

Special Provisions for: Woodstock BHF 020-2(32)

1. LABOR SUPPLY. Available workers for this contract may be obtained from Manager, Employment & Training, White River Junction, VT. The latest edition of the DBE Registry and Wage Rates for Federal-Aid Projects can be obtained from the Office of Civil Rights and Labor's Webpage at the following address: www.aot.state.vt.us/CivilRights Contractors that do not have access to the internet may obtain a copy from the Office of Contract Administration upon request.
2. CONTRACT COMPLETION DATE. The Contract shall be completed on or before August 24, 2007.
3. NOTICE TO BIDDERS. U.S. Department of Labor Davis-Bacon wage rates are applicable to this project. Copies of the applicable rates are included in this proposal.
4. NOTICE TO BIDDERS. This project has a pre-bid conference that will be held at the Vermont Agency of Transportation Offices located at the National Life Building in Montpelier, VT, at (TIME), (PLACE), (DATE). Attendance at this conference is MANDATORY for any contractor planning to bid as a prime contractor. Contractors are encouraged to submit project questions to the Agency's Contract Administration Office before noon on (DATE). Questions submitted by this time will be kept anonymous as to the author of the question. Other questions will still be taken on the date of the pre-bid Conference.
5. CONTACT WITH THE AGENCY. From the time of advertising until the actual bid opening for this Contract, all prospective Contractors, subcontractors and suppliers shall direct all inquiries related to this project solely to the Agency's Office of Contract Administration at (802) 828-2641. This number may also be accessed via the Agency's TTY/TDD Telecommunications Relay Service at 1-800-253-0191.
6. NOTICE TO BIDDERS - INCENTIVE/DISINCENTIVE (I/D). The Agency's intent is to have the bridge closure period as short a duration as possible. This I/D provision is also intended to recover damages to the traveling public for late completion. To encourage the Contractor to provide a maximum effort to achieve the date as defined below, the Agency is willing to pay a bonus.
 - A. Dates. The allowable bridge closure period is from 7:00 a.m. on Tuesday May 29, 2007 to 11:59 p.m. on Sunday June 24, 2007. During the time, the Contractor will be allowed to work 24 hours per day, 7 days per week, including holiday periods.

The Incentive/Disincentive dates as established above for this Contract are absolute fixed dates and will not be changed for any Act of God, omission, improper action, direction of the Engineer, or any other reason unless done so by the Secretary and only under extreme conditions as determined by the Secretary. See Notice to Bidders (Section XX) for information on activities not permitted during the night.

- B. Identified Work. All work required to open the bridge to two-way traffic including:
Concrete Deck Overlay placed (note modification to curing in these Special Provisions).

Temporary Barrier placed allowing two 10 foot wide lanes.
Base course of pavement placed on approaches.
Centerline marked with line striping targets.
Bridge curb and sidewalk (placed a minimum of 48 hours prior to opening to traffic).

- C. Pay Schedule for I/D. The Contractor will be compensated a lump sum compensation of twenty thousand dollars (\$50,000) if the identified work is completed on or before the I/D finish date. Additionally, as an incentive, the Contractor will be compensated at a rate of two hundred dollars (\$200) per hour that the identified work is complete and ready to be opened to two-way traffic before 11:59 P.M. of the I/D finish date. The maximum amount payable under the incentive clause shall be \$80,000 (including the \$50,000 lump sum payment).

For each hour after 11:59 P.M on the I/D finish date that the identified work remains uncompleted, the Contractor will be penalized at a rate of three hundred dollars (\$300) per hour for the first twelve hours, four hundred dollars (\$400) per hour for the next twelve hours, and six hundred dollars (\$600) per hour thereafter. There shall be no maximum on the disincentive amount.

- D. UNDERRUNS AND OVERRUNS. The proposal indicates an estimated quantity for each pay item. The fact that the actual amounts used in the construction of this project may vary from the estimate will not be a basis or cause for changing any of the conditions for Incentive/Disincentive.

The Agency recognizes that additional work and Extra Work, beyond the work indicated in the plans, are always possibilities in any construction contract. The Agency is willing to pay for necessary additional work and Extra Work in accordance with the terms and requirements of the Contract and the Standard Specifications for Construction, however, the Contractor shall absorb any resulting additional construction time within the original project and CPM Schedules, and there will be no adjustments or changes to the I/D date or the Incentive/Disincentive conditions.

- E. PAYMENT. Payment will be made as specified in Section 995.

9. STANDARD SPECIFICATIONS. The provisions of the 2001 STANDARD SPECIFICATIONS FOR CONSTRUCTION, as modified herein, shall apply to this contract.

Errata Sheet 2, dated April 17, 2003, has been issued and included in each copy of the 2001 Standard Specifications, in order to correct minor misprints, errors, and omissions.

10. SUPPLEMENTAL SPECIFICATIONS AND CONTRACT REQUIREMENTS. The Contractor's attention is directed to the following specifications and contract requirements included in the Proposal form and effective for this contract:

Required Contract Provisions for Federal-Aid Construction
Standard Federal EEO Specifications
VT Agency of Transportation Contractor Workforce Reporting Requirements
General Special Provisions dated December 6, 2005

Bulletin 3.5 Compliance dated February 6, 2003
Vermont Minimum Labor & Truck Rates
Disadvantaged Business Enterprise (DBE) Policy Contract Requirements
U.S. Department of Labor Davis Bacon Wage Rates
Section 208 - Cofferdams dated April 5, 2005
Section 501A - HPC Structural Concrete dated March 10, 2004
Section 510A - Prestressed Concrete dated February 1, 2005
Section 580 - Structural Concrete Repair dated June 1, 2004
Section 780 - Concrete Repair Materials dated August 9, 2000
Stream Alteration Permit HD-1-0205 dated December 16, 1996
Army Corps of Engineers Permit NAE-2006-1410 dated May 17, 2006
Certification for Federal-Aid Contracts
Debarment & Non-Collusion Affidavit
Contractor's EEO Certification Form

11. UTILITY SPECIAL PROVISIONS. Existing aerial facilities owned by Woodstock Aqueduct Company, Verizon and Central Vermont Public Service will not require adjustment. The Contractor is cautioned to protect these facilities from damage.

Employees or agents of the above listed companies are to be allowed free and full access within the project limits with the tools, materials, and equipment necessary to install, operate, maintain, place, replace, relocate, and remove their facilities.

There will be no extra compensation paid to the Contractor for any inconvenience caused by working around and with the companies.

Act No. 86 of 1987 (30 VSA Chapter 86) ("Dig Safe") requires that notice be given prior to making an excavation. It is suggested that the Permit Holder or his/her Contractor telephone 1-888-344-7233 at least 48 hours before, and not more than 30 days before, beginning any excavation at any location.

Should the Contractor desire additional adjustments of the utility facilities for his/her convenience, proper arrangements shall be made in conformance with Subsection 105.07 of the Standard Specifications for Construction.

12. RIGHT OF WAY SPECIAL PROVISIONS.

Parcel #1 Woodstock Associates, Inc.

A temporary construction easement was acquired from Woodstock Associates, Inc. to be used as a staging area. Since this area will occupy a portion of the parking lot, which could be damaged, it was agreed that the entire parking lot would be resurfaced at the end of construction. Paving depth to be a minimum of one inch (1"). Also, adjoining lawn and landscaped areas will be returned to the original condition, as near as possible, at the end of construction.

Parcel #4 David and Kathie Mandel

The Town will require its contractor or the Contractor's agent to inspect, video tape and or photograph the property owners house and foundation prior to project commencement and at project completion. The Town will require its contractor to warrant to correct any damages to the house/house foundation resulting from project construction.

8. NOTICE TO BIDDERS. All paving and the restoration of lawn and landscaped areas within the temporary construction area of Parcel #1

and outside the Project limits will be repaired by the Town of Woodstock.

9. BUILDING INSPECTION. For the protection of the Contractor and any affected property owners, before beginning any construction activities the Contractor shall deliver to the Engineer a copy of the Contractor's Insurer Inspection Report, inside and out, of buildings that may be affected by any construction operations. Included with the Report will be a copy of a complete video CD record of the buildings made as part of the inspection.

Upon completion of project construction, the Contractor's insurer shall again completely inspect, inside and out, and make a complete video CD record of all buildings as part of the inspection. A written copy of the complete inspection report and a copy of the complete video CD record shall be delivered to the Engineer by the Contractor.

The Agency will not accept the project until the Engineer has received all reports and all video CDs. The Engineer will forward the reports and the video CDs to the Project Manager for safe-keeping.

All members of the insurer inspection team shall personally identify themselves to the Engineer prior to beginning each inspection.

All costs involved in performing this work and materials shall be considered incidental to all other Contract items.

6. NOTICE TO BIDDERS. During the bridge closure period, no work shall be performed between the hours of 9:00 p.m. and 6:00 a.m. that creates a noise level exceeding 75 decibels. The decibel level shall be measured from the point of activity to the nearest occupied residence. Construction activities expected to reach this noise threshold include pneumatic hammers, hoe-ram, and similar impact type equipment.

The contractor shall provide the Resident Engineer, for the duration of the night time work, with a sound level meter capable of meeting this noise criteria during the bridge closure period.

Sound level meters shall be: Rion NL-20, CESVA SC-160, or Extech 407780 or an approved equal capable of meeting IEC60651: 1979 Type 2 and IEC60804: 1985 Type 2 Standards.

The cost for providing this equipment and meeting this noise level criteria shall be included in Item 641.12 Public Relations Officer.

13. NOTICE TO BIDDERS. The Contractor's attention is directed to all notes on the plans. These notes may contain information about material requirements, working restrictions, methods of payment, traffic control, erosion control and other important information for properly bidding and performing the work. Several items on this project are new or unusual and may not be paid for in the usual Agency manner as has been specified on other projects.

7. NOTICE TO BIDDERS. The Contractor will be required to submit a detailed schedule of work required during the bridge closure period a minimum of 60 days before the scheduled closing. The schedule should include each activity to take place and specify the critical path sequencing during the closure period. Durations within the schedule shall be shown in terms of hours rather than days. The agency will review the schedule and provide comments within 14 days of receipt. In

addition, there shall be a pre-closure coordination meeting held on site with all sub-contractors, the Contractor's superintendent, the Engineer, and the Town of Woodstock to discuss durations of work, types of night work, work sequencing, etc. The contractor shall keep the CPM schedule up-to-date based on work performed and shall be prepared to provide the Resident Engineer with revised schedules when requested.

8. NOTICE TO BIDDERS. The Contractor is hereby notified that in the absence of the Engineer, the Agency Safety Coordinator and the Agency Hazardous Waste and Materials Coordinator shall each have the authority to suspend work when they determine that a serious safety or environmental violation exists on the job site. The period of time work is suspended due to a serious safety or environmental violation will not be justification for an extension of time.
12. NOTICE TO BIDDERS. All temporary construction signs shall meet the following requirements:
- A. All sign stands and post installation shall be National Cooperative Highway Research Program Report (NCHRP) 350 compliant.
 - B. As a minimum, roll up sign material shall have ASTM D 4956-01 Type VI fluorescent orange retroreflective sheeting.
 - C. All post-mounted signs shall have ASTM D 4956-01 Type VII, Type VIII, or Type IX fluorescent orange retroreflective sheeting.
 - D. All traffic cones, barricades, and barrels shall have Type VI retroreflective sheeting.
 - E. All stationary signs shall be mounted on two 1.5 kg/m (3 lb/ft) flanged channel posts. No sign posts shall extend over the top edge of sign installed on said posts.
 - F. Prior to placing temporary work zone signs on the project, the Contractor must furnish for the Engineer's approval a detail for temporary work zone signs on steel posts showing stubs projecting a maximum of 100 mm (4 inches) above ground level and bolts for sign post.
 - G. Construction signs shall be installed so as to not interfere with nor obstruct the view of existing traffic control devices, stopping sight distance, and corner sight distance from drives and town highways.
 - H. Speed zones, if used, shall be a maximum of 10 mph (16 kph) below existing posted speeds or as directed by the Engineer.
13. NOTICE TO BIDDERS. All reflective sheeting on permanent signs shall be at a minimum ASTM Type III sheeting.
13. HIGHWAY PARKING RESTRICTIONS. Only such trucks and equipment as are necessary for the construction of this project will be permitted to stop or park on the shoulders or right-of-way of the highway. All trucks or equipment so stopped or parked shall be at least four feet from the edge of the thru traffic lanes. Parking or stopping on the traveled portion of the roadway will not be permitted unless authorized by the Engineer to meet field conditions.

Private automobiles or workers will not be permitted to stop or park on the shoulders or right-of-way of the highway.

Each of the Contractor's trucks or equipment used for the construction of this project and permitted to park or stop as provided above shall be equipped with flashing light signals on the front and rear and the

signals shall be operating at all times when parked or stopped on the highway unless otherwise authorized by the Engineer.

The flashing light signals shall be visibly distinct from and physically separate from the hazard warning system required by Federal and State motor vehicle laws and regulations. At least one of these flashing light signals shall be visible to traffic approaching from any angles at all times.

Qualified Traffic Control Personnel shall be employed whenever the Contractor's vehicles or equipment (including that which belongs to the individual workers) enter or leave the traffic flow. All movement, in or out of the traffic flow, shall be with the flow of traffic.

14. SPECIAL CONSTRUCTION REQUIREMENTS.

- A. The Contractor shall maintain a safe access to all drives and intersecting side roads at all times during the construction of this project.
- B. Two-way radios shall be provided by the Contractor when requested by the Engineer for use by traffic control personnel. All costs for furnishing and using two-way radios will not be paid for directly, but will be considered incidental to all other Contract items.
- D. The Contractor shall have available on the project the current editions of the Manual on Uniform Traffic Control Devices (MUTCD) and the Traffic Control Devices Handbook. These reference books may be ordered from: Superintendent of Documents, U.S. Government Printing Office, Washington, DC, 20402. Information for obtaining these publications may be found at: <http://mutcd.fhwa.dot.gov/index.htm>.
- E. Except as directed by the Engineer, all work outside the paved portion of the shoulders, including excavation, pipe extensions, grading, filling, sign installation, guardrail construction, topsoil and turf establishment shall be completed prior to placing the wearing course of pavement.
- F. Unless otherwise directed by the Engineer, the Contractor shall also begin and end the wearing course of pavement for the project with a full depth butt joint constructed as directed by the Engineer. The costs of cutting the butt joint will not be paid for directly, but will be considered incidental to item 210.10 - Cold Planing - Bituminous Pavement.
- G. Night work maybe permitted on portions of this project. Town of Woodstock has ordinances concerning Night Work and Noise requirements that may apply to the contractors operations.

If the Contractor works at night the Contractor shall design a lighting system and present it to the Resident Engineer for approval. The Contractor shall not perform any night activity within the project limits until the lighting system has been fully approved and the lighting system is in-place on the project.

The designed lighting system shall be mobile, shall be mounted separately from other construction equipment, shall illuminate

the entire work area to daylight intensity with minimal glare, and shall be a surrounding design that minimizes shadows in the work area. The area of illumination shall be contained within the work zone area as much as feasibly possible.

SECTION 104 - SCOPE OF WORK

15. 104.04 MAINTENANCE OF TRAFFIC, is hereby modified by adding the following paragraphs:

Necessary traffic control devices, including but not limited to signs, pavement markings, pavement marking removals, temporary traffic barrier, barricades, reflectorized plastic drums, cones, flashing arrow boards, and detours, as appropriate for the construction operation and traffic maintenance work to be performed, shall be installed, approved and functioning to the satisfaction of the Engineer prior to the Contractor changing traffic movements or beginning any other construction operation at that project location.

All signs, barrels, cones and barricades to be used for channelizing traffic on this project shall be cleaned by the Contractor and then presented to the Engineer for inspection prior to being used on the project. The presented items shall be in new or like new condition as presented or shall have new reflective sheeting applied prior to being placed in use on this project as directed by the Engineer.

All reflectorized sheeting on the project shall be cleaned on a bi-weekly basis unless more frequent cleaning is directed by the Engineer. The costs of this work will be considered incidental to Contract item 641.10.

All costs involved in covering or removing signs at the beginning of a suspension of work, including winter shutdown, and in uncovering or reinstalling the signs at the end of a suspension of work will be considered incidental to Contract item 641.10. Such signing adjustments shall be done as directed by the Engineer.

All costs involved in covering, uncovering, and otherwise adjusting the signing and traffic control devices during construction to conform to the changing requirements of traffic flow around and through various construction operations will be considered incidental to Contract item 641.10.

SECTION 105 - CONTROL OF THE WORK

16. 105.03 PLANS AND WORKING DRAWINGS, paragraph 1, part (b) Working Drawings, subpart (1), Fabrication Drawings, paragraph 5, is hereby modified by adding the following:

510 Prestressed Concrete Structures Engineer

17. 105.03 PLANS AND WORKING DRAWINGS, paragraph 1, part (b) Working Drawings, subpart (2), Construction Drawings, paragraph 4, is hereby modified by adding the following:

510 Prestressed Concrete (erection plan) Construction Engineer
510 Prestressed Concrete (structural design) Structures Engineer

18. 105.24 POLLUTION CONTROL, is hereby modified by adding the following paragraphs:

The Contractor's attention is directed to the provisions of this Subsection, Subsections 105.22 and 105.23, and Section 652. Temporary erosion prevention and sediment control measures will be used when and where ordered by the Engineer.

Unless otherwise noted in the Plans, all materials, installation, maintenance and, where necessary, removal for those erosion prevention and sediment control measures which are items in the Contract will be paid for at the appropriate Contract unit price bid. All materials, installation, maintenance and, where necessary, removal for all other erosion prevention and sediment control measures required by the Plans and/or the Engineer that are not items in the Contract will not be paid for directly, but will be considered incidental to all other Contract items.

The construction of major drainage facilities such as culverts, special ditches, and channel relocations shall be completed in a continuous manner, including the incorporation of all design features and permanent erosion prevention and sediment control items and such temporary erosion prevention and sediment control measures as may be ordered by the Engineer.

The Contractor's schedule of accomplishment of erosion prevention and sediment control work will be submitted prior to the start of construction and, as specified in Subsection 105.22, shall include site-specific methods of operation. Location, type, and size of sediment basins, temporary construction fills, stream crossings proposed, check dams, silt barriers, and other erosion prevention and sediment control work shall be described and shown on pertinent plans.

Water pumped from excavation shall be discharged overland or to settling basins so that the effluent shall be essentially clarified before reentering the stream flow.

The Contractor shall take all necessary precautions to prevent the loss of debris, removed materials, new materials, equipment of any kind, concrete, fuels, lubricants, sealers, and any other polluting items into the waters of, or on the banks of, any stream, river, pond, swamp, or lake in the State. Any items which escape the Contractor's efforts of prevention shall be immediately and entirely cleaned up or removed at the Contractor's expense. Unless specifically provided for in the Contract, the cost of all preventive measures will not be paid for directly, but will be considered incidental to all other Contract items.

SECTION 501A - HPC STRUCTURAL CONCRETE

19. SUPPLEMENTAL SPECIFICATION 501A - HPC STRUCTURAL CONCRETE, dated March 10, 2004 is hereby made a new section of these Specifications.
20. SUPPLEMENTAL SPECIFICATION SECTION 501A - HPC STRUCTURAL CONCRETE, is hereby modified as follows:

501.01A DESCRIPTION, is hereby modified by adding the following paragraphs:

Concrete, High Performance Class AA (Mod. - Rapid Cure) is to be used on the concrete overly and has been modified to reduce cure time and

allow the bridge to be opened to traffic when only 50% of the compressive strength has been attained.

Concrete, High Performance Class A (Mod.) is to be used for bridge curbs and sidewalks and is modified to reduce the cure time to 5 days and to allow vehicle loading 48 hours after placement.

- 21. 501.02A MATERIALS, is hereby modified by adding the following to the list of materials:

Lightweight Coarse Aggregate for Structural Concrete.....704.14

- 22. 501.03A CLASSIFICATION AND PROPORTIONING, is hereby modified by being deleted in its entirety and replaced with the following:

501.03A CLASSIFICATION AND PROPORTIONING. The following classes of concrete are included in these Specifications and shall be used as shown on the Plans:

TABLE 501.03A-HPC (METRIC)

HP Class	Req.*** Cem. Mat. (kg/m ³)	Maximum Water- Cem. Mat. Ratio	Max.* Slump (mm)	Air Content(%)	Coarse Aggregate Gradation Table	28-Day** Comp. Strength (MPa)	28-Day** Modulus of Rupture (MPa)
AA (MOD)	To be designed	0.40	180	7.0 ± 1.5	704.02A	30	----
A (MOD)	To be designed	0.44	180	6.0 ± 1.5	704.02B	30	----
B	362	0.49	180	5.0 ± 1.5	704.02B, C	25	4.14

*A maximum slump of 180mm is allowed after the addition of admixtures.
 ** The listed 28-day compressive strength or modulus of rupture will serve as the basis of designing or approving the concrete mix.
 ***See additional (Metric unit) tables below for required cementitious materials .

TABLE 501.03A-HPC (ENGLISH)

HP Class	Req.*** Cem. Mat. (lbs./ft ³)	Maximum Water- Cem. Mat. Ratio	Max.* Slump (in.)	Air Content(%)	Coarse Aggregate Gradation Table	28-Day** Comp. Strength (psi)	28-Day** Modulus of Rupture (psi)
AA (MOD)	To be designed	0.40	7	7.0 ± 1.5	704.02A	4000	----
A(MOD)	To be designed	0.44	7	6.0 ± 1.5	704.02B	4000	----
B	611	0.49	7	5.0 ± 1.5	704.02B, C	3500	600

*A maximum slump of 7 inches is allowed after the addition of admixtures.
 ** The listed 28-day compressive strength or modulus of rupture will serve as the basis of designing or approving the concrete mix.
 ***See additional (English unit) tables below for required cementitious materials.

The maximum unit density for Concrete, High Performance Class AA (Mod. - Lightweight), and Concrete, High Performance Class A (Mod. - Lightweight) shall be:

- (a) Plastic: 1922 kg/m³ (120 pounds per cubic foot)

(b) Dry: 1842 kg/m³ (115 pounds per cubic foot)

Required Cementitious Materials

(Metric Units)

HP Class	Cement (kg/m ³)		Fly Ash (kg/m ³)		Slica Fume Admixture (kg/m ³)		Cementitious Materials (kg/m ³)
AA	311	+	84	+	24	=	419
A	289	+	78	+	24	=	391
B	266	+	72	+	24	=	362

OR

HP Class	Cement (kg/m ³)		GGBFS (kg/m ³)		Slica Fume Admixture (kg/m ³)		Cementitious Materials (kg/m ³)
AA	290	+	105	+	24	=	419
A	269	+	98	+	24	=	391
B	248	+	90	+	24	=	362

OR

HP Class	Blended Silica Fume Cement (8.0%) (kg/m ³)		Fly Ash (kg/m ³)				Cementitious Materials (kg/m ³)
AA	355	+	84	=			419
A	313	+	78	=			391
B	290	+	72	=			362

OR

HP Class	Blended Silica Fume Cement (8.0%) (kg/m ³)		GGBFS (kg/m ³)				Cementitious Materials (kg/m ³)
AA	314	+	105	=			419
A	293	+	98	=			391
B	272	+	90	=			362

Required Cementitious Materials

(English Units)

HP Class	Cement (lbs/cy)		Fly Ash (lbs/cy)		Silica Fume Admixture (lbs/cy)		Cementitious Materials (lbs/cy)
AA	524	+	141	+	40	=	705
A	488	+	132	+	40	=	660
B	449	+	122	+	40	=	611

OR

HP Class	Cement (lbs/cy)		GGBFS (lbs/cy)		Slica Fume Admixtu re (lbs/cy)		Cementitious Materials (lbs/cy)
AA	489	+	176	+	40	=	705
A	455	+	165	+	40	=	660
B	418	+	153	+	40	=	611

OR

HP Class	Blended Silica Fume Cement (8.0%) (lbs/cy)		Fly Ash (lbs/cy)		Cementitious Materials (lbs/cy)
AA	564	+	141	=	705
A	528	+	132	=	660
B	489	+	122	=	611

OR

HP Class	Blended Silica Fume Cement (8.0%) (lbs/cy)		GGBFS (lbs/cy)		Cementitious Materials (lbs/cy)
AA	529	+	176	=	705
A	495	+	165	=	660
B	458	+	153	=	611

If bagged silica fume is being used, the total number of bags for the batch shall be the least number of whole bags required - round fractional numbers of bags required down to the next whole number. The total batch weight of silica fume ignored shall be substituted with portland cement. Exceptions: For a one cubic yard batch, use 50 lbs of silica fume. For a one cubic meter batch, use 34 kilograms of silica fume.

If the blended silica fume cement contains silica fume at a rate other than that required for the approved design mix, the Contractor shall provide additional silica fume or cement, as required, to provide concrete meeting the mix design requirements. The additional cement or silica fume provided shall be of the same brand and type as contained in the silica fume cement blend.

If test results indicate a failure to obtain the 28-day compressive strength as specified in Table 501.03A-HPC as tested in accordance with AASHTO T 22 or AASHTO T 97, changes shall be made with no extra payment. Changes may include, but are not limited to, changing the source of cement or aggregate, using a water reducer or other additives, or, if necessary, obtaining concrete from another supplier. If deemed to be in the best interest of the project, the Engineer may, at any time, order plant production stopped.

An AASHTO M 194 Type A Water-Reducing or Type D Water-Reducing and Retarding, or Type F Water-Reducing, High Range, or Type G Water-Reducing, High Range, and Retarding Admixture shall be required to produce a workable mixture. The use of an accelerating or water-reducing-accelerating admixture to alter the setting characteristics of concrete mixtures shall be employed only with the approval of the Engineer. The use of chlorides or admixtures containing chlorides is

prohibited. All admixtures will be considered incidental to the work and included in the Contract unit price of the concrete.

The concrete mix shall be approved by the Engineer. The concrete materials shall be proportioned using the absolute volumes method in accordance with the requirements for each class as specified in Table 501.03A-HPC or an approved alternate mix design. The volumetric proportioning method such as that outlined in ACI Standard 211.1, *Recommended Practice for Selecting Proportions for Normal Weight Concrete*, or other approved volumetric proportioning methods shall be employed in the mix design.

On a project by project basis, when Concrete, Class A QC/QA mix is being specified for superstructure concrete, the approved QC/QA mix design shall be allowed for superstructure curb and sidewalk pours. However, all specifications for Concrete, High Performance Class A (including specifications for measurement and payment) shall apply to the quantity of concrete provided for superstructure curbs and sidewalks.

The Contractor must submit a mix design for Concrete, High Performance Class AA (Mod. - Lightweight) and Concrete High Performance Class A (Mod. - Lightweight) meeting the requirements specified. In lieu of the high performance class B concrete mix specifications provided herein, the Contractor may submit (for the Engineer's approval) a high performance portland cement concrete mix. The mix design/designs submitted by the Contractor must meet the following requirements:

A minimum of thirty (30) calendar days - thirty seven (37) calendar days, if the first time the mix is being submitted - prior to placement (or prior to the pre-placement meeting, if one is required), the Contractor shall submit (for approval) the mix design for the class of concrete specified. The mix design(s) shall be submitted to the Agency's Materials and Research Laboratory, National Life Building, Drawer 33, Montpelier, VT, 05633, attention Structural Concrete Engineer. No class of concrete shall be placed on a project until the mix design is approved. The mix design must contain the following (including name and source of materials):

- Saturated Surface Dry or Dry Weights
- Compressive Strength
- Cement Content in kg/cubic meter (lbs/cubic yard)
- Mineral Admixture Content (each) in kg/cubic meter (lbs/cubic yard)
- Air Content
- Water/Cementitious Material Ratio
- Chemical Admixtures (types, brand names, dosages)
- Laboratory Test Results (strength, air content, water/cement ratio, slump)

The first time a mix design is submitted, the Contractor shall include permeability test results for (a minimum of) three four inch diameter x eight inch high test cylinders, made and cured in accordance with AASHTO T 22. The specimens will undergo rapid chloride permeability testing at an independent AASHTO accredited laboratory. The cylinder test results shall be submitted with the mix design. Subsequent use of an approved design will not require submittal of cylinder test results for permeability testing.

The cylinder test results shall be submitted with the following data regarding fabrication of the specimens:

Size of Batch
Type of Mixer
Mixing Time
Type of Cure
Age Upon Delivery

After the materials to be furnished by the Contractor have been approved, no change in the source or character of the materials shall be made without notice to the Engineer. No new materials shall be used until the Engineer has accepted such materials, and has designated or approved new proportions. In no case shall concrete from more than one batch plant be permitted on the same structure without prior written approval of the Engineer. The Engineer may require a period of up to 60 calendar days from the date the aggregate is available for testing to test the material(s) and redesign the mix.

The various classes of concrete shall have air content by volume as specified. The entrained air shall be obtained by the use of an approved admixture.

Fly ash and GGBFS will not be permitted in the same concrete mixture.

Strict adherence to the requirements of Subsection 501.07A is required when using concrete with GGBFS. The setting time may be retarded in cool weather, or accelerated in hot weather. The Resident Engineer, after consultation with the Agency's Structural Concrete Engineer, may require that the curing period, as designated in Table 501.17A, be extended.

23. 501.17A CURING CONCRETE, is hereby modified by deleting table 501.17A-HPC in its entirety and replacing it with the following:

TABLE 501.17A-HPC
CURING OF CONCRETE COMPONENTS

Type of Construction	Curing Methods	Curing Period Days
Substructure	501.17(b)(1), (2), (3), (5), (7), (8)	5 Days*
Superstructure	501.17(b)(2), (8)	5 Days*
Retaining Walls	501.17(b)(1), (2), (5), (6), (8)	7
Headwalls	501.17(b)(1), (2), (5), (6), (8)	7
Sidewalks, Curbs, and Gutters	501.17(b)(2), (8)	As determined by the Engineer.

* Curing periods shall be a minimum of 5 days or when 28 day design strength is reached, whichever is longer.

24. 501.20A BASIS OF PAYMENT, is hereby modified by adding the following pay items:

<u>Pay Item</u>	<u>Pay Unit</u>
501.32 Concrete, High Performance Class AA (Mod. - Rapid Cure)	CUBIC METER (CUBIC YARD)

501.33 Concrete, High Performance Class A (Mod.) CUBIC METER
(CUBIC YARD)

SECTION 501B - HPC STRUCTURAL CONCRETE (SELF CONSOLIDATING CONCRETE)

vv. SECTION 501B - HPC STRUCTURAL CONCRETE (SELF CONSOLIDATING CONCRETE),
is hereby made a new Section of the Specifications as follows:

XX. 501.01B DESCRIPTION. This work shall consist of furnishing and
placing high performance portland cement concrete for structures and
incidental construction.

The portland cement concrete shall consist of a homogeneous mixture of
cement, fine aggregate, coarse aggregate, water, admixtures, and
pozzolans, proportioned and mixed according to these Specifications.

Self-Consolidating Concrete is a highly workable concrete that can flow
through densely reinforced or complex structural elements under its own
weight and adequately fill voids without segregation or excessive
bleeding without the need for vibration

VV. 501.02B MATERIALS. Materials shall meet the requirements of the
following Subsections:

Portland Cement.....	701.02
Blended Silica Fume Cement.....	701.06
Tar Emulsion.....	702.05
Fine Aggregate for Concrete.....	704.01
Coarse Aggregate for Concrete.....	704.02
Asphalt Treated Felt.....	707.08
PVC Waterstop.....	707.10
Concrete Curing Materials.....	725.01
Air-Entraining Admixtures.....	725.02(b)
Retarding Admixture.....	725.02(c)
Water-Reducing Admixture.....	725.02(f)
Water-Reducing and Retarding Admixture.....	725.02(g)
Water-Reducing, High Range Admixture.....	725.02(h)
Water-Reducing, High Range, and Retarding Admixture.....	725.02(i)
Accelerating Admixture.....	725.02(j)
Water-Reducing and Accelerating Admixture.....	725.02(k)
Mineral Admixtures.....	725.03
Silica Fume Admixture.....	725.03(b)
Ground Granulated Blast-Furnace Slag (GGBFS).....	725.03(c)
Polystyrene Insulation Board.....	735.01
Blanket Insulation Material.....	735.02
Pipe Insulation.....	740.08
Water.....	745.01

xx. 501.03B CLASSIFICATION AND PROPORTIONING. The following classes of
concrete are included in these Specifications and shall be used as
shown on the Plans:

TABLE 501.03B-SCC (ENGLISH)

SCC Class	Min.*** Cem. Mat. (lbs./ ft ³)	Max. Water- Cem. Mat. Ratio	Inverted slump cone Flow* (in.)		Air Content(%)	28-Day** Comp. Strength (psi)	56- Day** Permea- bility, Coulomb	VSI Rating	T ₂₀ Seconds	
			Min	Max					Min	Max
B (MOD)	611	0.44	20	28	5.0 ± 1.5	3500	2500	=/<1	2	5

*A higher maximum flow greater than 28 inches may be allowed if the Visual Stability Index is 1 or less.

** The permeability can be tested prior to 56 days but results must still be 2500 or less coulombs.

***There must be 20% fly ash or 25% GGBFS replacement of total cement content.

If silica fume is used, the maximum shall be 40 lbs/cy and shall be a direct replacement of the cement. If bagged silica fume is being used, the total number of bags for the batch shall be the least number of whole bags required - round fractional numbers of bags required down to the next whole number. The total batch weight of silica fume ignored shall be substituted with portland cement. Exceptions: For a one cubic yard batch, use 50 lbs of silica fume. For a one cubic meter batch, use 34 kilograms of silica fume.

If the blended silica fume cement contains silica fume at a rate other than that required for the approved design mix, the Contractor shall provide additional silica fume or cement, as required, to provide concrete meeting the mix design requirements. The additional cement or silica fume provided shall be of the same brand and type as contained in the silica fume cement blend.

If test results indicate a failure to obtain the 28-day compressive strength as specified in Table 501.03B-SCC as tested in accordance with AASHTO T 22 or AASHTO T 97, changes shall be made with no extra payment. Changes may include, but are not limited to, changing the source of cement or aggregate, using a water reducer or other additives, or, if necessary, obtaining concrete from another supplier. If deemed to be in the best interest of the project, the Engineer may, at any time, order plant production stopped.

An AASHTO M 194 Type F Water-Reducing, High Range, or Type G Water-Reducing, High Range, and Retarding Admixture shall be required to produce a workable mixture. The use of an accelerating or water-reducing-accelerating admixture to alter the setting characteristics of concrete mixtures shall be employed only with the approval of the Engineer. The use of chlorides or admixtures containing chlorides is prohibited. All admixtures will be considered incidental to the work and included in the Contract unit price of the concrete.

The concrete mix shall be approved by the Engineer. The concrete materials shall be proportioned using the absolute volumes method in accordance with the requirements for each class as specified in Table 501.03B-SCC or an approved alternate mix design. The volumetric proportioning method such as that outlined in ACI Standard 211.1, *Recommended Practice for Selecting Proportions for Normal Weight Concrete*, or other approved volumetric proportioning methods shall be employed in the mix design.

The Contractor must submit, for the Engineer's approval, a self consolidating portland cement concrete mix, providing the following requirements:

The first time a mix design is submitted, the Contractor shall include permeability test specimens for (a minimum of) three four inch diameter x eight inch high test cylinders, made and cured in accordance with AASHTO T 22. The cylinders shall be made a minimum of 70 days prior to the prepour meeting and submitted when the cylinders are 14 days of age. The specimens will undergo rapid chloride permeability testing at VAOT Materials and Research AASHTO accredited laboratory at 56 days of age. If due to time constraints, the cylinders may be tested at an age of less than 56 days but the permeability results cannot be more than 2500 coulombs for the results to be acceptable. The test batch shall be a minimum of 4 cubic yards. Subsequent use of an approved design will not require submittal of cylinder test specimens for permeability testing.

The cylinder test specimens shall be submitted with the following data regarding fabrication of the specimens:

Size of Batch
Type of Mixer
Mixing Time
Type of Cure
Age Upon Delivery
Saturated Surface Dry or Dry Weights
Compressive Strength at 4, 7, 14, 28 days of age (14 and 28 day strength results can be submitted at a later date)
Cement Content in kg/cubic meter (lbs/cubic yard)
Mineral Admixture Content (each) in kg/cubic meter (lbs/cubic yard)
Chemical Admixtures (types, brand names, dosages)
Test Batch Results (air content, water/cementitious ratio, flow, VSI rating, T₂₀)

After the materials to be furnished by the Contractor have been approved, no change in the source or character of the materials shall be made without notice to the Engineer. No new materials shall be used until the Engineer has accepted such materials, and has designated or approved new proportions. In no case shall concrete from more than one batch plant be permitted on the same structure without prior written approval of the Engineer. The Engineer may require a period of up to 60 calendar days from the date the aggregate is available for testing to test the material(s) and redesign the mix.

The class of concrete shall have air content by volume as specified. The entrained air shall be obtained by the use of an approved admixture.

Fly ash and GGBFS will not be permitted in the same concrete mixture.

Strict adherence to the requirements of Subsection 501.07B is required when using concrete with GGBFS or fly ash. The setting time may be retarded in cool weather, or accelerated in hot weather. The Resident Engineer, after consultation with the Agency's Structural Concrete Engineer, may require that the curing period, as designated in Table 501.17B, be extended.

501.04B BATCHING. Measuring and batching of materials shall be done at an approved batch plant. The batch plant shall meet the

requirements of AASHTO M 157, except as modified and shall be maintained in good repair at all times and shall be subject to a periodic inspection by an authorized representative of the Agency.

All new or relocated concrete batch plants offered for Agency approval shall be equipped for semi-automatic batching and proportioning of all cementitious material, aggregates, water and for automatic insertion of admixtures. The plants shall be equipped to automatically and accurately record (in English and metric units) the quantity of all aggregates, cementitious material and the water incorporated into each batch and shall identify and record the addition of the required admixtures.

Proper facilities shall be provided for the Engineer to inspect ingredients and processes used in the batching and delivery of the concrete. The Contractor shall, without charge, afford the Engineer all reasonable facilities for securing samples to determine whether the concrete is being furnished in accordance with these Specifications.

The Contractor shall give the Engineer 24-hour notice of intent to place concrete so that arrangements can be made for laboratory inspection and control. Failure to give notice which causes postponement of placing operations shall not be reason for determining extension of Contract time per specifications of Subsection 108.11 of the Standard Specifications for Construction.

- (a) Semiautomatic Batch Plants. When actuated by a starting mechanism, the semiautomatic batch controller shall start the mass measuring (weighing) operation of the materials and stop the flow automatically when the designated mass (weight) has been reached. It shall be interlocked to ensure that the discharge mechanism cannot be opened until the mass (weight) is within the tolerance specified in Subsection 501.04B(d).

Water and admixtures may be batched in a weigh batcher or by volume in a volumetric device. When actuated, volumetric controls shall start the measuring operation and stop the flow automatically when the designated volume has been reached.

- (b) Testing Laboratory. The Contractor shall provide at the plant site a weatherproof building or room for the use of Agency personnel as a testing laboratory. The laboratory shall have a minimum gross internal area of 14 m² (150 square feet) with a layout providing a minimum internal width of 2.1 m (7 feet), in which to house and use the equipment specified. Should the Contractor elect to provide additional equipment relevant to testing of portland cement concrete and materials, the gross inside floor area of the laboratory shall be increased in proportion to the area required to house and operate the additional equipment. If the additional equipment is to be operated on a bench, the length of bench sections shall also be proportionally increased. An adequate method of ventilation, lighting, heating, and necessary electrical or gas connections shall be provided. Sanitary toilet facilities with lavatory shall be available for use by Agency personnel at the plant site.

The laboratory shall be equipped with the following:

- 1 Standard office desk, with lockable drawers or a separate lockable two-drawer file cabinet and chair.

- 1 Bench section(s) at least 600 mm (2 feet) wide providing a minimum of 2.6 m² (28 square feet) of working area with undercounter shelving.
- 1 Standard laboratory stool.
- 1 Fully automatic electronic calculator with eight digit capacity.
- 1 Standard laboratory sink and faucet provided with an adequate supply of water meeting the requirements of Subsection 745.01. The sink shall drain to the outside of the laboratory.
- 1 Bench brush.
- 1 Floor brush.
- 1 Motorized 203 mm (8 inch) sieve shaker (with adjustable timer) with sieving operation conducted by means of lateral and vertical motion of the sieve accompanied by jarring action with the following 203 mm (8 inch) diameter sieves: 9.5 mm (3/8 inch), 4.75 mm (No. 4), 2.36 mm (No. 8), 1.18 mm (No. 16), 600 µm (No. 30), 300 µm (No. 50), 150 µm (No. 100), plus pan and cover.
- 1 Mechanical aggregate shaker (with adjustable timer) with a 0.0283 m³ (1 cubic foot) capacity with the following screens: 45 mm (1 3/4 inch), 37.5 mm (1 1/2 inch), 25 mm (1 inch), 19 mm (3/4 inch), 12.5 mm (1/2 inch), 9.5 mm (3/8 inch), 6.3 mm (1/4 inch), 4.75 mm (No. 4), 2.36 mm (No. 8), 1.18 mm (No. 16), and pan. The aggregate shaker may be placed in a separate enclosed area or be shielded for dust and sound. When the aggregate shaker is placed in a separate enclosed area, there shall be a minimum of 1.5 m (5 feet) of clear space measured from the front frame of the shaker outward. The enclosed area shall be well lighted and ventilated. Also, the shaker shall have an adjacent bench section approximately 900 mm (36 inches) high, 600 mm (24 inches) deep and 1250 mm (50 inches) long.
- 1 Electronic balance with a minimum capacity of 45 kg (100 pounds) accurate to 1.0 g (0.002 pound).
- 1 Double burner hot plate, variable temperature.
- 5 Metal pans, nominal size, 230 by 230 by 50 mm (9 × 9 × 2 inches).
- 1 Sample splitter, 63.5 mm (2 1/2 inch) chute.
- 1 250 mm (10 inch) blunted trowel.
- 1 1.25 by 1.25 m (4 × 4 feet) minimum heavy canvas for quartering samples.
- 1 Brass wire bristle brush.
- 1 Pair, heat resistant gloves.
- 2 38 mm (1 1/2 inch) soft bristle paint brushes.
- 3 355 mL (12 ounce) clear graduated glass bottles.
- 1 Reference color comparison chart with five organic plate number colors.
Reagent sodium hydroxide solution (3 percent) in sufficient quantity for the duration of the project.

Acceptable substitutes for the aforementioned equipment may be provided when approved by the Materials and Research Engineer.

Prior to constructing a new testing laboratory or modifying an existing laboratory, the Contractor shall submit to the Agency for approval, two sets of drawings and specifications detailing the proposed location, dimensions, and materials to be used. The

details shall include the location of all testing equipment, benches, desk/file cabinet, sink, doors, windows, electrical or gas connections, lighting, ventilating, and heating equipment.

The laboratory and all testing equipment shall be maintained in operating condition. Equipment which, during concrete operations, becomes worn or damaged to the point of being unsuitable for testing purposes, shall be replaced or repaired by the Contractor. A testing laboratory shall be required at each plant site at least one month prior to the start of batching operations, and shall remain at the site either until concreting operations on the project are completed and the concrete has been accepted, or as otherwise directed by the Chief Engineer.

Batching operations shall not begin until the testing laboratory has been installed and approved as being in compliance with these Specifications and all requirements of the current VAOT Quality Assurance Plan document. Removal of any equipment, except at the direction of the Engineer, will revoke any prior approval and require the termination of batching operations.

The building or room designated as a testing laboratory shall be maintained in a clean condition by the user and kept free of all articles not necessary for the testing of materials. Cleaning supplies shall be furnished by the Contractor.

- (c) Bins and Scales. The batch plant shall include bins, weighing hoppers, and scales with adequate separate compartments for fine aggregate and for each required separate size of coarse aggregate. If cement is used in bulk, a bin, hopper, and scale for cement shall be included. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper or hoppers. Means of control shall be provided so that when required, the material may be added slowly in minute quantities and shut off with precision. Means of removing the overload of any one of the several materials shall be provided. Hoppers shall be constructed so as to eliminate accumulations of tare materials and to discharge fully without jarring the scales. Partitions between compartments shall be ample to prevent spilling under any working condition. All batch plant structures shall be properly leveled and maintained in that condition within the tolerance required by the design of the mass measuring (weighing) mechanism.

The scales for determining the mass (weight) of aggregate and cementitious material shall be comprised of a suitable system of levers or load cells. The levers or load cells will determine the mass (weigh) consistently within 0.5 percent under operating conditions, with loads indicated either by means of a beam with balance indicator, a full-reading dial, or a digital read-out or display.

Adequate means for checking the accuracy of the scales shall be provided by the Contractor either by the use of 22.68 kg masses (50 pound weights) or by other methods approved by the Engineer. All exposed fulcrums, clevises, and similar working parts of scales shall be kept clean. When beam-type scales are used, provision shall be made for indicating to the operator that the required load in the weighing hopper is being approached. Poises shall be designed to be locked in any position to prevent

unauthorized change of position. All mass measuring (weighing) and indicating devices shall be in full view of the operator while charging the hopper and the operator shall have convenient access to all controls.

The scales shall be serviced and their accuracy verified annually by a hopper scale service person licensed by the Division of Weights and Measures of the Vermont Department of Agriculture. For Vermont plants, an inspector representing the Division of Weights and Measures shall witness all testing conducted by the service person and will attach a seal to each hopper scale, provided it meets the current specifications, tolerances, and regulations adopted by the Division of Weights and Measures. Standard test masses (weights) used to determine the accuracy of hopper scales shall be certified yearly by the Division of Weights and Measures in accordance with their established standards.

The ready-mixed concrete producer shall hire a licensed hopper scale service person for annual checking and service of scales. In addition, Vermont producers shall schedule an inspection with the Division of Weights and Measures between February 15 and April 30 of each year. After April 30, Vermont plants without current seals affixed to the hopper scales will not be permitted to supply concrete to Agency projects, unless otherwise directed by the Engineer or until the seals are affixed.

Out of state concrete producers shall observe all annual hopper scale mass measurement (weighing) and seal requirements of their respective states of location.

- (d) Accuracy of Plant Batching. For weighed ingredients, accuracy of batching is determined by comparison between the desired mass (weight) and the actual scale reading; for volumetric measurement of water and admixtures, accuracy is determined by checking the quantity either by mass (weight) on a scale or by volume in a calibrated container.

Chemical admixture containers or scales shall be calibrated annually by a qualified admixture distributor representative.

Batching shall be conducted to accurately measure the desired quantities within the following tolerances:

Cement:	± 1 percent	Aggregates:	± 2 percent
Water:	± 1 percent	Chemical	± 3 percent
Mineral		Admixtures:	
Admix.:	± 1 percent		

- (e) Storage and Proportioning of Materials.

- (1) Portland Cement. Either sacked or bulk cement may be used. No fraction of a sack of cement shall be used in a batch of concrete unless the cement is weighed.

All bulk cement shall be weighed on an approved mass measuring (weighing) device. The bulk cement-weighing hopper shall be properly sealed and vented to preclude dusting during operation. Facilities shall be provided for

the sampling of cement at the batch plant, either from the storage silo or from the weighing hopper. This device shall be a permanent installation located so as to allow safe and easy access. It shall provide a sample that represents the true nature of the material being used.

- (2) Water. Water may be measured either by volume or by mass (weight). When measurement is by meter, the water meter shall be so located that the measurements will not be affected by variable pressure and temperature in the water supply line.

Measuring tanks shall be equipped with an outside tap and valve to provide for checking the setting, unless other means are provided for readily and accurately determining the amount of water in the tanks.

- (3) Aggregates. In stockpiling aggregates, the location and preparation of the sites shall be subject to the approval of the Engineer. Stockpiles shall be formed on hard well-drained areas that prevent contamination from underlying material and accumulation of excessive moisture.

Aggregates from different sources or of different gradations shall not be stockpiled together. Only rubber-tired equipment shall be permitted to operate on aggregate stockpiles.

Stockpiles shall be constructed as follows:

- a. If the stockpile is to be made using mechanical equipment (front end loader, clam bucket, rock ladder, radial stacker, or other approved equipment), the stockpile shall be made in such a manner that segregation is kept to a minimum.
- b. If the stockpile is to be made by dumping from trucks in multiple layers, each layer shall be approximately 1.2 m (4 feet) in depth. Each layer shall be completely in place before commencing the next layer. Care shall be taken that successive layers do not "cone" down over the previous layer.
- c. No equipment shall be used to haul aggregate over the stockpiled material except to deposit the material for the layer being placed. It shall be the responsibility of the Contractor that the aggregate be kept free from deleterious material or degradation.

Stockpiles shall be maintained in such a manner that twice the anticipated aggregate requirement for any Agency project placements will be on hand and available for sampling and testing at least 48 hours before mixing operations for the placements are scheduled to begin. The Engineer may modify this requirement when special aggregates are required.

Aggregates shall be handled from stockpiles or other sources to the batch plant in such a manner as to

secure a uniform grading of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used. All aggregates produced or handled by hydraulic methods and washed aggregates shall be stockpiled or binned for draining at least 12 hours before being batched. In case the aggregates contain high or non-uniform moisture content, storage or stockpile period in excess of 12 hours may be required by the Engineer.

- (4) Admixtures. The Contractor shall follow an approved procedure for adding the necessary amount(s) of admixture(s) to each batch. Admixture(s) shall be dispensed in such a manner that will ensure uniform distribution of the material throughout the batch within the required mixing period. Except as specified herein, all admixtures shall be added to the batch at the plant, unless otherwise authorized by the Engineer.

All dispensers shall include visual inspection aids such as graduated transparent cylinders. A separate dispenser shall be provided for each liquid admixture. Storage and dispensing systems for liquid admixtures shall be equipped so as to allow thorough circulation and/or agitation of all liquid in the system. This shall be required prior to the first batching of concrete for Agency projects in any calendar year and periodically thereafter at intervals not to exceed 60 calendar days for the duration of the period the plant is supplying concrete for Agency projects. If the circulation method is used, the admixture shall be circulated until a complete exchange of admixture is achieved. If an agitation method is used, the method shall be subject to approval by the Engineer.

Storage and dispensing systems for liquid admixtures shall be sufficiently protected to prevent freezing of admixtures at all times.

It shall be the responsibility of the Contractor to use the quantity of Agency approved admixtures needed to obtain concrete meeting the requirements of the Contract. All admixtures will be approved by the Engineer prior to incorporation into the mix.

- a. Air-Entraining Admixture. Air-entraining admixture shall be used as required to obtain the specified air content.
- b. Water-Reducing, Retarding, and Water-Reducing and Retarding Admixtures. The chemical admixture used in the self consolidating concrete shall be an approved chemical admixture and recommended by the admixture Manufacturer for use in self consolidating concrete. Dosages shall be those recommended by the Manufacturer, unless otherwise approved by the Engineer.
- (5) Fly Ash or GGBFS. Fly Ash or GGBFS shall be stored at the batch plant in separate storage or holding bins and shall be protected from rain and moisture.

xx. 501.05B MIXING AND DELIVERY.

- (a) General. Concrete may be mixed at the site of construction, at a central point, or wholly or in part in transit mixers. The production of concrete shall meet the requirements of AASHTO M 157 with the following additional requirements:
- (1) All concrete shall reach its final position in the forms within 1.5 hours after the cement has been added to the aggregates. When the ambient air temperature is 16°C (60°F) or above, the elapsed time may be reduced by as much as 45 minutes, as directed by the Engineer or in accordance with Subsection 501.07B(a).
 - (2) The Engineer may authorize the addition of water at or near the site, or the use of admixtures at the Contractor's expense.
 - (3) The addition of water in excess of the design water-cementitious material ratio for purposes of meeting the flow limits will not be permitted. Concrete that is not within the specified flow limits at time of placement shall not be used.
 - (4) Each load of concrete delivered at the job site shall be accompanied by a State of Vermont Batch Slip signed by the authorized Agency representative at the plant.
 - (5) The Contractor shall provide direct communication service from the site of the work to the batch plant that shall be available to the Engineer at all times during concrete operations. The cost of this service will be considered incidental to the work.
 - (6) When use of a Water-Reducing, High Range Admixture or Water-Reducing, High Range, and Retarding Admixture is specified for deck concrete, the contractor shall submit, for the Engineer's approval, the following information: Admixture manufacturer, admixture addition rate, and when the admixture is to be added to the mixture (i.e., at the plant, on project, or a combination thereof). In order to obtain the required slump, a representative from the concrete producer is required on the project to determine the final admixture dosage for each load of concrete. This representative shall be responsible for adding the Water-Reducing, High Range Admixture or Water-Reducing, High Range, and Retarding Admixture to the mixer. The dosage shall be applied by means of a dispenser, or by other means as approved by the Engineer.
 - (7) Not including initial mixing revolutions, all concrete shall be discharged into the forms before 300 revolutions of the drum or blades. The total revolutions may be increased as directed by the Engineer.

Mortar shall be mixed in an approved mixer at the site of placement or in transit mixers when approved by the Engineer. The Engineer will withdraw approval for use of transit mixers, if

necessary, to ensure a quality product or if the rate of delivery cannot be coordinated with finishing requirements.

- (b) Stationary Mixers. When a stationary mixer is used for the complete mixing of the concrete, the mixing time for mixers having a capacity of 7.5 m³ (10 cubic yards) or less shall be not less than 90 seconds. For mixers of more than 7.5 m³ (10 cubic yards) capacity, the mixing time shall be determined by the Engineer. The time is valid provided mixer efficiency tests prove the concrete is satisfactory for uniformity and strength. The plant shall be equipped with a timing device that will not permit the batch to be discharged before the predetermined mixing time has elapsed. Vehicles used in hauling shall comply with the requirements of Subsection 501.05B(c).
- (c) Transit Mixers. Transit mixers and agitators shall be subject to a periodic inspection by an authorized representative of the Agency. Such equipment shall bear a currently dated inspection "sticker" supplied by the Agency indicating that the transit mixer or agitator conforms to the Agency's requirements.

Transit mixers shall be equipped with a water-measuring tank with a visible sight gauge for use when the water for the batch is supplied from the transit mixer tank. The gauge shall be clean and legibly graduated. Measuring tanks shall be provided with outside drain valves or other means to check their calibration.

No transit mixer or agitator shall be charged with the ingredients of the concrete unless an authorized Agency representative is present.

Electrically actuated revolution counters shall be required on all transit mixers except on mixers charged at central mix plants and utilized as agitator trucks only.

Transit mixer maximum load size shall be limited to 80 percent of the manufacturer's rated mixing capacity; however legal vehicle load restrictions shall not be exceeded. The mixer shall be capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity.

Agitators, when loaded, shall also not exceed 80 percent of the manufacturer's rated mixing capacity or legal load restrictions and shall be capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity.

The Engineer may make tests for consistency (slump) of individual samples at approximately the beginning, the midpoint and end of the load. If the range of results exceeds 50 mm (2 inches), the mixer or agitator shall not be continued in use unless the condition is corrected.

All mechanical details of the mixer or agitator such as water measuring and discharge apparatus, condition of the blades, speed of rotation of the drum, general mechanical condition of the unit and clearance of the drum shall be checked before a further attempt to use the unit will be permitted.

Mixers and agitators shall be kept free from accumulation of hardened concrete or mortar. The mixing blades shall be rebuilt or replaced when any part or section is worn 19 mm (3/4 inch) or more below the original height of the manufacturer's design. A copy of the manufacturer's design, showing the dimensions and arrangements of blades shall be available to the Engineer at the plant at all times.

The mixing of concrete containing silica fume is very important and shall be mixed in accordance with the appropriate situation:

1. When silica fume is added to the batch by bags or in bulk from a silo, each batch of concrete shall be mixed for not less than 150 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as the mixing speed. The mixing and agitating speeds shall be found on the metal plate on the mixer.
2. When silica fume is blended with cement or a combination of cement and mineral admixture at the cement plant prior to being delivered to the concrete plant, each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as the mixing speed. The mixing and agitating speeds shall be found on the metal plate on the mixer. If inconsistent test results are obtained or the batch of concrete appears not to be completely mixed, the mixing revolutions shall be extended as necessary.
3. The mixing speed may need to be reduced to get proper mixing action due to the nature of the high flow of the concrete.

When a transit mixer or agitator is used for transporting concrete, mixing during transport shall be at the speed designated by the manufacturer of the equipment as agitating speed.

Transit mixers and agitators assigned to a project shall not be used for other purposes until the desired work is completed at the site, and shall arrive at the project within the cycle that anticipated placement conditions dictate. The interval between loads shall be controlled in order that concrete in place shall not become partially hardened prior to placing succeeding batches. The plant capacity and transportation facilities shall be sufficient to ensure continuous delivery at the rate required.

Before discharging transit mix from a transit mixer that has been operating at agitating speed, the drum or blades shall be rotated approximately one minute at mixing speed. The same procedure shall apply to agitators if admixtures, water or other ingredients are added to the mix in the field.

If additional mixing water is required to maintain the specified slump and is added with the permission of the Engineer, a minimum of 20 revolutions of the transit mixer drum at mixing speed shall be required before discharge of any concrete. At no time shall the total water introduced into any mix exceed the maximum water-cementitious material ratio shown in Table 501.03B-SCC.

Upon discharge of the concrete from the drum, a sufficient amount of water shall be charged into the drum to properly cleanse the drum. This water shall not be used as a part of the next succeeding batch but shall be discharged from the drum prior to the charging of the drum with the concrete ingredients. The drum shall be completely emptied before receiving materials for the succeeding batch. Retempering of concrete or mortar that has partially hardened, by remixing with or without additional materials, shall not be permitted.

xx. 501.06B FIELD TESTS. The Contractor shall provide assistance, equipment, materials, and curing for field sampling and testing as required by the Engineer. All costs shall be included in the Contract unit prices under Section 631. The Engineer shall perform all sampling and testing.

(a) Sampling. Sampling for tests shall be taken in accordance with AASHTO T 141 or other procedures approved by the Agency.

(b) Flow Tests. Procedure and Measurement: A standard slump cone will be used in the slump flow test. However, the cone shall be inverted and concrete placed in the slump cone shall not be rodded.

A base plate, minimum of 32 in. in diameter will be used. Moisten the base plate and inside of slump cone. Place the base plate on stable and level ground. Fill the slump cone with a scoop dropping the concrete into the center of the mold from a distance of 6 inches above the top of the cone. Do not tamp. Strike off the concrete level with the top of the slump cone. Remove any surplus concrete from around the base of the cone. Raise the slump cone vertically and allow the concrete to flow out freely. Measure the final diameter of the slump flow in two perpendicular directions. Calculate the average of the two measured diameters. This is the flow. The concrete flow will be tested on the first 2 loads and at a minimum of every 40 cubic yards, including the first two loads.

(c) Air Content Tests. Air content tests shall be made in accordance with the pressure method in AASHTO T 152, for acceptance or rejection. The air meter shall be filled in one lift using a scoop and dropping the concrete into the center of the pot from a distance of 6 inches from the top edge of the pot with no rodding and only tap the sides if needed prior to running the test.

(d) T20 Spread Flow. Procedure: From the center of the base plate a 20 in. diameter ring is marked. Once the inverted slump cone is raised, the time is measured for the mix to reach the 20 in. diameter. The time to reach this mark should be between 2-5 seconds. The T20 will be done every time the flow test is run.

(e) Visual Stability Index (VSI). This test is to be executed in accordance with Precast/Prestress Concrete Institute TR-06-03 Section 3.2.3 Part D and Appendix A13.0. The mix, according to the Visual Stability Index Test, shall provide a VSI rating no greater than 1.0. The VSI will be done every time the flow test is run.

VSI Rating = 0.0 indicates no evidence of segregation in the slump flow patty, in the mixer drum, or in the sampling wheelbarrow.

VSI Rating = 0.5 indicates no mortar halo or aggregate pile in the slump flow patty, but very slight evidence of bleed or air popping on the surface of the SCC in the mixer drum or sampling wheelbarrow.

VSI Rating = 1.0 indicates no mortar halo or aggregate pile in the slump flow patty but some slight bleed or air popping on the surface of the SCC in the mixer drum or sampling wheelbarrow.

VSI Rating = 1.5 indicates just noticeable mortar halo and/or a just noticeable aggregate pile in the slump flow patty and noticeable bleeding in the mixer drum and sampling wheelbarrow.

VSI Rating = 2.0 indicates a slight mortar halo (<0.4 inch) and/or aggregate pile in the slump flow patty and highly noticeable bleeding in the mixer drum and or sampling wheelbarrow.

VSI Rating = 3.0 indicates clearly segregating by evidence of large mortar halo (>0.4 inch) and/or large aggregate pile in the center of the SCC patty and a thick layer of paste on the surface of the resting SCC in the mixer drum or sampling wheelbarrow.

(f) Strength Tests.

- (1) General. Strength tests shall be by test cylinder. A test shall be the average of the strengths of at least two specimens from the same sample of concrete.

The number of strength tests shall be as follows:

- a. A minimum of one test shall be required for each project.
- b. One test shall be required for each placement of 75 m³ (100 cubic yards) or fraction thereof except that a test will not be required on placements of less than 7.5 m³ (10 cubic yards).
- c. The Engineer may order additional tests as deemed necessary.

Test cylinders shall be made in accordance with AASHTO T 23, except the cylinders shall be filled in one lift using a scoop and dropping the concrete into the center of the mold from a distance of 6 inches from the top edge and shall not be rodded, vibrated or tapped on the sides unless needed, and tested for compressive strength in accordance with AASHTO T 22.

(2) Categories of Testing.

- a. Quality acceptance testing utilizes specimens to determine the compliance with strength requirements for the project. All test cylinders used for quality acceptance testing shall be stored in an approved

curing box until they are shipped to the central laboratory.

Quality acceptance testing shall be performed at 28 days except as follows:

When 90 percent of the 28-day design compressive strength requirement is obtained at 14 days, the 28-day testing may be omitted when approved by the Engineer.

- b. Job control testing utilizes specimens to determine whether adequate curing procedures are being followed and for early form removal or early loading of structure. All job control specimens shall be stored on the structure and shall receive the same curing and protection from the elements as the concrete that they represent up until 24 hours before anticipated testing of specimens.
- c. Specimen curing requirements shall be as follows:

Number of Specimens	Category	Location of Curing
2	Quality Acceptance - 28 days	Curing Box
2	Quality Acceptance - 14 days	Curing Box
2	Job Control - Applicable Curing Period	On Structure

- xx. 501.07B WEATHER AND TEMPERATURE LIMITATIONS-PROTECTION OF CONCRETE. The temperature of the concrete just prior to placement in the forms shall not be less than 10°C (50°F) nor more than 29°C (85°F). Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits.

Placement and curing procedures shall be approved by the Engineer prior to actual placement.

- (a) Hot Weather Concrete. Placement of concrete during hot weather may be limited by the Engineer based on an assessment of temperature, humidity, wind velocity, and sun radiation conditions.

No concrete shall be placed when the ambient air temperature is, or is expected to be, above 32°C (90°F).

- (b) Cold Weather Concrete.

- (1) General. When it is necessary to place concrete or mortar at or below an ambient air temperature of 5°C (40°F), or whenever in the opinion of the Engineer, ambient air temperatures may fall below this limit within the curing period, the mixing water, aggregates, or both, shall be heated and the work protected by adequate housing, covering and heating, or insulated forms.

When using concrete with GGBFS or fly ash, strength gain may be retarded in cool weather. When the ambient air temperature is 10°C (50°F) or less, the Resident Engineer,

after consultation with the Agency's Structural Concrete Engineer, may require special preparation and protection of the concrete and its components and that the curing period, as indicated in Subsection 501.17B, be extended.

The Contractor shall have on the job, ready to install prior to starting any placing operation adequate equipment meeting the approval of the Engineer for heating and protecting the materials and freshly placed concrete.

No concrete shall be placed when the temperature of the surrounding atmosphere is lower than -12°C (10°F) except by written permission of the Engineer.

No concrete shall be placed in any superstructure or thin section under cold weather conditions - ambient air temperature 5°C (40°F) or less - without written permission of the Engineer.

- (2) Heating of Materials. The heating equipment shall be capable of heating the materials uniformly. Aggregates shall not be heated over 66°C (150°F). If water is heated in excess of 66°C (150°F), the water shall be mixed with the aggregate before the cementitious material is added. The materials shall be heated in such a manner, for such a period of time, and in such quantity as to produce concrete having a uniform temperature within the specified temperature range at the time of placing. Materials containing frost or frozen lumps shall not be used. Stockpiled aggregates may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or oil flame or on sheet metal over fire. When aggregates are heated in bins, steam-coil or water-coil heating, or other methods that will not be detrimental to the aggregates, may be used.
- (3) Antifreeze Compounds. Salts, chemicals, or other foreign materials shall not be used in the mix to lower the freezing point of the concrete.
- (4) Preparation of Forms. Before placing concrete; ice, snow, and frost shall be completely removed from the forms.

Concrete shall not be placed on a surface that is frozen or on one that contains frozen materials. The frozen surface shall be completely thawed the day previous to the placing of the concrete and shall be kept continuously thawed until the concrete is poured.

- (5) Housing. The Contractor shall furnish sufficient canvas and framework or other suitable type of housing to enclose and protect the structure. The sidewalls of the housing for protecting abutments and piers shall be completely built before the placing of any concrete. They shall be constructed independent of the forms and bracing and with space large enough to provide for form removal and initial finishing of concrete as required during the heating period. Joists adequately spaced to prevent sagging shall support the top of the housing. The housing shall be completely built and the heat applied before placing any concrete.

When the temperature readings taken on or in the concrete indicate the temperature of the concrete may fall below 10°C (50°F), the Contractor shall, without exposing the concrete, immediately build the necessary enclosures around the area involved and supply heat to ensure curing conditions as specified in Subsection 501.17B. The enclosure shall be removed when directed by the Engineer.

- (6) Heating the Enclosure. The enclosure shall be heated in such a manner that the temperature of the concrete and the enclosed air shall be kept above 10°C (50°F) for the designated curing period. During this time, the concrete shall be kept continuously wet to provide proper curing. After the curing period, the temperature shall be gradually lowered to that of the surrounding atmosphere, taking at least 48 hours for the transition but at no time exceeding a 0.5°C (1°F) change per hour.

When dry heat is used, a means of maintaining atmospheric moisture shall be supplied. The Contractor shall maintain adequate fire protection and shall provide personnel to keep the heating units in continuous operation. When operations are in locations where water levels may fluctuate, the supports for heating equipment shall be built so that the heating equipment can be raised and steam lines shall be placed above the probable high water level.

- (7) Temperature Records. The Contractor shall provide an automatic temperature recorder to continuously record concrete curing temperatures and ambient air temperatures for the entire curing period. Recording thermometers shall be capable of measuring and recording temperatures within the range of -20 to 100°C (-4 to 212°F) with maximum graduations of 5°C (10°F).

Temperature sensors shall be carefully placed within the curing enclosure or the concrete to ensure that temperatures are measured at typical locations. Recorder accuracy shall be certified once every 12 months, and the certificate displayed with each recorder. The Engineer may make random checks of each recorder. On each recorder chart, the Engineer shall indicate the location of the representative concrete, date of placement, and time of start and finish of the record. At the completion of the curing period, the recorder charts shall be given to the Engineer.

When the Contractor places concrete at more than one location within the specified curing period, additional recorders shall be furnished to provide temperature records at each location.

- (8) Insulated Forms.

- a. General. When authorized by the Engineer, the concrete forms shall be completely covered with an approved insulating material.

To prevent loss of heat, immediately upon completion of concrete placement, all exposed surfaces shall be covered with a double thickness of burlap or cotton mats. This covering will be designed to prevent loss of moisture from the concrete and then covered with sufficient hay, straw, or insulated mats to prevent loss of heat from the concrete

during the curing period. Tarpaulins shall be used as additional cover when directed.

To prevent excessive heat build up, provisions shall be made for loosening of insulation to provide ventilation and the subsequent cooling of the concrete if the surface temperature of the concrete approaches 38°C (100°F). In no case shall this temperature drop below 10°C (50°F) during the curing period.

The following table shall be used as a guide in determining the outside temperature at which concrete walls, piers, abutments, or floor slabs above ground shall be protected with blanket insulation.

TABLE 501.07B
MINIMUM AIR TEMPERATURE ALLOWABLE
FOR ALL CLASSES OF CONCRETE

Concrete Thickness		Insulation Rating of R-4		Insulation Rating of R-8	
mm	in.	°C	°F	°C	°F
150	6	5	40	-2	29
300	12	-2	28	-18	0
450	18	-11	13	-34	-29
600	24	-18	0	-48	-55
900	36	-33	-27	---	---
1200	48	-40	-40	---	---
1500	60	-40	-40	---	---

- b. Concrete With Water-Reducing, High Range Admixture or Water-Reducing, High Range, and Retarding Admixture.

These admixtures are not to be used if the ambient temperature is below 10°C (50°F) at the time of placement, or if it is forecasted to drop below 10°C (50°F) and with in 24 hours after completion of the placement, unless hot water is used or the concrete temperature is maintained in accordance with 501.07B(b), subparts (5) and (7).

- xx. 501.08B. THIS SUBSECTION RESERVED.

- xx. 501.09B FORMS. If required by the Engineer, falsework and form work plans shall be submitted by the Contractor for approval before being used. In all cases, the Contractor shall be responsible for, and shall make good, any injury arising from inadequate forms. The Engineer shall inspect and approve all forms prior to concrete placement. Unless the Plans specifically call for the use of stay-in-place forms, such forms shall not be used in the construction of any superstructure or bridge deck. Stay-in-place forms will only be allowed in the construction of substructure elements in locations where the Engineer agrees that removable formwork is impossible to use.

- (a) Falsework. In general, falsework that cannot be founded upon a solid footing shall be supported by falsework piling.

The Engineer may require the Contractor to employ screw jacks or hardwood wedges to take up any slight settlement in the falsework.

- (b) Construction. The Contractor shall design falsework and forms for full hydrostatic head pressure of the concrete. Forms shall be mortar tight and sufficiently rigid to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations including vibration, which should not be needed. Forms shall be constructed and maintained so as to prevent the opening of joints due to shrinkage of the lumber. Sealer/caulking as approved by the Engineer shall be used where forms abut structural steel members, such as top flanges of beams and girders, etc.

Forms shall be filleted and chamfered at all sharp corners, unless otherwise shown on the Plans or directed by the Engineer, and shall be given a bevel or draft in the case of all projections, such as girders and copings to ensure easy removal.

Falsework and forms for slabs, beams, and girders shall be constructed to provide camber shown on the Plans or ordered by the Engineer.

- (c) Form Lumber. All face form lumber for exposed surfaces shall be concrete form exterior grade plywood, not less than five ply and not less than 19 mm (3/4 inch) in thickness. In computing stud spacing, plywood shall be considered 25 mm (1 inch) lumber provided that the grain of three of the plies runs perpendicular to the studs.

Form lumber for unexposed surfaces may be dressed tongue and groove, dressed shiplap, or square edge sized four sides of uniform width and thickness. It shall have a minimum thickness, after finishing, of 19 mm (3/4 inch).

All form lumber shall be sound and free from loose or rotten knots, knotholes, checks, splits, or waness showing on the surface in contact with the concrete. Used face form lumber, having defects or patches which may produce work inferior to that resulting from new material, shall not be used.

Other form material may be used with permission of the Engineer.

- (d) Studs. Studs shall have a minimum nominal size of 51 by 152 mm (2 x 6 inches), except that 51 by 102 mm (2 x 4 inch) nominal size studs may be used for pours not exceeding 1.1 m (3 1/2 feet) in height. Studs shall be spaced center to center not more than 16 times the actual thickness of the form lumber.

Studs shall be capped at the top with a plate of not less than 51 by 152 mm (2 x 6 inches) nominal size, carefully selected as to straightness. All joints in plates shall be scabbed 1.2 m (4 feet) each way to provide continuity.

- (e) Wales. All wales shall be at least 102 by 152 mm nominal size (4 x 6 inches, minimum section) or equivalent and shall be scabbed at least 1.2 m (4 feet) each side of joints to provide continuity. A row of wales shall be placed within 150 mm (6 inches) of the bottom of each pour unless studding can be extended below the bottom of the pour and secured by wales fastened to ties in the previous pour. Wales shall have a maximum spacing of 900 mm (36 inches).

- (f) Form Ties. Metal ties or anchorages within the forms shall be constructed to permit their removal to a depth of at least 25 mm (1 inch) from the face without injury to the concrete.

Wire ties shall be used only in locations where they will not extend through surfaces exposed in the finished work and then only when authorized.

The cavities shall be filled with cement mortar in accordance with Subsection 501.16B.

- (g) Walls. Where the bottom of the form is inaccessible, the lower form boards shall be left loose or other provisions made so that extraneous material may be removed from the form immediately before placing the concrete.
- (h) Surface Treatment. All forms shall be treated with commercial form oil prior to placing reinforcement and wood forms shall be saturated with water immediately before placing the concrete. Any material that will adhere to or discolor the concrete shall not be used.
- (i) Metal Forms. The specifications for forms regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse, and oiling also apply to metal forms. The metal used for forms shall be of such thickness that the forms will remain true to shape. All bolt and rivet heads shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms that do not present a smooth surface or do not line up properly shall not be used. Care shall be exercised to keep metal forms free from rust, grease, or other foreign matter.
- (j) Removal of Forms. The forms, or their supports, for any portion of a structure shall not be removed without the approval of the Engineer. Forms under arches, beams, floor slabs, pier caps, or special designs may be removed upon approval of the Engineer after the concrete attains 85 percent of the minimum compressive strength as specified in Table 501.03B-SCC.

If field operations are not controlled by cylinder tests, the following periods for removal of forms and supports, exclusive of days when the ambient air temperature is below 5°C (40°F), may be used as a guide:

Arch Center	14 Days
Centering under Beams	14 Days
Supports under Flat Slabs	14 Days
Floor Slabs	14 Days
Vertical Wall Surfaces	24 Hours
Columns	24 Hours
Sides of Beams	12 Hours
Top Slabs R.C. Box Culverts	14 Days

When field operations are controlled by strength tests, the removal of forms and supports may begin when the concrete is found to have the required strength. In no case shall the number of curing days be less than specified in Table 501.17B-SCC.

Methods of form removal likely to cause overstressing of the concrete shall not be used. Forms and their supports shall not be removed without approval. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own dead load.

XX. 501.10B PLACING CONCRETE.

- (a) Workforce. The Contractor shall have sufficient skilled personnel at all times during the concreting operations to properly place, consolidate, and finish the concrete. If, in the opinion of the Engineer, the Contractor does not have sufficient skilled personnel to handle the concrete properly, the Engineer may postpone the start of the concreting operations until such time as the Contractor has remedied this condition.
- (b) Pre-placement Meeting. For the self consolidating concrete placement, or as required by the Engineer, a pre-placement meeting shall take place at least 7 calendar days before concrete placement. The pre-placement meeting shall be attended by all participating parties, including but not limited to, the Contractor's Project Superintendent, the Engineer, the Concrete Engineer and the concrete producer.
- (c) Placement Limitations. All concrete shall be placed in daylight, unless otherwise authorized in writing by the Engineer. Authorization to place concrete at any other time shall not be given unless an adequate lighting system is provided prior to beginning the concreting operation.

Concrete shall not be placed under adverse environmental conditions that the Engineer determines will interfere with acceptable placement and/or finishing operations.

Concrete shall not be placed until the depth and character of the foundation, the apparent adequacy of the forms and falsework and the placing of the reinforcing steel have been approved by the Engineer. The interior of the forms shall be clean of all debris before concrete is placed.

The Contractor shall submit to the Engineer a schedule of batching, delivery, and placement prior to the beginning of the concreting operations. The Contractor shall comply with the requirements of Subsection 501.05B.

Equipment and tools necessary for handling materials and performing all parts of the work shall meet the approval of the Engineer as to design, capacity, and mechanical condition and must be on the site before the work is started. Any equipment, in the judgment of the Engineer which proves inadequate to obtain results prescribed, shall be improved or new equipment substituted or added.

For simple spans, concrete should be deposited by beginning at the lower end of the span and working toward the upper end. Concrete in girders shall be deposited uniformly for the full length of the girder and brought up evenly in horizontal layers. For continuous spans, where required by design considerations,

the concrete placing sequence shall be as shown on the Plans or in the Special Provisions.

Concrete shall not be deposited in the forms more than 20 feet from its final position.

Concrete shall not be deposited in running water.

The rate of placing the concrete shall be so regulated that no excessive stresses are placed on the forms. Concrete in all slabs, decks, girders, or ribs of arches shall be placed in one continuous operation, unless otherwise specified.

Concrete shall be placed in continuous horizontal layers, the thickness of which shall not exceed 450 mm (18 inches), unless otherwise directed by the Engineer. The maximum time between each successive load will be 30 minutes. Each succeeding layer shall be placed before the underlying layer has taken initial set and shall be consolidated in a manner that will eliminate any line of separation between the layers. When it is necessary, by reason of any emergency, to place less than a complete horizontal layer at one operation, such layer shall terminate in a vertical bulkhead.

After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of projecting reinforcing bars.

- (d) Placement of Overlays. Unless otherwise shown on the Plans, existing expansion joints and dams shall be maintained through the overlay. A bulkhead equal in width to that of the joint shall be installed to the required grade and profile prior to placing the overlay material. Expansion dam treatment shall be as shown on the Plans.

Screed rails shall be placed and fastened in position to ensure finishing the new surface to the required profile. Supporting rails shall be anchored in such a manner as to provide horizontal and vertical stability. Screed rails shall not be placed so as to create a recess in the overlay surface and shall not be treated with form oil.

A construction dam or bulkhead shall be installed in case of major delay in placement. During minor delays of one hour or less, the end of the placement shall be protected from drying with several layers of wet burlap.

For a period of at least one hour before the placement of overlay material, the prepared surface shall be flooded with water. After removal of all free water, the overlay material shall be deposited on the damp surface and manipulated so as to coat the horizontal and vertical surfaces to be covered. The rate of progress shall be controlled so as to prevent the drying of previously deposited material.

- (e) Use of Chutes. Chutes, troughs, and pipes used in placing concrete shall be arranged so as to avoid segregation of the materials and the displacement of the reinforcement and shall be approved by the Engineer. Aluminum chutes, troughs, or pipes will not be permitted.

All chutes, troughs, and pipes shall be kept clean and free of hardened concrete by thoroughly flushing with water after each run. Open troughs or chutes shall be either of metal or metal lined and shall extend as nearly as possible to the point of deposit. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

Dropping of unconfined concrete more than 5 feet

(f) Use of Vibrators. Unless otherwise specified, the concrete shall not be consolidated with mechanical vibrators.

- (1) If the Engineer request use of a vibrator it shall be of an approved type and design, operating within the concrete. It shall be used as little as possible to avoid segregation of the self consolidating concrete. When required, vibrating may be supplemented by hand spading with suitable tools to ensure proper and adequate consolidation. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and imbedded fixtures and into corners and angles of the forms to produce surfaces free of imperfections. Vibrators shall not be used as a means to cause concrete to flow or run into position instead of placing. The vibration at any point shall be of sufficient duration to accomplish consolidation but shall not be prolonged to the point where segregation occurs.

Vibrators shall be used in concrete with reasonable care and shall not come in contact with structural steel, reinforcing steel, ties, forms, or partially set or hardened concrete at any time. Vibrators used in concrete with epoxy coated reinforcing steel shall have non-metallic or rubber coated heads. Vibrating machines shall at no time be left running unattended in the concrete.

When it is necessary by reason of an emergency to discontinue the placing of a monolithic section, the use of vibrators shall cease. Vibrators shall not again be used until a sufficient depth of fresh concrete is placed to prevent any possibility of the effect of vibration on the concrete already in place and in no case shall this depth be less than 600 mm (2 feet).

The number of vibrators used shall be ample to consolidate the incoming concrete immediately after it is deposited in the form. The Contractor shall have at least one spare vibrator in serviceable condition at the site of the structure in which more than 20 m³ (25 cubic yards) of concrete are to be placed. The vibrators shall be capable of transmitting vibration to the concrete at frequencies of not less than 4500 impulses per minute under load. The vibration shall be of sufficient intensity and duration to cause plasticity, settlement, and complete consolidation of the concrete without causing segregation. The vibrator shall visibly affect a mass of concrete of 50 mm (2 inch) slump over a radius of at least 450 mm (18 inches).

- (g) Blasting Operation. All blasting operations within 60 m (200 feet) of any concrete work shall be completed prior to the placement of the concrete. Regardless of the above limitation on blasting operations, the Contractor shall be responsible for any damage resulting from blasting operations.

XX. 501.11B DEPOSITING CONCRETE UNDER WATER.

- (a) General. Concrete shall not be deposited under water except upon approval of the Engineer and shall be subject to the following modifications:
- (1) After the specified concrete mix has been designed, the cement shall be increased by 56 kg/m³ (94 pounds per cubic yard) in all classes of concrete and no additional compensation will be allowed for the extra cement used. The maximum water/cementitious material ratio for the mix shall remain the same as that determined by the required amount (Table 501.03B-SCC or approved mix) of cementitious material for the mix.
 - (2) The slump shall be 200 mm, +/- 25 mm (8 inches, +/- 1 inch) after the addition of admixtures.
- (b) Placement. Concrete deposited under water shall be carefully placed in still water by use of a tremie hopper and tube, and shall not be disturbed after being deposited.

In no case shall vibrators be used for underwater concrete where their use will incorporate free water into the mix.

The placement shall be continuous to the elevations shown on the Plans and the resulting concrete shall be monolithic and homogeneous.

Concrete shall not be deposited in water having a temperature of 2°C (35°F) or below. When the water temperature is between 2 and 5°C (35 and 40°F), the mixing water, the aggregates, or both shall be heated and placed as specified in Subsection 501.07B(b).

A tremie shall consist of a watertight tube with a diameter of not less than 250 mm (10 inches). The tremie hopper shall have a capacity of at least 0.4 m³ (1/2 cubic yard). When a batch is dumped into the hopper, the flow of the concrete shall be induced by slightly raising the discharge tube, always keeping it in the concrete.

The discharge tubes for tremies shall be equipped with a device that will prevent water from entering the tube while charging the tube with concrete. Such tubes shall be supported to permit free movement of the tubes over the entire work surface and to permit rapid lowering, when necessary to retard or stop the flow of concrete from the tube.

Tubes shall be kept continuously submerged in concrete during discharge. The depth that the tube is submerged in concrete and the height of the concrete in the tube will be sufficient to prevent water from entering the tube. The Contractor shall continuously monitor the difference in elevation between the top of the concrete and the end of the discharge tube.

Horizontal movement of discharge tubes through the concrete will not be allowed.

- XX. 501.12B PUMPING. Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall be suitable in kind and adequate in capacity for the work. The pump shall be capable of pumping concrete within the specified slump limits. The use of aluminum pipe as a conveyance for the concrete will not be permitted.

The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. The equipment shall be arranged so that no resulting vibrations may damage freshly, placed concrete.

- xx. 501.13B CONSTRUCTION JOINTS.

- (a) Location of Construction Joints. Joints shall be formed at the location shown on the Plans. Any variation or new location of joints shall require written permission of the Engineer. Feather edges at construction joints will not be permitted and joints shall be so formed with inset form work that each layer of concrete will have a thickness of not less than 150 mm (6 inches).
- (b) Joining Fresh Concrete to Previously Set Concrete. In joining fresh concrete to concrete that has hardened, the surface shall be roughened in such a manner that will not leave loosened particles or damaged concrete at the surface and be thoroughly cleaned of all laitance, loose, and foreign material. Immediately prior to the placing of the new concrete, the surface shall be saturated with water. When shown on the Plans or ordered by the Engineer, the surface shall be thoroughly coated with a very thin coating of mortar or neat cement grout and all forms drawn tight against the face of the concrete. The neat cement mortar or bonding agent shall not be allowed to dry out before being covered with fresh concrete.
- (c) Keys. Suitable keys shall be formed at construction joints. Unless otherwise directed by the Engineer, these keys shall be of the type and detail shown on the Plans.
- (d) Filled Construction Joints. Filled construction joints shall contain a preformed cork joint filler or other preformed joint filler that may be shown in the Contract Documents. Joint filler shall be cut to fit exactly and shall completely fill the space that is shown on the Plans. Where a pour grade or caulking grade filler is indicated to be used in the joints, that portion of the joint to be filled shall be formed with a separate material (other than the preformed joint filler) that can easily be removed prior to placement of the above indicated filler.
- (e) Water Stops. Approved water stops shall be placed at locations shown on the Plans. They shall form continuous watertight joints.

- (f) Bond Breakers. Bond breakers shall be one of the following materials as shown on the Plans: asphalt-treated felt, pipe insulation, or tar emulsion.
- xx. 501.14B EXPANSION JOINTS. All joints shall be constructed according to details shown on the Plans.
- (a) Filled Compression and Expansion Joints. Filled compression and expansion joints shall be made with a preformed self-expanding cork joint filler or other preformed joint filler that may be shown in the Contract Documents. Joint filler shall be cut to fit exactly and shall completely fill the space that is shown on the Plans. Where a pour grade or caulking grade filler is indicated to be used in the joint, that portion of the joint to be filled shall be formed with a separate material (other than the expansion joint filler) that can easily be removed prior to placement of the above indicated filler.
- (b) Special Types of Expansion Joints. Special types of expansion joints may be used when so shown on the Plans or ordered by the Engineer.
- XX. 501.15B. THIS SUBSECTION RESERVED.
- XX. 501.16B CONCRETE FINISHING. Unless otherwise specified, the surface of formed concrete shall be finished immediately after form removal.

All concrete surfaces shall be given a dressed finish. If further finishing is required, exposed surfaces shall be given a rubbed finish. Other finish classes may be shown on the Plans for designated surfaces.

- (a) Dressed Finish. The dressed finish work shall begin within 12 hours after removal of forms and shall continue until completed. All fins and irregular projections shall be removed from all surfaces except from those that are not to be exposed. On all surfaces, the cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges, and other defects shall be thoroughly cleaned, saturated with water, and carefully pointed and trued with a mortar composed of the same type of cement and fine aggregate and mixed in the same proportions used in the class of the concrete being finished. Mortar used in pointing shall be not more than one hour old. The mortar patches shall be cured a minimum of 72 hours in accordance with Subsection 501.17B. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint shall be left exposed to its full length with clean and true edges.

All surfaces that cannot be repaired to the satisfaction of the Engineer shall be "rubbed" as specified for a Rubbed Finish.

- (b) Rubbed Finish. After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing to thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of the same type of cement and fine sand mixed in proportions used

in the concrete being finished. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks.

- (c) Float Finish. This finish for horizontal surfaces shall be achieved by placing an excess of material in the form and removing or striking off the excess with a template, forcing the coarse aggregate below the mortar surface. Creation of concave surfaces shall be avoided. After the concrete has been struck off, the surface shall be made uniform by longitudinal or transverse floating.

When the concrete has hardened sufficiently, the surface shall be given a broom finish, burlap drag finish, or left smooth as determined by the Engineer.

xx. 501.17B CURING CONCRETE.

- (a) General. Water for use in curing concrete shall conform to the provisions of Subsection 745.01.

Effective cure time shall be only the time that the concrete has been maintained in a wet condition with the concrete surface temperature above 10°C (50°F).

Regardless of the curing medium specified, the entire surface of the newly placed concrete shall be kept damp. This shall be achieved by applying water with a nozzle that atomizes the flow so that a mist and not a spray is formed. The moisture shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate in a quantity sufficient to cause a flow or washing of the surface.

The atomized flow shall be applied continuously until the surfaces can be covered by the specified curing mediums. For bridge barriers, curbs and sidewalks the curing method shall be applied within 15 minutes of the completion of the finishing process.

TABLE 501.17B-SCC
CURING OF CONCRETE COMPONENTS

Type of Construction	Curing Methods	Curing Period Days
Substructure	501.17(b)(1), (2), (3), (5), (7), (8)	7
Superstructure	501.17(b)(2), (8)	10
Retaining Walls	501.17(b)(1), (2), (5), (6), (8)	7
Headwalls	501.17(b)(1), (2), (5), (6), (8)	7
Sidewalks, Curbs, and Gutters	501.17(b)(2), (8)	7

(b) Methods of Curing. All exposed surfaces of newly placed concrete shall be cured by one of the following specified methods:

- (1) Water Curing. Curing with water shall be by continuously sprinkling or flooding of all exposed surfaces for the entire required curing period.
- (2) Burlap Curing. The entire exposed surface of the concrete shall be covered with two layers of approved burlap that has been pre-soaked with water. The burlap shall then be covered with a lapped layer of white polyethylene sheeting. Once the concrete superstructure has hardened sufficiently, a stream of water (per soaker hose or other device) shall be continuously applied under the polyethylene sheeting until the cure period is complete.
- (3) Sand Cover. The entire exposed surface of the concrete shall be covered with at least 75 mm (3 inches) of approved sand that shall be kept wet for the entire curing period.
- (4) White Polyethylene Sheeting. The entire exposed surface of the concrete shall be covered with a blanket of white polyethylene sheeting, maintained and fastened to provide a nearly airtight condition in contact with the surface where possible. If, in the opinion of the Engineer, this cover is not adequately provided or maintained to ensure the proper conditions for concrete cure, then white polyethylene sheeting cure shall be terminated and another method substituted.
- (5) White Burlap-Polyethylene Sheeting. The entire exposed surface of the concrete shall be covered with a blanket of white burlap-polyethylene sheeting. The burlap shall be thoroughly dampened prior to placing and shall be placed next to the concrete. All joints shall be lapped a minimum of 450 mm (18 inches). The burlap shall be kept damp throughout the curing period.
- (6) Membrane Forming Curing Compound. White pigmented or fugitive dye membrane curing solution may be used for curing concrete in minor drainage structures. All other use of curing compound shall be approved in writing by the Engineer. When membrane curing is used, the exposed concrete shall be thoroughly sealed immediately after the

free water has left the surface. The concrete inside the forms shall be sealed immediately after the forms are removed and necessary finishing has been done. The solution shall be applied in one or two separate applications. If the solution is applied in two increments, the second application shall follow the first application within 30 minutes. Satisfactory equipment shall be provided, together with means to properly control and ensure the direct application of the curing solution on the concrete surface so as to result in a uniform coverage of the surface area at the rate of 275 mL/m² (1 gallon for each 150 square feet).

If rain falls on the newly coated concrete before the film has dried sufficiently to resist damage, or if the film is damaged in any other manner, a new coat of the solution shall be applied to the affected portions equal in curing value to that specified above.

Should the surface be subject to continuous injury or the use of curing compound result in a streaked or blotchy appearance, the method shall be stopped and water curing applied.

Only curing compounds approved by the Agency's Materials and Research Section may be used.

- (7) White Polyethylene Sheeting with Sand Cover. This method may be used only when approved by the Engineer and shall conform to the requirements of part (b)(4) above. The airtight condition shall be obtained by the addition of a uniform sand cover at a minimum depth of 50 mm (2 inches).
- (8) Pre-dampened cotton mats. The entire exposed surface of the concrete shall be covered with a blanket of cotton mats that has been pre-dampened with water. The mats shall be maintained in a damp condition until the curing period is complete.
- (c) Bridge Decks. For bridge decks the curing method shall promptly follow the screed machine, within a maximum lag time of 10 minutes and without interruption.

If, in the opinion of the Engineer, the Contractor's curing procedure is not producing an adequate cure, the Engineer may direct a change in the cure method at no additional costs to the Agency.

xx. 501.18B LOADING OF CONCRETE. After the concrete has been placed and the finishing operations concluded, it shall not be walked on or disturbed in any manner, including removal of forms, for a minimum period of 18 hours. If retarder is used as an admixture, this minimum period may be extended as directed by the Engineer.

- (a) Substructure. No backfill material shall be placed against a newly completed structure unless the concrete cure is maintained in accordance with Table 501.17B-SCC, and until the field cured test cylinders have attained 85 percent of the compressive strength specified in Table 501.03B-SCC. However, the Contractor may erect forms for subsequent concrete placement on footings after 18 hours have elapsed from the time that the footing

placement was completed, provided the concrete has sufficient strength to allow it to be worked on without damage, and proper cure is maintained.

Static loads, such as forms, reinforcing steel, or other materials necessary for construction, may be placed on any concrete after it has been in place 72 hours, or a compressive strength of 12.4 MPa (1800 pounds per square inch) has been obtained, provided proper curing is maintained. Superimposed loads from subsequent concrete pours will not be allowed on any substructure unit or section in place until the field cured test cylinders have attained 85 percent of the compressive strength specified by Table 501.03B-SCC, and provided curing of the supporting section is maintained in accordance with Table 501.17B-SCC.

- (b) Superstructure. Static loads, such as forms, granite curbing, cast-in-place concrete curb, and other materials necessary for deck construction, may be placed on deck concrete as long as the field cured test cylinders for this concrete have attained 85 percent of the compressive strength specified in Table 501.03B-SCC, the proper curing is maintained, and the materials are spread out uniformly to avoid point loading.

The Contractor shall keep bridge floors free of all motor vehicles, transit mixers, and heavy construction equipment until the curing period is satisfactorily completed, the field cured test cylinders for the bridge floor concrete have attained the compressive strength specified in Table 501.03B-SCC, and the field cured test cylinders for the curb concrete have attained 85 percent of the compressive strength specified in Table 501.03B-SCC.

- (c) Vertical Joint. Concrete shall not be placed against a vertical construction joint until the previously placed concrete has been in place a minimum of 72 hours.

The Contractor must not allow loads that are in excess of the legal loads permitted by the laws of the State to travel over the completed structure, except with written permission of the Engineer.

- XX. 501.19B METHOD OF MEASUREMENT. The quantity of Concrete, High Performance B (MOD) to be measured for payment will be the number of cubic meters (cubic yards) of the class of concrete specified in the complete and accepted work, as determined by the prismoidal method using dimensions shown on the Plans or as directed by the Engineer, including the volume of precast concrete stay-in-place forms, but excluding the volume of steel or other stay-in-place forms and form filling materials. No deductions will be made for the volume of concrete displaced by steel reinforcement, structural steel, expansion joint material, scuppers, weep holes, conduits, tops of piles, scoring, chamfers or corners, inset panels of 38 mm (1 1/2 inches) or less in depth, or any pipe less than 200 mm (8 inches) in diameter.
- XX. 501.20B BASIS OF PAYMENT. The accepted quantities of the Contract items specified will be paid for at the Contract unit prices. Payment will be full compensation for performing the work specified, including satisfactory finishing and curing, and for furnishing all forms, materials including joint filler and bond breaker, labor, tools,

admixtures, equipment, trial batches, and incidentals necessary to complete the work.

The cost of heating materials and protecting the concrete against cold weather, and any additional cost for cement, will not be paid for separately but will be considered incidental to the Contract unit prices for Section 501B.

The costs of providing automatic temperature recording units to monitor temperatures as required under Subsection 501.07B(b)(7) will be considered incidental to and paid for under the Contract item Testing Equipment - Concrete.

The cost of furnishing testing facilities and supplies at the batch plant and the setting of inserts, bench marks, and bridge plaques furnished by the Agency will not be paid for separately but will be considered incidental to the Contract unit price(s) for High Performance concrete.

Costs for all materials, labor and incidentals for steel or other stay-in-place forms and form filling materials will not be paid for separately, but will be considered incidental to the Contract unit price(s) for High Performance concrete.

Payment will be made under:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
501.34 Concrete, High Performance Class B (Mod.)	CUBIC YARD

SECTION 508 - SHEAR CONNECTORS

- 25. 508.04 PLACING, INSPECTING, AND TESTING, Part (b) Studs, is hereby modified by deleting the phrase "beam or girder" from the first line of the second paragraph and replacing it with the phrase "sheet pile retaining wall".
- 26. 508.06 BASIS OF PAYMENT, is hereby modified by adding the following pay items:

<u>Pay Item</u>	<u>Pay Unit</u>
508.15 Shear Connectors (80 - 7/8" X 10") (Mod. - Sheet Pile)	Lump Sum
508.15 Shear Connectors (210 - 7/8" X 13") (Mod. - Sheet Pile)	Lump Sum

SECTION 510A - PRESTRESSED CONCRETE

- 27. SUPPLEMENTAL SPECIFICATION 510A - PRESTRESSED CONCRETE, dated February 1, 2005 is hereby made a new section of these Specifications.
- 28. SUPPLEMENTAL SPECIFICATION 510A - PRESTRESSED CONCRETE, is hereby modified as follows:
- 29. 510.02A MATERIALS, is hereby modified by adding the following to the list of materials:

Lightweight Coarse Aggregate for Structural Concrete.....704.14

30. 510.05A CONCRETE, is hereby modified by deleting the first sentence of subpart (b)(1) and replacing it with the following:

Compressive strength at 28 days, as determined in accordance with AASHTO T 22, of not less than 6000 pounds per square inch.

31. 510.05A CONCRETE, is hereby further modified by adding subpart (b)(8) as follows:

(8) The maximum unit density for Prestressed Concrete shall be 1842 kg/m³ (115 pounds per cubic foot).

32. 510.16A, BASIS OF PAYMENT, is hereby modified by adding the following pay items:

<u>Pay Item</u>	<u>Pay Unit</u>
510.21 Prestressed Concrete Box Beams(27" X 36") (Mod. - Lightweight)	Meter (Linear Foot)
510.21 Prestressed Concrete Box Beams(27" X 48") (Mod. - Lightweight)	Meter(Linear Foot)

SECTION 514 - WATER REPELLENT

33. SECTION 514, WATER REPELLENT, all subsection text, and all previous editions or modifications thereof are hereby deleted in their entirety and replaced as follows:

34. 514.01 DESCRIPTION. This work shall consist of furnishing and applying a penetrating type protective sealer on concrete surfaces.

35. 514.02 MATERIALS. The material shall be a one component material consisting of a penetrating sealer which does not alter the color or texture of the Portland cement concrete.

Acceptable penetrating type sealers will be based upon the products appearing on the Agency's Approved Products List.

36. 514.03 PREPARATION OF SURFACES. All surfaces on which the protective sealer is to be applied shall be clean and thoroughly dry. Dirt, grease, curing compounds, asphalt, or other foreign materials shall be removed from the concrete surface before application of the sealer.

37. 514.04 APPLICATION. The Contractor shall follow the Manufacture's recommendations for the application of the sealer. In the absence of specific recommendations from the supplier, the protective sealer shall not be applied to new concrete surfaces that are less than 14 days old. The concrete surfaces shall be free from precipitation for 48 hours prior to application of the sealer. Application of the sealer shall be completed within 40 days of original concrete placement.

38. 514.05 PROTECTION. After application of the sealer, the concrete surfaces shall be protected in accordance with the Manufacturer's recommendations.

39. 514.06 METHOD OF MEASUREMENT. The quantity of Water Repellent (Mod. - Silane) to be measured for payment will be the number of liters (gallons) of solution applied in the complete and accepted work, measured to the nearest liter (gallon).

40. 514.07 BASIS OF PAYMENT. The accepted quantity of Water Repellent (Mod. - Silane) will be paid for at the Contract unit price per liter (gallon). Payment will be full compensation for furnishing, transporting, handling, and placing the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
514.10 Water Repellent (Mod. - Silane)	LITER (GALLON)

SECTION 516 - EXPANSION DEVICES

41. 516.02 MATERIALS, is hereby modified by adding the following:

Asphaltic Plug Bridge Joint 707.15

42. 516.04 FABRICATION, is hereby modified by deleting paragraphs 4, 5 and 6 in their entirety.

43. 516.05 INSTALLATION, is hereby modified by adding the following:

ASPHALTIC PLUG BRIDGE JOINT

1. The joint shall be located centrally over the deck expansion gap or fixed joint marked out to the manufacturer's recommended width.
2. The joint shall be excavated as shown on the plans, by use of saws and pneumatic hammer or a hammer and chisel.
3. The joint area shall be blast cleaned of debris and asphalt. The joint area shall be thoroughly dried using hot compressed air prior to applying binder material.
4. Spalled and defective concrete shall be repaired with an approved material as agreed upon by the Resident Engineer.
5. Properly sized heat resistant backer rod shall be place in the movement gap allowing for 25mm ± of binder above the rod.
6. The binder material shall be heated and placed as recommended by the Manufacturer.
7. Place 6 mm (1/4 inch) thick by 200 mm (8 inch) wide sections of steel plate over the center of the movement gap. Secure plates from moving by inserting locating pins through the prestamped holes into backer rod and cover with hot binder.
 - a. The steel plates may be omitted where the approach slab is covered with a stone base or bituminous pavement and vertical movement of the plates might occur.
8. The binder material and aggregate shall be heated and mixed as recommended by the Manufacturer.
9. The installation of material, compaction, and topcoating shall be as recommended by the Manufacturer.

10. Immediately after topcoating, an anti-skid material shall be cast over the joint to reduce the risk of tracking.
11. Joint shall be protected from traffic until the material has cooled to 52°C ± (125°F).
44. 516.05A, WEATHER LIMITATIONS. Binder material shall be applied only when the following conditions prevail:
- (a) The ambient air temperature is at least 10°C (50°F) and rising.
 - (b) The road surface is sufficiently dry.
 - (c) Weather conditions or other conditions are favorable and are expected to remain so for the performance of satisfactory work.
45. 516.07, BASIS OF PAYMENT, is hereby modified by adding the following:
- The accepted quantities of Bridge Expansion Joint (Asphaltic Plug) will be paid for at the contract unit price for all of the materials and work required to complete the work as shown in the project plans, as the Asphaltic Plug-Type Joint Detail.
- SECTION 519A - SHEET MEMBRANE WATERPROOFING (TORCH APPLIED)
46. SECTION 519A - SHEET MEMBRANE WATERPROOFING (TORCH APPLIED), is hereby made a new Section of the Specifications as follows:
47. 519.01A DESCRIPTION. This work shall consist of the application of reinforced asphalt, synthetic resin, or coal-tar based preformed sheet membrane to bridge decks to serve as a waterproof barrier between the concrete deck and the bituminous concrete surface pavement. The system shall include the use of a prime coat over the horizontal deck surface and an acceptable polyurethane liquid membrane on the lower portion of the curb face and adjacent deck area.
48. 519.02A MATERIALS. This material shall consist of an approved prefabricated reinforcement of synthetic nonwoven material, thoroughly impregnated and coated with SBS modified bitumen. The system includes a primer which provides an adhesive bond between the concrete deck and the membrane. The entire system shall be applied by an Applicator approved by the manufacturer. The Engineer shall receive written certification from the manufacturer regarding the Applicator's qualifications at least seven days prior to the application of any system component. The certification shall apply only to the named individual(s) performing the application. A manufacturer's representative shall be present at all times during the installation of the membrane system.
49. 519.03A WEATHER LIMITATIONS. Waterproofing shall not be done in wet weather or when the temperature is 5°C (40°F), without the authorization of the Engineer.
50. 519.04A SURFACE PREPARATION. The surface of the deck shall have a smooth, fine-textured finish. All honeycombed areas and surface cavities shall be cleaned and filled with approved patching materials. The entire deck shall be abrasive blasted to achieve an anchor profile which is clean, and free of laitance, oil and foreign materials. Prior to blasting, the surface shall be dry and free of sharp protrusions.

51. 519.05A CONSTRUCTION DETAILS. Conditions before application: The concrete deck shall be cured. For such a time for the moisture content to reach 6% or less, before application of the primer shall commence.

The Contractor shall supply a portable electronic surface moisture meter capable of measuring the moisture content of concrete surfaces in percent. The air temperatures shall be at least 5°C (40°F) and rising.

Immediately prior to application of the primer, the deck shall be cleaned by brooms and compressed air. The concrete surfaces shall be inspected and approved by the Engineer and the Applicator prior to priming.

Application of adhesive primer. The handling of components shall be performed in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations.

The primer shall consist of one coat covering the entire deck with an overall coverage rate of 4.9 m²/l (200 ft²/gal) or as specified by the manufacturer.

The primer shall be applied by brush, roller or sprayer.

The primer shall cure tack-free in accordance with the manufacturer's recommendations before application of the waterproofing membrane.

Application of membrane. The waterproofing membrane will be applied by a mobile applicator approved by the Engineer, which is capable of applying the membrane in a uniform manner onto the prepared substrate in accordance with the manufacturer's recommendations to assure bond with the primed surface and elimination of air bubbles. The membrane will be hand welded by torch around drains, joints, and along the curb as directed by the Engineer. The Applicator shall be responsible for the protection of adjacent areas.

Membrane shall be installed in a shingled pattern so that water is permitted to drain to the low areas of the deck without accumulating against seams. Laps shall be staggered at the beginning and ends of rolls and shall overlap the previous roll and be sealed in accordance with the manufacturer's recommendations. Prior to suspension of work for any reason, all exposed edges shall be heated, troweled and sealed in accordance with the manufacturer's recommendations.

Damaged membrane shall be patched or repaired in accordance with the manufacturer's recommendations.

Any blisters found in the applied membrane shall be punctured with a torch-heated pick prior to paving. Blisters found subsequent to paving shall be punctured in the same manner.

52. 519.06A PROTECTION OF MEMBRANE. No traffic shall be permitted on an exposed membrane surface. Traffic may be permitted on the Type IV bituminous overlay. Care shall be exercised to prevent damage to the completed membrane, especially during paving operations. All damaged areas shall be cleaned and patched to the satisfaction of the Engineer.

The specified bituminous overlay shall be placed on the membrane within three days after application. Failure to adhere to this requirement

may result in the development of an excessive amount of blisters prior to, during, and following the pavement application.

A rubber tired or rubber-tracked paver shall be used to place the bottom course of bituminous mix.

The temperature of the bituminous concrete pavement to be placed on sheet membrane waterproofing shall be as recommended by the membrane manufacturer and approved by the Engineer.

The Contractor shall maintain a small supply of portland cement on the project during the time of paving. The cement dust shall be sparingly cast over the membrane surface to reduce tackiness and thereby prevent the paver or truck tires from sticking to the membrane and damaging it.

The paver operator shall be directed not to ride the curb lines while paving such areas since the screed shoe may damage the polyurethane sealant on the vertical curb face.

53. 519.07A PROTECTION OF EXPOSED SURFACES. The Contractor shall exercise care in the application of the waterproofing materials to prevent surfaces not receiving treatment from being spattered or marred. Particular reference is made to the face of curbs, copings, finished surfaces, substructure exposed surface, and outside faces of the bridge. Any material that spatters on these surfaces shall be removed and the surfaces cleaned to the satisfaction of the Engineer.

54. 519.08A METHOD OF MEASUREMENT. The quantity of Sheet Membrane Waterproofing (Mod. - Torch Applied) to be measured for payment will be the number of square meters (square yards) of the specified type used in the complete and accepted work. Measurement will be based on the horizontal distance between the face of the curbs and the horizontal length of membrane installed. Any material specified to be lapped up the face of the curb will not be included in the measured quantity.

55. 519.09A BASIS OF PAYMENT. The accepted quantity of Sheet Membrane Waterproofing (Mod. - Torch Applied) will be paid for at the Contract unit price per square meter (square yard). Payment will be full compensation for furnishing, transporting, handling, and placing the waterproofing system specified, including primer, mastic, polyurethane membrane sealant, and surface preparation, and for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
519.20 Sheet Membrane Waterproofing (Mod. - Torch Applied)	Square meter (Square Yard)

56. SECTION 527 - MAINTENANCE OF TRAFFIC FOR BRIDGE PROJECTS, is hereby modified by being deleted in its entirety and replaced with new SECTION 527 - MAINTENANCE OF STRUCTURES AND APPROACHES as follows:

SECTION 527 - MAINTENANCE OF STRUCTURES AND APPROACHES

57. 527.01 DESCRIPTION. This work shall consist of the maintenance of existing structure(s) and approaches within the project limits.

527.02 ROAD MAINTENANCE. The Contractor shall maintain all highway sections within the confines of the work under the Contract to the satisfaction of the Engineer. When traffic is to be maintained over the present highway, the full width of the roadway shall be maintained.

The maintenance shall be done by means of an approved road grader or other approved equipment of a type that will be efficient in keeping the roadway in a reasonably smooth and passable condition for traffic and shall be subject to the approval of the Engineer. The material for and the necessary filling of holes and similar depressions that develop in the roadway shall be included in the Contract price for this item. If, in the opinion of the Engineer, the Contractor fails to maintain a reasonably smooth roadway surface, and fails to fix the same after written notification, the Engineer will make the necessary provisions to maintain the roadway surface, and the cost shall be deducted from any money due or to become due under the Contract.

58. 527.03 BRIDGE MAINTENANCE. When traffic is maintained over an existing structure, the Contractor shall keep all parts of the structure safe for the legal or posted load of the structure including satisfactory maintenance of the substructure, superstructure, and the bridge surface. The Contractor shall strengthen, patch, shore, or renew any part or parts of this substructure or superstructure when necessary for the safety of the traveling public.

If the existing structure over which traffic is being maintained becomes unsafe for public travel, and if, on written order by the Engineer, the Contractor fails to make satisfactory repairs, the Engineer will make the necessary provisions to repair the structure, and the cost will be deducted from any monies due under the Contract.

59. 527.04 METHOD OF MEASUREMENT. The quantity of Maintenance of Traffic for Bridge Projects (Mod.) to be measured for payment will be on a lump sum basis.

60. 527.05 BASIS OF PAYMENT. The accepted quantity of Maintenance of Traffic for Bridge Projects (Mod.) will be paid for at the Contract lump sum price. Payment will be full compensation for performing the work specified and for furnishing all labor, materials, tools, equipment, and incidentals necessary to properly maintain substructures, superstructure(s), and roadway approaches.

Payment for this work will be made periodically as follows:

- (a) 50 percent will be paid after all construction signing has been installed; any required repairs to the bridge(s) or approaches have been made to the satisfaction of the Engineer; and traffic is being maintained over the existing bridge(s) and approaches.
- (b) The remaining 50 percent will be paid when traffic is permanently moved to the new/rehabilitated bridge(s) and approaches. When the Contract specifically provides for Item 607, Roadway Patrol Maintenance, the Contract item Maintenance of Structures and Approaches shall only cover maintenance of the existing structure(s).

Payment will be made under:

Pay Item

Pay Unit

527.10 Maintenance of Traffic for Bridge
Projects (Mod.)

LUMP SUM

SECTION 580 - STRUCTURAL CONCRETE REPAIR

63. SUPPLEMENTAL SPECIFICATION SECTION 580 - STRUCTURAL CONCRETE REPAIR, dated June 1, 2004, is hereby made a new section of these specifications.
63. SUPPLEMENTAL SPECIFICATION SECTION 580 - STRUCTURAL CONCRETE REPAIR, dated June 1, 2004, is hereby modified as follows:
64. 580.01 DESCRIPTION, is hereby modified by deleting the second paragraph in its entirety and replaced with the following:

This Section shall be used in conjunction Supplemental Specification Section 501A - HPC Structural Concrete, however where the repaired area will be encased, Concrete, High Performance Class B (Mod. - SCC) will be allowed. Anything not specifically addressed in this Section relative to concrete shall be governed by Section 501 or Supplemental Specification Section 501A or Section 501B of these Special Provisions.

65. 580.09 BASIS OF PAYMENT, is hereby modified by adding the following paragraphs:

The unit price bid for item 580.14, Repair of Concrete Substructure Surface, Class II (Mod. - SCC), will be full compensation for the removal and replacement of concrete. Replacement material shall be Concrete, Class AA, Vertical Concrete Repair Material or an acceptable alternate such as pneumatically applied concrete. Where the repaired area will be totally encased the repaired area may also use Concrete, High Performance Class B (Mod. - SCC). Payment for the repaired area, from the plane of the original surface to the depth of concrete, will be paid for as 580.14, Repair of Concrete Substructure Surface, Class II (Mod. - SCC), regardless of the type of concrete used for the repair.

The unit price bid for item 580.15, Repair of Concrete Substructure Surface, Class III (Mod. - SCC), will be full compensation for the removal and replacement of concrete. Replacement material shall be Concrete, Class AA, Class A, Class B or an acceptable alternate as directed by the Engineer. Where the repaired area will be totally encased, Concrete, High Performance Class B (Mod. - SCC) will be allowed. Payment for the repaired area, from the plane of the original surface to the depth of concrete, will be paid for as 580.15, Repair of Concrete Substructure Surface, Class III (Mod. - SCC), regardless of the type of concrete used for the repair.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
580.14, Repair of Concrete Substructure Surface, Class II (Mod. - SCC)	Cubic Yard
580.15, Repair of Concrete Substructure Surface, Class III (Mod. - SCC)	Cubic Yard

SECTION 602 - RUBBLE MASONRY

64. 602.01 DESCRIPTION, is hereby modified by inserting the words "or providing a form liner system" between the words "masonry" and "in" in the third line.

65. 602.07 POINTING AND REPOINTING, is hereby modified by adding the following paragraphs:

The concrete retaining walls shall have a form liner system as detailed on the plans.

If the Contractor wishes to use a different form liner than the ones specified, the Contractor will be required to submit the liner system intended for use to the Engineer for approval prior to doing any form work on these walls. At a minimum, the submittal shall include working drawings showing details of the overall pattern, joint locations, form tie locations and details at ends and edges. The drawings shall conform to Section 105.03(b)(1). The submittal shall also include the liner system supplier's recommended construction procedures, associated materials and specifications. The Contractor shall be responsible for following all procedures and specifications and using all materials required by the manufacturer or supplier of the form liner system as approved by the Engineer.

66. 602.10 METHOD OF MEASUREMENT, is hereby modified by adding the following paragraph:

The quantity for Stone Masonry Facing (Mod.) to be measured for payment will be the number of square yards of stone textured facing in the completed and accepted work. The height measurement shall extend from a maximum of 24 inches below the finished ground surface to the top of wall or, where used, the under side of concrete cap. The height measurement shall include the top of the wall whenever the top is sculpted to simulate a stone surface. The width measurement shall be the actual width of the completed and accepted work. No deductions will be made for width of expansion joints or openings less than 2 square feet.

67. 602.11 BASIS OF PAYMENT, is hereby modified by adding a new paragraph and pay item as follows:

The accepted quantity for Stone Masonry Facing (Mod.) will be paid for at the Contract unit price per square yard. Payment will be full compensation for furnishing, transporting, handling, placing and removing the form liners required to provide the stone patterned texture as specified. Payment will be full compensation for furnishing all labor, tools, equipment and incidentals necessary to complete the work including submittals of working drawings and building of test panels.

<u>Pay Item</u>	<u>Pay Unit</u>
602.25 Stone Masonry Facing (Mod.)	Square Yard

SECTION 613 - STONE FILL, RIPRAP, AND SLOPE PAVING

112. 613.02 MATERIALS, is hereby modified by adding the following paragraphs:

Materials for Stone Fill, Type I (Mod. - Check Dam), Stone Fill, Type I (Mod. - Construction Entrance), and Stone Fill, Type I (Mod. - Inlet Protection) shall be approved by the Engineer prior to use.

Stone for Stone Fill, Type I (Mod. - Check Dam), Stone Fill, Type I (Mod. - Construction Entrance), and Stone Fill, Type I (Mod. - Inlet Protection) shall be cleaned and washed in an approved manner resulting in material that is free of organic matter and fine particles.

113. 613.06 BASIS OF PAYMENT, is hereby modified by adding the following paragraphs and pay items:

The accepted quantity of Stone Fill, Type I (Mod. - Check Dam) will be used for Stone Check Dams as detailed in the Plans and will be paid for at the Contract unit price per cubic meter (cubic yard). Payment will be full compensation for furnishing, transporting, placing, and removing the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

The accepted quantity of Stone Fill, Type I (Mod. - Construction Entrance) shall be used for Construction Entrances as detailed in the Plans and will be paid for at the Contract unit price per cubic meter (cubic yard). Payment will be full compensation for furnishing, transporting, placing, and removing the material specified including stone, geotextile fabric, and culvert pipe if necessary, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

The accepted quantity of Stone Fill, Type I (Mod. - Inlet Protection) shall be used for Inlet Protection as detailed in the Plans and will be paid for at the Contract unit price per cubic meter (cubic yard). Payment will be full compensation for furnishing, transporting, handling, placing, and completely removing the Inlet Protection. Payment shall be for all material specified including stone, wire mesh, filter fabric, concrete blocks, and metal support posts, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for the monitoring and maintenance of Stone Check Dams, Construction Entrances, and Inlet Protection devices will be made in accordance with the Plans.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
613.10 Stone Fill, Type I (Mod. - Check Dam)	Cubic Yard
613.10 Stone Fill, Type I (Mod. - Construction Entrance)	Cubic Yard
613.10 Stone Fill, Type I (Mod. - Inlet Protection)	Cubic Yard

SECTION 618 - SIDEWALKS

18. 618.02 MATERIALS, is hereby modified by deleting the second paragraph in its entirety and replacing it with the following:

Concrete for sidewalks shall conform to the requirements of Section 501 for Concrete, Class B. There shall be a mineral admixture substitution for portland cement of 20% fly ash or 25% GGBFS.

19. 618.03 PORTLAND CEMENT CONCRETE SIDEWALK, part (f) Curing, is hereby modified by adding the following paragraph:

Concrete placed after September 30th shall have a drying period of seven (7) days immediately following the end of the cure period. The concrete shall be kept moisture free and above freezing for this period.

20. 618.06 BASIS OF PAYMENT, is hereby modified by adding the following pay item:

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
618.10 Portland Cement Concrete Sidewalk, 125 mm (5 inch) (Mod.)	Square Yard

SECTION 620 - FENCES

71. 620.01 DESCRIPTION, is hereby modified by adding the following paragraphs:

Snow Fence (Mod. - Arch) shall include the installation of a snow fence as a visible barrier between the work area and sensitive areas for the protection of these areas and the removal of snow fence when it is no longer required by the Engineer.

The scope of work for the item Snow Fence (Mod. - PDF) shall be the installation of a fence as a visible barrier beyond which there shall be no construction activity by the Contractor or project personnel and the removal of such fence when it is no longer required by the Engineer.

72. 620.02 MATERIALS, is hereby modified by adding the following:

Construction materials for Snow Fence (Mod. - PDF) shall be those approved by the Engineer.

73. 620.04 ERECTION WOVEN WIRE FENCES, is hereby modified by adding the following paragraphs:

The fencing to be erected as Snow Fence (Mod. - Arch) shall be a fluorescent orange or yellow plastic fabric having a minimum height of 1.25 meters (4 feet) and a maximum mesh size of 75 mm (3 inches) by 75 mm (3 inches). The fabric shall be installed on 1 kg/m w-shaped steel posts and the bottom of the fabric shall be 75 mm (3 inches) ± 25 mm (1 inch) above the ground.

The posts shall be embedded a minimum of 600 mm (2 feet) into the ground, shall extend a minimum of 150 mm above the fabric, and shall be installed at 1.5 meters (5 feet) centers.

Snow fencing shall be installed to enclose archaeologically sensitive areas and existing wetlands so as to constitute a visible barrier to keep the Contractor and project personnel from accidentally entering these areas.

The fencing Snow Fence (Mod. - PDF) shall be 25 mm x 25 mm x 1220 mm (1" x 1" x 4') hardwood stakes linked together by one strand of 75 mm

(3") wide, 0.08 mm (3 mil) thickness fluorescent orange or yellow polyethylene barricade tape. The posts shall be embedded a minimum 300 mm (one foot) into the ground with the tape attached at the top. The posts shall be spaced at 3 m (10 feet) on center with each post marked "PDF" (Project Demarcation Fence).

74. 620.10 BASIS OF PAYMENT, is hereby modified by adding the following paragraphs and pay items:

Payment for Removing and Resetting Fence (Mod. - Stone Wall) shall be paid for at the Contract unit price per Linear Foot which price shall be full compensation for removing and then resetting a portion of the stone wall located at station 5+66.1 LT as detailed in the plans; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for Snow Fence (Mod. - Arch) shall be full compensation for furnishing, installing, maintaining and removing of the snow fence at the locations indicated on the Plans and as directed by the Engineer and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for Snow Fence (Mod. - PDF) will also be full compensation for removal of the fence as specified in Subsection 620.01.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
620.50 Removing and Resetting Fence (Mod. - Stone Wall)	Linear Foot
620.70 Snow Fence (Mod. - Arch)	Linear Foot
620.70 Snow Fence (Mod. - PDF)	Linear Foot

SECTION 621 - TRAFFIC BARRIERS

75. 621.06 TEMPORARY TRAFFIC BARRIERS, is hereby modified by deleting the first three paragraphs in their entirety and replacing them with the following paragraph:

Temporary Traffic Barrier (Mod.) used on this project shall be pre-cast Concrete Median Barrier (CMB) units that are NCHRP 350 compliant.

76. 621.12 METHOD OF MEASUREMENT, is hereby further modified by deleting the thirteenth (last) paragraph in its entirety and substituting the following:

The quantity of Temporary Traffic Barrier (Mod.) to be measured for payment will be the number of linear feet installed and accepted measured from end to end. Adjustment of individual units of CMB to improve alignment or safety at a given location or to repair the alignment after an impact will be considered incidental to the unit price bid for Temporary Traffic Barrier (Mod.).

77. 621.13 BASIS OF PAYMENT, is hereby further modified by adding the following paragraph and pay item:

Payment for Temporary Traffic Barrier (Mod.) will be full compensation for furnishing, handling and installing the barrier; for removal and site restoration where required; for all movement or realignment

necessary as specified; and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work.

Temporary Traffic Barrier (Mod.) will only be paid for once.

The Contractor will be paid 75% of Contract unit price for Temporary Traffic Barrier (Mod.) after installation is complete.

The Contractor will be paid the remaining 25% of the Contract unit price for Temporary Traffic Barrier (Mod.) after the Temporary Traffic Barrier has been removed from the project.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
621.90 Temporary Traffic Barrier (Mod.)	Linear Foot

SECTION 630 - UNIFORMED TRAFFIC OFFICERS AND FLAGGERS

- XX. GENERAL SPECIAL PROVISIONS FOR ALL PROJECTS, dated December 6, 2005, Item No. 68, 630.01 DESCRIPTION, part (d) Use of Flaggers, text is hereby modified by being deleted in its entirety and replaced with the following:

Use of Flaggers. A flagger shall be used as directed by the Engineer to stop and release traffic within a designated work zone or where the entrance or exit of construction equipment or other construction activity constitutes a hazard to the traveling public. Flaggers shall not be used to direct traffic.

SECTION 641A - PUBLIC RELATIONS OFFICER

101. 641.01A PUBLIC RELATIONS OFFICER, is hereby made a new Section of the Specifications as follows:
102. 641.01A PUBLIC RELATIONS OFFICER. The Contractor will supply a person to act as a Public Relations Officer on this project. The name and phone number of the Public Relations Officer will be supplied to the Resident Engineer, the Town of Woodstock, the Two Rivers-Ottawaquechee Regional Commission, and all emergency services (police, fire, and the medical center).

The name and phone number of the Public Relations Officer will also appear on all information distributed to the public identifying him as the contact person concerning work schedule, traffic flow and patterns, access delays, etc.

The Contractor's Public Relations Officer will compose and distribute informational flyers to all residents and businesses within and along the border of the construction zone and those on affected side streets. The distribution list will be approved by the Resident Engineer prior to beginning delivery of the flyers.

The flyers shall be distributed as directed by the Resident Engineer, but, as a minimum, shall be distributed prior to commencing construction activities to forewarn the public of the project. A flyer

distribution will also be required to select residences and businesses when construction activities directly affect them. The content of the flyer shall be approved by the Resident Engineer.

Upon receiving the notice to proceed, the Contractor's Public Relations Officer will submit an initial press release to the local TV stations, radio stations, and newspapers. Once construction begins the Public Relations Officer shall submit a press release on a weekly basis to the local TV stations, radio stations, and newspapers.

These releases shall indicate changes in traffic patters and work zones so as to give the public some advance warning which may result in the diversion of some traffic away from the construction zone. These releases shall include a map indicating construction areas/activities.

The Contractor's Public Relations Officer shall contact all involved parties (including, but not limited to, the Contractor, the subcontractor, the Resident Engineer, the Town of Woodstock, the Two Rivers-Ottawaquechee Regional Planning Commission, and all effected utility companies and departments) to invite and schedule a weekly on site meeting to update/communicate them on anticipated construction activities.

The Public Relations Officer shall contact emergency personnel on a daily basis to alert them of construction activities/locations, and to update them on lane restrictions, traffic flow, or any other activities that may affect emergency access. The Public Relations Officer shall also contact emergency personnel immediately in the event of any unanticipated/unexpected occurrences which may affect emergency access.

The Public Relations Officer will also give weekly updates to the Two Rivers-Ottawaquechee Regional Planning Commission [Tel. (802)457-3188] as to anticipated construction activities/schedule and update them as to the extent of public relations work performed to date.

103. 641.02A METHOD OF MEASUREMENT. The quantity of Public Relations Officer to be measured for payment will be on a lump sum basis.

104. 641.03A BASIS OF PAYMENT. The accepted quantity of Public Relations Officer will be paid for at the Contract lump sum price. Payment will be full compensation for performing all work specified and for furnishing all materials, equipment and incidentals necessary to complete the work as detailed in the contract documents.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
641.12 Public Relations Officer	LUMP SUM

SECTION 646 - REFLECTORIZED PAVEMENT MARKINGS

105. 646.02, MATERIALS, is hereby modified by adding the following:

All final pavement markings on the wearing course of pavement shall be thermoplastic meeting the requirements of subsection 708.10 and shall be placed in accordance with section 646 except that outside the seasonal limitations, 646.10 shall govern.

Where possible a 2 in (50mm) space should be maintained between thermoplastic pavement markings and parallel joints in bituminous concrete pavement. This requirement is secondary to the alignment controls contained in subsection 646.04, part (d).

- 106. 646.02, MATERIALS, is hereby modified by adding the material and Division 700 Subsection.

Waterborne White and Yellow Traffic Paint 708.08(d)

- 107. 646.06, PAINT PAVEMENT MARKINGS, is hereby modified by being deleted in its entirety and replaced with the following subsection 646.06, Paint Pavement Markings:

- 108. 646.06, PAINT PAVEMENT MARKINGS. The Contractor shall use waterborne white and yellow traffic paint.

Liquid tanks on paint application equipment shall be equipped with mechanical agitators.

Waterborne Paint.

- 1. Waterborne Paint shall conform to the requirements of subsection 708.08 (d). Application shall be in accordance with the manufacturer's requirements.
- 2. The paint shall be applied at a rate of 100 square feet (2.5 square meter) to 115 square feet (2.8 square meter) per gallon (liter) with glass beads applied at a rate of 8 lbs per gallon (960 gram per liter) of paint.
- 3. Waterborne Paint shall be applied at a temperature of 150°F maximum in the heat exchanger and 122°- 140°F (50° to 60°C) at the spray guns.
- 4. Reflectorized paint pavement markings shall be applied by a method in which the liquid paint is applied to the road surface and the glass beads are immediately applied on the paint and firmly embedded therein, which shall provide a reflective marking with a night visibility satisfactory to the Engineer.

The material shall have a minimum wet film thickness of 0.15 inch ± .001 inch (0.380 ± 0.025mm) for paint, unless otherwise specified, and shall be applied in a smooth uniform coat, free from thin places or films of excessive thickness.

- 5. Only painted pavement markings shall be used on Portland cement concrete pavement surfaces.

- 109. 646.07, DURABLE PAVEMENT MARKINGS, Subsection (c) 2c, Beads, paragraph 1, is hereby modified by being deleted in its entirety and replaced with the following paragraph.

Crushed glass will be incorporated into the thermoplastic material at a rate of between 9 - 10% by weight of the combined material. The crushed glass will be used as a substitute for an equal amount by weight of the filler material. The crushed glass shall be produced from cullet of clear glass, with a maximum size of 33 mils (850 micrometers) (100% passing by weight) and a minimum size of 17 mils (425 micrometers) (0-2% passing by weight). Glass beads meeting the

requirement of 708.09 (a) thru (i) shall be incorporated into the thermoplastic composition at a rate of between 28-30% by weight of the combined material.

Thermoplastic composition shall be as follows:

Pigment & Binder	25%
Glass Beads	30%
Filler	35%
Crushed Glass	10%

SECTION 652 - EROSION PREVENTION & SEDIMENT CONTROL PLAN

110. SECTION 652 - EROSION PREVENTION & SEDIMENT CONTROL PLAN, is hereby made a new Section of these Specifications as follows:
111. 652.01 DESCRIPTION. This work shall consist of designing, furnishing, and submitting for approval an Erosion Prevention & Sediment Control Plan (hereinto known as the EPSC Plan), becoming a co-permittee with the Agency of Transportation, State of Vermont on associated permits, monitoring the EPSC Plan using an On-Site Plan Coordinator, and maintaining the erosion prevention and sediment control measures to insure the effectiveness of the EPSC Plan.
112. 652.02 MATERIALS. Materials required for the field work maintenance of the EPSC Plan shall meet all requirements of the appropriate section of the most recent VAOT Standard Specifications for Construction.
113. 652.03 QUALIFICATIONS. The EPSC Plan shall be prepared and signed by a Licensed Professional Civil Engineer registered in the State of Vermont or a qualified professional in erosion prevention and sediment control, certified by CPESC, Inc. or equivalent, hereinafter called the "Preparer."
114. 652.04 EROSION PREVENTION & SEDIMENT CONTROL PLAN. The EPSC Plan shall be developed using a combination of structural, non-structural and vegetative practices to adequately prevent erosion and control sedimentation, as recommended in the latest *Vermont Handbook for Erosion Prevention and Sediment Control*.
- (a) For projects that do not require or have not obtained authorization from the Agency of Natural Resources (ANR) to discharge construction site runoff, the Agency (VAOT) has provided a narrative and plan sheets to include site specific information describing the construction site(s) conditions prior to and after construction and proposed temporary erosion prevention and sediment control measures during construction.

The Contractor shall provide a narrative and plan sheets that address all items listed on the *VAOT Contractor's Checklist for Erosion Prevention and Sediment Control*. This shall include all staging, waste and borrow areas and associated EPSC Plans for each. The Contractor shall then combine the information from both the VAOT Designer Checklist and Contractor Checklist to create one stand alone document (**the** EPSC Plan) that meets the goals of the General Permit for Construction Stormwater Runoff.

The Contractor may use the Agency's Erosion Prevention and Sediment Control plan sheet(s) as a basis for the Grading Plan. However, if necessary to convey the sequential nature of

construction activities and associated erosion prevention and sediment control measures, several plan sheets showing successive site conditions are recommended.

All work shown in the EPSC Plan shall be included in the Contractor's CPM Progress Schedule, as required by Subsection 108.03.

- (b) For projects that do require and have obtained authorization from the ANR to discharge construction site runoff prior to the contract being let, the Contractor need only amend the authorized EPSC Plan to fit their proposed construction methods and schedule if necessary. The authorized EPSC Plan is available upon request prior to award of the contract. It will be supplied to the awarded bidder so that Contractor can propose amendments as necessary and can sign on as a Co-Permittee.

For multi-year projects and projects with site work beginning prior to May 1 and/or extending beyond October 15 that involve areas of earth disturbance, special winter erosion prevention and sediment control measures shall also be included in the EPSC Plan submittal. For those projects that were originally intended to be completed by October 15 but due to project delays throughout the season will not be, a Plan amendment, including specific winter EPSC measures must be submitted to the Engineer prior to September 15.

115. 652.05 SUBMITTALS. Three sets of the EPSC Plan, stamped and signed by the Preparer shall be submitted to the Construction Engineer in accordance with Subsection 105.03(b)(2). The submittal shall occur after award of the Contract but not later than the Pre-Construction Conference to allow time for review by the Agency. Such review time shall be within 10 working days.

If the EPSC Plan requires modification, review time for modification will be completed within an additional 10 working days. Modifications or additions to the EPSC Plan shall not be considered to be an acceptable delay as defined in Subsection 108.11 - DETERMINATION OF EXTENSION OF CONTRACT TIME FOR COMPLETION.

For projects that do not require authorization from the ANR, construction activities shall commence only after the EPSC Plan has been approved by the Agency. For projects that do require authorization from the ANR, construction activities shall commence only after that authorization has been granted.

All amendments to the EPSC Plan will be submitted to the Agency Construction Engineer and will be forwarded on to the ANR as appropriate. A copy of the authorized amendments shall be incorporated into the original authorized EPSC Plan.

116. 652.06 MONITORING EROSION PREVENTION & SEDIMENT CONTROL PLAN. The Contractor shall designate a person (On-Site Plan Coordinator) who is directly responsible for the on-site implementation of the EPSC Plan. This person shall generally be on-site on a daily basis during active construction and have the authority to halt construction activities if necessary. The On-Site Plan Coordinator shall have demonstrated experience in construction practices as they relate to erosion prevention and sediment control as well as a general understanding of State and Federal environmental regulations and permits pertaining to

the National Pollutant Discharge Elimination System Construction Program. The On-Site Plan Coordinator shall be proficient at reading and interpreting engineering and EPSC plans. Preference will be given to a Licensed Professional Civil Engineer registered in the State of Vermont or a qualified professional in erosion prevention and sediment control, certified by CPESC, Inc. or equivalent. The qualifications of the On-Site Plan Coordinator shall be included in and accepted upon approval of the EPSC Plan. However, the Engineer, if not satisfied with the performance of the individual may at any time request a replacement.

The On-Site Plan Coordinator shall be responsible for inspections and reporting. The Agency's *Erosion Prevention and Sediment Control Weekly Plan Review* (or other authorized form) shall be completed to inform the Agency of the status of the project with regard to erosion prevention and sediment control. The Agency's *Storm Event Monitoring Report* (or other authorized form) shall be completed to provide information regarding the effectiveness of the EPSC Plan during a storm event. Sheet 1 of the Report shall be completed within 24 hours of a storm event great enough to cause stormwater runoff to leave the construction site. Both sheets 1 and 2 of the Report shall be completed if there is any evidence of sediment or sediment laden water leaving the construction site or entering surface waters (including wetlands). Immediate action shall be taken to correct the discharge of sediment, including halting or reducing construction activities as necessary until the discharge and/or the condition is fully corrected. Corrective actions shall be recorded on the monitoring reports and shown on the EPSC Plan. Each report shall be signed by the On-Site Plan Coordinator.

Monitoring of erosion prevention and sediment control measures for multi-year projects shall be conducted while the site is inactive throughout the winter season. The Contractor shall contact the Engineer prior to conducting any reviews, and the reviews shall be conducted at least once every 30 days, and after any storm or significant snow melt event that may cause stormwater runoff to leave the construction site. The Contractor shall have available a crew to correct deficiencies noted on the reports.

Copies of all reports shall be submitted to the Engineer within 24 hours of inspection and kept on site in the Contractor's project files.

117. 652.07 MAINTENANCE OF EROSION PREVENTION & SEDIMENT CONTROL PLAN. This work shall consist of the field maintenance required to keep the features of the EPSC Plan in its approved form. This item shall be used to maintain effective and continuous erosion prevention and sediment control throughout the construction period. Maintenance shall be used to correct conditions that develop during construction that lessen the performance of the EPSC Plan. Erosion prevention and sediment control measures shall be maintained by the Contractor and removed when authorized by the Engineer. The Contractor shall establish vegetation in all areas disturbed during removal of the erosion prevention and sediment control measures.

Any maintenance required due to the failure of the Contractor to follow the EPSC Plan in its approved form shall be done at the Contractor's expense.

118. 652.08 METHOD OF MEASUREMENT. The quantity of Erosion Prevention & Sediment Control Plan to be measured for payment will be on a lump sum basis in the complete and accepted work.

The quantity of Monitoring Erosion Prevention & Sediment Control Plan will be measured to the nearest 1/4 hour, for the actual number of authorized hours spent monitoring, reviewing and reporting on the construction site(s), including waste areas, as it relates to the EPSC Plan. Travel time and other time not spent at the construction site(s) or time not authorized will not be measured for payment (i.e. travel expenses, clerical staff time, copying, miscellaneous expenses, overhead, etc.).

The quantity of Maintenance of Erosion Prevention & Sediment Control Plan will be on a lump unit basis for all such field maintenance provided for in the Contract, excluding waste areas.

119. 652.09 BASIS OF PAYMENT. The accepted Erosion Prevention & Sediment Control Plan will be paid for at the Contract lump sum price. Payment will be full compensation for preparation, submittals, modifications, and resubmittals and all incidentals necessary to complete the work. Partial payments will be made as follows:

- (a) The first payment of 50 percent of the lump sum price for the EPSC Plan will be paid for upon approval of the EPSC Plan for the entire project.
- (b) The second payment of 35 percent of the lump sum price for the EPSC Plan will be made on the first estimate following the completion of 50 percent of the project.
- (c) The third payment of 15 percent of the lump sum price for the EPSC Plan will be made when the project is substantially complete.

The accepted quantities of Monitoring Erosion Prevention & Sediment Control Plan will be paid for at the Contract unit price per hour. Payment will be full compensation for performing the work specified. Payment will not be made unless a report for the monitoring is submitted to and accepted by the Engineer.

The accepted quantities of Maintenance of Erosion Prevention & Sediment Control Plan will be paid for as specified for force account work in Subsection 109.06 of the VAOT Standard Specifications for Construction and payments drawn against the amount established as the Contract Lump Unit for this item. To provide a common proposal for all bidders, the Agency has entered an amount in the proposal to become part of the Contractor's total bid. Maintenance related to material supply and disposal areas shall be done in accordance with Section 105.29.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
652.10 Erosion Prevention & Sediment Control Plan	LUMP SUM
652.20 Monitoring Erosion Prevention & Sediment Control Plan	HOUR
652.30 Maintenance of Erosion Prevention & Sediment Control Plan (N.A.B.I.)	LUMP UNIT

SECTION 679 - STREET LIGHTING

112. 679.02 MATERIALS, is hereby modified by adding the following:

Luminaries and light poles shall be manufactured by:
Holophane

Jim Bailey
489 Lewiston Road
W. Gardiner, ME 04345-3301
Tel: (207)582-5106 Fax: (207)582-8088
JBailey@Holophane.com

Luminaries shall be: Granville, 70 W. Metal Halide, Medium Base, 120, 208, 240, and 277 Multivolt, Leaf Design Housing for 3 inch tenon, Black Finish, Asymmetric, Type III, No Ribs and Bands, Standard Finial Painted Cast Aluminum, Black Trim Finish, with GE (MVR70/C/U/MED) 70MH Coated Medium Base "E" Pulse Start Lamp. Catalog Number **GV70DMHMTLB3NSB G-12594**

Light Poles shall be: North Yorkshire cast iron pole, 7'-6" height, 17" diameter base, black powder paint finish, special for bridge deck mount.
Catalog Number **NY8/17-CI/BK-SPEC**

120. 679.11 BASIS OF PAYMENT, is hereby modified by adding *Light Pole (Mod.)*, *Luminaire (Mod.)*, between the words *Light Pole*, and *Luminaire* in the Third Paragraph.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
679.45 Light Pole (Mod.)	Each
679.50 Luminaire (Mod.)	Each

SECTION 707 - JOINT MATERIALS

121. SECTION 707 JOINT MATERIALS, is hereby modified by adding the following new subsection:

707.15, Asphaltic Plug Bridge Joint. Acceptable asphaltic plug bridge joint systems shall be one of the joint systems listed on the Approved Product List on file at the Agency's Materials and Research Section (802) 828-2561.

SECTION 780 - CONCRETE REPAIR MATERIALS

122. SUPPLEMENTAL SPECIFICATION SECTION 780 - CONCRETE REPAIR MATERIALS, dated August 9, 2000, is hereby made a new section of these specifications superseding all previous editions and their modifications.

SECTION 995 - INCENTIVE/DISINCENTIVE (I/D)

123. SECTION 995 - INCENTIVE/DISINCENTIVE (I/D), is hereby made a new Section of these specifications as follows:

The payment of monies for performance under the Incentive/Disincentive specifications contained in these Special Provisions shall be as follows:

1. For the incentive payment as described in Part (C) of Special Provision No. 6, the Contractor will be paid in the next bi-weekly estimate in which the Contractor has satisfactorily met the requirements of I/D.
2. For the disincentive penalties as described in Part (C) of Special Provision No. 6, the Engineer will deduct the amount due the Agency from the monies due the Contractor on the next bi-weekly estimate. *Insure paragraph numbers are correct.*

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
995.10 Incentive/Disincentive Work Order (N.A.B.I.)	LUMP UNIT

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