**S T A T E  O F  C O N N E C T I C U T**
**DEPARTMENT OF TRANSPORTATION**

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**NEWINGTON, CONNECTICUT 06131-7546**

**Phone:** 860-594-3129

April 29, 2013

Subject: Project Nos.63-601 & 63-674: Reconstruction of Flatbush Avenue Connector (State Road 504) and New Britain – Hartford Busway Wetland Mitigation Contract 9, Town of Hartford.

NOTICE TO CONTRACTORS:

This is to notify all concerned and especially the prospective bidders that the bid opening for the subject project has been previously postponed to **May 8, 2013** at 2:00 P.M. in the Conference Room of the Department of Transportation Administration Building, 2800 Berlin Turnpike, Newington, Connecticut.

Addenda No. 3 is attached and can also be obtained on the Statewide Contracting Portal at http://www.biznet.ct.gov/scp_search/BidResults.aspx?groupid=64

This addendum is necessary to revise contract documents.

The Department has established a general mailbox to receive contractor questions. Please send all future questions to **DOTContracts@ct.gov**

*Philip J. Melchionne*
For: Gregory D. Straka
Contracts Manager
Division of Contracts Administration

**APRIL 26, 2013**
**RECONSTRUCTION OF FLATBUSH AVENUE CONNECTOR (STATE ROAD 504)**
**AND**
**NEW BRITAIN – HARTFORD BUSWAY WETLAND MITIGATION CONTRACT 9**

**STATE PROJECT NO. 63-601**
**AND**
**FTA FEDERAL AID PROJECT NO. CT - TBD**
**STATE PROJECT NO. 63-674**

**HARTFORD**

**ADDENDUM NO. 3**

**SPECIAL PROVISIONS**
**NEW SPECIAL PROVISIONS**
The following Special Provisions are hereby added to the Contract:

- NOTICE TO CONTRACTOR – REVISED SECTIONS 6.01 AND M.03
- SECTION M.03 – PORTLAND CEMENT CONCRETE
- ITEM NO. 0969070A – CONSTRUCTION FIELD OFFICE FURNISHINGS AND EQUIPMENT

**REVISED SPECIAL PROVISIONS**
The following Special Provisions are hereby deleted in their entirety and replaced with the attached like-named Special Provisions:

- SECTION 6.01 – CONCRETE FOR STRUCTURES
- ITEM NO. 0203000A – STRUCTURE EXCAVATION – EARTH (COMPLETE)
- ITEM NO. 0949007A – WETLAND CREATION

**DELETED SPECIAL PROVISION**
The following Special Provision is hereby deleted in its entirety:

- ITEM NO. 0969064A – CONSTRUCTION FIELD OFFICE, LARGE

**CONTRACT ITEMS**
**NEW CONTRACT ITEMS**

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|
| 0202502 | REMOVAL OF CONCRETE PAVEMENT | SY | 6106 |
| 0969070A | CONSTRUCTION FIELD OFFICE FURNISHINGS AND EQUIPMENT | MO | 40 |

**REVISED CONTRACT ITEMS**

| ITEM NO. | DESCRIPTION | ORIGINAL QUANTITY | REVISED QUANTITY |
|---|---|---|---|
| 0202000 | EARTH EXCAVATION | 97192 CY | 95665 CY |

**DELETED CONTRACT ITEMS**

| ITEM NO. | DESCRIPTION | ORIGINAL QUANTITY | REVISED QUANTITY |
|---|---|---|---|
| 0651012 | 15" R.C. PIPE | 46 LF | 0 LF |
| 0969064A | CONSTRUCTION FIELD OFFICE, LARGE | 40 MO | 0 MO |

**PLANS**

**REVISED PLANS**

The following Plan Sheets are hereby deleted and replaced with the like-numbered Plan Sheets:

01.02.01.A3
01.03.09.A3

**QUESTIONS & ANSWERS**

Q. In reference to sheet 01.06.03 – "Barrier Section Along Wall 101" shows a 6" Thick by 17'-9" Wide distribution slab that will require membrane waterproofing. In reference to sheet 01.06.04 – Beneath the Note section it states "Use EPS (2 PCF Density) for top 4 foot depth of EPS blocks where there is no concrete distribution slab above." Volume 1 Subset 05 (Cross Sections) shows a 36' wide distribution slab. Please confirm correct dimensions and locations.

A. The 2.0 pcf EPS is shown to be placed prior to station 329+30.29 (begin wall 101 station) on sheet 01.06.04, from the slope of the pre load to Sta. 329+30. The legend beneath the "note section" applies to that sheet only. There is no distribution slab in the area prior to station 329+30.29. There are no roadway cross sections shown within the limits of the 2.0 pcf EPS.

The width of the distribution slab is shown as 17'-9" on sheet 01.06.03 and it extends from the end of the moment slab to under the curb on the other side. The cross sections in Subset 1.05 reflect this.

Q. In reference to Special Provision 0101117A Controlled Materials Handling Page 191 "The existing WSA is to be utilized on an emergency as-needed basis only" Please clarify what is considered an "emergency as-needed basis" and how the DOT arrived at their quantity for this item.

A. It is expected that the contractor will be able to live-load all soil for disposal directly from the project site to the disposal facility. However, should a situation arise to due construction issues or facilities not being able to accept material or a limited amount of material, the contractor shall have use of the WSA for temporary storage.

Q. In reference to sheet 01.03.03 – Surcharge detail indicates 2.5' of material required above finished grade. Where will installation and removal be paid?

A. The material required to preload the proposed ramp alignment will be from the quantity excavated in stage 1. A quantity for borrow is included in the contract to make up any shortage.

Q. In reference to Special Provision 0101176A Disposal of PCB Waste Page 204 "Contractor Take Note: PCB Waste has not been documented to exist within the Project Limits" Is the bid quantity correct?

A. The Task 210 – Surficial Site Investigation report shows low-level detections of PCBs within the site LLAOEC. PCB Waste has not been documented within the project limits, however to avoid a delay during construction should higher levels of PCBs be detected, we have included this item. This item will be used if and only if PCB Waste is identified during construction activities.

Q. In reference to Special Provision 0949007A Wetland Creation on page 298 it states "Approved Wetland Topsoil material will be placed to an average depth of 1.5 feet within all proposed wetland areas." The 2010 wetland design shown on Special Provision pages 576 – 591 (Plates 72 – 87) indicate 1.5 feet of organic soil material. This information conflicts with the 1 foot of organic soil material proposed in the wetland design shown in Volume 2 Subset 4. Please clarify if the special provision will govern or if it needs to be updated to reflect the latest design by the DOT.

A. The Plans are correct as shown in Volume 2 Subset 4. The approved wetland topsoil will be 1 foot in depth across the entire mitigation site for both wetland creation and wetland enhancement. The Special Provision #0949007A Wetland Creation is revised in this Addendum to call for a depth of 1 foot within all proposed wetland areas. The Permit Plates will be revised prior to construction to match the design construction documents.

Q. Please provide the thickness of the concrete under asphalt for the existing I-84 ramps.

A. The thickness of the concrete under the asphalt for the existing I-84 ramps is 9 inches according to the original construction plans. The Contractor is urged to obtain as-built plans of the existing ramps from CTDOT's project # 63-184.

Q. The plan set cover sheet includes a List of Discipline Subsets which lists subset no.8 Utilities. There is no subset no. 8 in the project plan portfolio package. Notice to Contractor-MDC Sewer Relocation states that subset 8 will be issued via an addendum. So far we have received addendum #1 and it did not include subset 8. Please clarify.

A. Plan Subset 1.08 and all bid items for the sewer relocation work were included in Addendum No. 2.

Q. The Plan sheet Revision Sheet 01.02.001.A1 included with addendum #1 is for project no. 63-641 Reconstruction of Broad Street. Please clarify.

A. The plan sheet in question was inadvertently posted to the DAS Portal as a result of the similar project number (63-641 vs. 63-601). The mistaken posting was previously discovered and removed.

Q. Referencing sheet 01.03.09, please confirm RCCE located at Station 127+00 80' RT is to be 12" RCCE or 15" RCCE.

A. The pipe is mislabeled. It should be a 12" RCP. A revised plan sheet is included in the addendum.

Q. Referencing sheet 02.03.001, Item # 0651013, please clarify location of outlined 18" R.C. pipe.

A. The 18" RC Pipe is located on sheet 02.04.006 (GRD-01). The pipe is intended to be used for temporary stormwater diversion of the existing ramp drainage outlets during the earthwork operations and should be placed under the temporary construction access road near Flatbush Avenue.

Q. The existing S.R. 504 On and Off Ramps indicate that they consist of Bituminous over Concrete Pavement. Currently there isn't an item for Removal ofConcrete Pavement, however Fonn 816 states under Section 2.02.05 -Basis of Payment (Earth Excavation) that the removal of concrete pavement or concrete base will be paid for at the contract unit price for "Removal of Concrete Pavement". Please confinn which item this work is to be paid for under and add an item if required.

A. Item#0202502 - Removal of Concrete Pavement has been included in this addendum.

Q. Reference Item #0949007A -Wetland Creation, and Item #0202094A -Earth Excavation in Wetlands:

A. Is it the Departments intent that work performed in both the Wetland Enhancement Areas and Wetland Creation Areas is to be paid for under Item #0949007A ¬Wetland Creation?

B. Does Item #0202094A include only the excavation in existing wetlands excluding the stripping of existing topsoil, which is to be included in item #0949007A - Wetland Creation?

C. Reference pg. 298 of the Special Provisions "(f) Strip and stockpile existing topsoil from within the proposed limits of wetland creation if approved for re-use. Strip topsoil only to the

depth at which the soil color and texture changes, indicating the lower limit of topsoil and the beginning of the subsoil." Since this item is paid by the square yard, and we won't be able to determine where this color change actually occurs until the work is being performed, can the Department either set a depth for all bidders to use or remove this portion of the work and pay for it on a cubic yard basis?

D. Reference pg. 298 of the Special Provisions, "(h) ...Approved Wetland Topsoil material will be placed to an average depth of 1.5 feet within all proposed wetland areas." However, on Plan Sheet 02.04.005, all cross sections indicate 1 foot of organic soil material. Which is the correct thickness?

A. A. Yes. All proposed wetland creation and enhancement is to be paid for under Item #0949007A Wetland Creation. The terms “enhancement” and “creation” as shown on the plans are used for permitting purposes.

B. Yes. Item #0202094A Earth Excavation in Wetlands pertains to excavation only within existing wetland limits as shown on the plans.

C. Section (f) of the Special Provision for Item No. 0949007A-Wetland Creation pertains only to areas within the proposed wetland limits where material has been “approved” for reuse. The entire site has been classified as a Low Level Area of Environmental Concern and therefore, it should be assumed for bidding purposes that all contaminated material, including topsoil, should be handled according to Special Provision Item Nos. 0101117A-Controlled Materials Handling, 0202315 - Disposal of Contaminated Materials, and 0202318-Management of Reusable Controlled Materials. Contaminated topsoil may not be used for creating the wetland topsoil material. Prior to earth excavation operations, the Contractor may request, at their own expense, that the Environmental Engineer test specific areas to determine if the topsoil can be approved for reuse within the Proposed Wetland Areas. Section (f) has been revised for clarification under this Addendum.

D. The Plans are correct as shown in Volume 2 Subset 4. The approved wetland topsoil will be 1 foot in depth across the entire mitigation site for both wetland creation and wetland enhancement. The Special Provision #0949007A Wetland Creation is revised in this Addendum to call for a depth of 1 foot within all proposed wetland areas. The Permit Plates will be revised prior to construction to match the design construction documents.

Q. Reference Plan Sheets 02.05.001-006, there are a number of environmental borings shown on these plan sheets. We cannot find the boring results listed anywhere in the Plans or Special Provisions. Please provide this boring information as it is critical to determining the amount of groundwater we may encounter.

A. As stated in the Notice to Contractor – Environmental Investigations, information pertaining to the results of the environmental investigation can be found in the Task 210 Subsurface Site Investigation report. This report is available for review at the Office of Contracts, 2800 Berlin Turnpike Newington, CT or online on the DOT website.

Q. Page 226 of the special provisions calls for granular backfill to be placed and compacted around areas of remaining substructure following the removal of the designated substructure elements and the corresponding excavation. How is the granular fill paid for?

A. There is no need for using granular fill at these locations. Special Provision Item No. 0203001A – Structure Excavation – Earth (Complete) has been revised accordingly in this addendum.

The Detailed Estimate Sheets do not reflect these changes.

The Bid Proposal Form has been revised to reflect these changes.

There will be no change in the number of calendar days due to this Addendum.

The foregoing is hereby made a part of the contract.

## NOTICE TO CONTRACTOR - REVISED SECTIONS 6.01 AND M.03

This contract contains Special Provisions that replace Section 6.01 - *Concrete for Structures* and Section M.03 - *Portland Cement Concrete* in their entireties. Other Standard Specifications, Supplemental Specifications or Special Provisions may contain references to Articles or Subarticles from previous versions of Sections 6.01 and M.03 which are no longer valid.

**Any references to Articles beginning with "6.01" or "M.03" shall refer to the pertinent topic or materials in the new Special Provisions contained herein.**

# SECTION M.03 PORTLAND CEMENT CONCRETE

**Section M.03 *Portland Cement Concrete* is hereby replaced in its entirety with the following:**

**M.03.01 - Component Materials**
**M.03.02 - Mix Design Requirements**
**M.03.03 - Producer Equipment and Production Requirements**
**M.03.04 - Curing Materials**
**M.03.05 - Non Shrink, Non Staining Grout**
**M.03.06 - Expansive Cement for Anchoring**
**M.03.07 - Chemical Anchors**
**M.03.08 - Joint Materials**
**M.03.09 - Protective Compound/Sealers**
**M.03.10 - Formwork**

## M.03.01 – Component Materials

**1. Coarse Aggregate:** Coarse aggregate shall be broken stone, gravel, or reclaimed concrete aggregate defined as mortar-coated rock, consisting of clean durable fragments of uniform quality throughout. It shall be free from soft, disintegrated pieces, mud, dirt, organic or other injurious material and shall not contain more than one percent of dust by mass, as determined by AASHTO T-11. Coarse aggregate of a size retained on a 1-inch square opening sieve shall not contain more than 8% of flat or elongated pieces, whose longest dimension exceeds five times their maximum thickness. Heating or cooling of coarse aggregates may be required to meet concrete mix temperature requirements at time of placement.

**(a) Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO Method T 104, coarse aggregate shall not have a loss of more than 10% at the end of five cycles.

**(b) Loss on Abrasion:** When tested by means of the Los Angeles Machine, using AASHTO Method T 96, coarse aggregate shall not have a loss of more than 40%.

**(c) Gradation:** Grading and stone sizes of the coarse aggregate shall conform to Article M.01.01 as determined by AASHTO T-27. All coarse aggregate proportions shall be approved in advance by the Transportation Division Chief (TDC) as part of the Mix Design requirements.

**(d) Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.

**(e) Reclaimed Concrete Aggregate:** In addition to the above requirements (a-d), when reclaimed concrete aggregate is proposed, it shall be tested for chloride content. If blended with virgin aggregate reclaimed aggregate shall be tested prior to being mixed. The test used to determine chloride content shall be that outlined in AASHTO T-260 "Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials". Aggregate shall not be used if the chloride content as determined from this test exceeds 0.5 pound/cubic yard. Regardless of chloride content, reclaimed concrete aggregate shall not be used in concrete mixes used for pre-stressed concrete construction.

**2. Fine Aggregate:** Fine aggregate shall be natural or manufactured sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, mica, loam, organic or other injurious material. In no case shall fine aggregate containing lumps of frozen material be used. Heating or cooling of fine aggregates may be required to meet concrete mix temperature requirements at time of placement.

For continued shipments of fine aggregate from a given source, the fineness modulus of any sample shall not vary more than 0.20 from the base fineness modulus. The base fineness modulus for a source shall be established by the Engineer and may be revised based on current testing results.

**(a) Fine Material:** Fine aggregate shall contain not more than 3% of material finer than a #200 sieve, as determined by AASHTO T 11.

**(b) Organic Impurities:** Fine aggregate subjected to the colorimetric test shall not produce a color darker than Gardner Color Standard No. 11, using AASHTO T 21. If the fine aggregate fails to meet this requirement, the provisions of AASHTO M 6, Section 7.2.3, may apply.

**(c) Gradation:** Fine aggregate gradation shall be within the ranges listed in Table M.03.01-1 for any source. All fine aggregate proportions shall be approved in advance by the TDC as part of the Mix Design requirements.

**(d) Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO T 104, fine aggregate shall not have a loss of more than 10% at the end of five cycles. Fine aggregate that fails to meet this requirement, but meets all other requirements, may be allowed for use on a restricted basis with the approval of the Engineer on a case-by-case basis. Typically concrete forming any surface subject to polishing or erosion from running water will not be allowed to contain such material.

**(e) Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.

**Table M.03.01-1 TOTAL % PASSING BY WEIGHT**

| Sieve Size | 3/8" | No. 4 | No. 8 | No. 16 | No. 30 | No. 50 | No. 100 |
|---|---|---|---|---|---|---|---|
| Percent Passing | 100 | 95-100 | 80-100 | 50-85 | 25-60 | 10-30 | 2-10 |

**3. Cement:**

**(a) Portland:** Types I, II, and III Portland cement shall conform to the requirements of AASHTO M 85. Type I and Type III Portland cement shall be used only when required or expressly permitted by the project specification or the Engineer. The use of Type I or III will require that these mixtures be submitted as Non-standard Mix Designs. All cement shall be provided by a mill participating in the Departments' Cement Certification program. The requirements of the Certification Program are detailed in the Departments' Quality Assurance Program for Materials.

**(b) Pre-Blended Cements**: Binary or Ternary cements consisting of Portland Cement and supplemental cementitious materials may be used provided that all the requirements of Sub articles M.03.01- 3(a) and -3(c) are met.

**(c) Replacement Materials:** Unless already approved as a Standard Mix Design, any Contractor proposed Mix Designs with partial replacement of Portland Cement (PC) with fly ash or ground granulated blast furnace slag (GGBFS), must be submitted in writing to the Engineer for approval prior to the start of work, on a project-by-project basis. The type of material, source, and the percentage of the PC replaced must be clearly indicated. Upon request, a Certified Test Report for the cement replacement material must be provided to the Engineer for use during the Mix Design review.

1. Fly Ash: Fly ash to be used as a partial replacement for Portland cement shall meet the requirements of AASHTO M 295, either Class C or Class F, including the uniformity requirements of Table 2A. Loss on Ignition for either class of fly ash shall not exceed 4.0%. Fly ash may be used to replace up to a maximum of 20% of the required Portland cement. The fly ash shall be substituted on a weight basis, with a minimum of 1 pound of fly ash for 1 pound of Portland cement. Different classes of fly ash or the same class from different sources shall not be permitted on any single project without the written approval of the Engineer.

2. Ground Granulated Blast Furnace Slag (GGBFS): GGBFS used as a partial replacement for Portland cement shall conform to the requirements of AASHTO M 302/ASTM C989, Grade 100 or 120. As determined by the Engineer, GGBFS may be used to replace a maximum of 30% of the required Portland cement. The Engineer may restrict or prohibit the use of GGBFS if ambient temperatures anticipated during the placement and initial curing of the concrete are low. The GGBFS shall be substituted on a weight basis, with a minimum of 1 pound of slag for 1 pound of Portland cement. Different sources of GGBFS shall not be permitted on any single project without the written approval of the Engineer.

**4. Water:** All water used in the mixing of concrete shall be clear in appearance and free from oil, salt, acids, alkalis, sugar, and organic matter. Surface water may be used if not taken from shallow or muddy sources; classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping; accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer. The Engineer may request that water from any surface or ground source be tested in accordance with AASHTO T26 and AASHTO D512 if the appearance or scent of the water is suspect. To be acceptable, the pH of the water must not be less than 6.0 or greater than 8.0 and Chloride Ion Concentration of the water must not exceed 250ppm. Potable water taken directly from a municipal or regional water supply may be used for mixing concrete without testing. Heating or cooling of water may be required to meet mix temperature requirements at time of placement.

**5. Admixtures:** All admixtures shall perform their function without injurious effects upon the concrete. If requested by the TDC, the Contractor shall present a certified statement from a recognized laboratory attesting to this requirement. A "recognized" laboratory is any cement and concrete laboratory approved and inspected regularly by the Cement and Concrete Reference Laboratory. The statement shall contain results of compression tests of cylinder specimens made with concrete utilizing the admixture(s) in proportions equal to those proposed by the Contractor. The results of at least 5 standard 6-inch x 12-inch cylinders of each mix design must be listed with the results of at least 5 like-sized cylinders not utilizing the admixture(s). Specimens must be made and cured in the laboratory in accordance with AASHTO T 126 and will be tested in accordance with AASHTO T 22.

**(a) Air-Entraining Admixtures:** In the event that air entrained concrete is required, an admixture conforming to the requirements of AASHTO M 154 may be used. Tests for 7 and 28-day compressive and flexural strengths and resistance to freezing and thawing are required whereas tests for bleeding, bond strength and volume change will not be required.

**(b) Other Chemical Admixtures:** In the event that concrete properties are specified that require the use of additional admixtures, or the Contractor proposes the use of additional admixtures to facilitate placement, the admixtures shall conform to the requirements of AASHTO M194M/M, including the one year performance data.

**M.03.02 – Mix Design Requirements**

**1. Standard ConnDOT Mix Designs:** Standard Mix Designs shall be designed in accordance with applicable sections of ACI 211 and ACI 318. The mixtures shall consist of Portland cement, fine aggregate, coarse aggregate, admixtures[1], and water proportioned in accordance with the following table. The mixtures shall also be designed to obtain the physical properties of plastic concrete as specified in Article 6.01.03

**Table M.03.02-1**

| TYPE | 28-day Minimum Compressive Strength (psi) | Water / Cement; or Water / Cement plus other approved Cementitious Material (by weight) Maximum | Minimum Cement[2] Required (pounds/ cubic yard) | Maximum Aggregate Size Required Section M.01.01 |
|---|---|---|---|---|
| Class "A" | 3300 | 0.53 | 615 | No. 4 |
| Class "C" | 3300 | 0.53 | 658 | No. 6 |
| Class "F" | 4400 | 0.44 | 658 | No. 6 |
| Pavement | 3500 | 0.49 | 615 | No. 4 |
| Slope Paving | 2200 | 0.69 | 455 | No. 3 |

[1] Approved admixtures may be used in proportions recommended by the manufacturer.

[2] Portland Cement may be partially replaced within a Standard Mix Design by other approved cementitious material meeting the requirements of Article M.03.01-3(b) if permitted by the Engineer.

Mix designs must indicate the dosage of admixtures anticipated to provide plastic properties required in the project specification. Properties of standard classes of concrete in the plastic state are listed in Article 6.01.03

Standard Mix Designs are required to be designed and submitted by the concrete producers, and are approved by the Department on a standing basis. Submittal or re-approval of these Standard Mix Designs on an annual basis is not required. Previously approved producer-designed Standard Mixes that have a record of satisfactory performance may be utilized on Department projects unless there is a change in the gravimetric properties or the sources of any materials. Revisions to the Standard Mix Designs, which include changes in component sources, can be submitted at any time to the TDC, but must be approved prior to use on Department projects.

**2. Non-Standard ConnDOT Mix Designs:** Any proposed Mix Designs that do not comply with Table M.03.02-1 are required to be submitted 15 days prior to use on a project-by-project basis and be approved by the TDC prior to use. The use of an approved admixture with an otherwise approved Standard Mix Design is not considered non-standard.

All Non-standard Mix Designs used for load-bearing structures shall contain a minimum of 658 lbs/cubic yard of cementitious materials.

Concrete used in applications such as flowable fill or controlled low-strength material may be designed with less than 658 lbs/cubic yard of cementitious materials.

**M.03.03 - Producer Equipment and Production Requirements**

**1. General Requirements:** The source of the concrete must be approved by the Engineer prior to use on Department projects. Specifically the location and capacity of the central mix or dry

batch plant, and complement of truck mixers/haulers, shall be adequate for continuous placement of concrete on a typical Department project. Approval may be revoked at any time in accordance with Section 1.06.01.

**(a) Inspection:** The production facility supplying hydraulic cement concrete shall have a current Certification of Ready Mixed Concrete Production Facilities from the National Ready Mixed Concrete Association (NRMCA), or equivalent certification approved by the Engineer.

**(b)** In addition to the requirements of approved third party certification, the facility must produce batch tickets that conform to Sub article 6.01.03-3(a).

**(c) Quality Control**: The Contractor is responsible for all aspects of Quality Control (QC). As determined by the Engineer, should material delivered to a project not meet specification, the Contractor may be required to submit to the Engineer a corrective procedure for approval within 3 calendar days. The procedure must address any minor adjustments or corrections made to the equipment or procedures at the facility.

**(d) Suspension**: As determined by the Engineer, repeated or frequent delivery of deficient material to a Department project may be grounds for suspension of that source of material. A detailed QC plan that describes all QC policies and procedures for that facility may be required to formally address quality issues. This plan must be approved by the Engineer and fully implemented, prior to reinstatement of that facility.

**2. Hand Mixed Concrete:** Hand mixing shall be permitted only with the permission of the Engineer. Hand mixed batches shall not exceed 1/2 cubic yard in volume. Hand mixing will not be permitted for concrete to be placed under water.

**M.03.04 - Curing Materials**

**1. Water:** Any water source deemed acceptable by the Engineer for mixing concrete may be used to provide water for curing purposes. Surface water may be used if classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping and accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer. In general water shall not be taken from shallow or muddy sources. In cases where sources of supply are relatively shallow, the intake pipe shall be enclosed to exclude silt, mud, grass, etc.; and the water in the enclosure shall be maintained at a depth of not less than 2 feet under the intake pipe.

**2. Mats:** Mats for curing concrete shall be capable of maintaining moisture uniformly on the surface of the concrete. The mats shall not contain any materials such as dyes, sugar, etc., that may be injurious to the concrete.

The length or width of the mats shall be sufficient to cover all concrete surfaces being cured. Should more than one mat be required, sufficient overlap must be provided by the Contractor as determined by the Engineer.

**3. Liquid Membrane-Forming Compound:** Liquid membrane-forming compound shall conform to the requirements of AASHTO M 148 Type 2, Class B, or shall be a water-soluble linseed oil-based compound conforming to the requirements of AASHTO M 148, Type 2.

**4. White Polyethylene Sheeting (Film):** White polyethylene sheeting (film) shall conform to the requirements of AASHTO M 171.

**M.03.05 - Non Shrink, Non Staining Grout**

**1. Bagged (pre-mixed):** Bagged (pre-mixed) formulations of non-shrink grout shall meet the requirements of ASTM C 1107. The grout must be mixed with potable water for use. The grout shall be mixed to a flowable consistency as determined by ASTM C 230. All bagged material shall be clearly marked with the manufacturer's name, date of production, batch number, and written instructions for proper mixing, placement and curing of the product.

**2. Bulk:** The Contractor may formulate and design a grout mix for use on the project in lieu of using a pre-bagged product. The Contractor must obtain prior written approval of the Engineer for any such proposed Mix Design. Any such Mix Design shall include the proportions of hydraulic cement, potable water, fine aggregates, expansive agent, and any other necessary additive or admixture. This material shall meet all of the same chemical and physical requirements as must the pre-bagged grout, in accordance with ASTM C 1107.

**M.03.06 – Expansive Cement for Anchoring**

The premixed anchoring cement shall be non-metallic, concrete gray in color and prepackaged. The mix shall consist of hydraulic cement, fine aggregate, expansive admixtures and water conforming to the following requirements:

**1.** The anchoring cement shall have a minimum 24 hour compressive strength of 2,600 psi when tested in accordance with ASTM C 109.

**2.** The water content of the anchoring cement shall be as recommended by the manufacturer. Water shall conform to the requirements of Sub article M.03.01-4.

The Contractor shall provide a Certified Test Report and Materials Certificate for the premixed anchoring cement in conformance with Article 1.06.07. The Contractor shall also provide, when requested by the Engineer, samples of the premixed anchoring cement for testing and approval.

**M.03.07 – Chemical Anchors**

Chemical anchor material must be listed on the Departments' Qualified Products List and approved by the Engineer for the specified use.

The chemical anchor material shall be epoxy or polyester polymer resin. It shall not contain any metals or other products that promote corrosion of steel. The Contractor shall supply the Engineer with a Certified Test Report and Materials Certificate for the chemical anchor material in conformance with Article 1.06.07. When requested by the Engineer, the Contractor shall also provide samples of the chemical anchor material.

**M.03.08 – Joint Materials**

**1. Transverse Joints for Concrete Pavement:**

Transverse joints shall consist of corrosion resistant load transfer devices, poured joint seal and in addition, in the case of expansion joints, expansion joint filler all conforming to the following requirements:

**(a)** The corrosion resistant load transfer device shall be coated steel or sleeved steel or be made of corrosion resistant material. The dimensions of any devices used shall be as shown on the plans, exclusive of any coating or sleeving. Core material of coated or sleeved metallic devices shall be steel meeting the requirements of AASHTO M 255M/M 255 Grade 520, or steel having equal or better properties and approved by the Engineer. Nonmetallic devices shall meet the various strength requirements applicable to metallic devices as well as all other requirements stated herein.

**(b)** All coated load transfer devices shall conform to the requirements of AASHTO M 254. Uncoated or sleeved load transfer devices shall meet the applicable physical requirements of AASHTO M 254. The use of field applied bond breakers will not be permitted.

**(c)** The basis of acceptance for corrosion resistant load transfer devices shall be the submission by the Contractor of a minimum of two samples accompanied by Certified Test Reports conforming to the requirements of Article 1.06.07 demonstrating that the load transfer device conforms to the requirements of AASHTO M 254 for the type of device supplied. The Engineer reserves the right to reject any load transfer device which he deems unsatisfactory for use.

**2. Joint Filler for Concrete Curbing**

Expansion joint filler shall be either preformed expansion joint filler or wood joint filler as indicated on the plans and shall conform to the following requirements:

**(a)** Preformed expansion joint filler shall be the bituminous cellular type and shall conform to the requirements of AASHTO M 213.

**(b)** Boards for wood joint filler shall be planed on two sides and shall be either redwood, cypress or white pine. Redwood and cypress boards shall be of sound heartwood. White pine boards shall be of sound sapwood. Occasional small, sound knots and medium surface checks will be permitted provided the board is free of any defects that will impair its usefulness for the purpose intended. The joint filler may be composed of more than one length of board in the length of the joint, but no board of a length less than 6 feet may be used; and the separate boards shall be held securely to form a straight joint. Boards composed of pieces that are jointed and glued shall be considered as one board.

**(c)** Dimensions shall be as specified or shown on the plans; and tolerances of plus 1/16-inch thickness, plus 1/8-inch depth and plus 1/4-inch length will be permitted.

**(d)** All wood joint filler boards shall be given a preservative treatment by brushing with creosote oil conforming to AASHTO M 133. After treatment, the boards shall be stacked in piles, each layer separated from the next by spacers at least 1/4 inch thick; and the

boards shall not be used until 24 hours after treatment. Prior to concreting, all exposed surfaces of the wood filler shall be given a light brush coating of form oil.

**(e)** Testing of board expansion joint filler shall be in accordance with pertinent sections of AASHTO T 42.

**3. Longitudinal Joint Devices:** The metal used in the fabrication of longitudinal joint devices shall conform to ASTM requirements for each type of metal used. The dimensions shall be as shown on the plans.

**4. Expansion Joint Fillers for Bridges and Bridge Bearings**

**(a)** Preformed expansion joint filler for bridges shall conform to the requirements of AASHTO M 153, Type I or Type II.

**(b)** Pre-molded expansion joint filler for bridge bearings shall conform to the requirements of AASHTO M 33.

**5. Joint Sealants**

**(a) Joint Sealer for Pavement:** The joint sealer for pavement shall be a rubber compound of the hot-poured type and shall conform to the requirements of AASHTO M 324 Type II unless otherwise noted on the plans or in the special provisions.

**(b) Joint Sealer for Structures:** Structure joint sealers shall be one of the following type sealants:

1. Where "Joint Seal" is specified on the plans, it shall conform to the Federal Specifications SS-S-200-E (Self-leveling type), TT-S-0227E (COM-NBS) Type II-Class A (Non-sag type), or one component polyurethane-base elastomeric sealants conforming to the Federal Specification TT-S-00230C Type II-Class A or an approved equal.

   A Certified Test Report will be required in accordance with Article 1.06.07, certifying the conformance of the sealant to the requirements set forth in the Federal Specification. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify the shipment.

2. Where "Silicone Joint Sealant" is specified on the plans, it shall be one of the following or an approved equal:

   Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan Dow Corning 888 Silicone Joint Sealant or Dow Corning 888-SL Self-Leveling Silicone Joint 48686-0994.

**6. Closed Cell Elastomer:** The closed cell elastomer shall conform to the requirements of ASTM D1056, Grade RE-41 B2. The elastomer shall have a pressure-sensitive adhesive backing on one side.

The Contractor shall deliver the closed cell elastomer to the job site a minimum of 30 days prior to installation. Prior to the delivery of the closed cell elastomer, the Contractor shall notify the Engineer of the date of shipment and the expected date of delivery. Upon delivery of the closed cell elastomer to the job site, the Contractor shall immediately notify the Engineer.

Each separate length, roll or container shall be clearly tagged or marked with the manufacturer's name, trademark and lot number. A lot is defined as that amount of closed cell elastomer manufactured at one time from one batch of elastomer. A batch is defined as that amount of elastomer prepared and compounded at one time. The Contractor shall furnish a Certified Test Report in accordance with Article 1.06.07, confirming the conformance of the closed cell elastomer to the requirements set forth in these specifications. Should the co-signee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify shipment.

The Contractor shall furnish a 1 ft. length of closed cell elastomer in each lot for purposes of inspection and testing by the Engineer. The Engineer will cut a 1 ft. sample from each lot and inspect the sample for conformance to size, and perform physical tests on the sample as deemed necessary.

The Engineer shall reject any lot or portion of a lot that does not conform to the requirements stated herein. A rejected lot or portion of a lot may be resubmitted provided the Contractor has removed or corrected, in a manner acceptable to the Engineer, all non-conforming material.

**M.03.09 – Protective Compound/Sealers**

The brand and type of material must be listed on the Department's Qualified Products List and approved by the Engineer for the specified use.

**M.03.10 – Formwork**

1. **Stay-in-place Forms:** Material for stay-in-place metal forms shall be made of zinc-coated (galvanized) steel sheet conforming to ASTM Specification A653 (Structural Steel (SS) Grade 33 through 80). The minimum thickness shall be 20 gage. Coating weight shall conform to ASTM A924, Class G235, and shall otherwise meet all requirements relevant to steel stay-in-place metal forms and the placing of concrete as specified herein and as noted in the contract documents.

   Form supports shall either be fabricated and conform to the same material requirements as the forms, or be fabricated from structural steel conforming to the requirements of ASTM A36 and shall be hot-dip galvanized in accordance with ASTM A123.

   Lightweight filler material for forms shall be as recommended by the form manufacturer.

2. **Temporary Forms and Falsework:** Forms and Falsework shall be of wood, steel or other material approved by the Engineer. This approval does not relieve the Contractor from employing adequately sized materials of sufficient rigidity to prevent objectionable distortion of the formed concrete surfaces caused by pressure of the plastic concrete and other loads incidental to the construction operations.

# ITEM # 0969070A - CONSTRUCTION FIELD OFFICE FURNISHINGS AND EQUIPMENT

**Description:** This item requires that all equipment, labor, materials, service contracts, maintenance, replacements, and incidental work necessary to maintain said equipment, be provided by the Contractor, for the duration of the work. The equipment will be supplied for the exclusive use of ConnDOT forces and others who may be engaged to augment ConnDOT forces with relation to the contract. Ownership and liability of the equipment shall remain with the Contractor. The supplies shall be furnished and installed at the program office at 430 New Park Avenue, West Hartford.

**Materials/Supplies/Equipment:** Materials, supplies and equipment shall be in new condition as approved by the Engineer.

General Requirements: This item does not include an office, but does include the equipment indicated below.

The Contractor shall provide the additional equipment and/or services described in this specification to the satisfaction of the Engineer.

The following equipment shall be provided:

| QTY | Description: |
|---|---|
| 6 | Digital Camera as specified below under Computer Hardware and Software. All supplies and maintenance shall be provided by the Contractor. |
| 2 | Cellular Phone as specified below under Computer Hardware and Software. All supplies, maintenance and service plans shall be provided by the Contractor. |
| 3 | Laptop computer as specified below under Computer Hardware and Software. All supplies and maintenance shall be provided by the Contractor. |
| 1 | Concrete Curing Box as specified below under Concrete Testing Equipment. |
| | |
| | |
| 12 | Office desks (30” by 60”) with drawers, locks, and matching high-back desk chairs that have pneumatic seat height adjustment and dual wheel casters on the legs or base. |
| 200 | Office Chairs- new and padded with arms. |
| 2 | Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustments and dual wheel casters on the legs or base. |
| 2 | Conference table, 44 in x 20 ft (nominal). |

| QTY | Description: |
|---|---|
| 2 | Conference table, 44 in x 8 ft (nominal). |
| 40 | Conference table chairs, medium back padded, swiveling with casters. |
| 8 | Fire resistant cabinets (letter size/4 drawer), locking. |
| 4 | Non-fire resistant cabinets (letter size/4 drawer), locking. |
| 4 | Drafting, type tables each 3 ft x 6 ft, self-supported. |
| 4 | Drafters' stools. |
| 2 | Flat file (4/drawers). |
| 1 | Heavy Duty Stapler, capable of 160 sheets, minimum. |
| 1 | Heavy Duty 3 Hole punch |
| 1 | Multifunction color copier/scanner/facsimile/printer machine with auto document feeder and sorter/stapler. All supplies, paper and maintenance shall be provided by the Contractor. Specified below under Computer Hardware and Software. |
| 12 | Personal computer tables – 4 ft x 2.5 ft size and quality for the purpose intended. |
| 1 | Hot and cold water dispensing unit and supply of cups and bottled water shall be supplied by the Contractor for the duration of the project. |
| 2 | Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper. |
| 2 | "POD" style conference room telephone. (I.e. Polycom VoiceStation 300 Conferencer with external microphones). |
| 12 | Desktop computer systems as specified below under Computer Hardware and Software. |
| 4 | Black and White Laser printers and supplies as specified below under Computer Hardware and Software. |
| 30 | Solid Top Tables, 2.5' x 6'. |
| 1 | 18 cu. Ft. Refrigerator/freezer. |
| 2 | Logitech R800 with Green Laser Pointer. |
| 1 | Dell 1610 HD Projector- with all cables. |
| 2 | 100" Manual wall/ceiling mount projector screens. |
| 20 | Telescoping Presentation Easels. |
| 2 | Color Laser printer and supplies as specified below under Computer Hardware and Software. |
| 1 | SMART Board 885ix interactive whiteboard system with speakers (includes an interactive white board and projector) or equivalent. Including all necessary software and installation accessories as needed. |
| 6 | Digital Camera and supplies as specified below under Computer Hardware and Software. |

| QTY | Description: |
|---|---|
| 37 | Wastebaskets – two 30 gal and thirty five 5 gal. |
| 37 | Recycling Bins (two large, thirty five 5 gal). |
| 1 | Cross-cut paper shredder, commercial grade. |
| 2 | Electric pencil sharpeners. |
| 15 | Wall clocks. |
| * | Fire extinguishers – provided and install type and number to meet applicable State and local codes for size of office indicated, including a fire extinguisher suitable for use on a computer terminal fire. |
| 3 | First Aid kits. |
| 8 | Tables – 3 ft x 6 ft. |
| 15 | Cubicles – 6 ft x 6 ft, soundproof type, portable and freestanding. |
| 5 | Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack. |
| 2 | Double door supply cabinet with 4 shelves and a lock – 6ft x 4 ft. |
| 2 | Easel/Chalkboard |
| 20 | Open bookcases – 3 shelf – 3 ft long. |
| 5 | Infrared Thermometer, including certified calibration, case, cleaning wipes. |
| 3 | Concrete Air meter as specified below under Concrete Testing Equipment. |
| 3 | Concrete Slump Cone as specified below under Concrete Testing Equipment. |
| 1 | The latest version of Primavera Contractor software (deluxe version or equivalent, capable of servicing 2000 or more activities) with associated data pack, including Oracle technical support for the duration of the Contract, licensed to ConnDOT. The software is to remain the property of the Engineer at the conclusion of the Contract. |
| 1 | Set of the following building and fire codes, consistent with the Contract Documents, to remain the property of the Engineer at the conclusion of the Contract:<br>International Building Code with the State Building Code, including latest Connecticut Supplement.<br>International Plumbing Code<br>International Mechanical Code<br>International Existing Building Code<br>International Energy Conservation Code<br>NFPA 70 National Electric Code<br>ICC/ANSI A117.1<br>The Fire Safety Code, including latest Connecticut Supplement<br>International Fire Code<br>NFPA 1 Uniform Fire Code<br>NFPA 101 Life Safety Code<br>“Americans with Disabilities Act Accessibility Guidelines” |

The equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the equipment above listed above shall be provided by the Contractor for the duration of the project at no additional charge.

Computer Hardware and Software:

The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

Before ordering the computer hardware and software, the Contractor shall submit a copy of their proposed PC specifications and the type of printer to the ConnDOT Project Engineer for review by the ConnDOT Data Center. If the specification meets or exceeds the minimum specifications listed below, then the Contractor will be notified that the order may be placed.

Before any equipment is delivered to the Data Center, arrangements must be made a minimum of 24 hours in advance by contacting 860-594-3500. All software, hardware and licenses listed below shall be clearly labeled, specifying the (1) Project No., (2) Contractor Name, (3) Project Engineer's Name and (4) Project Engineer's Phone No., and shall be delivered to the ConnDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with ConnDOT field personnel and the computer system specified will be stationed in the Department's project field office.

The computer system furnished shall have all software and hardware necessary for the complete installation of the latest versions of the software listed, and therefore supplements the minimum specifications below. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability, the compatibility with current agency systems, and to provide the Department with a computer system that can handle the needs of the project. **There will not be any price adjustment due to the change in the minimum system requirements.**

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by each software producer for the duration of the Contract. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals. The Contractor shall provide original backup media for the software.

The Contractor shall provide the computer system with all required supplies, maintenance and repairs (including labor and parts) throughout the Contract life.

Once the Contract has been completed, the computer will remain the property of the Contractor. Prior to the return of any computer(s) to the Contractor, field personnel will coordinate with the

Data Center personnel for the removal of Department owned equipment, software, data, and associated equipment.

A) Computer – Minimum Specification:

Processor – Intel® Core i3 Processor (2.93 GHz, 1066 MHz FSB 3MB L2 Cache)
Memory – 4 GB DIMM DDR3 1333MHz.
Monitor – 24.0 inch LCD color monitor.
Graphics – Intel Graphics Media Accelerator 4500 or equivalent.
Hard Drive – 500 GB Ultra ATA/SATA hard drive (Western Digital, IBM or Seagate).
Optical Drive – CD-RW/DVD-RW Combo.
Multi-Card Reader – Must include SD
Multimedia Package – Integrated Sound Blaster Compatible AC97 Sound and speakers.
Case – Small Form or Mid Tower, capable of vertical or horizontal orientation.
Integrated Network Adapter – comparable to 3COM 10/100/1000 twisted pair Ethernet.
Keyboard – 104+ Keyboard.
Mouse – Optical 2-button mouse with scroll wheel.
Operating System – Windows 7 Professional.
Application Software – MS Office Professional Edition 2010.
Additional Software (Latest Releases, including subscription services for the life of the Contract) –

- Norton Anti-Virus,
- Adobe Acrobat Professional

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so the computer can be restored to original prior to shipment back to the contractor. Uninterrupted power supply – APC Back-UPS 500VA.

Note A1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows 7 Professional, Microsoft Office 2010 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell (preferred) and HP (acceptable) brands only. No other brands will be accepted. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

B) Laptop Computer – Minimum Specification:

Only Dell or HP brand laptop computers will be accepted
Processor – Intel® Core i5 Processor (2.50 GHz, 1333 MHz FSB, 3M Cache)
Memory – 4 GB DIMM DDR3 1333MHz.
Screen – 14.0 inch LED anti-glare.
Graphics – Intel Graphics Media Accelerator 3000. or equivalent.
Hard Drive – 250 GB 7200 rpm hard drive (Western Digital, IBM or Seagate).
USB ports – Four (4).
Optical Drive – CD-RW/DVD-RW Combo.
Multimedia Package – Integrated microphone and speakers.
Integrated Network Adapter – comparable to 3COM PCI 10/100/1000 twisted pair Ethernet.
Wireless Network Adapter – Intel® Centrino a/b/g/n.
Internal GOBI Modem capable of 3G/4G connection – Modem only. The Department will be responsible for furnishing data service for the device.
Card Reader – multi-card reader including SD.
Battery – Two (2) 9-cell batteries: 1-primary and 1-spare.
Power adapters – One (1) AC wall adapter and One (1) 12 Volt DC Auto adapter.
Mouse – Cordless laser 2-button mouse with scroll wheel.
Operating System – Windows 7 Professional 64-Bit Service Pack 1.
Application Software – MS Office 2010 Professional Edition.
Additional Software (Latest Releases, including subscription services for the life of the Contract.–

- Norton Anti-Virus,
- Adobe Acrobat Professional

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so that computer can be restored to original prior to shipment back to the contractor.
Carrying Case – Carrying case sized to carry laptop and accessories.

Note B1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows 7 Professional, Microsoft Office 2010 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell (preferred) and HP (acceptable) brands only. No other brands will be accepted. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

C) Laser Printer – Minimum Specification:
Print speed – 20 ppm.

Resolution – 1,200 x 1,200 dpi.
Paper size – Up to 216 mm x 355 mm (8.5 in x 14 in).
RAM – 16 MB
Print Drivers – Must support HP PCL6 and HP PCL5e.
Printer cable – 1.8 m (6ft).

Note C1: Laser printer brands are limited to Hewlett-Packard and Savin brands only. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note C2: For 'Small', 'Medium' and 'Large' Field Officers, it is acceptable to substitute a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the required laser printer and fax machine.

Note C3: For Type 'Extra-Large' Field Offices it is acceptable to substitute (1) a high-speed multi-function all-in-one printer/copier/scanner/fax machines listed on the approved printer list in place of one required laser printer and fax machine, and (2) a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the second required laser printer and fax machine. Only one of these devices is required to be set-up to function as the one required fax machine.

D) Multifunction color/copier/scanner/facsimile/printer machine:
Copy speed – 20 ppm.
Resolution – 600 x 600 dpi
Paper size – Up to 12 in x 18 in.
Printer calbe – 1.8 m (6 ft).
Capable of duplex printing (two-sided)

Note D1: Multifunction brands are limited to Savin only. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is award.

E) Digital Camera – Minimum Specification:
Optical – 5 mega pixel, with 3x optical zoom.
Memory – 4 GB.
Connectivity – USB cable or memory card reader.
Software – Must be compatible with Windows XP and Vista
Power – Rechargeable battery and charger.

Communications:

The Contractor shall provide rugged cell phones with unlimited nation-wide calling plan that operates on the Verizon, ATT or Sprint networks. The phones should be capable of sending and receiving text messaging and shall also include voice mail. Additional features beyond those

described shall be at no additional cost to the Department. Accessories for each cell phone shall include holster, AC wall charger, DC auto charger, and extended life battery.

The Contractor is responsible for service and repairs to all computer and communications hardware. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then a replacement must be provided. All supplies, paper and maintenance for the computers, laptops, printers, copiers, and fax machines shall be provided by the Contractor.

Concrete Testing Equipment:

The Contractor shall provide the following. All testing equipment will remain the property of the Contractor at the completion of the project.

A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.

B) Air Meter – The air meter provided shall be in good working order and will meet the requirements of AASHTO T 152.

C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

**Method of Measurement:** The furnishing and maintenance of the construction field office furnishings and equipment will be measured for payment by the number of calendar months that the equipment is in place and in operation, measured to the nearest month.

There will not be a price adjustment due to a change in the minimum computer system requirements.

**Basis of Payment:** The furnishing and maintenance of the construction field office furnishings and equipment will be paid at the listed unit price per month for the respective item "Construction Field Office Furnishings and Equipment", which price shall include all material, equipment, labor, service contracts, licenses, repair or replacement of hardware and software, and work incidental thereto, as outlined in the various sections of this specification.

| Pay Item | Pay Unit |
|---|---|
| Construction Field Office Furnishings and Equipment | Month |

Current Approved Printers

The following list of printers includes the only printers that will be **approved** for use in the Field Offices, the Terminal Servers with SiteManager system. If you currently have a construction project that is scheduled to start please ensure that the contractor only supplies one of these printers. No other printers will be approved or supported for new construction projects.

NOTE: Network interface requirements for all printing/scanning/copying devices:

- Shall be network ready (MIN 10/100 RJ45)
- Network/OS – Windows XP/Windows 7/Server 2008R2
- Network Protocols - TCP/IP (IPv4, IPv6)
- Shall have a built in display window.
- Wireless connection is not allowed or supported.

NOTE: All printing/scanning/copying devices shall have a built in display window.

- <u>HP Laser Jet models</u>: All models acceptable, with the exception of the following seven devices or series:
    - *No HP Laser Jet 1xxx Series (Not compatible w/ our network)*
    - *No HP Laser Jet P2035 (Not compatible w/ our network)*
    - *No HP Laser Jet Color 2550N(Not compatible w/ our network)*
    - ***No HP Laser Jet P2015 (Not compatible w/ our network)***
    - *No HP Laser Jet P1xx Series (Not compatible w/ our network)*
    - *No HP Laser Jet Mxxx Series (Not compatible w/ our network)*
    - *No HP laser Jet CMxx Series (Not compatible w/ our network)*
    - *No HP laser Jet CP1xxx Series (Not compatible w/ our network)*

- <u>Savin B&W Multifunction models with network interface</u>: All models starting with the numbers acceptable:
    - 3….Series
    - 8….Series
    - 9….Series

- <u>Savin Color Multifunction models with network interface</u>: All models starting with the numbers acceptable:
    - C….Series

Previously approved Models include:

| Manufacturer | Model No. | Manufacturer | Model No. |
|---|---|---|---|
| Hewlitt Packard | HP LJ P2015 | Hewlitt Packard | HP Color LJ CP4005 |
| Hewlitt Packard | HP LJ P2055 | Hewlitt Packard | HP Color LJ 4700 |
| Hewlitt Packard | HP LJ P3055 | Hewlitt Packard | HP Color LJ 5550 |
| Hewlitt Packard | HP LJ P4014 | Savin | Multifunction 3515 |
| Hewlitt Packard | HP LJ P4015 | Savin | Multifunction 9016 |
| Hewlitt Packard | HP Color LJ CP2025 | Savin | Multifunction 9021D |
| Hewlitt Packard | HP Color LJ CP3525 | Savin | Color Multifunction C6055 |
| Hewlitt Packard | HP Color LJ 3600 | Savin | Color Multifunction C2020 |

# SECTION 6.01 CONCRETE FOR STRUCTURES

**Section 6.01 *Concrete for Structures* is hereby replaced in its entirety with the following:**

**6.01.01—Description**
**6.01.02—Materials**
**6.01.03—Construction Methods**
**6.01.04—Method of Measurement**
**6.01.05—Basis of Payment**

**6.01.01—Description:** This item shall include concrete for use in bridges and culverts, walls, catch basins, drop inlets and other incidental construction as required. The concrete shall be composed of Portland cement, pozzolans, fine and coarse aggregate, admixtures and water, prepared and constructed in accordance with these specifications, at the locations and of the form dimensions and class shown on the plans, or as directed by the Engineer.

The use of concrete from dry batch or central mixed plants is permitted for all concrete mixtures.

**6.01.02—Materials:** The materials for this work shall conform to the requirements of Section M.03.

**6.01.03—Construction Methods:**

**1. Falsework and Forms:** Falsework is considered to be any temporary structure which supports structural elements of concrete, steel, masonry or other material during the construction or erection. Forms are to be considered to be the enclosures or panels which contain the fluid concrete and withstand the forces due to its placement and consolidation. Forms may in turn be supported on falsework.

This work shall consist of the construction and removal of falsework and forms that are designed by the Contractor in the execution of the work, and whose failure to perform properly could adversely affect the character of the contract work or endanger the safety of adjacent facilities, property, or the public. Falsework and forms shall be mortar tight and of sufficient rigidity and strength to safely support all loads imposed and to produce in the finished structure the lines and grades indicated in the contract documents. Forms shall also impart the required surface texture and rustication and shall not detract from the uniformity of color of the formed surfaces. Forms shall be of wood, steel or other material approved by the Engineer.

**(a) Design:** The design of falsework and formwork shall conform to the *AASHTO Guide Design Specifications for Bridge Temporary Works*, or to other established and generally accepted design codes such as ACI Standard *ACI 347-Recommended Practice for Concrete Formwork* or specific form or falsework manufacturer specifications. When other than new or undamaged materials are used, appropriate

reductions in allowable stresses, and decreases in resistance factors or imposed loads shall be used for design.

**(b) Loads:** The design of the falsework and forms shall be based on load factors specified in the *AASHTO LRFD Bridge Design Specifications* and all applicable load combinations shall be investigated. The design load for falsework shall consist of the sum of appropriate dead and live vertical loads and any horizontal loads.

As a minimum, dead loads shall include the weight of the falsework and all construction material to be supported. The combined unit weight of concrete, reinforcing and pre-stressing steel, and forms shall be assumed to be not less than 0.16 kip/ft$^3$ of normal-weight concrete or 0.13 kip/ft$^3$ of lightweight concrete that is supported.

Live loads shall consist of the actual weight of any equipment to be supported, applied as concentrated loads at the points of contact and a uniform load of not less than 0.02 kip/ft$^2$ applied over the area supported, plus 0.075 kip/ft applied at the outside edge of deck overhangs.

The horizontal load used for the design of the falsework bracing system shall be the sum of the horizontal loads due to equipment; construction sequence including unbalanced hydrostatic forces from fluid concrete and traffic control devices; stream flow, when applicable; and an allowance for wind. However, in no case shall the horizontal load to be resisted in any direction be less than two percent of the total dead load.

For post-tensioned structures, the falsework shall also be designed to support any increase in or redistribution of loads caused by tensioning of the structure. Loads imposed by falsework onto existing, new, or partially completed structures shall not exceed those permitted in Sub article 6.01.03-12, "Application of Loads."

**(c) Working Drawings:** The working drawings for falsework and formwork shall be prepared in accordance with Article 1.05.02 whenever the falsework or formwork exceeds 14.0 feet in height or whenever vehicular, marine, or pedestrian traffic may travel under or adjacent to the falsework or formwork. Working drawings shall include the sequence, method and rate of placement of the concrete.

Manufacturer catalog cuts or written installation procedures shall be provided for any clips, braces, hangers or other manufactured parts used with the formwork or falsework.

**(d) Construction:** Forms and falsework shall be built true to lines and grades shall be strong, stable, firm, mortar-tight and adequately braced or tied, or both. They shall be designed and constructed to withstand all loads and pressures including those imposed by plastic concrete, taking full account of the stresses due to the rate of pour, effect of vibration and conditions brought about by construction methods. Forms and

falsework shall be constructed to compensate for variations in camber of supporting members and allow for deflections.

Falsework and formwork shall be chamfered at all sharp corners, unless otherwise ordered or permitted, and shall be given a slight bevel or draft in the case of projections to insure satisfactory removal. Materials for falsework and formwork and their supports, ties and bracing, shall be of the type, quality and strength to achieve the structural requirements. Form material in contact with concrete shall provide the finished concrete surface smoothness as specified in Sub article 6.01.03-10, "Finishing Concrete Surfaces" and uniform appearance.

Falsework and formwork shall be treated with form oil or other release agent approved by the Engineer before the reinforcing steel is placed or self-releasing forms approved by the Engineer may be used. Release agents which will adhere to or discolor the concrete shall not be used.

Falsework and formwork for concrete surfaces exposed to view shall produce a smooth surface of uniform texture, free of voids, indentations, protrusions and bulges. Panels lining falsework and formwork shall be arranged so that the joint lines form a symmetrical pattern conforming to the general lines of the structure. The same type of form-lining material shall be used throughout each element of a structure. Falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/4 inch when checked with a 4 foot straightedge or template.

For non-exposed surfaces the falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/2 inch when checked with a 4-foot straightedge or template.

Metal ties and anchors to hold the falsework and formwork in alignment and location shall be so constructed that the metal work can be removed to a depth of at least 2 inches from the concrete surface without damage to the concrete. All cavities resulting from the removal of metal ties shall be filled after removal of forms with cement mortar of the same proportions used in the body of the work or other materials approved by the Engineer, and the surface finished smooth and even, and if exposed in the finished work, shall conform to the texture and color of adjacent surfaces. With permission of the Engineer, the Contractor need not remove from the underneath side of bridge decks portions of metal devices used to support reinforcing steel providing such devices are of material, or are adequately coated with material, that will not rust or corrode. When coated reinforcing steel is required, all metal ties, anchorages, or spreaders that remain in the concrete shall be of corrosion-resistant material or coated with a dielectric material.

Forms shall be clean and clear of all debris. For narrow walls and columns where the bottom of the form is inaccessible, an access opening will be allowed in the form and falsework for cleaning out extraneous material.

**(e) Date of Completion:** The year in which the superstructure is completed in its entirety shall be cast in at least two places as shown on the plans unless otherwise ordered by the Engineer. The date shall be placed in diagonally opposite ends of the bridge parapets or as designated by the Engineer. The reverse molds for the date will be furnished by the Contractor.

**(f) Bridge Decks:** After erection of beams and prior to placing falsework and forms, the Contractor shall take elevations along the top of the beam at the points shown on the plans or as directed by the Engineer. The Contractor shall calculate the haunch depths and provide them to the Engineer a minimum of 7 days prior to installing the falsework and forms. The Contractor shall also provide calculations for the setting of the overhang brackets based on the final beam deflection. These calculations shall be based on the final proposed deck grade and parapet elevations.

Falsework or formwork for deck forms on girder bridges shall be supported directly on the girders so that there will be no appreciable differential settlement during placing of the concrete. Girders shall be either braced and tied to resist any forces that would cause rotation or torsion in the girders caused by the placing of concrete for diaphragms or decks, or shown to be adequate for those effects. Unless specifically permitted, welding of falsework support brackets or braces to structural steel members or reinforcing steel shall not be allowed.

**(g) Stay-In-Place Metal Forms for Bridge Decks:** These forms may be used if shown in the contract documents or approved by the Engineer. Prior to the use of such forms and before fabricating any material, the Contractor shall submit working drawings to the Engineer for review in accordance with Article 1.05.02 Working Drawings. These drawings shall include the proposed method of form construction, erection plans including placement plans, attachment details, weld procedure(s), material lists, material designation, gage of all materials, and the details of corrugation. Also, copies of the form design computations shall be submitted with the working drawings. Any changes necessary to accommodate stay-in-place forms, if approved, shall be at no cost to the Department.

The metal forms shall be designed on the basis of the dead load of the form, reinforcement and the plastic concrete, including the additional weight of concrete (considered to be equivalent to the weight imposed by an additional concrete thickness equal to 3% of the proposed deck thickness, but not to exceed 0.3 inches) due to the deflection of the metal forms, plus 50 pounds per square foot for construction loads. The allowable stress in the corrugated form and the accessories shall not be greater than 0.725 times the yield strength of the furnished material and the allowable stress shall not exceed 36,000 psi. The span for design and deflection shall be the clear distance between edges of the beams or girders less two inches and shall be measured parallel to the form flutes. The maximum deflection under the weight of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form span or 0.5 inches, whichever is less. In no case shall the loading used to estimate this deflection be less than 120 pounds per square foot. The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in

excess of the foregoing limits. The form support angles shall be designed as a cantilever and the horizontal leg of the form support angle shall not be greater than 3 inches.

No stay-in-place metal forms shall be placed over or be directly supported by the top flanges of beams or girders. The form supporting steel angles may be supported by or attached to the top flanges.

Stay-in-place metal forms shall not be used in bays where longitudinal slab construction joints are located, under cantilevered slabs such as the overhang outside of fascia members, and bridges where the clearance over a salt-laden body of water is less than fifteen feet above mean high water level.

Welding to the top flanges of steel beams and girders is not permitted in the areas where the top flanges are in tension, or as indicated on the plans. Alternate installation procedures shall be submitted addressing this condition.

Drilling of holes in pre-stressed concrete beams or the use of power-actuated tools on the pre-stressed concrete beams for fastening of the form supports to the pre-stressed concrete beams will not be permitted. Welding of the reinforcing steel to the pre-stressed units is not permitted.

All edges of openings cut for drains, pipes, and similar appurtenances shall be independently supported around the entire periphery of the opening.

All fabricated stay-in-place metal forms shall be unloaded, stored at the project site at least four inches above the ground on platforms, skids or other suitable supports and shall be protected against corrosion and damage and handled in such a manner as to preclude damage to the forms. Damaged material shall be replaced at no additional cost to the State.

Any exposed form or form support metal where the galvanized coating has been damaged, shall be thoroughly cleaned, wire brushed, then coated with two coats of Zinc Dust – Zinc Oxide primer, Federal Specification No. TT-P-641d, Type II or another product acceptable to the Engineer.

The forms shall be installed from the topside in accordance with the manufacturer's recommended installation procedures. The form supports shall insure that the forms retain their correct dimensions and positions during use at all times. Form supports shall provide vertical adjustment to maintain design slab thickness at the crest of corrugation, to compensate for variations in camber of beams and girders and to allow for deflections. Stay-in-place metal forms shall have a minimum depth of the form valley equal to two inches. The forms shall have closed tapered ends. Lightweight filler material shall be used in the form valleys.

All field cutting shall be done with a steel cutting saw or shears including the cutting of supports, closures and cutouts Flame cutting of forms is not permitted.

All welding shall be performed by Department certified welders in accordance with the "Welding" Sub article in Section 6.03. Welding of forms to supports is not permitted.

The steel form supports shall be placed in direct contact with the flange of stringer or floor beam flanges and attached by bolts, clips, welding where permitted, or other approved means. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. The forms shall be securely fastened to form supports with self-drilling fasteners and shall have a minimum bearing length of one inch at each end. In the areas where the form sheets lap, the form sheets shall be securely fastened to one another by fasteners at a maximum spacing of 18 inches. The ends of the form sheets shall be securely attached to the support angles with fasteners at a maximum spacing of 18 inches or two corrugation widths, whichever is less.

The depth of the concrete slab shall be as shown on the plans and the corrugated forms shall be placed so that the top of the corrugation will coincide with the bottom of the deck slab. No part of the forms or their supports shall protrude into the slab. All reinforcement in the bottom reinforcement mat shall have a minimum concrete cover of one inch unless noted otherwise on the plans.

The completed stay-in-place metal form system shall be sufficiently tight to prevent leakage of mortar. Where forms or their installation are unsatisfactory in the opinion of the Engineer, either before or during placement of the concrete, the Contractor shall correct the defects before proceeding with the work.

**(h) Construction Joints:** Construction joints other than those shown on the plans will not be permitted without prior approval of the Engineer. In joining fresh concrete to concrete that has already set, the work already in place shall have all loose and foreign material removed, and the surface roughened and thoroughly drenched with water.

All reinforcing steel shall extend continuously through joints. Where unplanned construction joints may be needed, they shall be constructed as directed by the Engineer.

**(i) Expansion and Contraction Joints:** Expansion and contraction joints shall be constructed at the locations and in accordance with the details specified in the contract documents. The forming of joint openings shall be dimensioned in accordance with the joint manufacturer's design requirements. Joints include open joints, filled joints, joints sealed with sealants, joints reinforced with steel armor plates or shapes, paraffin coated joints, and joints with combinations of these features.

Open joints shall be placed at locations designated on the plans and shall be formed by the insertion and subsequent removal of templates of wood, metal or other suitable material. The templates shall be so constructed that their removal may be readily accomplished without damage to the work.

Filled joints shall be made with joint filler, the materials for which shall conform to the requirements of the plans and of these specifications.

For mechanical joint systems, the concrete shall be placed in such a manner that does not interfere with the movement of the joint.

**(j) Pipes, Conduits and Utility Installations:** The Contractor shall coordinate the installation of pipes, conduits and utilities as shown on the plans and in conformance with the contract documents or as directed by the Engineer. The openings accommodating such pipe, conduit and utility installations shall be incorporated into the formwork by the Contractor.

**(k) Anchorages:** Anchor bolts and systems shall be set to the requirements of the plans and contract documents. Anchor bolts and systems shall be clean and free of dirt, moisture or other foreign materials at the time of installation. The anchor bolts and systems shall be installed prior to placing concrete.

With the Engineer's approval, the Contractor may install anchorages after placement and setting of the concrete or in formed holes. The anchorages shall be installed into drilled or formed holes having a diameter and a depth suitable to receive the bolts in accordance with the grout manufacturer's requirements. Such holes shall be located to avoid damage to the existing reinforcement. All holes shall be perpendicular to the plane surface. The Contractor shall take every precaution necessary to prevent damage to the concrete due to freezing of water or grout in anchor bolt holes.

**(l) Ornament or Reverse Moulds:** Ornamental work, when so noted on the plans, shall be formed by the use of reverse moulds. These moulds shall be produced by a qualified manufacturer approved by the Engineer. They shall be built in accordance with the general dimensions and appearance shown on the plans. The Contractor shall submit all detailed drawings, models, or carvings for review by the Engineer before the moulds are made.

The Contractor shall be responsible for their condition at all times, and he will be required to remove and replace any damaged or defective moulds at his own expense.

The surfaces of the moulds shall be given a coating of form release agent to prevent the adherence of concrete. Any material which will adhere to or discolor the concrete shall not be used.

Form Liners, if required, shall be installed per the Contract Special Provisions.

**(m) Removal of Falsework and Forms:** The Contractor shall consider the location and character of the structure, the weather, the materials used in the mix, and other conditions influencing the early strength of the concrete when removing forms and falsework. Methods of removal likely to cause damage to the concrete surface shall

not be used. Supports shall be removed in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. For structures of two or more spans, the sequence of falsework release shall be as specified in the contract documents or approved by the Engineer.

Removal shall be controlled by field-cured cylinder tests. The removal shall not begin until the concrete has achieved 75 percent of the design compressive strength. To facilitate finishing, side forms carrying no load may be removed after 24 hours with the permission of the Engineer, but the curing process must be continued for seven days.

When the results of field-cured cylinder tests are unavailable, the following periods, exclusive of days when the temperature drops below 40°F, may govern the removal of forms.

| **Form Removal Requirements** | |
|---|---|
| Structure Element | Minimum Time Period |
| Arch Centers, centering under beams, pier caps, and unsupported elements | 14 days |
| Slabs on grade, Abutments and Walls | 24 hours |
| Columns | 2 days |
| Bridge Decks | 28 days |

The Contractor may submit for review and approval by the Engineer, alternate methods to determine the in-place strength of the concrete for removal of forms and falsework.

**2. Protection from Environmental Conditions:** The concrete shall be protected from damage due to weather or other environmental conditions during placing and curing periods. In-place concrete that has been damaged by weather conditions shall be either repaired to an acceptable condition or removed and replaced as determined by the Engineer.

**(a) Rain Protection:** The placement of concrete shall not commence or continue unless adequate protection satisfactory to the Engineer is provided by the Contractor.

**(b) Hot Weather Protection:** When the ambient air temperature is above 90°F, the forms, which will come in contact with the mix shall be cooled to below 90°F for a minimum of one hour prior to and one hour after completion of the concrete placement by means of a water spray or other methods satisfactory to the Engineer.

**(c) Cold Weather Protection:** When there is a probability of ambient air temperature below 40°F during placement and curing, a cold-weather concreting plan shall be submitted to the Engineer for review and comment. The plan shall detail the methods and equipment, including temperature measuring devices that will be used to ensure that the required concrete and air temperatures are maintained.

1. Placement: The forms, reinforcing steel, steel beam flanges, and other surfaces

which will come in contact with the mix shall be heated to a minimum of 40°F, by methods satisfactory to the Engineer, for a minimum of one hour prior to, and maintained throughout, concrete placement.

2. Curing: For the first six days, considered the initial cure period, the concrete shall be maintained at a temperature of not less than 45°F and the air temperature surrounding the structure shall be maintained at a temperature of not less than 60°F. When pozzolans or slag is used in the concrete mix, the initial cure period shall be increased to ten days. After the initial cure period, the air surrounding the structure shall be maintained at a temperature above 40° F for an additional eight days. If external heating is employed, the heat shall be applied and withdrawn gradually and uniformly so that no part of the concrete surface is heated to more than 90°F or caused to change temperature by more than 20°F in 8 hours. The Engineer may reduce or increase the amount of time that the structure must be protected or heated based on an indication of in-place concrete strength acceptable to the Engineer.

**(d) Additional Requirements for Bridge Decks:** Prior to the application of curing materials, all the concrete placed on bridge decks shall be protected from damage due to rapid evaporation by methods acceptable to the Engineer. During periods of low humidity (less than 60% relative humidity), sustained winds of 25 mph or more, or ambient air temperatures greater than 80ºF the Contractor shall provide, in writing for the Engineer's review, details of what additional measures during placement and curing shall be taken.

Protection may include increasing the humidity of the surrounding air with fog sprayers and employing wind-breaks or sun-shades. Additional actions may include reduction of the temperature of the concrete prior to placement, scheduling placement during the cooler times of days or nights, or any combination thereof.

**(e) Concrete Exposed to Salt Water:** No Construction joints shall be formed between the levels of extreme low water and extreme high water or the upper limit of wave action as determined by the Engineer.

**3. Transportation and Delivery of Concrete:** All material delivered to the project shall be supplied by a producer qualified in accordance with Section M.03. The producer shall have sufficient plant capacity and trucks to ensure continuous delivery at the rate required to prevent the formation of cold joints.

**(a) Material Documentation:** All vendors producing concrete must have their weigh scales and mixing plant automated to provide a detailed ticket. Delivery tickets must include the following information:

1. State of Connecticut printed on ticket
2. Name of producer, identification of plant
3. Date and time of day
4. Type of material

5. Cubic yards of material loaded into truck
6. Project number, purchase order number, name of contractor (if contractor other than producer)
7. Truck number for specific identification of truck
8. Individual aggregate, cement, water weights and any admixtures shall be printed on plant tickets
9. Water/cement ratio
10. Additional water allowance in gallons based on water/cement ratio for mix

A State inspector may be present to monitor batching and/or weighing operations.

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the recording system in the automated plant or weigh scales. Manually written tickets containing all required information may be allowed for up to one hour after malfunction provided they are signed by an authorized representative of the producer.

**(b) Transportation of Mixture:** Trucks delivering concrete shall be qualified in accordance with Section M.03.

If the concrete mix arrives at the project with a slump lower than allowed by specification, water may be considered as a means to temper concrete to bring the slump back to within specification. This tempering may only be done prior to discharge with the permission of the Engineer. The gallons of water added to the concrete cannot exceed the allowance shown on the delivery ticket.

The concrete shall be completely discharged into the forms within one and one-half hours from the batch time stamped on the delivery ticket. This time may be extended if the temperature of the concrete is measured and the reading is below 90ºF. This time may also be reduced if the temperature of the concrete is over 90ºF. Rejected concrete shall be disposed of by the Contractor at its own expense.

The addition of chemical admixtures or air entrainment admixtures at the project site, to increase the workability or to alter the time of set, will only be permitted if prior approval has been granted by the Engineer. The addition of air entrainment admixtures at the project site will only be permitted by the producer's quality control staff. Follow-up quality control testing to verify compliance with the specification is the responsibility of the Contractor.

**4. Acceptance Testing and Test Specimens:** The facilities and concrete required for sampling, transport to the testing location in the field, performing field testing and for casting sample cylinders for compressive-strength determinations shall be furnished by the Contractor. The personnel for sampling and casting Acceptance specimens will be furnished by the Department and the number of specimens required will be determined by the Engineer.
The equipment for the aforementioned testing is provided for elsewhere in the contract.

**(a) Temperature, Air Content and Slump**: Field testing will be in accordance with AASHTO T-23, "Making and Curing Concrete Test Specimens in the Field" and will be performed at the point of placement and at a frequency determined by the Engineer.

| Standard Mix Class | Air Content | Slump | Concrete Temperature |
|---|---|---|---|
| A (3300 psi) | 6.0 +/- 1.5% | 4" +/- 1" | 60º-90ºF |
| C (3300 psi) | | | |
| F (4400 psi) | | | |
| Modified Standards[1] | 6.0 +/- 1.5% [2] | 4" +/- 1" [2] | |
| Special Provision Mix[3] | As specified | As specified | |

[1] Modifications to Standard Mixes, including mixes placed by pumping, shall be reviewed by the Engineer prior to use. These include but are not limited to the use of chemical admixtures such as high range water reducing (HRWR) admixtures and the use of coarse aggregate sizes for that class not specified in Article M.03.

[2] If the only modification is the addition of HRWR, the maximum allowable slump shall be 7 inches.

[3] All concrete mixes with a design strength not shown in the table must be approved by the Engineer on a case-by-case basis. Limits on the plastic properties and strength requirements of these mixes are listed in the special provision.

**(b) Acceptance Testing and Compressive Strength Specimens:** Concrete samples shall be taken at the point of placement into the forms or molds. Representatives of the Engineer will sample the mix.

The Contractor shall provide and maintain facilities, acceptable to the Engineer, on the project site for sampling, transporting the initial sample, casting, safe storage and initial curing of the concrete test specimens as required by AASHTO T-23. This shall include but not be limited to a sampling receptacle, a means of transport of the initial concrete sample from the location of the concrete placement to the testing location, a level and protected area of adequate size to perform testing, and a specimen storage container capable of maintaining the temperature and moisture requirements for initial curing of Acceptance specimens. The distance from the location of concrete placement to the location of testing and initial curing shall be limited to 100' unless otherwise approved by the Engineer.
The specimen storage container described in this section is in addition to the concrete cylinder curing box provided for elsewhere in the contract specifications.
After initial curing, the test specimens will be transported by Department personnel and stored in the concrete cylinder curing box until such time as they can be transported to the Division of Materials Testing for strength evaluation.

**(c) Sampling Procedure for Pumping**: It is the responsibility of the contractor to provide concrete that meets specification at the point of placement. Samples of concrete shall be taken at the discharge end of the pump at the point of placement with the exception of underwater concrete. The contractor may submit an alternate location to provide a sample from the discharge end of the pump with verification

showing that the characteristics of the mix will not be altered from that of which would have been attained at the point of placement. The Engineer will review the documentation and other extenuating circumstances when evaluating the request.

In the case of underwater concrete the contractor shall submit the proposed sampling location with the submittals required in Subarticle 6.01.03-6(f) of this specification.

**(d) Additional field testing:** Additional field testing such as density and yield measurements may be required at the time of placement as determined by the Engineer.

**5. Progression Cylinders and Compressive Strength Specimens:** Progression Cylinders outlined in this section are field cured compressive strength specimens taken for information related to when a structure or segment of a structure can be loaded or put into service, adequacy of curing and protection of concrete in the structure, or when formwork or shoring may be removed from the structure. The information produced from strength results of Progression Cylinders will not be considered for acceptance of the concrete.

The personnel, equipment, and molds for sampling, casting, curing and testing of Progression Cylinders shall be furnished by the Contractor at no expense to the Department.

Sampling, casting, and field curing of the specimens shall be performed in accordance with AASHTO T23 by an ACI Concrete Field Testing Technician Grade 1 or higher and shall be witnessed by a representative of the Department.

The sample shall be taken at the point of placement into the forms or molds from one or more of the same truck loads that an Acceptance sample was taken from.

A minimum of two of cylinder results will be used to determine in-place strength.

Compression testing shall be performed in accordance with AASHTO T-22 by personnel approved by the Engineer.

A Certified Test Report in accordance with Section 1.06.07 shall be provided to the Engineer reporting the Progression Cylinder test results. A copy of the results of the compressive strength testing shall be provided to the Engineer at least 24 hours prior to any project activity that the results may control.

**6. Handling and Placing Concrete:** Concrete shall be handled, placed, and consolidated by methods acceptable to the Engineer that will not segregate the mix and will result in a dense homogeneous concrete. The methods used shall not cause displacement of reinforcing steel or other materials to be embedded in the concrete. Concrete shall not be placed until the forms and all materials have been inspected by the Engineer. All mortar from previous placements, debris, and foreign material shall be removed from the forms

and steel prior to commencing placement. The forms and sub grade shall be thoroughly moistened with water immediately before concrete is placed. All water that has ponded within the forms shall also be removed. Temporary form spreader devices shall not be left in place.

All laitance or unsound material shall be removed before placing substructure concrete onto the surface of any concrete placed underwater.

Placement of concrete for each section of the structure shall be performed continuously between construction or expansion joints as shown on the plans. The delivery rate, placing sequence and methods shall be such that fresh concrete is always placed and consolidated against previously placed concrete before initial set has occurred. The temperature of the concrete mixture during placement shall be maintained between 60ºF and 90ºF. During and after placement of concrete, care shall be taken not to damage the concrete or break the bond with reinforcing steel. Platforms for workers and equipment shall not be supported directly on any reinforcing steel. Forces that may damage the concrete shall not be applied to the forms or reinforcing steel.

**(a) Sequence of Placement:** The sequence of placement shall be in accordance with the contract documents or as permitted by the Engineer.

Concrete for integral horizontal members, such as caps, slabs, or footings shall not be placed until the concrete for the columns, substructure, culvert walls and other similar vertical members has achieved sufficient strength as stated in Sub article 6.01.03-1(m).

The concrete in arches shall be placed in such a manner as to load the formwork uniformly and symmetrically.

The base slab or footings of cast-in-place box culverts shall reach sufficient strength before the remainder of the culvert is constructed.

**(b) Placement Methods:** The Contractor shall notify the Engineer at least 24 hours in advance of his intention to place concrete.

Vibrators shall not be used to shift the fresh concrete horizontally. Vibrators shall be adequate to consolidate the concrete and integrate it with the previous lift.

The rate of concrete placement must not produce loadings that exceed those considered in the design of the forms.

The use of chutes and pipes for conveying concrete into the forms must be reviewed by the Engineer. Chutes shall be clean, lined with smooth watertight material and, when steep slopes are involved, shall be equipped with baffles or reverses. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

Aluminum shall not be permanently incorporated into the concrete unless otherwise specified.

When placing operations involve dropping the concrete more than five feet, the Contractor shall take action to prevent segregation of the mix and spattering of mortar on steel and forms above-the elevation of the lift being placed. This restriction shall not apply to cast-in-place pilings.

When using stay-in-place forms, concrete shall not be dropped more than three feet above the top of the forms, and the concrete shall be discharged directly over the beams or girders.

**(c)** **Pumping:** The Contractor shall use equipment specifically manufactured to pump concrete mixes and that meets the needs of the specific concrete placement.

**(d)** **Consolidation:** Unless otherwise specified, all concrete, except concrete placed under water shall be sufficiently consolidated by mechanical vibration immediately after placement.

The Contractor shall provide a sufficient number of commercially available mechanical immersion type vibrators to properly consolidate the concrete immediately after it is placed in the forms unless external form vibrators are used. The Contractor shall have an adequate number of operable vibrators available in case of breakdown.

External form vibrators may be used if submitted prior to concrete placement and reviewed by the Engineer.

Vibration shall not be applied directly to the reinforcement or hardened concrete. Special care shall be taken in placing and consolidating concrete around ornamental moulds, form liners and other embedded items. The vibrator shall not touch these items at any time.

**(e)** **Additional Requirements for Bridge Decks:** At least 15 days before the erection of the screed rails, the Contractor shall submit his screed erection plans, grades and sequence of concrete placement and proposed rate of placing concrete for review by the Engineer. These plans shall include details of equipment to be used in the placement and finishing of the concrete, including the number and type of personnel who will be engaged in placing the concrete. The screed equipment shall be a commercially available vibratory system. The use of wooden screeds is prohibited.

When setting screed rails for mechanical finishing, the Contractor shall take into consideration and make proper allowances for the deflection of the bridge superstructure due to all operations.

Screed and runway supports shall not be located on any stay-in-place metal form sheets, form supports or reinforcing steel. The Contractor shall operate the mechanical screed at least 24 hours prior to actual placement of the concrete to verify deck survey and equipment operations to the satisfaction of the Engineer.

Concrete shall be deposited in a uniform manner across the entire width being placed, and only 2 passes of the transverse screed will be permitted over a given deck area, unless otherwise allowed by the Engineer.

If the Contractor proposes to place concrete outside of daylight hours, an adequate lighting system must be provided.

Concrete shall be deposited in accordance with the placement sequence as noted on the plans. If no sequence is indicated, the Contractor shall provide a placement sequence to the Engineer for review. The placement sequence shall proceed in such a manner that the total deflection or settlement of supporting members, and the final finishing of the surface will occur before the initial set of the concrete takes place.

At construction joints, concrete shall not be placed against the previously placed concrete for at least 12 hours unless otherwise allowed by the Engineer.

**(f)** **Underwater Placement:** Concrete may only be placed under water within a cofferdam unless otherwise specified in the contract documents or otherwise allowed by the Engineer. Placement shall begin following inspection and acceptance of the depth and character of the foundation material by the Engineer.

Underwater concrete mixes are considered non-standard designs and shall be submitted to the Engineer for approval. Typically a minimum of ten percent additional cement than comparable non-underwater mixes will be required.

Underwater concrete shall be placed continuously with the surface of the concrete kept as horizontal as practical. To ensure thorough bonding, each succeeding layer shall be placed before the preceding layer has taken initial set. For large pours, more than one tremie or pump shall be used to ensure compliance with this requirement.

To prevent segregation, underwater concrete shall be placed in a compact mass, in its final position, by means of a tremie, concrete pump, or other approved method and shall not be disturbed. Still water shall be maintained at the point of deposit. Cofferdams shall be vented during the placement and curing of the concrete to equalize the hydrostatic pressure and thus prevent flow of water through the concrete.

If a tremie is used, the method of depositing the concrete shall be detailed in a submission to the Engineer as a working drawing for review. The tube shall have watertight couplings and shall permit the free movement of the discharge end over the area of the work.

**(g) Mass concrete placement:** Mass concrete placement shall be defined as any placement in which the concrete being cast has dimensions of 5 feet or greater in each of three different directions. For placements with a circular cross-section, a mass concrete placement shall be defined as any placement that has a diameter of 6 feet or greater and a height of 5 feet or greater. For all mass concrete placements, the mix temperature shall not exceed 85°F as measured at point of discharge into the forms. Any special concrete mix design proposed by the Contractor to meet the above temperature requirements shall be submitted to the Engineer for review.

**7. Finishing Plastic Concrete:** Unless otherwise specified in the contract documents, after concrete has been consolidated and prior to final curing, all surfaces of concrete that are not placed against forms shall be struck-off to the planned elevation or slope. The surface shall be finished by floating with an acceptable tool. While the concrete is still in a workable state, all construction and expansion joints shall be tooled with an edger. Joint filler shall be left exposed. For requirements on float finish, refer to Sub article 6.01.03-10, "Finishing Concrete Surfaces".

After completion of the placing and finishing operation and for at least 12 hours after the concrete has set, the Contractor shall not operate any equipment in the immediate vicinity of the freshly placed concrete if in the opinion of the Engineer; it could cause excessive vibration, movement or deflection of the forms.

The addition of water to the surface of the concrete to assist in finishing operations will not be permitted.

**(a) Bridge Decks:** After the concrete has been consolidated and brought to the proper elevation by the screed machine, it shall be finished by use of a suitable float. The Contractor shall not disturb the fresh concrete after it has been finished. All finishing work, including the application of the fog spray and placement of the curing mats, shall be performed from work bridges supported above the deck surface. A work bridge shall be made available to the Engineer for inspection of the concrete work.

Surfaces that are to be covered with a waterproofing membrane shall be finished to a smooth surface, free of mortar ridges and other projections and in accordance with the membrane manufacturer's recommendations.

Unless otherwise noted in the contract, the concrete wearing surfaces shall be given a skid-resistant texture by dragging, brooming, tining, or by a combination of these methods These methods shall be done after floating and at such time and in such manner that the desired texture will be achieved while minimizing displacement of the larger aggregate particles.

1. Dragging: The surface shall be finished by dragging a seamless strip of damp burlap over the surface. The burlap to be dragged shall consist of sufficient layers and have sufficient length in contact with the concrete to slightly groove the surface. The burlap shall be drawn longitudinally along the

surface in a slow manner so as to leave an even texture. The burlap shall be kept damp, clean, and free of particles of hardened concrete. The Contractor may propose an alternate material for the Engineer's consideration.

2. Tining: Tining shall be in a transverse direction using a wire broom, comb, or float having a single row of tines or fins. The tining grooves shall be between 1/16 inch and 3/16 inch wide and between 1/8 inch and 3/16 inch deep, spaced ½ inch to ¾ inch on centers. Tining shall be discontinued 12 inches from the curb line on bridge decks. The area adjacent to the curbs shall be given a light broom finish longitudinally. As an alternative, tining may be achieved using a machine designed specifically for tining or grooving concrete pavements.

The transverse grooving shall be performed when the grooves can be formed to a maximum depth of 3/16 inch with relative ease and without the walls of the grooves closing in on each other. The tining shall be aligned so as to prevent overlapping of grooves in any two successive transverse passes. The Contractor shall measure the depth of the grooves in the presence of the Engineer with an appropriate device to ensure compliance.

**(b) Surface Testing and Correction:** The completed surface shall be constructed in accordance with grades and cross slopes shown on the plans. The entire surface shall be checked by the Contractor in the presence of the Engineer, with an acceptable 10-foot straightedge. The surface shall not vary more than +/- 1/8 inch in 10 feet for decks which will not be covered with an overlay. The surface shall not vary more than +/- 1/4 inch in 10 feet for decks which will be covered with an overlay. Variances greater than this, which, in the opinion of the Engineer, may adversely affect the riding qualities of the surface shall be corrected; and this shall be done at the expense of the Contractor. The Contractor shall submit a corrective procedure to the Engineer for review and approval. This procedure shall correct such irregularities by such methods as but not limited to concrete planing or grooving.

**8. Bearing Surfaces:** Concrete surfaces under metallic masonry plates and elastomeric bearings shall have a float finish. After the concrete has set, the area which will be in contact with the masonry plate shall be ground as necessary to provide full and even bearing. The finished surface shall not vary from a straightedge laid on the surface in any direction within the limits of the masonry plate by more than 0.0625 in. Surfaces which fail to conform shall be ground or filled until acceptable to the Engineer.

**9. Curing Concrete:** All newly placed concrete shall be cured so as to prevent loss of water by use of one or more of the methods specified. If requested by the Engineer, the contractor shall furnish a curing plan.

The duration of the initial and final curing period in total shall continue uninterrupted for a minimum of seven days.

**(a) Curing Methods:**

1. Forms-In-Place Method: Formed surfaces of concrete may be cured by retaining the forms in place without loosening. During periods of hot weather, water shall be applied to the forms until the Engineer determines that it is no longer required.

2. Water Method: Exposed concrete surfaces shall be kept continuously wet by ponding, spraying, or covering with materials that are kept continuously and thoroughly wet. Such materials may consist of cotton mats, multiple layers of burlap, or other approved materials that do not discolor or otherwise damage the concrete.

3. Waterproof Cover Method: This method shall consist of covering exposed surfaces with a waterproof sheet material so as to prevent moisture loss from the concrete. The concrete shall be wet at the time the cover is installed. The sheets shall be of the widest practicable width and adjacent sheets shall overlap a minimum of 6.0 inch. to form a waterproof cover of the entire concrete surface and shall be adequately secured. Broken or damaged sheets shall be immediately repaired and the concrete shall be remoistened.

**(b) Additional Requirements for Bridge Decks:**

1. Curing Plan: The contractor shall submit to the Engineer, at least 14 days prior to the placement of concrete for the bridge deck, a detailed curing plan that describes the following: the initial and final curing durations, equipment and materials to be used for curing concrete and monitoring concrete temperature, and proposed primary and secondary water and heat sources.

2. Initial Curing Period: A water fog spray shall be used by the Contractor from the time of initial placement until the final curing period begins. The amount of fog spray shall be strictly controlled so that accumulations of standing or flowing water on the surface of the concrete shall not occur.

   Should atmospheric conditions render the use of fog spray impractical, the Contractor shall request approval by the Engineer to use a curing compound that meets the requirements of Section M.03 in lieu of a fog spray. The application shall be in accordance with the manufacturer's recommendation and be compatible with the membrane waterproofing.

3. Final Curing: After completion of finishing and as soon as any bleed water has dissipated and the concrete reaches sufficient strength to avoid marring, the Final curing period shall begin and the entire concrete surface shall be covered with water-retaining materials such as cotton mats, multiple layers of burlap, or other materials approved by the Engineer. Materials used shall be kept saturated by means of an acceptable sprinkler or wetting system. The

Contractor may cover the wet water-retaining material with a suitable polyethylene film to minimize evaporation during the curing period. The use of the polyethylene film does not relieve the Contractor from maintaining saturation of the curing materials.

4. Temperature Monitoring: The internal temperature of the concrete will be monitored with a calibrated continuous recording thermometer for a minimum of seven days. The air temperature at the concrete surface or the air temperature between the concrete surface and its protective covering will be monitored with a minimum of one recording thermometer.

   The number and placement of the thermometers will be determined by the Engineer. A minimum of two thermometers per concrete placement shall be provided by the contractor.

   Thermometers used to monitor curing temperatures will consist of one of the following types:

   a. Continuously Recording Thermometer: The thermometer shall be capable of continuously recording temperatures within a range of -4 ºF to 122 ºF for a minimum of 24 hours.

   b. Maximum–Minimum Recording Thermometer: For all placements, the thermometer shall be capable of recording maximum and minimum temperatures in a range of -4 ºF to 122 ºF.

**10. Finishing Concrete Surfaces:** Any minor repairs due to fins, bulges, offsets and irregular projections shall be performed immediately following the removal of forms. For areas of newly placed concrete that are honeycombed or segregated the contractor shall provide a written corrective procedure for review by the Engineer prior to the work being performed. Construction and expansion joints in the completed work shall be left carefully tooled and free of mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The cavities produced by form ties and all other holes, broken corners or edges, and other defects shall be cleaned, saturated with water, pointed and trued with a mortar conforming to Section M.11.04. Cement similar in color to the exposed surface being repaired shall be added to the mortar. Mortar used in pointing shall be used within one hour of mixing. The concrete shall be finished as defined below if required and the cure continued as previously specified in "Curing Concrete."

Finishing work shall not interrupt the curing period unless permitted by the Engineer. The curing period may be extended to provide the minimum total number of days required.

Concrete surface finishes shall be classified as follows:

**(a) Float Finish:** This finish shall be achieved by placing an excess of material in the form and removing or striking off of such excess forcing the coarse aggregate below the mortar surface. Concave surfaces in which water will be retained will not be allowed. After the concrete has been struck off, the surface shall be thoroughly worked and floated. Before this last finish has set, the surface shall be lightly stripped with a fine brush to remove the surface cement film, leaving a fine-grained, smooth, but sanded texture. Curing, as specified elsewhere, shall follow. Any surfaces that will support appurtenances such as light standards, railing, or fences shall be finished in accordance with 6.01.03-8, "Bearing Surfaces".

**(b) Rubbed Finish:** The initial rubbing shall only be allowed within three days after placement. The entire surface shall be thoroughly wet with a brush and rubbed with a No. 16 Carborundum Stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth, dense surface without pits or irregularities. The paste formed by the rubbing may be finished by stripping with a clean brush, or it may be spread uniformly over the surface and allowed to re-set. If all or portions of the rubbed surface are unacceptable to the Engineer or a rubbed finish is not provided within three days after removal of forms, the Contractor will be directed to provide a grout clean down finish.

**(c) Grout Clean-Down Finish:** As soon as all cavities have been filled as required elsewhere and the cement mortar has set sufficiently, grout clean-down shall be performed. All burrs, unevenness, laitance, including that in air holes, and any other material which will adversely affect the bond of the grout to the concrete, shall be removed by acceptable methods. This cleaning shall be done from the top or uppermost part of the surface to be finished to the bottom.

A mixture of a fine aggregate and Portland cement shall be thoroughly blended while dry. The proportions shall be such that when mixed with the proper amount of water, the color will match that of the concrete to be finished. Water shall be added to this mixture in an amount which will bring the grout to a workable thick paint-like consistency.

The surface to be treated shall be thoroughly wetted with a sufficient amount of water to prevent the absorption of water from the grout. Grout shall then be applied to the wetted surface before setting of the grout occurs. Grout which has set shall not be re-tempered and shall be disposed of by the Contractor at his expense.

The grout shall be uniformly applied over the entire surface, completely filling all air bubbles and holes. Immediately after applying the grout, the surface shall be floated with a suitable float, scouring the surface vigorously. While the grout is still plastic, all excess grout shall be removed.

After the final rubbing is completed and the surface has dried, it shall be rubbed to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks. Wetting, application and removal of excess grout shall be completed in one work shift.

All finished surfaces shall be cured for a minimum of 24 hours. Horizontal surfaces shall have a float finish and vertical exposed surfaces shall have a rubbed finish. A grout clean down finish may be substituted for a rubbed finish as noted in this section or as directed by the Engineer

**11. Mortar, Grout, Epoxy and Joint Seal**

**(a) Mortar and Grout:** This work consists of the making and placing of mortar and grout. At least 48 hours prior to the planned use, a copy of the installation instructions and MSDS sheet(s) shall be provided to the Engineer for review and concurrence of their applicability and for verification of proper hole sizes in concrete structures. Such uses include mortar for filling under masonry plates, mortar used to fill voids and repair surface defects, grout used to fill sleeves for anchor bolts, and mortar and grout for other such uses where required or approved.

Concrete areas to be in contact with the mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond, and the concrete surfaces shall be flushed with water and allowed to dry until no free-standing water is present.

The mortar or grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, under structural members, and at other locations specified. After placing, all surfaces of mortar or grout shall be cured as previously specified under Sub article 6.01.03-9(a)-2 “Curing Concrete – Water Method" for a period of not less than three days.

**(b) Epoxy:** The epoxy shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. Instructions furnished by the supplier for the safe storage, mixing, handling and application of the epoxy shall be followed. Contents of damaged or previously opened containers shall not be used.

**(c) Joint Seal:** This work consists of sealing joints where shown on the plans or as otherwise directed by the Engineer.

Before placement of the sealing material, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust or other foreign matter. Projections of concrete into the joint space shall be removed. The joint shall be clean and dry before the sealing compound is applied.

The joint sealant shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. The sealing

compound shall be flush with, or not more than 1/8 inch above the adjacent surface of concrete, cutting off all excess compounds after the application. The joints shall be sealed in a neat and workmanlike manner and when the work is completed, the joints shall effectively seal against infiltration of moisture and water.

The Contractor shall arrange for, and have present at the commencement of the joint-sealing operation, a technically competent manufacturer's representative knowledgeable in the methods of installation of the sealant. The Contractor shall also arrange to have the representative present at such other times as the Engineer may request.

**(d) Closed Cell Elastomer:** The closed cell elastomer shall be of the thickness, size and type specified and installed as shown on the plans and shall be in accordance with Section M.03.

**12. Application of Loads:** Loads shall not be applied to concrete structures until the concrete has attained sufficient strength and, when applicable, sufficient pre-stressing and post tensioning has been completed, so that damage will not occur. The means to determine when the concrete has attained sufficient strength shall be the use of Progression cylinders as defined elsewhere in this specification, or other means approved in advance by the Engineer.

**(a) Earth Loads:** The placement of backfill shall not begin until the concrete is cured and has reached at least 80 percent of its specified strength unless otherwise permitted by the Engineer. The sequence of placing backfill around structures shall minimize overturning or sliding forces and flexural stresses in the concrete.

**(b) Construction Loads:** Light materials and equipment may be hand carried onto bridge decks only after the concrete has been in place at least 24 hours providing curing is not interfered with and the surface texture is not damaged.

Prior to the concrete achieving its specified compressive strength, any other live or dead loads imposed on existing, new, or partially completed portions of structures, shall not exceed the reduced load carrying capacity of the structure, or portion of structure. The Contractor may be required to submit to the Engineer calculations that verify these requirements are being met. The compressive strength of concrete ($f'$ c) to be used in computing the load-carrying capacity shall be the smaller of the actual field compressive strength at the time of loading or the specified design strength of the concrete. The means to determine the actual field compressive strength shall be approved by the Engineer.

For post-tensioned structures, no live or dead loads shall be allowed on any span until the steel for that span has been tensioned.

**(c)** Precast concrete or steel girders shall not be placed on substructure elements until the substructure concrete has attained 85 percent of its specified strength.

No load shall be allowed on mortar or grout that has been in place less than 72 hours.

**(d) Traffic Loads:** The concrete deck will not be opened to traffic until at least 14 days after the last placement of deck concrete and until such concrete has attained its specified strength.

**13. Dispute Resolution:**

The basis of any dispute resolution is side-by-side and quality control testing by the Contractor or his representative. The Contractor and Engineer should perform independent testing on the material to reasonably establish the true characteristics of the material at the time of delivery. Absent of Contractor QC testing, the Engineer's test results will apply to the quantity of concrete represented by the sample, not to exceed 75 cubic yards.

Air Content: Contractor QC Testing must be performed by personnel qualified by The American Concrete Institute as an ACI Concrete Field Testing Technician Grade 1 or higher and performed in accordance with AASHTO T-23. If the Contractor's test results vary from those of the Engineer, the Contractor must immediately notify the Engineer of the difference and work in a cooperative fashion to determine the reasonable cause and recognize the valid test. Should there be agreement, then the result of the valid test will be used for acceptance and adjustment purposes for that lot of material. Should there not be an agreement as to the valid test, then an additional set of tests should be performed. Results of all valid tests on the same lot may be averaged and used for acceptance and adjustment purposes. Should the Contractor wish to perform additional QC testing on subsequent material, then the lot sizes may be adjusted to the amount of material included in that specific delivery. Any such QC testing must be witnessed and agreed to be valid by the Engineer.

Compressive Strength: Contractor QC testing for compressive strength must be performed in accordance with AASHTO T-22 by personnel approved by the Engineer. Samples used to dispute the Engineer's test results must be made simultaneously and from the same batch of concrete. Should the Contractor wish to pursue a dispute resolution with regard to compressive strength, the Contractor must submit in writing to the Engineer all test results, control charts, or other documentation that may be useful in determining if the specific lot(s) of material met the Contract specifications. The Engineer will consider the submittal and may average specific test results on the disputed lot(s) for acceptance and adjustment purposes. Destructive testing of any kind on the placed concrete structure will not be allowed.

**6.01.04—Method of Measurement:** This work will be measured for payment as follows:

**1. Concrete:** The quantity of concrete shall be the actual volume in cubic yards of the specified class or classes, with the exception of underwater concrete, completed and accepted within the neat lines as shown on the plans or as ordered by the Engineer.

When concrete is placed against bedrock, a maximum of six additional inches beyond the neat lines can be measured for payment.

No deduction will be made for panels, form liners, reinforcing bars, structural steel shapes or for pile heads. Also there will be no deduction made for the volume occupied by culvert and drainage pipes, scuppers, weep holes, public utility structures or any other opening, unless the surface area of any such single opening is 9 square feet or more.

In the case of culverts or drainage pipes, the computation of the surface area shall be based on the nominal diameter of the pipe, disregarding the thickness of the shell.

Miscellaneous materials necessary for completion of the work such as felt, mortar, grout, epoxy, joint seal, paraffin coating and closed cell elastomer will not be measured for payment.

Incidental work such as forming for anchor bolts, utilities, keyways, and sampling and testing will not be measured for payment.

**2. Underwater Concrete:** When underwater concrete is used, it will be measured by the volume in cubic yards within the actual horizontal limits of the cofferdam and between the elevations established by the Engineer.

**3. Joint Filler:** This material will be measured by the area in square feet of the joint filler, of the type and thickness specified, actually installed and accepted.

**6.01.05—Basis of Payment:** Payment for this work will be made as follows:

**1. Concrete:** Progress payments may be allowed for completed major labor elements of work such as forming, placing and curing. Prior to placement, the Contractor shall submit a proposed schedule of values for review and approval by the Engineer.

Payment for any lot of concrete allowed to remain in place will be adjusted when the field and laboratory testing of the material is completed. The quantity of concrete in each lot will be a maximum of 75 cubic yards. Payment for each lot of concrete will be adjusted based on the results of the Acceptance testing performed by the Engineer.

The following pay factors apply for Standard and Modified Standard Mix classes with regard to entrained air content:

| **Measured air (%)** | | **Pay factor (%)** |
|---|---|---|
| 4.5 to 7.5 | | 100 |
| 4.3 and 4.4 | 7.6 and 7.7 | 98 |
| 4.1 and 4.2 | 7.8 and 7.9 | 96 |
| 3.9 and 4.0 | 8.0 and 8.1 | 94 |
| 3.7 and 3.8 | 8.2 and 8.3 | 92 |
| 3.5 and 3.6 | 8.4 and 8.5 | 90 |
| | | |
| Concrete lots with less than 3.5% or greater than 8.5% entrained air will be rejected. | | |

The following pay factors apply for Standard and Modified Standard Mix classes with regard to compressive strength:

| **Compressive Strength (%)** | **Pay factor (%)** |
|---|---|
| 95 or greater | 100 |
| 90 to 94.9 | 95 |
| 85 to 89.9 | 90 |
| | |
| Concrete lots with less than 85% specified strength will be rejected. | |

The adjusted payment for any lot of concrete that is allowed to remain in-place is the product of both pay factors, an index price of $400.00, and the quantity of concrete within the lot.

The Contractor must request permission from the Engineer to remove and replace a lot(s) of concrete to avoid a negatively adjusted payment. Any replacement material will be sampled, tested and evaluated in accordance with this specification.

No direct payment will be made for any labor, equipment or materials used during the sampling and testing of the concrete for Progression or Acceptance. The cost shall be considered as included in the general cost of the work or as stated elsewhere in the Contract. The work of transporting the concrete test specimens, after initial curing, for Acceptance testing will be performed by the Department without expense to the Contractor.

This material will be paid for at the contract unit price per cubic yard less any adjustments, for the specified class or classes, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including heating, all admixtures, joint sealer roofing felt and closed cell elastomer, and any miscellaneous materials such as metal flashing and metal used in expansion joints and bearings.

**2. Underwater Concrete:** When this class of concrete is used, it will be paid for at the contract unit price per cubic yard for "Underwater Concrete," complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

**3. Joint Filler:** Expansion joint filler will be paid for at the contract unit price per square foot for "Joint Filler for Bridges" of the type and thickness specified, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

| Pay Item | Pay Unit |
|---|---|
| Concrete (Class A, C, F) | c.y. |
| Underwater Concrete | c.y. |
| Joint Filler for Bridges (Thickness and Type) | s.f. |

## ITEM #0203000A – STRUCTURE EXCAVATION – EARTH (COMPLETE)

Work under this item shall conform to the requirements of Section 2.03 amended as follows:

**2.03.01 - Description:** Add the following:

Work under this item shall also consist of the removal of all material, of whatever nature, necessary for the demolition and removal of the existing substructure components and the shaping of the ground to the final grade shown on the plans.

**2.03.03 – Construction Methods:** Add the following:

**7. Excavation for Demolition:** Excavation around existing components to be removed, shall extend deep enough and wide enough to allow for the component's removal to the limits shown on the plans, or as directed by the Engineer. Following removal of the component, the area will be backfilled and compacted around and above the remaining portions of the substructure. Additional excavation, as required, shall be performed to shape the surrounding ground to a stable slope as shown on the plans, or as directed by the Engineer. Excavated material may not be disposed of anywhere within the 100 year flood plain, the wetland creation area or elsewhere on site without the approval of the Engineer.

**2.03.04 – Method of Measurement:** Add the following:

Horizontal pay limits for the removal of substructure components shall vertical planes located 2 feet away from the largest perimeter of the component being removed. The volume of the substructure component removed shall not be included in the measurement for Structure Excavation. Additionally, the actual volume of material removed beyond these vertical planes, in order to create the stable slope shown on the plans, shall be measured for payment.

**2.03.05 – Basis of Payment:** Add the following:

Removal of existing substructure components shall be paid for under the item "Removal of Existing Masonry".

| PAY ITEM | PAY UNIT |
|---|---|
| Structure Excavation – Earth (Complete) | C.Y. |

## ITEM #0949007A - WETLAND CREATION

**Description:** The work under this item shall consist of the construction of the Wetland Mitigation Areas at the sites identified on the Wetland Mitigation Plans under the direction of an Environmental Scientist from the Connecticut Department of Transportation's Office of Environmental Planning (OEP).

**Materials:**

**(1) Woody Debris:** Woody debris shall consist of the materials stockpiled in accordance with the special provision for "Clearing and Grubbing." Materials shall be salvaged from the clearing and grubbing portions of the project. These materials may not include woody debris of any invasive species.

**(2) Wetland Topsoil:** Wetland Topsoil shall meet the requirements of **Article M.13.01 – Topsoil**, amended as follows:

*Delete the first 2 paragraphs,* "The topsoil shall not contain less than 6% … not more than sixty percent silt ", *and replace with the following:*

The topsoil shall be analyzed for the textural classification based on the USDA Soils Manual with the following classes being acceptable:

- Sandy loam, with not more than 80% sand
- Loam
- Silt loam, with not more than 60% silt

The topsoil shall be analyzed for total organic content using the USDA-approved methodology for measuring organic matter by loss-on-ignition of oven dried samples. The samples shall be heated to 400 degrees centigrade for ignition and measured at 105 degrees centigrade for loss. The samples shall not contain less than 20% nor more than 60% organic matter.

The topsoil shall be analyzed for the content of the nutrients Nitrogen (N), Phosphorus (P), and Potassium (K) using the Morgan Soil Test or accepted alternative. The sample shall have a nutrient content within the following ranges:

- N – 15-35 ppm
- P – 20-30 ppm
- K – 100-160 ppm

If soil does not meet the required nutrient levels, a method for amendment must be submitted, for approval, to the Environmental Scientist prior to acceptance.

*Delete the last paragraph, "When topsoil is … shall meet the above specifications", and add the following:*

Any topsoil requested to be re-used from on-site sources must be identified a minimum of 6 months prior to excavation for review by the Environmental Scientist and stockpiled for a minimum of 2 months during the growing season to verify no invasive species are present. Any topsoil furnished by the Contractor from off-site must be certified to be free of any invasive plant material.

Topsoil not furnished by the Contractor shall be natural topsoil material stripped from earth excavation areas within the project limits, or stripped and stockpiled from the Wetland Mitigation Area, if it meets all the criteria described above. If these soils do not meet the criteria, additional make-up material from off-site areas may be substituted or mixed with the on-site project material provided the resultant soil composition meets the applicable criteria. Clean leaf compost is the preferred soil amendment to achieve these criteria. If other soil amendments are more readily available than clean leaf compost they may be requested to be used to meet the requirement for organic content but must be approved by the Environmental Scientist.

If topsoil needs to be supplemented with organic material the material must be tested for organic content prior to mixing in order to determine the proper mixture ratios. The following sources are acceptable:

a) **Natural Wetland Soil:** The top layer of natural wetland soil excavated from within the project limits or from another wetland source. The bottom of this layer shall be defined as the depth at which the soil color and texture changes, indication the beginning of the subsoil. Each source must be inspected at least 6 months prior to excavation and determined by the Environmental Scientist to be free from seeds and roots of invasive species.

**b) Compost:** Compost shall meet the requirements of **Subarticle M.13.06 – Compost.**

c) **Peat:** Peat shall only be used if it is excess material generated from project activities and meets all other requirements of Subarticle M. 13.07 – 13 – Peat.

**Construction Methods:** An Environmental Scientist from the OEP must be on-site to monitor construction of the Wetland Mitigation Areas to ensure compliance with the mitigation plan.

The Contractor shall submit a construction schedule and an outline of construction methodologies for the required earthwork and planting of the wetland creation sites according to the general construction sequence and requirements outlined below. **Compensatory mitigation shall be initiated within 90 days of project initiation and completed not later than the completion of the permitted project.** As stated in Item (k) *below*, the Contractor must schedule wetland creation activities to allow at least one full winter shutdown period between the final grading and seeding of the Wetland Mitigation Areas and the planting of proposed vegetation in the areas. All work prior to the required overwintering period must be performed in the same construction season with no scheduled inactive period of more than 10 workdays. The final grading must be completed in a fall season, and the seeding of the sites with the appropriate wetland seed mixture(s) must be completed within that same fall planting season.

(a) Identify temporary stockpile and staging locations. Boulders and woody debris (logs, stumps and root wads) from the clearing and grubbing activity shall be set aside for use in the wetland creation area. Woody debris shall consist of a majority of intact rootcrowns and trunks a minimum of 3 feet in diameter.

(b) Verify and delineate established work limits in the field.

(c) Install temporary sedimentation and erosion control measures.

(d) Remove nuisance vegetation and all invasive plant species identified in the NOTICE TO CONTRACTOR – INVASIVE PLANT SPECIES from the site **and within 50 feet of the mitigation site limits. The Environmental Scientist shall direct removal of additional species or from additional locations as deemed necessary for mitigation success**.

(e) Identify, clear, grade, and stabilize any required haul road(s). Construct haul roads in a manner that minimizes disturbance to existing vegetation.

(f) Strip and stockpile existing topsoil from within the proposed limits of wetland creation if approved for re-use. Strip topsoil only to the depth at which the soil color and texture changes, indicating the lower limit of topsoil and the beginning of the subsoil. The entire site has been classified as a Low Level Area of Environmental Concern and therefore, it should be assumed for bidding purposes that all contaminated material, including topsoil, should be handled according to Special Provision Item Nos. 0101117A-Controlled Materials Handling, 0202315 - Disposal of Contaminated Materials, and 0202318-Management of Reusable Controlled Materials. Contaminated topsoil may not be used for creating the wetland topsoil material. Prior to earth excavation operations, the Contractor may request, at their own expense, that the Environmental Engineer test specific areas to determine if the topsoil can be approved for reuse within the Proposed Wetland Areas.

(g) Excavate Wetland Mitigation Area to a depth of 1.0 feet below proposed finished grade (subgrade).

(h) Place tested and approved Wetland Topsoil over approved subgrade to the final grades shown on the Wetland Mitigation Plan. Soil shall be placed within the wetland creation sites in conformance with Article 9.44.03 of Section 9.44 – Topsoil, except that sod may comprise a portion, but not more than 20% by volume, of the soil. Approved Wetland Topsoil material will be placed to an average depth of 1 foot within all proposed wetland areas.

Microtopography (a ground surface that fluctuates regularly or irregularly over short distances) shall be provided within all planting zones within the created wetlands. The microtopography shall provide a surface that varies between approximately 1 foot, maximum above or below the finished grade depicted on the Wetland Mitigation Plan. The microtopographic surface variations shall not result in slopes exceeding 6 horizontal: 1 vertical (17%). The Contractor shall avoid exposing the subsoil at the lowest

depressions in this microtopography. It is anticipated that upon settling, at least 6 inches of wetland topsoil material shall cover the subsoil at lowest levels within the microtopography. Construction methodology must be submitted by the Contractor and approved by the Environmental Scientist prior to beginning work. All activities shall be performed in a manner that prevents excessive compaction of the soil. No machinery will be allowed within the created wetlands once the topsoil has been placed.

During the performance of this work, an Environmental Scientist will be on site to direct the construction activities involved in constructing the wetland creation sites. The Contractor must arrange the presence of the Environmental Scientist, through the Engineer, at least 10 days prior to the commencement of any activity to ensure availability.

Remove unsuitable or unused stockpiled soils from the project site and dispose of off-site, in conformance with Section 2.02.03-10 – Disposal of Unsuitable Material. The soil stockpile area shall be restored to its original condition.

(i) Place woody debris and boulders. A sufficient quantity of woody debris shall be placed to cover at least 3%, but not more than 5% of the Wetland Mitigation Area. Boulders shall cover between 2% and 3% percent of the Wetland Mitigation Area and be placed at random in the area(s) shown on the Wetland Mitigation Plan. Placement and amount of woody debris and boulders shall be directed by the Environmental Scientist.

(j) Stabilize Wetland Mitigation Area and adjacent disturbed areas with the appropriate wetland seed mixture(s): Conservation Seeding for Slopes and Wetland Grass Establishment.

(k) Allow overwintering (one winter shutdown period) after seeding for wetlands to stabilize prior to planting.

(l) Initiate and complete planting and seeding as seasonally permitted.

(m) Remove temporary sedimentation and erosion control measures. Temporary devices and structures to control erosion and sedimentation in and around mitigation sites shall be properly maintained at all times. The devices and structures shall be disassembled and properly disposed of at the close of the project. Sediment collected by these devices will be removed and placed upland in a manner that prevents its erosion and transport to a waterway or wetland in accordance with Section 1.10, including Best Management Practices.

(n) Irrigate new plantings, as required, during the plant establishment period.

**Method of Measurement:** Wetland Creation will be measured for payment by the number of square yards of Wetland Mitigation Area re-graded, covered with wetland topsoil, planted, irrigated and accepted.

**Basis of Payment:** The work will be paid for at the contract unit price per square yard of "Wetland Creation" within the Wetland Mitigation Area; the price shall include all materials, equipment, maintenance, tools, labor, and work incidental thereto.

The price shall also include: excavating (stripping), hauling and stockpiling existing topsoil; testing, mixing, and providing wetland topsoil and/or supplemental wetland topsoil material; placing wetland topsoil; disposing of excess or unacceptable stockpiled topsoil; restoring stockpiling and staging site(s); placing woody debris and boulders; forming subgrade within the Wetland Mitigation Areas; and forming the fluctuation surface topography of the finished grade.

The cost of installing and removing sedimentation and erosion controls, including Sedimentation Control Systems, shall be paid for under their respective contract items.

The cost of removing invasive species shall be paid for under the contract item "Control and Removal of Invasive Species".

The cost of obtaining and stockpiling woody debris and boulders shall be included under the contract item for "Clearing and Grubbing"

The cost of all excavation from below stripped topsoil down to subgrade will be paid under the contract item "Earth Excavation".

All plantings will be paid for under their respective contract items.

Establishing wetland grasses within the Wetland Mitigation Area will be paid for under the contract items "Wetland Grass Establishment" and "Conservation Seeding for Slopes".

| Pay Item | Pay Unit |
|---|---|
| Wetland Creation | S.Y. |