer’s certification that the frame and grate is in conformance with Standard Specification §106-11, Buy America. The Contractor shall notify the Engineer-in-Charge of any frames or grates from foreign country producers and the Engineer-in-Charge will confirm that the Contractor’s bid was based on using foreign steel and/or iron. If the bid was not based on using foreign steel, the Engineer-in-Charge will determine whether the total quantity of foreign steel and/or iron from all items surpasses the maximum allowed in §106–11. The entire quantity of any material above the maximum allowed will be rejected, unless a waiver is obtained by the Contractor from the approving authority.

Unless otherwise specified, frames, grates, covers and appurtenant parts shall be delivered to the work site free of any coatings other than galvanizing. Frames, grates, covers or appurtenant parts that fail to meet the specification requirements will be rejected and the Contractor shall remove them from the work site.

II. CAST ARTICLES
A. Approvals. Cast articles may be approved by either of the two methods outlined below:
1. The Contractor shall provide Manufacturer’s Certification that the casting is in conformance with one of the following:
   - Standard Sheet M655-9R1 Cast Manhole Frames, Grates and Covers,
   - Standard Sheet M655-11R1 Cast Frames and Curb Boxes and Welded Frames,
   and the material is one of the following:
   - Steel - ASTM A27M Grade N-1 §715-02 Steel Castings
   - Malleable Iron - ASTM A47M, Grade 22010 §715-09 Malleable Iron Castings; or:
2. The Contractor shall submit two copies of the Material Details to the Engineer-in-Charge, at least ten days prior to the use of the product, for each type of casting supplied. The Engineer-in-Charge will verify that the Material Details appear on the Department Approved List by Manufacturer’s name, reference number and approval date for that item. The Contractor shall provide Manufacturer’s certification that the casting was manufactured in conformance with the approved Materials Details and the material is one of the following:
   - Grey Iron - AASHTO M105, Class 30B §715-07 Proof Loaded Iron Castings
   - Grey Iron - AASHTO M105, Class 35B §715-07 Proof Loaded Iron Castings

B. Markings. The Inspector will verify the identification markings listed below on the article. All castings, except those approved under A(1) above, shall have the identifying markings required in both AASHTO M105 and AASHTO M306, space permitted. These markings should be permanent and indelible:

Required Markings as per AASHTO M105:
Identifying mark of the Manufacturer
Part or pattern number

Required Markings as per AASHTO M306:
Country of manufacture
AASHTO designation or ASTM Designation number
Class of Cast Iron
Heat number and date
III. FABRICATED ARTICLES

The Contractor shall provide the following certifications for all fabricated articles:

1. The Contractor shall provide Manufacturer’s certification identifying each component of the fabricated item as conforming to one of the following steel materials; ASTM A36M, AISI Grade 1020, AISI Grade 1025, or ASTM A529M Grade 345. Mill certifications identifying the steel material compositions shall accompany the Manufacturer’s certifications. Longitudinal bars for grates G1, G2, G3, 10 PCB, 11 PCB, and 12 PCB shall be certified as meeting the requirements of ASTM A529M, Grade 345. Mill certification of ASTM A529M Grade 345 shall accompany Manufacturer’s certification for these grates.

2. The Contractor shall provide Manufacturer’s certification that the welding and galvanizing comply with the requirements of Section 655. The specification requires welds conforming to the New York State Steel Construction Manual (except the requirement for radiographic inspection), and any applicable standard sheets, plans, approved shop drawings, or proposal. The specification requires galvanizing in accordance with §719-01, Type I unless required otherwise.

3. The Contractor shall provide Manufacturer’s certification that the fabricated article is in conformance with one of the following:

   - Standard Sheet M655-6 *Rectangular Grates*
   - Standard Sheet M655-8R2 *Parallel Bar Frames and Grates*
   - Standard Sheet M655-10R2 *Reticuline Grates*
   - Standard Sheet M655-11R1 *Cast Frames and Curb Boxes and Welded Frames* (For welded frames only.)

   The Inspector will inspect the fabricated articles for conformance to the appropriate Standard Sheet. Non conforming articles will be rejected.

IV. INSTALLATION

The Engineer-in-Charge will ensure that the frames are placed to line and grade and that the frames make a firm, full and even bearing on its underlying surface. The Engineer-in-Charge will ensure that grates and covers have full and uniform bearing contact with their corresponding frames. The system and its components shall be non-rocking when in place and under the influence of traffic or other loads. Non-rocking fits between grates, covers and their corresponding frames may be achieved by ground mating surfaces or machined and milled mating surfaces (horizontal and/or vertical)

RELATED CONTRACT PROVISIONS

- §715-02 *Steel Castings*
- §715-07 *Proof Loaded Iron Castings*
- §715-09 *Malleable Iron Castings*
- §719-01 *Galvanized Coatings and Repair Methods*

REFERENCES

HDM Chapter 13; Utilities
Standard Sheets M655-6, M665-8R2 to M655-14
Contract Administration Manual (CAM) §106-11, *Buy America*
BACKGROUND

Water supply utilities typically belong to municipalities or water districts. The organization, staffing and capabilities of these organizations varies widely, as well as their material and construction requirements. The Engineer-in-Charge will frequently represent the interests of the Owner, though some Owners will require that their staff or consultant be present to observe work on the water supply system. These arrangements are spelled out in the Utility Agreement between the Owner and the State. Installation of new water main as a betterment or relocation/replacement due to other work requires a State Department of Health (DoH) permit. The DoH permit will outline disinfection, testing and certification requirements.

GENERAL REQUIREMENTS

The requirements of the System Owner are contained in Special Notes entitled “Owner Requirements for Water Mains and Appurtenances”. Read these notes to determine any Owner requirements for materials, installation, valve operation, testing, etc. A utility agreement may also contain requirements for inspection by Owner personnel, tapping requirements (some Owners will not allow wet tapping of a live main by Contractor personnel), valve operation requirements, etc. Contractor personnel should not operate valves outside the project limits, or valves within the project limits after they are placed in service, without Owner approval.

The following documentation is required for ductile iron water pipe, steel water pipe, valves, hydrants, tapping sleeves, line stop fittings, bolted couplings, wedge type mechanical restraint glands, high deflection restrained joint fittings, iron water main fittings, etc:

1. The Contractor shall provide Manufacturer's certification that the material is domestically manufactured in conformance with Standard Specification §106-11, Buy America (this need not be a separate certification). The Contractor shall notify the Engineer-in-Charge of any ductile iron water pipe, steel water pipe, valves, hydrants, tapping sleeves, line stop fittings, bolted couplings, wedge type mechanical restraint glands, high deflection restrained joint fittings or iron water main fittings from foreign producers. If the bid was not based on using foreign steel and/or iron, the Engineer-in-Charge will determine whether the total quantity of foreign steel and/or iron for all items surpasses the maximum allowed in §106-11. The entire quantity of any material above the maximum allowed will be rejected, unless a waiver is obtained by the Contractor from the approving authority. System owners are not the approving authority, and Buy America provisions supercede any local requirements regarding foreign steel and/or iron. If the Contractor's bid was based on using foreign steel and/or iron, no certification of domestic manufacture is required.

2. The Contractor shall provide Manufacturer's Certification identifying the material as one of the following and the bare fitting weight as listed in the appropriate AWWA Standard (currently listed only in lbs.). Some fittings are not listed under the above standards and the weight cannot be certified under these standards (though manufacture of the fitting can). The weight of those fittings shall be provided by the Manufacturer.

<table>
<thead>
<tr>
<th>Cast Material</th>
<th>AWWA Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Iron and Ductile Iron Full Body Fittings</td>
<td>C110</td>
</tr>
<tr>
<td>Ductile Iron Compact Fittings</td>
<td>C153</td>
</tr>
</tbody>
</table>

Note: The AWWA Standards are available on the IntraDot under Organizations> Design Division> DQAB > Specifications and Standards Section > AWWA Standards. The AWWA Standards contain a significant amount of information that may be valuable to the Engineer-in-Charge, however they are copyrighted, and may not be reproduced here.
Removals
Unused/abandoned water supply pipe should be removed, but it may be abandoned in place. If abandoned in place, the ends shall be capped in accordance with the contract documents. All pipe abandoned in place shall be shown on the contract record plans. Removal and storage can become problematic if the Owner does not arrive to take the materials. The Contractor is not required to deliver, but if the Owner does not accept the responsibility to remove the material, the Contractor may dispose of it (properly). Requiring a Contractor to deliver removed materials outside of the contract limits is a violation of federal policy. The Owner should be notified by Certified Mail that the material will be disposed of if not removed in a specified time period. Iron or steel pipe has residual value, and may be scrapped. Iron, steel or plastic pipe may also be disposed of as Construction and Demolition (C&D) Debris at an approved facility.

Asbestos-Cement Pipe
Large quantities of water supply pipe fabricated from asbestos-cement (AC) were installed across the State prior to the banning of asbestos containing products. AC pipe was originally white, but may be discolored, the surface is smooth, and has a texture similar to concrete pipe. AC pipe is non-metallic and will crack if struck with a hammer. In place, the material poses no health threat, but the material should never be cut, ground, tapped, swept or any other operation performed that may create dust. Dust from AC pipe poses a severe health hazard. Any operation, including cutting, tapping, removal, etc., may be performed only by a licensed asbestos abatement contractor under an asbestos removal permit from the Department of Labor (DOL). If AC pipe is encountered in the field, and not identified in the contract documents, stop all associated work adjacent to the pipe, backfill the area and contact the Regional Construction Environmental Coordinator for assistance. The Contractor shall ensure that workers, inspection staff and the public are protected from potentially objectionable and/or hazardous airborne dust and/or by-products in accordance with §107-05 and §107-15.

Shutdowns
The Contractor shall only shut down a portion of the water supply system with the consent of the Owner. The Contractor shall provide a minimum of 48 hours notice to each customer, which may be provided by posting a written notice on the building entrance. The Contractor should attempt to schedule work, particularly for commercial customers, during days or hours that minimize impact on customers. The Contractor should provide the Engineer-in-Charge a plan for work, and confirmation that notifications were made. The temporary water service item is typically used to supply critical facilities (hospitals, commercial/industrial users, etc.) and should not be paid for to meet the Contractor’s selected construction schedule or to correct Contractor created deficiencies.

Existing Valves
The Owner should be asked to operate and exercise any existing valves that will need to be operated during construction, prior to the Contractor beginning work. The Owner may refuse to operate an existing valve if there is a chance that the valve will malfunction during operation, leaving the risk of failure and subsequent replacement cost to the State. If the valve breaks during operation, and the failure is not due to negligence by the Contractor, replacement of the valve may be a State responsibility. If there is a water main betterment as a part of the contract, the replacement of the valve should be the Owner’s responsibility.

Excavation and Backfill
Trench widths for water supply pipe excavation, installation and backfill are shown on the Standard Sheets. Safety related requirements for trench protection must be addressed. Materials containing fly ash or slag are corrosive to cast and ductile iron, and shall not be allowed to come into contact with cast or ductile iron water supply pipe or appurtenances. Pipe bedding shall only be installed when called for in the contract documents (typically in the Owner Requirements), or where unsuitable or unstable material is encountered during excavation.
Thrust Restraint
Thrust restraint is required to prevent a pressurized pipe from separating due to movement. Many Owners will require redundant thrust restraint. External threaded rods are the least effective, due to corrosion and potential failure. Concrete thrust blocks are common, but can be expensive. The most effective types are restrained joints, where the joints are firmly bolted together. Restrained joints can be provided for existing pipe through the use of wedge type mechanical restraint glands. The thrust block sizes shown on Standard Sheet M663-2 are for standard conditions ONLY (1.5m burial, 1380kPa (200 psi) test pressure, 96kPa (2,000 psf) soil bearing capacity, and 1440 kg/cm (90 pcf) soil unit weight). These values are conservative for most applications. See the standard sheet for adjustment method, and refer to the Owner Requirements for test pressure. The Regional Geotechnical Engineer can provide assistance in evaluating soil conditions.

Example: Assuming the standard values for bury depth, soil bearing capacity and soil unit weight are acceptable, for a test pressure of 690kPa (100 psi), reduce the thrust block area by 50% (100psi/200psi). Maintain the minimum dimensions shown on the Standard Sheet.

Water Supply Pipe Installation
Ductile iron pipe is available with three types of joints, as shown on the Standard Sheets. Push-on joints are assembled by simply pushing the plain end of a length of pipe into the bell end of another piece of pipe with a gasket installed. This provides no thrust restraint. A mechanical joint provides a limited amount of thrust restraint. A restrained joint mechanically locks a retainer ring welded to the plain end of a pipe.

The Contractor shall follow the Standard Sheets for pipe installation and installation procedures outlined in the pertinent AWWA Standards (C600, C603, C605). Care must be used in the handling of pipe, as the lengths are typically too heavy to be handled manually. Pipe shall be kept clean and free of dirt, typically by using temporary pipe plugs. Ductile iron pipe is supplied in 5.5m (18 ft) or 6.1m (20 ft) standard laying lengths, and installation of uncut lengths need not be field measured, but rather may be counted. Plastic pipe may also be measured in this manner, based on a standard full length. Pipes that are field cut must be field measured, deducting the amount of plain end that is inserted into the bell of the next section. The length of fittings must be deducted from field measurements of installed lengths, as fittings are paid for by weight.

Installation of steel water pipe is different from iron or plastic. Steel pipe is typically used for very large diameters (48 NPS and larger). Rather than gasketed joints and fittings, steel water pipe is installed with fully welded joints and the fittings are shop fabricated from lengths of steel pipe. Steel pipe is typically coated, on the inside and outside, and some of the coating will need to be done in the field. The use of steel water pipe normally requires a cathodic protection system to prevent corrosion. Follow the contract documents for installation and inspection of cathodic protection systems.

Water supply pipe of any kind should be kept as clean as possible during storage and installation. Pipe lengths should be visually inspected for debris prior to installation. If debris remains in the pipe, or enters from a wet trench, joint make-up will be difficult, joints may leak and hydrostatic testing and disinfection will likely be problematic. Dewatering of trenches and the use of pipe plugs will aid in keeping the pipe clean.

Polyethylene Encasement and Insulation
Ductile iron pipe is frequently encased in polyethylene when installed in corrosive soil conditions. The encasement may be done using sheets or tubes, in accordance with AWWA Standard C105. Ends should be overlapped and taped. Fittings shall be encased using plastic sheets cut, fit and taped to encase the fitting.

Thermal insulation for buried water pipe is used when the bury depth over the pipe is less than the desired, typically 1.5 m (5 ft). This typically occurs when a water pipe is installed under a culvert or over some underground obstacle which reduces the bury depth. The insulation should extend along the water supply pipe to a point on either end that has a minimum 1.5 m ground clearance. The item for bridge mounted water mains includes insulation, and is not paid for separately.
Valves
Valves shall be installed with firm, even bearing. The Owner may require concrete blocks, pavers, crushed stone, gravel, etc. to support the valve. The valve box is placed over the operating nut on the top of the valve, but not bearing on the valve. Some Owners will require that concrete, concrete block or similar walls be installed to support the edges of the valve box, to prevent it from bearing on the valve. Screw type valve boxes are easier to install, but may transmit wheel loads to the body of the valve if not properly installed. The separate pieces of slide type valve boxes will telescope together under pressure, preventing damage to the valve. The slide type is the preferred type of valve box and shall be provided unless the Owner requires otherwise.

Hydrants
New hydrants shall not be connected to a main with a lateral pipe smaller than 6 NPS. Hydrants shall be supplied with a length(s) of anchor pipe up to 2.0 m long at no additional cost to the State. Anchor pipe, which is typically available in 300 mm increments up to 1800 mm, may be provided from the supplier with retainer rings and glands installed, to reduce field cutting and welding. Use of the correct length anchor pipe will allow proper placement of the hydrant. Larger offsets from the main to the hydrant will require installation of additional lengths of pipe, typically 6 NPS. An anchor pipe is a short length of pipe with two plain ends, and retainer rings welded to either end. Glands are installed prior to welding on the second retainer ring, allowing the anchor pipe to be bolted to both the tee and to the valve, and another bolted to both the valve and the hydrant. This provides a fully restrained valve and hydrant without the use of external rods or thrust blocks.

Hydrants shall be installed so that the lower barrel does not extend more than 100mm above grade over a 1.5m span, to prevent snagging on the bottom of an errant vehicle. The groundline is identified by the Manufacturer using an offset from the flange, because hydrant barrels are typically manufactured from ductile iron, and the groundline cannot be cast on the exterior as previously done with cast iron barrels. The hydrant shall be installed with groundline within 25mm of finished grade, to provide adequate restraint of the lower barrel, which allows the upper barrel to break off if struck by an errant vehicle. Barrel extensions to adjust the height of the upper barrel are available in 150mm increments; no more than one extension will be allowed. Small adjustments of a hydrant barrel are difficult, and localized minor adjustments of finished grade may be necessary.

Hydrant Fenders
Hydrant fenders should only be installed behind a raised curb, in a low speed (urban) setting.

Dry Hydrants
A dry hydrant consists of a length of pipe with strainer on one end that is in a pond or other year round source of water, and a fitting on the other end that allows quick connection to a fire department pumper truck. Dry hydrants shall be installed as detailed on the plans. The maximum allowable static lift for a dry hydrant is 7.0m (23ft) at sea level and decreases to 5.7m (18.8ft) at an altitude of 1525m (5,000ft). This does not take into account friction losses in the pipe or fittings. The lift is measured from the centerline of the pumper (0.6m above ground) to the water elevation in the pond or water source. Care must be taken to ensure that the riser, which will have water in it up to the source water level, is at least 1.5m below grade, measured both vertically and horizontally.
Iron Water Main Fittings

Iron water main fittings include bends, tees, crosses, reducers, plugs, etc. Fittings are available in mechanical joint (MJ), push on joint (POJ) and plain end (PE). Bends are referred to as a 1/4 bend (90°), 1/8 bend (45°), 1/16 bend (22-1/2°) and 1/32 bend (11-1/4°). Tees typically have the same size on the two ends opposite each other (run), and the same or a smaller size on the opposing end (branch). The size of a tee is written “run x branch”, ie a 12x6 Tee has two 12 NPS ends opposite each other (run) and a 6 NPS on the opposing end (branch).

Iron water main fittings are available in two basic types, “full body” fittings (AWWA Std C110) and compact fittings (AWWA Std C153). Unless specifically noted otherwise in the Owner Requirements, “full body” fittings may be supplied in either gray iron or ductile iron. Compact fittings are only available in ductile iron. In accordance with AWWA Standards C110 and C153, all fittings shall have the following distinctly cast on them: pressure rating, nominal opening diameters, manufacturer’s ID, country where cast and the number of degrees or fraction of circle on all bends. Ductile iron fittings shall have the letters “DI” or “Ductile” cast on them.

Iron water main fittings are paid for by weight. Fitting weights for payment are those listed in the appropriate AWWA Standard, when available (not all fittings or sizes are covered by the AWWA Standards). Total the weights in pounds, convert the contract total to kilograms and round to the nearest whole kilogram.

The material certification required under §722-01 shall list a fitting description, quantity, bare fitting weight and source of fitting weight (AWWA C110, C153 or Manufacturer, if fitting is not listed in either standard). Payment will be made based on material weight listed on the material certification.

Wedge Type Mechanical Restraint Glands

These glands are often known by their trade names, “Megalug”, “Ford 1100”, etc. The radial wedge bolts are tightened, and when the proper torque is reached, the outer portion of the bolt head snaps off, making the installation simple and reliable. The reliability may be compromised if the surface of the pipe opposite the wedges is dirty, or if the nuts are turned in the wrong direction with an air wrench, as the outer bolt heads will snap off. If this happens, or the device must be removed and re-installed, the bolts must be installed to the proper torque using a torque wrench.

Water Service Connections

A water service connection consists of a corporation stop, a length of small diameter service pipe, a curb stop and curb box and another length of small diameter service pipe to the customer. A corporation stop is a brass fitting that is either direct tapped (threaded) into a water main, or installed through a tapping sleeve or saddle. A corporation stop is a small valve that allows the water to be shut off after installing the device on a pressurized main. The service line is then attached to it and the curb stop is installed. This then allows the curb stop to be shut off, while the corporation stop is turned on, and the main backfilled.

A variety of tapping machines are available to install corporation stops. Care shall be taken to ensure that the machines are safely operated when tapping active mains under pressure.

Water Meter Pits

Water meter pits may be used in larger, commercial applications or when multiple structures on a single property are served from one service line. Meter pits are typically installed on the customers property, and will require a release. If a property owner does not grant a release, the (System) Owner may opt to discontinue service to that location. Unless otherwise noted in the Owner Requirements, meters shall be supplied by the Owner at no additional cost to the State or the Contractor.

Adjust Valve Box Elevation

Valve boxes may be adjusted using adjustment rings or frames, or by adjusting the existing box to the required grade. Valve box construction, either slide type or screw type, facilitates adjustment.
Hydrostatic Testing

Unless otherwise noted in the Owner Requirements, newly installed water supply pipe must be pressure tested to 1035kPa (150 psi) for a minimum of 2 hours. Allowable leakage amounts must be determined per AWWA Standard C600. Care must be taken to ensure that the main is restrained prior to pressurization, yet joints should be observed for visible leaks. No personnel should be allowed in a trench, excavation, meter pit or any confined space during the initial pressurization of a newly installed water supply pipe. Failure of a large diameter, high pressure water supply pipe may be hazardous to personnel in these locations. Valve operation to pressurize a newly installed water supply pipe shall be done gradually to prevent pressure fluctuations, if the valves are operated too quickly, or blow-off points are opened too quickly, escaping air pockets may cause water hammer, which may damage the system. The higher the system pressure, the greater the potential for problems and damage.

Disinfection

Disinfection and testing shall be conducted in accordance with AWWA Standard C651 and the project DoH permit, if applicable. The testing results typically must be completed prior to activation and use. This may require that the existing main be left in service until the new main is approved. Testing results must be received from the Contractor prior to final progress payment.

Highly chlorinated or neutralized water used for disinfection should not be directly discharged to an environmentaly sensitive water body or into a storm drainage system (open or closed) that outlets directly into a sensitive stream or water body. Highly chlorinated or neutralized water should be discharged to a sanitary sewer or municipal wastewater treatment facility if available. Highly chlorinated or neutralized water may be discharged into vegetated upland areas at least 100 feet from any surface water body. If this is not possible, contain highly chlorinated or neutralized water and aerate on site to allow chlorine to volatilize. If containing highly chlorinated or neutralized water on site is not feasible, discharge the water into a tank truck to be disposed of. Contact the Regional Environmental Contact for assistance.

RELATED CONTRACT PROVISIONS
§715-02 Steel Castings
§715-07 Proof Loaded Iron Castings
§715-09 Malleable Iron Castings
§719-01 Galvanized Coatings and Repair Methods
Section 722, Water Supply

REFERENCES
American Water Works Association (AWWA) Standards
Special Notes - “Owner Requirements for Water Mains and Appurtenances”
Highway Design Manual (HDM) Chapter 13; Utilities
Standard Sheets M663-1 to M663-7
Contract Administration Manual (CAM) §106-11, Buy America
SECTION 680 TRAFFIC SIGNALS

General
This section is intended for the use of Engineers-in-charge and Traffic Signal Crewpersons as a guide for conducting in-progress and final inspections of traffic signal construction. Although this check list does not include every item that should be checked, it includes those items that when properly completed contribute to the safe and efficient long-term operation of the traffic signal.

Due to differences in regional signal construction practices, there may be items in this check list that do not apply in a particular region. The contract documents should be consulted to determine the applicability of an item.

Unless otherwise specifically cited in the check list item, the Standard Specifications and Addenda as well as Proposal Inserts, Special Notes and Engineering Bulletins comprise the reference documents for the check list items.

Traffic Signal Pole Foundation
Anchor bolts properly aligned and plumbed to ensure proper signal pole orientation with respect to load attachment, hand hole and signal cabinet / wiring access hole.

Proper alignment and placement of the reinforcement bar cage.
Correct footing dimensions.
Proper number and orientation of conduits.
Proper specification concrete and placement.

Traffic Signal Pole Installation
Signal poles properly mounted on the anchor bolts with mortar caps with adequate grouting.
Poles bonded with a continuous ground.
Weather head(s) properly installed and aligned.
All covers, disconnect boxes, nipples, conduits and pedestrian signs properly installed.
Eye bolts for spanwire properly installed and aligned.
All scratch marks properly field repainted and treated with appropriate regalvanizing material.
Site restoration properly completed.
Placement per plan or A.O.B.E.
Top of pullbox cover at proper level with respect to finish grade.
Mortaring completed around conduits and frame.
Wire hangars properly installed.
Splices properly done, secure and water tight.
Proper amount of cable slack neatly coiled.
SECTION 680 TRAFFIC SIGNALS

Ground rod installed properly.

Metal conduit properly grounded and bonded.

Location of flexible conduit properly marked.

**Signal Controller Cabinets**

- Cabinets properly and securely mounted to pole or cabinet base.
- Cabinet mount at correct height above grade or work pad.
- Service connection, field wiring and grounding properly done.
- Output field wiring properly marked or color coded designating head number and indication connected to.
- Input field wiring properly marked or color coded designating input source (detector, push-button, etc.).
- Service conduit properly secured with meter pan or disconnect as required.
- Ground rods properly installed and connected.
- Metal conduits properly bonded.
- Ground tests meets specifications.
- Electrical functional tests satisfactory.
- Proper cabinet lock and spare keys provided.
- Copy of final wiring diagram in cabinet.

**Traffic Signal Span**

- Spanwire attached to poles with proper hardware and at proper height and sag.
- Traffic signal heads and signs are placed, aligned, aimed and attached with proper hanging hardware in accordance with the contract documents.
- Traffic signal heads and signs are the proper height above the roadway.
- Wiring to heads is electrically and mechanically secure.
- If required, tether spans to signal heads and/or signs are properly secured.
- Signal cable secured to spanwire in proper manner.
- Signal cable splices are made with staggered splices and are properly sealed.

**Vehicle Detectors**

- Vehicle detectors are located and installed per plan or A.O.B.E.
- Proper wire size and type used in loop detectors and as lead in all detector types.
Loop detectors and all lead-ins are tested for continuity and leakage to ground.

**Pedestrian Push-Buttons, Indicators and Signs**

Pedestrian push-button information signs and pedestrian indications have the proper wording and/or legend.

Pedestrian push-buttons, information signs and indications are properly installed, at the proper height and are visible.

Pedestrian push-buttons actuate the proper signal / pedestrian indications.

**Evidence of Acceptance for Traffic Signal Materials**

**Acceptance Documentation**

Section 680-3.01 of the Standard Specifications discusses equipment list and drawings which may need to be obtained to ensure that material to be installed meets specifications. In addition, the Materials Inspection Manual states that except for Traffic Signal Poles and Roadway Loop Embedding Sealer, manufacturer’s certification is considered adequate evidence of acceptance for traffic signal items. The requirement that catalog cuts must be submitted in addition to manufacturer’s certification should be requested for only those items that have physical or electrical properties critical to the proper fit or operation with other components. An example would be a catalog cut showing the bolt hole sizes and pattern of a pedestrian push-button signal pole to be installed on existing anchor bolts. The need for catalog cuts as additional evidence of acceptability should be determined early in the construction process so that provision of this documentation does not delay contract completion.

**Retention of Documentation**

To aid the Traffic Signal Crews in the maintenance/repair of the items installed in the contract, a copy of the manufacturer’s certifications and any catalog cuts should be maintained in the files of the Traffic Signal Crew Engineer-in-Charge.

**Final Accounting for Federal-Aid Projects**

When traffic signals are constructed with Federal participation, the Department is required to document to the FHWA the quantity and cost of that equipment used in the project. Accordingly, the Engineer-in-Charge must complete Form TE200b (Exhibit 680-A) Traffic Signal Equipment Furnished by the New York State Department of Transportation Equipment Summary per Engineering Instruction 81-10.

**References**

EI-81-10, TRAFFIC SIGNAL EQUIPMENT FURNISHED BY NYSDOT ON CONSTRUCTION CONTRACTS
SECTION 687 THERMOPLASTIC PAVEMENT MARKINGS

General
Thermoplastic is a durable-type pavement marking material that, when properly applied, can be expected to provide 3-5 years service on new bituminous concrete pavements. Thermoplastic markings are susceptible to damage from snowplows and should not be used in locations with significant plow activity. Thermoplastic adheres poorly and should not be used on portland cement concrete pavements.

Project Procedure
The specifications for thermoplastic (Section 687) were prepared with the intent that they would account for and minimize field installation problems. In most instances, contractors have adhered to the specifications. However, problems have occurred on some projects that have identified a need for additional clarification of the requirements of Section 687. The following is provided to alert engineering personnel to the most important specification requirements and to set guidelines for the inspection of thermoplastic applications.

A. Striping Contractor. Applicators of thermoplastic pavement markings are dealing with a unique item. In general, these contractors only work with the placement of pavement markings. To perform this work, a competent striping contractor has a large investment in his/her equipment (e.g., a mobile applicator is in the price range of $200,000 - $300,000). To obtain a return on his/her investment, the contractor must act as a "prime" or "sub" on several simultaneous on-going projects. To ensure timely contract completion, striping applicators should be thoroughly checked as to their current commitments, work schedules, and their ability to complete any additional work prior to their approval as a sub-contractor.

B. Application Equipment. The Engineer is responsible for approving application equipment, both mobile and portable, prior to the start of work. In addition to thermoplastic applicators, any extra equipment for primer application and pavement cleaning should also be inspected and approved.

The following is a listing of the minimum equipment components for approved thermoplastic applicators:

1. Melting Kettle(s) - The melting kettle must be capable of heating the molten thermoplastic to temperatures above 204.5°C. The heating mechanism must employ a heat transfer medium (usually an oil bath or hot air); heating by direct flame is not allowed. A material temperature gauge must be visible on the kettle. Some melting kettles will also have a temperature gauge to record the temperature of the heat transfer medium. Do not confuse this with the material temperature gauge nor consider that it represents material temperatures - it does not.

2. Mixing and Agitating Equipment - Melting kettles and portable applicators must be equipped with mixers (agitators). Most melting kettles are equipped with a continuously operating mixer, however, it should be checked periodically to ensure that it is operational. Portable application equipment should be equipped with a hand or mechanical mixer - this is usually located on the top of the materials storage reservoir. If a portable applicator is not equipped with a mixing device, do not approve this equipment. If the portable applicator has a hand operated mixer, ensure that it is used during marking operations. One purpose of the mixer is to maintain uniform material temperatures and these are most subject to change in the application of thermoplastic markings with portable equipment.

3. Priming Equipment - When specified, primer material is to be sprayed on the pavement surface at the coverage noted in the manufacturer's instruction for use. Spray equipment for primer application may be mounted directly on a mobile type thermoplastic applicator or may be a separate push or mobile type spray machine. Priming equipment should be checked to ensure
that is operational.

4. **Glass Bead Dispensers** - Both mobile and portable thermoplastic application equipment are required to be equipped with a drop-on type bead dispenser. The glass beads are to be dropped onto the hot thermoplastic stripe immediately after its application. The purpose of the glass spheres is to provide initial nighttime reflectivity of the pavement marking - without them the newly placed line would be barely visible to the motorist under night driving conditions. The bead dispenser should be checked for proper operation and to ensure uniform rates of bead application over the entire marking's surface. The Contractor is required to clean up the excess beads.

If application equipment is not equipped with a bead-dispenser or if it is non-operable during marking applications, work is to be stopped until the problem is corrected. Do not allow contractors to apply glass beads by hand or other unapproved methods.

5. **Extrusion Devices** - All thermoplastic pavement markings are specified for application by the extrusion method using an approved extrusion device. Schematics of acceptable extrusion devices are shown in Exhibit 687-A. The first two schematics show devices which use an extrusion shoe riding directly on the pavement surface. The shoe is designed to hold and extrude a mass of hot molten thermoplastic onto the pavement surface in the form of a stripe of specified width and thickness. The third schematic depicts a device that extrudes a vertical ribbon of thermoplastic from a properly sized slot located approximately one inch above the pavement surface. The slot is surrounded by a heated jacket and air shroud. Line thickness is controlled by the operating speed of the applicating equipment and low pressure that is used to extrude the material. The air shroud and pavement surface do not act as a shaping die. Exhibit 687-B is a schematic of an unacceptable extrusion device that has been used by a contractor. A primary objection to this device is that in a cool weather striping, air is allowed to cool the bottom of the extruded line prior to its contacting the pavement. This type application will result in a poor mechanical bond.

Material temperature gauges shall be affixed or incorporated in all extrusion devices in such a manner as to be visible and capable of monitoring the composition temperature throughout the marking operation. **Striping work should not be allowed to start or continue unless the temperature gauge is affixed in the device.** Some newer equipment may come equipped with a thermometer, etc. in the device; on older applicators it will be necessary for the contractor to determine an appropriate way to incorporate this.

C. **Inspection of Thermoplastic Marking Work.** After contractor and equipment approval requirements are satisfied, marking operations may begin. The basic work consists of pavement cleaning; primer application; melting and extruding the thermoplastic material on the pavement in a molten state at elevated temperatures; and an immediate drop-on application of glass beads.

A thermoplastic line that is properly placed within the specification requirements will soften (melt) and fuse with the underlying asphalt to form a mechanical bond (interlock) with the aggregate portion of the bituminous mix. If the bituminous pavement is unclean or wet; if air, surface and material temperatures are lower then specified; if other requirements are not met; this mechanical bonding will not be accomplished. If this occurs, the full service-life of the marking will not be realized.

Three basic modes of thermoplastic failure can be identified -- bond, abrasion and shaving.

**Bond** - A loss of the entire thickness of stripe because of its failure to adhere or bond to the pavement. This failure mode is normally due to some sort of improper installation technique such
as low temperatures, dirty pavement, etc. This failure is construction related.

**Abrasion** - Is a gradual wearing of the material from the top down, through traffic, debris and abrasives on the roadway, etc. Abrasion failures are not directly construction related. However, since the life of the marking is proportional to its thickness, the application of markings thinner than specified will result in earlier abrasion losses.

**Shaving** - A cutting or shaving away of thermoplastic line by snowplows. This failure mode is common on the leading edge of skip line stripes where 50-203 millimeters (2-8 inches) of line loss is normal during the first winter's use. Shaving failures are not related to installation.

Because shaving and bond failure may appear to be similar, a point should be made to distinguish them. Snowplow action may accelerate bond failure but it does not cause it. The bond must fail or at least be weakened before plows aggravate it. With a shaving failure the pavement bond may be very strong, but the plastic is actually cut or shaved away by the plow blade. This can be evidenced by closely examining pavement surfaces under a skip-line stripe that shows leading edge loss - the textured underlying asphalt will show thermoplastic material that is still bonded to the pavement if the markings were adequately bonded. Lack of adequate bond is evidenced by a clean separation of the thermoplastic from the pavement surface.

Because bond failures are construction related, they can be minimized by proper engineering controls; primarily through correct and increased inspection at the project site. The following guidelines are intended to direct the Engineer in the inspection of thermoplastic marking operations:

1. **Marking Location** - To minimize damage from plow blades and from bituminous substrate failures, thermoplastic markings must be placed directly on the bituminous pavement and slightly offset from shoulder and construction joints. Do no apply edge line markings directly over the joint formed between the roadway and adjoining shoulder; no skip line markings over the longitudinal joint between travel lanes.

2. **Equipment** - Daily inspections of the contractor's equipment should be made to insure that it is operable and within the specification requirements.

3. **Materials** - Materials for thermoplastic marking operations are covered under Section 727-01. Solid thermoplastic composition is supplied in the form of slabs, blocks of granular powder and should arrive at the job site pre-accepted. Material specifications and the MURK cover the requirements for acceptance of thermoplastic, reflective glass spheres and primer materials.

4. **Pavement Surface** - Pavement surfaces must be clean, dry and at a minimum temperature of 12.5°C (55°F). Each of these factors is critical to satisfactory bonding. New bituminous surfaces are often over-looked but should be inspected for cleanliness. Dirt from construction traffic, wind blown debris, etc. may be present and the contractor should be required to remove the contaminants in the location of the marking applications. Existing bituminous surfaces should be carefully inspected for cleanliness. Heavy deposits of existing pavement markings, built-up roadside accumulations of dirt, etc. will all require removal. In some cases an air blast will be sufficient to clean the surface - in others more effort or different methods will be needed. Regardless, the contractor should not be allowed to apply thermoplastic markings until the pavement is inspected and cleaned to the Engineer's satisfaction.

Pavement surfaces must be dry. At the minimum all pavement should be visibly dry. However, even with a surface dry appearance sub-surface moisture can be present in amounts sufficient to affect proper bonding. If excess pavement moisture exists, it will usually result in blistering of
the hot applied marking. Blisters will form as surface "bubbles" that may or may not have burst. They are easily spotted and if the condition occurs marking operations should be stopped until the pavement dries out.

The pavement surface temperature must be a minimum of 12.5°C (55°F) at the time of marking applications. Surface temperature should be verified at the start of each day's work. In cool weather conditions, the surface temperature should be checked periodically throughout the work day. Materials Method No. 20, BITUMINOUS PAVING INSPECTION, "SURFACE TEMPERATURES" describes a suitable procedure for determining pavement temperature. If at any time during work, the surface temperature falls below 12.5°C (55°F), marking operations should be stopped.

5. Air temperature - The ambient (air) temperature is to be a minimum of 9.5°C (49°F) and rising at the time of marking operations. Air temperature is to be verified at the start of each day's work and monitored as necessary during marking applications. If work has started and air temperatures fall below 9.5°C (49°F) and continual cooling is indicated, work should be stopped. Starting work at air temperatures lower than 9.5°C (49°F) should not be allowed.

6. Primer Applications - Primer is not used on "new" asphalt cement concrete pavement when the thermoplastic markings are applied within the same calendar year as the completion of the "new" asphalt paving.

When primers are used, they must be applied at the manufacturers recommended application rate and allowed to "set" for the specified cure time prior to the placement of thermoplastic. Rates of primer application should be checked to insure proper coverage (thickness). Primed pavement surfaces must be striped with the thermoplastic within the specified set time or within the same working day. Primed surfaces that are not striped over within these time limits must be reprimed prior to the application of thermoplastic markings.

7. Thermoplastic Application - The thermoplastic must be extruded on the primed pavement at a material temperature no lower than 204.5°C (400°F), as measured in the extrusion device, i.e., at the point of deposition. Immediately after placement, "drop-on" glass spheres are mechanically applied.

If the thermoplastic marking is not being applied at a minimum of 204.5°C (400°F), or if glass spheres are not dispensed, marking operations are to be stopped.

The material temperature requirement (minimum 204.5°C or 400°F) is one the most important factors affecting bond. It should also be one of the easiest to inspect because the extrusion device on approved equipment should contain a visible thermometer, or temperature recording device. This gauge allows for continuous monitoring of temperatures during marking work. The contractor's gauge in the device must be checked for accuracy. This can be done by comparing it with temperatures recorded on a stem-type thermometer that is commonly used to determine bituminous mix temperatures. Depending on the accuracy of the thermometer(s) variances of up to 12°C may occur. This degree of accuracy is satisfactory.

Strict attention must be paid to material temperatures. Time spent in melting and heating the thermoplastic material is non-productive time to the contractor. It is possible to extrude a "good looking" marking at temperatures much lower than 204.5°C (400°F), however, this material will not be well bonding to the pavement. It should also be noted that depending on the heat loss of the contractor's equipment between the kettle and the extrusion device, thermoplastic material in the kettle may require heating to temperatures greater than 204.5°C (400°F) to obtain the minimum specified temperature in the extrusion device. This is allowable provided that the
manufacturer's recommended maximum material temperature, normally 230°C (450°F), is not exceeded.

8. **Thermoplastic Thickness** - The specified thickness of the extruded thermoplastic marking is (3.2 mm minimum to 4.8 mm maximum). The service life of a thermoplastic marking is directly related to its thickness; e.g., a thin line will wear out faster. To insure that the proper thickness is being applied, both the wet and dry thickness of the line should be routinely checked. Wet thickness is inspected immediately after the line is extruded by inserting a thin, graduated machinists rule or a wet film gauge into the molten (liquid) plastic to the depth of the pavement substrate. The thickness of the line is simply determined by visually noting the depth of penetration. Dry thickness can be determined by various methods. One is to take a panel of known thickness, such as a piece of sheet metal, and place it in the path of the application equipment. After the thermoplastic has been deposited and has hardened on the panel, the total thickness should be measured with a micrometer and the panel thickness subtracted to indicate the line thickness.

9. **Applied Marking** - The applied markings should be inspected continually for overall workmanship. Markings should be of the specified width, with clean-cut edges. White and yellow colors should appear distinct. The drop-on application of glass spheres should appear uniform on the entire markings surface. The hardened thermoplastic should resist deformation, dirt pick-up, etc. by traffic. The markings should be firmly bonded to the pavement surface. Pavement bond of the hardened marking can be inspected by taking a stiff bladed putty knife and attempting "shock" the thermoplastic from the pavement. The putty knife should be positioned as parallel to the pavement as possible and pushed or hammered against the bottom edge of the marking, at the pavement interface. If only small pieces of marking can be chipped from the pavement, the bond is satisfactory. If large pieces of marking can be chipped from the pavement, the bond is satisfactory. If large pieces can be removed through the entire thickness of making and there is little visible evidence of the thermoplastic having melted or fused with the bituminous pavement, the bond is poor. Evidence of fusion (melting) will be visible in the form of bituminous material remaining on the underside of the removed marking. If the thermoplastic has melted and bonded with the underlying asphalt the majority of its underside will be coated with bitumen; if not only minor and "spotty" deposits of bituminous material will be present.

Questions concerning the application and the inspection of thermoplastic reflectorized pavement markings should be referred to the Materials Bureau, (518) 457-4285.

**References**
MATERIALS METHOD NO. 2, BITUMINOUS PAVING INSPECTION, "SURFACE TEMPERATURES"

**Related Contract Provisions**
Standard Specification §727-01
SECTION 691 TRAINING REQUIREMENTS

I. GENERAL
Training opportunities are provided in order to address the current under-representation of minorities and females in the skilled trades of the highway construction industry and to maintain a pool of qualified individuals to compete for journey worker positions which are created through attrition. (The Department submits an annual OJT Plan to FHWA; Item 691.03----20 Training Requirements is the Department’s version of “Training Special Provisions” (TSP). Contact the Civil Rights Bureau for additional background information.)

The Training Requirements item (special specification) is included in those contracts where there is anticipated to be an opportunity for meaningful and effective training. (See EI 06-018 & EI 06-019 for detailed guidance on selection vs. exclusion of contracts, based on type of work, size, and other factors.) Subsequent revisions to the criteria for inclusion of Training Requirements may occur, expanding use of the item to smaller-value contracts, based on experience in balancing meaningful opportunities, administrative effort, and cost of the item. The Training Requirements item may also be added by order-on-contract, subject to concurrence by the Contractor and approval by the Office of Construction, based on meaningful opportunities and Regional needs.

Meaningful and effective training is defined as when the duration and work of the contract provides a realistic and practical opportunity in the trade(s) selected, for the apprentice/trainee to complete elements of their apprenticeship/on-the-job training program in order to achieve journeyworker status. The specification provides details such as: number; trade(s); minority/female vs. race/gender neutral. Each apprentice/trainee shall be employed as such in the selected trade(s) in accordance with the currently approved Form AAP 35 Workforce and Training Utilization Schedule, to the extent that opportunities for training exist in contract work. (Note: Pay particular attention to the apprentice/journeyworker ratios in the prevailing wage rates.)

A. Apprentice And Training Programs
The focus of Training Requirements is on the typical construction trades, in accordance with FHWA regulations. It is Department policy that training programs will not be supported in competition with successful apprentice programs. (In general, non-union contractors can and do directly sponsor apprentice programs as long as they meet NYSDOL’s criteria. Some contractors and some Regions may have difficulty supporting apprentice programs due to small volumes of work.) The specification indicates that non-traditional job categories may be considered for apprenticeship or training; however, any proposals outside of the typical construction trades or inconsistent with the above Department policy are an exception to standard practice and must be submitted in advance to the Office of Construction for consideration as soon as possible.

B. Disadvantaged Persons
Disadvantaged persons are specifically recognized as candidates for construction training under FHWA policy (initiated under TEA-21) and are considered to be relevant to the Contractor=s recruitment and training efforts under their general civil rights responsibilities and under the race neutral component of the Training Requirements specification. A disadvantaged person® offered in those contexts is acceptable. There is no goal for disadvantaged persons®, so there can be no under-representation and no related Training Requirement as such. Accordingly, a disadvantaged person can not ordinarily qualify to fulfill a minority or female affirmative action position under the Training Requirements. Such a proposal by a Contractor is considered to be an exception to standard practice and must be submitted in advance for Office of Construction consideration as soon as possible. Furthermore, “disadvantaged” is not well defined, involving complex interpretation of tax law, specifications, public policy, etc.
SECTION 691 TRAINING REQUIREMENTS

II. PRE-AWARD REVIEW
The low bidder is required to submit a TSP letter to the Office of Construction as part of their pre-award review documentation. See MAP 7.7-07-02 for details of the review and approval procedure, including points-of-contact and Regional role. The purpose of the review is to ensure that the low bidder is aware of the requirement and to ascertain their intended approach. The criterion for acceptance of the low bidder’s proposal is a good faith effort to comply with the Training Requirements specification. Any exceptions will be coordinated by the Office of Construction with the Region and NYSDOL. Waivers may be granted for specialty contractors, out-of-state contractors, or for low value, material-intensive, short-duration contracts if the requirement is determined by the Department to be impractical or unreasonable.

The pre-award review does not preclude the full evaluation and negotiation of alternative approaches by the Region and contractor based on more detailed information prior to implementation.

III. REVIEWS
A. Preliminary Review
Prior to the beginning of construction, the Contractor submits a completed AAP 35 Workforce and Training Utilization Schedule, a completed AAP 26 Monthly Training Progress Report (Exhibit 691C) for each apprentice/trainee, a copy of the apprenticeship/OJT program(s) to be utilized on the contract, and a proposed cost analysis.

It is imperative that the workforce review and EEO analysis is conducted using the following three specific and distinct steps (see §102-11 and Exhibit D flowcharts):

1. Review EEO Goals vs. Journeyworkers By Trade. As a result of the first step EEO review under §102-11, supplementation of the workforce with apprentices/trainees may occur as part of the Contractor’s good faith efforts when there is a shortfall in EEO goal attainment with journeyworkers for a particular trade. Any apprentices/trainees employed to assist in meeting EEO goals are not considered to be part of the implementation of the Training Requirements and are not compensable under this specification. If EEO goals are not met with a suitable combination of journeyworkers and apprentices/trainees, then it will be impractical to attempt to satisfy the Training Requirements in that trade. If this occurs, the RCS should confer with Regional management and the Office of Construction to determine appropriate next steps. Options that may be considered are additional recruitment efforts, consideration of other job categories, and waiver of the training requirements.

2. Affirmative Action Component (AA) positions. The affirmative action component of the Training Requirements specification must be fulfilled with a minority (M) or female (F) in the trade(s) as indicated in the specification. This component is “targeted” to those areas based upon an analysis showing significant, programmatic under-representation. In the event the contractor is unable to fill these positions, the RCS should confer with Regional management and the Office of Construction to determine appropriate next steps. Options that may be considered are additional recruitment efforts or waiver of this component of the training requirements. No substitutions are allowed. (If the AA component is not fulfilled, the RGN component will not apply.)

3. Race/Gender Neutral Component (RGN) positions. White males are eligible to be proposed in fulfillment of the requirement, and trades where EEO goals are met are also eligible. There are legitimate opportunities and needs for training in those areas consistent with the intent and purpose of this specification. Note that the Contractor’s approach to addressing this aspect of the specification is a legitimate consideration in any discussion of overall good faith efforts in accordance with §102-11.
In reviewing a Contractor’s AAP 35, the EIC and the RCS must evaluate whether the projected total workforce is reasonable and whether the proposed training effort will result in sufficient opportunity for meaningful and effective training without sacrificing productivity. Routinely shifting the apprentice/trainee to work in other trades is inconsistent with the concept of meaningful and effective training leading to journeyworker status efficiently and expeditiously. If the Contractor cannot arrange the work and assignments in a fashion to support the program, the proposed training program should not be approved. In general, a reasonable program duration for the purposes of this specification is measured in weeks and months, not in hours and days.

The number of apprentices/trainees identified in the specification is a goal. Compliance with the goal should be evaluated based on the Contractor’s good faith efforts to provide training for the given number of full-time equivalent (FTE) employees for the duration of the contract, not numbers of persons on site. One FTE can be defined as approximately 1,000+ hours (40 hours x 25 weeks) of work per construction season for upstate Regions and approximately 2,000+ hours (40 hours x 50 weeks) of work per construction season for downstate Regions.

This would commonly be measured in hours of qualified work; i.e., one trainee specified for a 2 year contract upstate is equivalent to approximately 1,000 hours x 2.0 = 2,000 hours of work. Two people for 1,000 hours each, or three people for 700 hours each, would be an equal level of effort. Additional apprentice/trainee effort significantly above that specified is not encouraged. Using the same example, 2,000 hours is not a firm limit, but a proposal to use 3,000 hours would require additional justification for the “extra work”, just as with a proposal to add Training Requirements to a contract. (Subsequent revisions to the number of apprentice/trainees relative to contract value may occur, based on experience in balancing meaningful opportunities, administrative effort, and cost of the item.)

Contractors are free to employ as many apprentice/trainees as they see fit, subject to apprentice/journeyworker ratios; the above-described limits are only in reference to compensation under Training Requirements. Apprentice Training Ratios are included with the Prevailing Rate Schedule. The number of apprentices may be limited by the number of journeyworkers employed on the contract.

Depending on scope, cost, schedule and crafts employed, it may be appropriate for the Contractor to propose and for the Department to approve single/multiple/shorter/longer programs than identified in the specification. There are multiple goals for the Contractor and NYSDOT to attempt to balance:

- providing meaningful and effective training;
- completing as much as possible of remaining work processes in order to expedite progress of each apprentice/trainee to the completion of their approved program;
- balancing opportunities for entry-level and partly trained workers (currently employed apprentice/trainees are eligible under Training Requirements - the specification is not limited to new hires);
- retaining current employees and recruitment of new employees;
- continuity of employment; etc.

Truck drivers are a large segment of the construction workforce, and there are areas where the data and analysis shows significant under-representation of minorities and females. However, there are currently no NYSDOL-approved apprentice programs (or comparable training programs) for truckdrivers, so they are not considered to be eligible under Training Requirements until such programs are created. Such a proposal by a Contractor is considered to be an exception to standard practice and must be submitted in advance for Office of Construction consideration. The Office of Construction should be advised as soon as possible if such a proposal is offered.
B. Cost Analysis

The bid amount is a nominal dollars-and-cents item. The intent is to spend only what is necessary and consistent with the specification. Orders-on-contract will typically be necessary to provide sufficient funding for the agreed-upon training program.

Regardless of whether the Contractor uses apprentices or trainees, or pays in excess of the minimum established by the prevailing wage requirements, the compensation under Training Requirements is based on the prevailing wage for journeymen. An apprentice is paid at a discount (percentage) of the journeyworker rate per the prevailing wage rates, and the Contractor is reimbursed 35% of the journeyworker rate. (The Contractor still pays the applicable prevailing wage plus fringes/supplements to the apprentice/trainee.) There is no premium payment to the Contractor for overtime hours. Apprentice labor is reimbursable under force account work, with no reduction for payments made under this section.

The cost analysis estimate should be performed by the Contractor, submitted at or after the Preconstruction meeting, and reviewed for reasonableness and accuracy. The Contractor should estimate the number of hours per year (or other period), determine what phase/year of the apprenticeship program the individual is in, and determine the base hourly rate for an apprentice in that year. For estimating purposes, a full construction season upstate is approximately 1,000 hours (40 hours x 25 weeks), downstate is approximately 2,000 hours (40 hours x 50 weeks).

Example: The individual will receive 750 hours of qualifying training this season.

Carpenter’s base rate is $22.55/hr.
Hourly rate = ($22.55)(0.35) = $7.89/hr
Cost = ($7.89/hr)(750 hrs) = $5,917.50 --→ Say $6,000.

The Contractor must submit a cost analysis for each individual. To determine the amount required for the order-on-contract, total the costs for all individuals and round up to the nearest $500. If additional qualified hours are worked or if prevailing wage rates change in subsequent years, the hourly reimbursement will increase, and a subsequent order-on-contract may be needed to allow appropriate payments to be made.

C. Non-Reimbursable Costs

The Contractor will not be reimbursed for the following:
1. Apprentices/Trainees who are added to the workforce as a Good Faith Effort or corrective action measure in accordance with §102-11 EEO Requirements;
2. The cost of the Training Coordinator and Trainer;
3. Work by an apprentice/trainee outside of the craft in which they are being trained;
4. Continued work by an apprentice/trainee in a work process or phase in which the apprentice/trainee has completed training, without assignment to another work process or phase in which training is not complete;
5. Work by an apprentice/trainee who has obtained journeyworker status during the life of the contract;
6. Related classroom training and other off-site activities;
7. Benefits, insurance, and other non-wage costs;
8. Any work done prior to approval of the Training Requirements plan (AAP 35 and AAP 26).
IV. MONITORING/INSPECTION

If apprentices are being employed, Form AT 401 Apprenticeship Agreement/Documentation Form (Exhibit 691 A) must be submitted if the Contractor intends to pay that individual less than the journeyworker prevailing wage. Trainees/Apprentices are required to be identified to the EIC to facilitate monitoring of training activities. The EIC should verify that an apprentice/trainee has a copy of their training program; and in the case of apprentices, an AT 14 Apprentice Training Record (blue book) or AT 14.1 (yellow book) for electricians. The hours required in each work process for the program are entered on the inside front cover of the AT 14. The hours spent in various work processes are recorded on a daily basis in the AT 14. Trainees must have a breakdown sheet or method of recording information similar to that in the AT 14 (that is submitted to the EIC, who shares with the RCS, prior to the EIC approving payment).

The Training Coordinator will monitor the progress of the apprentice/trainee, paying particular attention to completion of work processes (phases) within the training program. When a work process (phase) is completed, the Contractor is expected to rotate the apprentice/trainee to other work processes (phases) of the OJT/apprenticeship program to the extent that such training opportunities exist. Otherwise, the apprentice/trainee can continue to work as long as there is work in their trade. [Short-term layoffs due to completion of work processes (phases) and lack of immediate work in additional needed work processes (phases) are not consistent with a goal of continuity of employment.] The duration of work processes (phases) are guidelines, not a rigid schedule. The rate of progress on work processes (phases) is highly variable among individuals; the goal is proficiency, not merely meeting the time periods suggested. Another consideration is safety; apprentices/trainees should not be learning in a complex, high-risk situation. (e.g., there are ways to learn to operate a crane without setting beams over a high-volume roadway in a very tight time window.) NYSDOL has suggested that flexibility within a range of ± 25% from the approved work process duration is the maximum that should be considered reasonable and should be reviewed on a case by case basis.

From a comprehensive perspective of contractors and the Department, it may be preferable to move people (and crews) from contract-to-contract due to the potential for enhanced productivity and improved safety from specialization. Apprentice/trainees working in such a situation may expedite completion of their programs, compared to being kept on a single contract. The Contractor should be congratulated rather than faulted for taking this approach when it supports general goals and principles. Payment can only be made under those contract(s) that have Training Requirements. Add the item by order-on-contract to accommodate this approach if mutually agreed.

When feasible, the inspector assigned to the operation in which training occurs should note on the Daily Work Report (DWR) a brief description of the apprentice=s/trainee=s activities and the number of hours of work in the craft. Inspectors are not expected to constantly monitor this work, to evaluate the quality or effectiveness of the training, or to keep highly detailed records, but should simply observe with sufficient frequency (1-3 times daily) to be able to reasonably conclude that the individual was present. Training may legitimately consist of instruction, observation or hands-on work. The Contractor has the primary obligation to ensure that hours worked are properly recorded, both for payroll purposes and for this specification.

A separate sheet containing a monthly summary of training may be kept at the field office to record the hours per day from each DWR. Upon receipt of the AAP 26, the hours of training provided during the estimate period should be checked against the DWRs (or the aforementioned monthly summary sheet) and certified payrolls. The AT 14/AT14.1 should also be spot checked and a copy obtained, where applicable, to cross-check hours and job rotation vs. the AAP 26 and the approved program. All calculations and backup documentation should be attached to the DWR upon which the payment is made. Copies should be provided to the RCS for their records (the process/work breakdown sheet should be attached to the AAP26).
A. Monthly Reports (AAP 26 and AAP 33).
The Monthly Training Report (AAP 26) summarizes training hours completed by an approved apprentice or trainee in a given month. The form is to be completed by the Contractor, signed by the apprentice/trainee, signed by his/her supervisor and forwarded contemporaneously to the Engineer-in-Charge for review. The Engineer-in-Charge signs and forwards to the RCS. A monthly work hours detail sheet listing what hours were worked and in what work processes (phases) must be attached to the AAP 26. (Once this data is received by the RCS, he/she enters it into an MS Access Training Report Program. The MS Access data file is then electronically forwarded by the RCS to the Office of Construction for inclusion in a statewide training database.) If the above information is not received, no payment or reimbursement may be made to the Contractor. In addition, a concurrent review of EEO goal attainment via the monthly AAP 33 occurs – see §102-11. When there appears to be a significant shortfall in EEO goal attainment, it may be necessary to rescind approval of Training Requirements if it appears that compensable apprentices/trainees are being employed in lieu of apprentices/trainees under good faith efforts provisions of §102-11. Confer with Regional management and the Office of Construction before such an action is taken.

B. Payments
Payment shall be made only for on-site training consistent with the specification. Measurement and tracking in hourly units is not intended to encourage work assignments by the contractor or record-keeping by inspection staff by the hour. Frequent occurrence of brief assignments or hourly computation suggests that meaningful and effective opportunities are not available; the training plan should be re-evaluated and perhaps should be discontinued.

Acceptance criteria:
1. Compliance with specification and conformance to pertinent Departmental procedures. Required documentation includes AAP 33, AAP 26 (with monthly work hours), AT 401, AT 14 (or equivalent), training/apprenticeship program, and verification documents from NYSDOL.
2. The Training Coordinator and Trainer are identified and performing the specified duties.
3. The apprentice/trainee is trained in accordance with the OJT/apprenticeship program, and is rotated when feasible to other work processes or phases of the OJT/apprenticeship program when completing a particular work process or phase.
4. The certified payrolls are periodically checked against the AAP 26 and other supporting documentation to verify consistency.

For the purposes of the Training Requirements pay item, the Contractor is reimbursed the same amount for all hours, for either an apprentice or a trainee, based on 35% of the base journeyworker wage rate only, with no supplements, fringes or additives, and no premium for overtime. (Do not confuse the amount reimbursed to the Contractor for an apprentice/trainee with the prevailing wages required to be paid to the individual.) If the Contractor chooses to pay an individual more than the prevailing wage rate, payment under this item is still determined from the prevailing wage. Payment should be limited to the number of hours outlined for each work process, unless additional hours are approved by the Regional Construction Engineer. (NYSDOL has suggested a variance of ±25% from the guideline is the maximum that should be considered reasonable.)

The reimbursement to the Contractor under the Training Requirements pay item does not compensate for the wages, benefits, etc. of an apprentice/trainee. It is intended to pay the Contractor to cover the costs to administer the apprentice/OJT program (and possibly a little more, depending on the circumstances). The Contractor is paid for the actual wages and benefits of an apprentice/trainee under item unit prices as the individual performs contract work, in the same manner as a journeyworker. For extra work performed under force account, pay the Contractor for an apprentice/trainee under the labor portion at full apprentice wages including supplements, taxes and
SECTION 691 TRAINING REQUIREMENTS

insurance.
For each contract payment, determine approved hours (per acceptance criteria above) for each individual; determine approved “Hourly Reimbursement Rate” (per description above); multiply hours by rate; sum compensable costs for each individual (if applicable) to determine total amount due contractor; enter the total amount due as the quantity in CEES (the unit price for Dollars-Cents items is $1.00, and the payment amount is the quantity). Note that a problem with payment for one individual does not affect making payment for another individual.

EXHIBITS
A NYSDOL Form AT401 Apprenticeship Agreement Documentation Form
B NYSDOL Form AT14 Apprentice Training Record
C Form AAP 26 Monthly Training Progress Report
D Training Program Review Process Flowcharts
### SECTION 691 TRAINING REQUIREMENTS

**NEW YORK STATE DEPARTMENT OF LABOR**

**APPRENTICESHIP AGREEMENT/DOCUMENTATION FORM**

**THIS AGREEMENT IS TO BE TYPED OR BLOCK PRINTED**

---

**I. APPRENTICESHIP AGREEMENT**

<table>
<thead>
<tr>
<th>SPONSOR NO.</th>
<th>ATP CODE</th>
<th>( \square ) FEDERAL</th>
<th>( \square ) STATE</th>
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1. **Name of the Apprentice (Last, First, M.I.)**  
   Social Security Number  

2. **Name of the Program Sponsor**

   **Address of the Apprentice (No. & Street)**

   **(City) (County) (State) (Zip Code)**

   **Ethnic Group:**  
   1. White
   2. African American
   3. Hispanic
   4. Native American or Alaskan Native
   5. Asian or Pacific Islander
   6. Other

   **Sex:**  
   1. Male
   2. Female

   **Date of Birth**

   **Disabled**
   1. Yes
   2. No

   **Veteran**
   1. Yes
   2. No

3. **Trade**

4. **Related Instruction - School and Location**

5. **Starting Date**

6. **Length of Program Apprentice Probationary Period**
   - Months
   - Months

7. **Credit for Previous Training or Experience**
   - Months

8. **Minimum Journey-worker Rate**

9. **Apprentice Wage Progression for each Period - in Months (M) or Hours (H)**

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**THE SPONSOR AND THE APPRENTICE AGREE TO THE TERMS ON THE REVERSE OF THIS FORM.**

**Signature of the Apprentice**

**Date**

**Signature of the Official Sponsor Representative**

**Date**

---

**REGISTERED BY THE NEW YORK STATE DEPARTMENT OF LABOR:**

**Signature New York State Department of Labor**

**Date**

---

**II. WORKSITE TRAINING COMPLETION OR TERMINATION**

Check one:  
1. \( \square \) Completed Worksite Training  
2. \( \square \) Terminated for Cause (Explain in Comments)  
3. \( \square \) Quit  
4. \( \square \) Layoff (Lack of Work)  
5. \( \square \) Program Termination

**Completion or Termination Date**

**Comments**

**Signature of Official Sponsor Representative**

**Date**

**Print Name**

---

**III. RELATED INSTRUCTION COMPLETION**

- \( \square \) Apprentice has satisfied the related instruction requirements. **Date of Completion:**

- \( \square \) Apprentice has not satisfied the related instruction requirements.

**Signature of DLEA Representative**

**Date**

**Print Name**

---

**STATE USE ONLY**

**To ATC:**

**To DLEA:**

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**STATE USE ONLY**

**To ATC:**

**To DLEA:**

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**STATE USE ONLY**

**To ATC:**

**To Input:**

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**STATE MUST BE RETURNED WITHIN THIRTY DAYS OF RECEIPT**

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March 2005  
New York State Department of Transportation  
Construction Inspection Manual  
Exhibit A
SECTION 691 TRAINING REQUIREMENTS

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**Hours Worked on Each Work Process Category**

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**Monthly Totals**

**Cumulative Totals**

Work Site Grade this Month: (Circle One) Excellent Good Fair Poor Supervisor

Comments
INSTRUCTIONS

This is your record of training received in the work process categories of your program. This is how to use it:

1. Inside Cover Page:
   Under the heading "Work Process" on lines A-O, enter the categories of training from the Apprentice Work Process Appendix A.

2. Apprentice and Employment Information Page:
   Name and address are essential. This may be your only training record.

3. Monthly Charts:
   a. Brought Forward:
      Enter the total from the previous page in each column, for each month after the first month.
   b. Work Process:
      Column Headings A-O refer to categories A-O on the inside cover page.
   c. Days of the Month (lines 1-31):
      Enter the hours of work site training or job experience under the appropriate category for each day worked. The hours in a work day may be divided among several Work Process categories.
      At the end of the day, add the day’s entries and post the total on the right side of the line under “Total Hours.”
      Have the supervisor initial each line on the right, under Journey Work/Supervisors Initials.
   d. Monthly Total Line:
      Add each column of hours worked during the month, for each of the Work Process categories and Total Hours.
   e. Cumulative Total Line:
      Add "Brought Forward" to the "Monthly Total Line" for each Work Process category and Total Hours, and enter the result.

4. Work Site Grade:
   At the end of the month, the supervisor will give you an overall grade of Excellent, Good, Fair or Poor and sign his/her name. The following month you start the process over again.

INSTRUCTIONS (continued)

Keep this book with you at the job site. Representatives of several State and Federal agencies may ask you to present this book for their inspection. They will be interested in seeing that you are getting the full amount of training the employer promised. They may be from an Apprentice Training agency within whose standards of training the employer must operate.

In addition, your employer may be part of a Group Employers Training Program. Representatives of this program may wish to keep a permanent record on your progress. A card for this purpose will be supplied to them by the Government agency concerned. If they ask to transcribe the records from your book, this is perfectly appropriate. The headings on the card are identical to the ones in your book.

All of your training is supervised by the Employment and Training Division of the New York State Department of Labor. If you have any problems, contact your Apprentice Training Representative whose name, address, telephone number are listed on the last page of your book. Your Designated Local Educational Agency Representative’s name, address and telephone number are also listed on this page. Further space is provided on the inside of the back cover to keep a personal record of your related instruction, if you so desire.

Note: One book allows for space for 15 months of training. If your program exceeds 15 months, you must use additional books.
### New York State Department of Transportation

#### Monthly Training Progress Report

**Location (County):** __________

**Contract D:** ________

**Agreement D:** ________

**Period:** ________(Mo/Yr)

**1. Name of Contractor or Consultant:**

1A. **Address:** __________

1B. **Telephone ( )** __________

**2. Name of Apprentice □ Trainee □ M □ F:**

2A. **Address:** __________

2B. **Telephone ( )** __________

**3. Social Security Number:** __________

**4. Employee Status (Check One)**

- □ New Hire
- □ Upgrade
- □ Re-Hire

**5. Ethnic Group Designation (Check One)**

- □ Black
- □ Hispanic
- □ Asian
- □ Native American
- □ Other

**6. Job Classification Code:** __________

(See Instructions for Codes)

6A. **Local/Sponsor:** __________

**7. Date Started:** __________

**8. Date Completed:** __________

**9. Termination (If Training was Terminated Prior to Completion of Approved Program Explain Reason for termination in Comments Section)**

- □ Seasonal Layoff
- □ Temporary Layoff
- □ Contract Completed
- □ Dismissal

**10. History (Attach Monthly Work Hours Detail Sheet)**

- Total Required Training Program: ______ Hrs
- Previous Training Received: ______ Hrs
- Class Hours: ______
- Training Provided This Period: ______ Hrs
- Remaining to Complete: ______

### Trainee Evaluation:

**Attendance:**

- □ Regular
- □ Irregular

**Punctuality:**

- □ Regular
- □ Irregular

**Quality of Work:**

- □ High
- □ Satisfactory
- □ Needs Improvement
- □ Unsatisfactory

**Overall Performance:**

- □ Outstanding
- □ Satisfactory
- □ Marginal
- □ Unsatisfactory

**Progress on Training Program:**

- □ Ahead of Schedule
- □ On Schedule
- □ Behind Schedule

**Comments:**

---

**I Have Read and Understand the Above Report**

**Trainee/Apprentice Signature:** ____________________________

**Date:** __________

**Report Prepared By:** ____________________________

**Date:** __________

*Supervisor of Trainee/Apprentice*

**Report Reviewed By:** ____________________________

**Date:** __________

*Signature of NYSDOT Representative*
SECTION 691 TRAINING REQUIREMENTS

PURPOSE
The Monthly Training Progress Report is prepared by the contractors/subcontractors, and consultants/subconsultants to document the progress of apprentice/trainees in completing their respective training programs, covering the various phases of the training activity. The completed report is used to monitor contract compliance with the Training Special Provisions.

SUBMISSION
The contractor/consultant shall complete and submit the signed original and one signed copy to the EIC by the 15th of the following month.
(1) When Training program begins. If the individual is an apprentice, attach the NYSDOL Apprentice Agreement (Form AT 401) with the first AAP26.
(2) When training ends e.g. seasonal layoff, project completed, dismissal, temporary layoff, etc.
(3) Attach the Monthly Work Hours Detail Sheet.

The supervisor of the apprentice/trainee shall complete the report, discuss it with apprentice/trainee, and then sign. The apprentice/trainee shall review and sign the report.
The EIC will:
(1) Check the report for accuracy/completion:
   a. Training hours, race, sex, etc.
   b. If comments are written that the EIC agree with the comments.
(2) EIC will sign both complete reports if he/she agrees. If EIC disagrees, reports will be return to Contractor/Consultant for corrections.
(3) Keep one of the complete report for the contract records.
(4) Submit one of the completed report to the Regional Office by the 20th of the month.

DIRECTIONS FOR COMPLETING FORM
Agreement D# is applicable to consultant agreement. Contract D# refers to construction contracts. If both consultant agreement and construction contract numbers are applicable, (e.g. A CI Agreement with a trainee) enter both.
1. Check Contractor or Consultant and enter name.
1A. Address of Contractor/Consultant
1B. Telephone number of Contractor/Consultant
2. Enter Name of apprentice/trainee, check apprentice or trainee and check male or female
2A. Address of apprentice/trainee (May be contractor’s address if the individual desires.)
2B. Telephone number of apprentice/trainee
3. Social Security number of apprentice/trainee
4. Employee Status – Check New Hire, Upgrade, or Re-hire
5. Ethnic group designation - (indicate Which Group)
6. Indicate job classification code using the codes listed below (e.g. for carpenter enter CP).
   LAB Labormer
   OP Equipment Operator
   SV Surveyor
   TD Truck Driver
   IW Ironworker
   CP Carpenters
   MS Mason
   PT Painter
   EL Electrician

6A. If Union Local enter number (e.g. L123), if Open Shop Association enter OSA and if a contractor enter C.
7. Start date of training on this contract.
8. Date training on this contract is completed.
9. Check appropriate box and give explanation in comments section.
10. History (self explanatory)

COMMENTS - Indicate any issue, concerns etc., not indicated on form.

Trainee/apprentice signature (self explanatory)
Report prepared by, this signature shall represent the supervisor of the trainee/apprentice and preparer of this report.
Reviewed by (self explanatory)
1-management review, evaluation and discussion may be required if there is a substantive disagreement on any issue among contractor, EIC, and/or RCS.

2-overall guidance for this process is found in CAM 99.

3-recognize that FHWA, NYSDOT and the contractor have multiple goals, sometimes in conflict; compromises may be necessary.

4-general specification guidance concerning “reasonable close conformity” is found in §105-04; although the emphasis in the Section is on technical issues, the contractual principle is also applicable to civil rights-related specs.

5-EEO goals are not quotas; specific language in §102-11 concerning EEO goals include: reasonably; is expected to; substantially uniform; may; good faith effort. Also note limitations on NYSDOT’s enforcement authority in relation to EEO goals.

6-EEO goal attainment is usually evaluated at the contract level, in the event of issues, evaluations at the contractor/area/trade may also be warranted. Contact OEODC for additional guidance. The same principles apply to 691 issues.

7-additional guidance on interpretation of these specs is found in corresponding sections of MURK.
SECTION 691 TRAINING REQUIREMENTS

From page 3

691 review is complete. Proceed with documentation and processing of OOC as needed

Also report results to OEODC for OJT plan purposes

Proceed with routine monitoring, evaluation, reporting, payment, etc.

THE END!
SECTION 697 - FIELD CHANGE ORDER

General Requirements
The Field Change Order (FCO) provides a contract contingency allowance for the timely payment of authorized work that is necessary to fulfill the intent of the plans and specifications. The payments for eligible work will be paid with progress payments from the Dollars-Cents quantity of Field Change Order Item. Prior to processing the final agreement, the FCO payments will be reconciled through a final order-on-contract, such that the quantity of FCO payments are converted to the corresponding quantities of the pertinent contract pay items. When payments are transferred to the appropriate items, all quantities of FCO payments will be deleted.

Eligible Work
Field Change Order Item payments shall be limited to work that is:

! Within the scope of the contract.
  i.e. Bridge repair items of work would be outside the scope of a landscaping contract.

! A quantity variation of existing contract pay items.
  i.e. more accurate field measurements indicate that additional quantities of T&L was required to achieve planned grades.

! A new contract pay item introduced as a result of omissions from the contract.
  i.e. the plans require a specific item, however, the proposal did not contain a bid quantity for this item.

! A new contract pay item introduced as a result of minor field adjustments in the details of the project. i.e. unforeseen utility conflicts require minor rerouting of the planned drainage, which would require introducing a new catch basin item, as well as increased pipe quantities.

All eligible items of work must also:

! have a known unit price either through bid price or agreed price, determined in accordance with § 109-05 A, Contract Item Charges or § 109-05 B.1., New Item Charges, Agreed Prices.
  Note that significant increases in major items of work or doubling of quantities for any other item of work will require that unit prices be reviewed and either affirmed or revised.

! be authorized in conformance with written procedures of § 104-03 of MURK Part 1A.

Disputed work, force account work, or work associated with Value Engineering Change Proposals are not eligible for FCO payment, and must be processed through an order-on-contract.

FCO Payment Documentation
The EIC shall develop and maintain a system to document and track actions taken regarding FCO payments. Such actions would include, but not be limited to:

! Authorization to perform the work (if required - see Murk 1A § 104-03.)
! Identification and review of work item quantities and unit prices that will be used to compute the FCO payment.
! Summary of FCO payments made.

Preparation of the Field Change Order
Once the need for extra work is identified and the authorization to perform the work is obtained, the Field Change Order can be prepared. The Field Change Order contains the Field Change Order
SECTION 697 - FIELD CHANGE ORDER

Sheet, explanations for the added work (prepared in accordance with MURK 1A, § 109-05 B), and supporting bid/agreed price information.

Review quantities and unit bid prices of the required additional work. Note that significant increases in major items of work or doubling of quantities for any other item of work will require that unit bid prices be reviewed and either accepted or renegotiated with the Contractor (see MURK 1A, § 109-05 III. D.). Agreed prices for new items of work or renegotiated contract bid items will be established in accordance with MURK 1A, § 109-05 III. E.

FCO payments will be computed as the quantities of added or altered work multiplied by the unit bid price or agreed price for that work. The total sum of these values equals the dollars-cents quantity of FCO payment for Item 697.02. The work item quantities and prices, and the FCO payments will be summarized on the CEES Field Change Order Sheet. The following CEES Field Change Order Sheet information will be completed similarly to the CONR -7 for orders-on-contracts unless noted otherwise (see MURK 1A, § 109-05 III. A.):

REGION NUMBER
COUNTY
NYS PROJECT IDENTIFICATION NO.
CONTRACTOR’S NAME
COMPTROLLER CONTRACT NO.
FEDERAL AID PROJECT NO.
FIELD CHANGE ORDER NO.; Enter the Field Change Order Number. Field Change Orders will have their own sequence and will not be sequential with Order-on-Contract numbers.

DESCRIPTION OF WORK
RELATED NYSDOT SPEC. ITEM. NO.
PRIOR APPROVED QUANTITY
UNIT OF MEASURE
UNIT PRICE
CHANGE IN QUANTITY
INCREASE IN FUNDS; The increase in funds resulting from the product of UNIT PRICE multiplied by the CHANGE IN QUANTITY.
TOTAL INCREASE IN FUNDS; The summation of all INCREASE IN FUNDS of all items in the FCO. This total will also represent the change in quantity for the FCO item.

Additional guidance on completing the Field Change Order Sheet can be found in the CEES User’s Manual.

Processing the Field Change Order

The EIC will assemble the FCO to include the original Field Change Order Sheet and the required supporting documentation. The EIC signs the Field Change Order Sheet, makes a copy of the FCO for the field office, and sends the original FCO to the Regional Construction Office.

The Regional Construction Office reviews the FCO for completeness and accuracy and approves the FCO by signature of the Regional Construction Engineer. The original plus one copy of the Field Change Order will then be sent to the Construction Division.

The Construction Division will spot check the FCO and review the supporting data. Approval of the FCO is indicated by signature of the Director, Construction Division. The approved original Field Change Order will then be returned to the Regional Construction Office.

Once the field office receives notification of the approved FCO, progress payments from the FCO item may be initiated. A copy of the approved Field Change Order Sheet must accompany
SECTION 697 - FIELD CHANGE ORDER

payment estimates that contain a FCO item quantity.

Payment Reconciliation
At the completion of the project, but prior to submitting the final estimate, all FCO payments will be transferred to the appropriate contract work items and their appropriate fiscal share by a final reconciliation order-on-contract. The reconciliation, or final “clean-up” order-on-contract, will include all quantity over-runs of existing contract items and new items of work that were previously paid under Item 697.02. It will also include the deletion of Item 697.02.

FCO payments shall not exceed the Dollars-Cents bid quantity. If sufficient quantity of Item 697.02 is not available to pay the total quantity of an added item of work, then pay the work item up to the available FCO quantity and submit the remaining quantity of work item in an order-on-contract (note: good tracking and documentation of FCO actions is especially important in these situations).
SECTION 698 - PRICE ADJUSTMENTS

Standard Specifications Section 698, Price Adjustments, contains the contract requirements for providing additional compensation to, or repayment by, the Contractor for increases or decreases in the price of asphalt or fuel throughout the life of the contract.

Eligible Work
Price adjustments will be determined for eligible work listed in the proposal and as described in the Standard Specifications.

General Requirements
Asphalt and Fuel adjustments need to be computed for each estimate period. A summary of all adjustments shall be maintained to determine when, and if a payment is necessary.

No adjustments either positive or negative, will be made until the payment of the final estimate, unless the accumulated adjustment amount of either the asphalt (Item 698.01 M) and/or the fuel (Item 698.02 M) exceeds $5000. When this value is exceeded, an order-on-contract (OOC) will be required to make payment. The OOC will pay the adjustment using a new item number, for example 4 #698.01 M (where the # is the Region number), and the original item number, 698.01, shall be reserved for the remaining adjustments in the final estimate. It is not necessary to process an OOC for overruns greater than the original quantity in the final. (The original quantity may be overrun in the final estimate for the asphalt and fuel adjustment items.)

An OOC shall be prepared each time the cumulative adjustment amount exceeds $5000 for either of the adjustment items.

Payment Documentation
Asphalt and Fuel price adjustments are to be computed as outlined in the Method of Computation section of the Specifications. These calculations are provided for in the Computerized Engineers Estimate System (CEES) and it is unnecessary to maintain manual records. CEES will generate a Fuel & Asphalt Report (Fuel & Asphalt Adjustment Worksheet) at the end of each estimate period and also provides a Fuel & Asphalt Adjustment Summary. This Fuel & Asphalt Summary Report is required to be submitted in the final estimate to the comptroller. CEES requires the eligible Asphalt and Fuel items and the index prices to be entered at contract set up. It is important to note that all eligible items should be entered at this point. If an item is added at a later date, CEES will only compute the adjustment from the date of entry, not from the contract start. Adjustments for these items used, prior to the date of entry will have to be performed manually. These manual adjustments will also have to be added to the Asphalt & Fuel Adjustment Summary.

To have CEES compute the Asphalt & Fuel Adjustments, the item number and quantity used must be entered into the Inspector’s Reports. Additionally, the Monthly posted price for Asphalt & Fuel must be entered for each month.

At the end of an estimate period, CEES will generate a Fuel and Asphalt Adjustment Worksheet. This is for information purposes only. Also note that CEES will also generate a Fuel & Asphalt Adjustment Summary. It is the Engineers responsibility to monitor the total adjustments and determine if a payment is necessary. CEES will not include the adjustments in any period estimate.

Please refer to the CEES user manual for a detailed description of the data entry process for Asphalt & Fuel Adjustments.

Negative Adjustments
CEES will calculate the negative adjustments as they occur. Any negative amount beyond the original contract quantity must be made as a Charge-to-Contractor under the corresponding item number. The
SECTION 698 - PRICE ADJUSTMENTS

Charge-to-Contractor is usually included on the Final Estimate, although it is possible to include it on a payment estimate.

References