March 27, 2023

REQUEST FOR PROPOSALS FOR REPAIRS TO
BASS ROAD BRIDGE OVER MERRICK BROOK
SCOTLAND, CT

The Town of Scotland, CT requests written proposals from licensed and qualified construction contractors with offices in the State of Connecticut to provide construction services for the repair of the Bass Road Bridge over Merrick Brook.

The Town has acquired a modular ACROW bridge deck which has been placed temporarily at the site, but requires modification of the existing bridge abutments so that the ACROW bridge can be placed permanently on the site. It also requires removal of an existing bridge and abutments currently underlying the ACROW bridge. The Town has developed design and construction drawings for these modifications, which will include:

1) Installation of water management and pollution control measures;
2) Removal of back wall of east side abutment of ACROW bridge;
3) Removal of existing ACROW bridge and providing for onsite storage;
4) Removal and disposal of the existing concrete bridge underlying the ACROW bridge, including abutments and any fill material between the ACROW bridge abutment and the existing concrete bridge and abutments;
5) Installation of helical piles on both the west and east side abutments;
6) Installation of tieback anchors on both the west and east side abutments;
7) Re-placement of the ACROW bridge on the modified abutments;
8) Rebuilding back wall of east side abutment;
9) Repaving of the Bass Road surface in approaches to the Bridge; and
10) Final site cleanup, grading, inspections, and equipment removal from the site.

Site Plans for the proposed bridge repairs are attached to this RFP, starting on page 169.

Because of the complexity and specificity of the project, the Town will be requiring interested parties to attend a mandatory site visit in order to provide an inspection of the bridge site and ensure that all components of the project and the Town's goals for the bridge repairs are understood.

The **mandatory site visit will take place at 9:00 a.m. on Thursday, April 13, 2023** at the Bass Road Bridge over Merrick Brook, approximately ¼ mile south of the Bass Road intersection with Gager Hill Road.

The Town has electronic files that include engineering and construction drawings, soil boring logs, watershed calculations, design calculations, and numerous site photos of the Bass Road Bridge and required improvements. These files will be made available via Dropbox link for interested bidders who send an email request to First Selectman Gary Greenberg at firstselectman@scotlandct.org.

The Town of Scotland will not reimburse from any expenses incurred in connection with this Request for Proposals (RFP) including, but not limited to, the cost of site visit attendance, preparing the initial response and any additional information requested or travel expenses relating to any oral presentation.

Please be advised that responses will be considered property of the Town, are matters of public record, and may be disclosed by Scotland after the awarding of a contract.

Respondents should provide the following items as part of their response:

1) Statement of Qualifications to undertake work of this nature;

2) Scope of services based on this project's description and the mandatory site visit;

3) A proposed construction fee itemized with proposed time and materials costs for all items included on the attached BID FORM and associated specifications;

4) Demonstration of sufficient financial resources or capacity for bonding to guarantee the performance of the construction installation;

5) A proposed plan for addressing contracting recommendations of the Connecticut Commission on Human Rights and Opportunities (CHRO); and

6) Proposed schedule for completion.

Bids will be evaluated based on the following criteria:

- Qualifications, relevant experience and licensing;
- Proposed Construction Fee, with Labor and Material Costs; and
- Anticipated time frame for project completion.

Questions about this RFP should be directed to First Selectman Gary Greenberg at firstselectman@scotlandct.org by email only, no later than April 14, 2023. Answers to questions received will be compiled and emailed to participants from the mandatory site visit no later than April 19, 2023.

Sealed Bids clearly marked "Scotland Bass Road Bridge Repairs" shall be received until 1:00 p.m. on Wednesday, April 26, 2023 at the Office of the First Selectman, Scotland Town Hall, 9 Devotion Rd, Scotland, CT 06264. The Town of Scotland reserves the right to accept or reject any and all bids.

Bids will be publicly opened and read at an open public meeting on Wednesday, April 26, 2023 at 7:00 p.m. at the Scotland Town Hall by the First Selectman.

Confidentiality - If the Respondent believes that any information in its proposal should be treated as confidential that material shall be clearly marked. The Town shall endeavor to protect confidential material from disclosure to non-Town employees to the extent required by State or Federal law. In no event will the Town be responsible for the inadvertent disclosure of your response to this RFP.

ATTACHMENTS:

1) Bid Form for Bass Road Bridge Repairs
2) Bid Specifications for Bass Road Bridge Repairs
3) Site Plan for Bass Road Bridge Repairs

Town of Scotland, Connecticut
Abutment Repairs for Bass Road Bridge
Over Merrick Brook (# 04772)

BID FORM

Form 818 Section	Work Item	Quantity	Units	Subtotal
9.75.05	Mobilization	Lump Sum	each	
9.80.05	Survey Site for Construction	Lump Sum	each	
2.04.05	Soil Erosion Control - Silt Fences - Cofferdams - Work Site Drainage	Lump Sum	each	
2.01.05	Clearing and Grubbing	Lump Sum	each	
1.05.05	Administration - Weekly Job Site Meeting	5	Each	
2.04.05	Work Area Pumping System Installation - 15' x 15' bag	1	each	
9.79.05	Traffic Control - Barriers - Detour Route	1	each	
2.02.05	Roadway Excavation - including removal of Bituminous Pavement	450	C. Y.	
2.02.05	Rock Excavation - (No Explosives)	10	C. Y.	
2.03.05	Structure Excavation - Earth (Excluding Cofferdam and Dewatering)	100	C. Y.	
5.03.05	Removal of Superstructure - ACROW Bridge (include ACROW Rep.)	1	L. S.	
2.04.05	Cofferdam Installation 4 ft high, 15' base - 200 l.f. long	450	C. Y.	
2.04.05	Dewatering - 15'x15' Filter Bag with pump and discharge pipe	1	each	
2.04.05	Trench Excavation - for Tie Rod Installation - 0 to 4' depth	450	C. Y.	
2.08.05	Free Draining Material	10	C. Y.	
2.09.05	Subgrade	270	S. Y.	
2.10.05	Temporary Slope Protection - silt fences	175	L. F.	
2.11.05	Anti-Tracking Pad	53	S. Y.	
2.12.05	Subbase - 12" thick	44	C. Y.	
3.04.05	Processed Aggregate Base	22	C. Y.	
4.06.05	Bituminous Concrete HMA S*	46	Tons	
6.01.05	Abutment and Wall Concrete	5	C. Y.	
6.02.05	# 5 Deformed Steel Bars - including epoxy anchorage, No epoxy coat	120	Lbs.	
6.02.05	Tieback Construction and Installation - # 5 bars	250	Lbs.	
6.02.05	Tieback Protection - PVC Wrap -	250	L. F.	
6.035.05	Helical Piles - Mobilization / Demobilization	1	L. S.	
6.035.05	Helical Piles Installation	12	Each	
6.035.05	Obstructions	Varies	Per Hour	
6.035.05	Add / Deduct (field changes only)	Varies	L. F.	
7.03.05	Riprap	43	C. Y.	
9.50.05	Seed Site - Grass & Wildflowers	400	S. Y.	

2.04.05	Removal of Erosion Control Measures - Cofferdams	2	Each
2.04.05	Removal of Erosion Control Measures - Dewatering	2	Each
2.04.05	Removal of Erosion Control Measures - Silt Fences	1	L. S.
2.04.05	Removal of Traffic Control Measures - Detour Route	1	L. S
9.75.05	Demobilization - Removal and Cleanup of all Disturbed Areas	400	S. Y.

Total Bid Price

SECTION 1.04
SCOPE OF WORK
1.04.01—Intent of Contract
1.04.02—Changes in Quantities of Pay Items, Including Elimination of Such Items
1.04.03—Changes in Quantities and Significant Changes in the Character of Work
1.04.04—Differing Site Conditions
1.04.05—Extra Work
1.04.06—Removal and Disposal of Structures on the Work Site
1.04.07—Rights in and Use of Materials Found on the Work Site

1.04.01—Intent of Contract: The Contract directs and obliges the Contractor to perform the Project described in strict compliance with the Contract terms, including its specifications, plans, special provisions, and other Contract documents. If the Engineer revises any of those terms in writing during the life of the Contract, the Contractor must comply with said revised terms. Among other things, the Contract obliges the Contractor to perform all Project work in conformity with the lines, grades, typical crosssections, dimensions, and other data shown on the plans and other Contract documents. The Department will pay the Contractor only for work (including materials necessary for that work, whether or not they are incorporated into that work) that the Contractor has actually performed under a Contract pay item, and only if the Engineer has accepted said work. (See 1.02.03 herein.) (The Contract as it existed when first duly executed by the Engineer is sometimes referred to herein as "the original Contract.")

1.04.02—Changes in Quantities of Pay Items, Including Elimination of Such Items: The quantities given in the original Contract for Contract pay items are only estimates of the quantities of those items that may be required for Project completion. (The quantities for given pay items in the original Contract are sometimes referred to herein as the "estimated quantities" or "original quantities.") A change in the original quantity of a Contract pay item (whether an increase or decrease of the quantity) shall be deemed to have occurred when the Engineer explicitly orders said change of quantity or when the change of quantity has been necessitated by a construction order or other written direction issued by the Engineer to the Contractor.

A Contract pay item shall be deemed a Major Item if the item's lump sum price in the original Contract, or its original quantity multiplied by its unit price in the original Contract, is equal to or greater than 10% of the original Contract's total bid price. All other Contract items shall be deemed Minor Items.

The provisions of 1.04.03 herein shall govern changes in compensation related to a "significant change" in Contract work (as such changes are defined in 1.04.03) necessitated by a written order of the Engineer.

The provisions of 1.04.04 herein shall govern changes in compensation related to any differing site condition encountered by the Contractor that affects its performance of Contract work.

The provisions of 1.04.03 or 1.04.04 shall govern in any case in which they conflict with another provision of the Contract.

If the Engineer and the Contractor together determine that a particular change in compensation to the Contractor should be made due to a change in a Contract pay item quantity (including an item's complete elimination), they may make that change in compensation by a written agreement to do so.

Changes in Quantities to Minor Items:

(a) Quantity Increases of More Than 25% over Original Quantity: If the actual quantity of work authorized and accepted by the Engineer under a Contract pay item exceeds the item's original quantity by 25%, the Department will pay for the quantity in excess of 125% of the original quantity in one of the following three ways. (One-time fixed costs for which the Department has already reimbursed the Contractor in paying for 125% of the original quantity shall not be included in a calculation of the actual cost of the excess units.)

(1) Pay for the aggregate excess units on a cost-plus basis as provided in 1.09.04.

(2) Adjust the unit price by the increase or decrease in the unit price for the excess units, which shall be the difference between the original Contract unit price and the actual unit cost (calculated on a cost-plus basis as provided in 1.09.04) of the excess units, said difference to be

calculated as of the time when work under the item was completed.
(3) Pay for the units in any other manner agreed on in writing by the Engineer and the Contractor.
If, however, the aggregate payment for the units in excess of 125% is less than $25,000 (using the original Contract unit price for the calculation) the Engineer will not adjust that unit price.

(b) Quantity Decreases of More Than 25% below Original Quantity: If the actual quantity of a Contract pay item authorized and accepted by the Engineer is less than 75% of the item's original quantity, the Engineer will not adjust the original Contract unit price for said item unless the Contractor makes a written request to the Engineer for such adjustment and the Engineer grants it in writing. If the Engineer grants such a request, the Engineer will adjust the price for each accepted unit of said item performed or provided in one of the following three ways:
(1) Pay for the total item units actually performed or provided in the aggregate units on a cost-plus basis as provided in 1.09.04.
(2) Adjust the unit price by any increase in the unit price for the deficit units, which shall be the difference between the original Contract unit price and the actual unit cost (calculated on a costplus basis as provided in 1.09.04) of the total units performed or provided, said difference to be calculated as of the time when work under the item was completed.
(3) Pay for the item units performed or provided in any manner agreed on in writing by the Engineer and the Contractor.
In no instance however, shall the unit price paid for the number of units performed or provided, when their quantity has been decreased by more than 25% of the original quantity, be less than their original unit price; and in no instance shall the aggregate payment for such a decreased quantity of items be more than the Engineer would have paid for the performance or provision of 75% of the original quantity at the original unit price.
Regarding treatment of eliminated Contract items, refer to 1.09.05 herein.

1.04.03—Changes in Quantities and Significant Changes in the Character of Work:
(i) The Engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the Project. Such changes in quantities and alterations shall not invalidate the Contract nor release the surety, and the Contractor agrees to perform the work as altered.
(ii) If the alterations or changes in quantities significantly change the character of the work under the Contract, whether such alterations or changes are in themselves significant changes to the character of the work or by affecting other work cause such other work to become significantly different in character, an adjustment, excluding anticipated profit, will be made to the Contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the Contractor in such amount as the Engineer may determine to be fair and equitable.
(iii) If the alterations or changes in quantities do not significantly change the character of the work to be performed under the Contract, the altered work will be paid for as provided elsewhere in the Contract.
(iv) The term "significant change" shall be construed to apply only to the following circumstances:
(A) When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction; or
(B) When a Major Item of work, as defined elsewhere in the Contract, is increased in excess of 125% or decreased below 75% of the original Contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125% of original Contract item quantity, or in case of a decrease below 75%, to the actual amount of work performed.

1.04.04—Differing Site Conditions:
(i) During the progress of the work, if subsurface or latent physical conditions are encountered at the Site differing materially from those indicated in the Contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the Contract, are encountered at the Site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the Site is disturbed and before the affected work is performed.
(ii) Upon written notification, the Engineer will investigate the conditions, and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the

performance of any work under the Contract, an adjustment, excluding anticipated profits, will be made and the Contract modified in writing accordingly. The Engineer will notify the Contractor of the determination whether or not an adjustment of the Contract is warranted.

(iii) No Contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

(iv) No Contract adjustment will be allowed under this clause for any effects caused on unchanged work.

1.04.05—Extra Work: Unforeseen work made necessary by the Engineer's changes of the Contract plans or specifications, or work that is necessary for completion of the Project, but for which no price is provided in the Contract, shall be done in accordance with the requirements of the specifications and as directed by the Engineer. The Engineer will notify the Contractor of the necessity for such extra work, stipulating its character and extent, and will notify the Contractor as to whether the Engineer wants the Contractor to propose a unit price or, lump sum price, or to perform the extra work on a cost-plus basis in accordance with 1.09.04. The Engineer need not solicit any price for the extra work from the Contractor, but may, in any event, simply order the Contractor to perform the extra work on a cost-plus basis. If the Engineer does solicit from the Contractor a unit or lump sum price for the extra work, the Contractor must propose such a price in writing within 5 days of the Engineer's request for one.

The Contractor's price proposal shall be itemized and reasonably detailed, and shall include all known or anticipated direct and indirect costs of the work, including but not limited to, the costs of all safety and other equipment, small tools, labor, subcontractor quotes, consumables, field office overhead, home office overhead, insurance, bonding, and profit.

The character and extent of the extra work, together with the basis of compensation, shall be communicated to the Contractor by means of a construction order which, when signed by the Engineer, shall become a part of the Contract. If a Contractor objects to any portion of a construction order submitted to it, the Contractor must, within 15 days of its receipt of said order, return the order with a letter to the Department's Assistant District Engineer administering the Contract, describing specifically what portions of the order the Contractor finds objectionable, the nature of its objections, and the bases for its objections. If the Contractor does not do so, it shall be deemed to have accepted the terms of the construction order.

If the Engineer changes the scope of Contract work, the Contractor shall submit a proposed revised schedule and a cost revision proposal, which takes all such changes into account, if the Contractor believes that such revisions are warranted. If the schedule is to be revised, it will be revised in accordance with 1.08.08.

1.04.06—Removal and Disposal of Structures on the Work Site: All structures on the Project site which are not to remain on the Project site after completion of the Project shall be removed from said site and disposed of by the Contractor once it is no longer needed for the Project, and any such structure shall then become the property of the Contractor, except as otherwise required or provided by 1.10.07.

1.04.07—Rights in and Use of Materials Found on the Work Site: Upon written request of the Contractor and with the written approval of the Engineer, subject to limitations which may be set forth within such approval, any stone, gravel, sand, topsoil or any material from existing bridge substructures, buildings, or other structures, found within the limits of the Project may be excavated or removed and used by the Contractor on the Project, provided that said materials meet the requirements of the specification for such materials. Any materials excavated or removed shall not be taken off the Project site unless the Engineer in writing specifically authorizes such action. The following conditions shall govern these matters:

1. Excavation or removal of materials that would necessarily be excavated or removed in making the improvement will be paid for at the applicable Contract unit prices; and, in addition, the item for which this material is used will also be paid for at its Contract unit price. The Contractor will not be charged for such materials. The Contractor shall, without compensation, place in the embankment or elsewhere, as appropriate, sufficient suitable material to fill the space that the excavated materials would have occupied, unless otherwise directed by the Engineer.
2. The excavation or removal of materials that are not required to be excavated or removed in connection with the Contract work will not be paid for; and the Contractor will be charged for such materials at a negotiated unit price. The item for which this material is used will be paid for at its Contract unit price. The Contractor shall, without compensation, backfill with accepted material the space that the excavated materials had occupied, to the satisfaction of the Engineer, unless otherwise directed by the Engineer.

Surplus material shall be removed from the Project only with the Engineer's written permission. The

Engineer may determine that such material is not surplus, and may order that it be incorporated into the Project.

1.04.08 – Division III - Materials Sections: All references in this specification to M sections – such as M.02 Portland Cement Concrete – may by found in the "**Standard Specifications for Roads, Bridges, Facilities and Incidental Construction Form 818**" which is available on the Connecticut Department of Transportation web site.

These Standard Specifications – Form 818, in a searchable document format, may be accessed on the Department's internet site:
Click on "Doing Business with CTDOT" under "Publications" choose "Specifications for Roads, Bridges, Facilities & Incidental Construction" from the list, then click on "Form 818" at:
https://portal.ct.gov/DOT

SECTION 1.05
CONTROL OF THE WORK

1.05.01—Authority of Engineer: All work shall be subject to the review of the Engineer. He shall decide all questions as to interpretation of the plans and specifications, and questions of mutual or respective rights of the Contractor and other Department contractors. The Engineer shall decide on an acceptable rate of progress, on the manner of performance, and on what shall be deemed acceptable fulfillment of the Contract. The Engineer shall have the right to determine the points at which the Contractor may begin work and the order in which the work shall be prosecuted in the best interests of the State within the intent of the terms in the Contract.

If a Project-related dispute arises between the Contractor and Department personnel assigned to the Project, and if those parties prove unable to resolve it, the Contractor may submit a detailed written description of the dispute to the Department's Assistant District Engineer administering the Contract.

It must be understood, though, that at no time may the Contractor, because of its disagreement with the Engineer, either disregard the orders of the Engineer or halt Project construction. If the Contractor cannot resolve a Project work or pricing dispute with the Engineer, the Contractor's proper remedy is a claim under CGS 4-61. A Contractor that disregards the orders of the Engineer with regard to the prosecution of Project work, or who refuses to continue Project work because of a disagreement with the Engineer, may be subject to termination of its Contract, to a subsequent finding that it is nonresponsible as an apparent low bidder for a Department contract, to the assessment of liquidated damages, and to other adverse legal or administrative action by the Department.

1.05.02—Plans, Working Drawings, Shop Drawings, Product Data, Submittal Preparation and Processing, and Designers Action:

1. Plans: The plans prepared by the Department show the details necessary to give a comprehensive idea of the construction contemplated under the Contract. The plans will generally show location, character, dimensions, and details necessary to complete the Project. If the plans do not show complete details, they will show the necessary dimensions and details, which when used along with the other Contract documents, will enable the Contractor to prepare working drawings, shop drawings or product data necessary to complete the Project.

2. Working Drawings: When required by the Contract or when ordered to do so by the Engineer, the Contractor shall prepare and submit six printed copies and one electronic copy in a pdf file format of the working drawings, signed, sealed and dated by a qualified Professional Engineer licensed to practice in the State of Connecticut, for review. The drawings shall be submitted to the Assistant District Engineer sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods specified in 1.05.02-5 (including any necessary revisions, resubmittal, and final review).

There will be no direct payment for furnishing any working drawings, procedures or supporting

calculations, but the cost thereof shall be considered as included in the general cost of the work.
a. Working Drawings for Permanent Construction: Drawings shall be submitted on 22 inch × 34 inch sheets with a border and title block similar to the Department standard. Calculations, procedures and other supporting data may be submitted in an 8-1/2 inch × 11 inch format.
The Contractor shall supply to the Assistant District Engineer a certificate of insurance in accordance with 1.03.07 at the time that the working drawings for the Project are submitted.
The Contractor's designer, who prepares the working drawings, shall secure and maintain at no direct cost to the State a Professional Liability Insurance Policy for errors and omissions in the minimum amount of $2,000,000 per error or omission. The Contractor's designer may elect to obtain a policy containing a maximum $250,000 deductible clause, but if the Contractor's designer should obtain a policy containing such a clause, they shall be liable to the extent of at least the deductible amount. The Contractor's designer shall obtain the appropriate and proper endorsement of its Professional Liability Policy to cover the indemnification clause in this Contract, as the same relates to negligent acts, errors or omissions in the Project work performed by them. The Contractor's designer shall continue this liability insurance coverage for a period of
(i) 3 years from the date of acceptance of the work by the Engineer, as evidenced by a State of Connecticut, Department of Transportation form entitled "Certificate of Acceptance of Work," issued to the Contractor; or
(ii) 3 years after the termination of the Contract, whichever is earlier, subject to the continued commercial availability of such insurance.
b. Working Drawings for Temporary Construction: The Contractor shall submit drawings, calculations, procedures and other supporting data in a format acceptable to the Assistant District Engineer.
3. Shop Drawings: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and submit 6 printed copies and 1 electronic copy in a pdf file format of the shop drawings to the Designer for review. Review timeframes and submission locations are specified in 1.05.02-5.
Drawings shall be submitted on 22 inch × 34 inch sheets with an appropriate border and with a title block in the lower right-hand corner of each sheet. Procedures and other supporting data may be submitted on 8-1/2 inch × 11 inch sheets.
There will be no direct payment for furnishing any shop drawings, but the cost thereof shall be considered as included in the general cost of the work.
4. Product Data: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and submit 6 printed copies and 1 electronic copy in a pdf file format of the product data.
The product data shall be submitted to the Designer for review, sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods specified in 1.05.02-5 (including any necessary revisions, resubmittal, and final review), and acquisition of materials, without causing a delay of the Project.
The Contractor shall submit the product data in a single submittal for each element of construction.
The Contractor shall mark each copy of the product data submittal to show applicable choices and options. Where product data includes information on several products that are not required, copies shall be marked to indicate the applicable information. Product data shall include the following information and confirmation of conformance with the Contract to the extent applicable: manufacturer's printed recommendations, compliance with recognized trade association standards, compliance with recognized testing agency standards, application of testing agency labels and seals, notation of coordination requirements, Contract item number, and any other information required by the individual Contract provisions.
There will be no direct payment for furnishing any product data, but the cost thereof shall be considered as included in the general cost of the work.
5. Submittal Preparation and Processing – Review Timeframes: The Contractor shall allow 30 calendar days for submittal review by the Department, from the date of receipt of printed copies in the appropriate Designer or Engineer's office. For any submittals marked with "Revise and Resubmit" or "Rejected," the Department is allowed an additional 20 calendar days for review of any resubmissions. An extension of Contract time will not be authorized due to the Contractor's failure to transmit submittals sufficiently in advance of the work to permit processing.
The furnishing of shop drawings, working drawings or product data, or any comments or suggestions by

the Designer or Engineer concerning shop drawings, working drawings or product data, shall not relieve the Contractor of any of its responsibility for claims by the State or by third parties, as per 1.07.10.
The furnishing of the shop drawings, working drawings and product data shall not serve to relieve the Contractor of any part of its responsibility for the safety or the successful completion of the Project construction.
Submissions: Unless otherwise defined in the Contract, the Contractor shall transmit the working drawings, shop drawings and product data as follows:

a. Working drawings for permanent construction, shop drawings, and product data shall be submitted to the Designer. A copy of the transmittal or cover letter shall be forwarded to the Assistant District Engineer of the administering Construction District.

b. Working drawings for temporary construction shall be submitted to the Assistant District Engineer of the administering Construction District.

c. If not provided in the Contract, the Contractor shall request a list detailing the delivery location and contact person for each type of submittal, from the administering Construction District.

6. Designers Action: The Designer or Engineer will review each submittal, mark each with a uniform, self-explanatory action stamp, and return the stamped submittal promptly to the Contractor. The Contractor shall not proceed with the part of the Project covered by the submittal until the submittal is marked "No Exceptions Noted" or "Exceptions as Noted" by the Designer or Engineer. The Contractor shall retain sole responsibility for compliance with all Contract requirements. The stamp will be marked as follows to indicate the action taken:

a. If submittals are marked "No Exceptions Noted," the Designer or Engineer has not observed any statement or feature that appears to deviate from the Contract requirements. This disposition is contingent on being able to execute any manufacturer's written warranty in compliance with the Contract provisions. The Contractor may proceed with the work covered in the submittal.

b. If submittals are marked "Exceptions as Noted" the considerations or changes noted by the Designer or Engineer are necessary in order for the submittal to comply with Contract requirements. The Contractor shall review the required changes and inform the Designer or Engineer if they feel the changes violate a provision of the Contract or would lessen the warranty coverage.

c. If submittals are marked "Revise and Resubmit," the Contractor shall revise the submittals to address the deficiencies or provide additional information as noted by the Designer or Engineer. The Contractor shall allow an additional review period as specified in 1.05.02-5.

d. If submittals are marked "Rejected," the Contractor shall prepare and submit a new submittal in accordance with the Designer's or Engineer's notations. The resubmissions require an additional review and determination by the Designer or Engineer. The Contractor shall allow an additional review period as specified in 1.05.02-5.

1.05.03—Conformity with Plans and Specifications (including Quality Control): The Contractor shall perform all work and provide all materials in conformity with the lines, grades, cross-sections, dimensions and material requirements, including tolerances, shown on the plans or indicated in the Contract specifications, or as directed by the Engineer.
Quality Management Plan: The Contractor shall maintain and implement a written Quality Management Plan (QMP). The QMP shall document the overall internal quality control operating procedures for the Contractor to meet or exceed Contract requirements. The details of the QMP must discuss how the Contractor will ensure that:

☐ Work processes are performed efficiently and as documented

☐ Work processes out of conformance are quickly identified

☐ Corrective action is quickly taken to bring such work processes back into conformance

The QMP must include the following components:

☐ Identification of Contractor staff and their specific duties and responsibilities with regard to execution of the QMP

☐ Standard operating procedures and frequency of quality control inspection and testing used to measure quality before, during and after those procedures

☐ Action plan for reporting and reacting to nonconformance and quality control issues

The Contractor shall furnish a copy of the QMP to the Engineer prior to the start of the work. The Contractor must revise the QMP if, as determined by the Engineer, the Contractor's procedures prove to be inadequate or ineffective in producing work that meets the Contract requirements. Failure of the

Contractor to comply with the provisions of this Article may result in a suspension of work in whole or in part. The Department will not grant the Contractor additional Contract time or compensation in connection with such a suspension.

1.05.04—Coordination of Special Provisions, Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements: All requirements indicated on the plans or in the Standard Specifications, the Supplemental Specifications, Special Provisions or other Contract provisions shall be equally binding on the Contractor, unless there is a conflict between or among any of those requirements. In the case of such a conflict, the order of governance among those requirements, in order of descending authority, shall be as follows:

1. Environmental Permit Special Conditions
2. Special Provisions
3. Plans other than Standard Sheets (enlarged details on plans, used to clarify construction, shall take precedence over smaller details of the same area; and information contained in schedules or tables, titled as such, shall take precedence over other data on plans)
4. Environmental Applications / Registrations / Certifications
5. Supplemental Specifications
6. Standard Specifications
7. Standard Sheets

Numerical designations of dimensions shall take precedence over dimensions calculated by applying a scale to graphic representations. Neither party to the Contract may take advantage of any obvious error or omission in the Contract. Should either party to the Contract discover such an error or omission, that party shall notify the other party of same immediately in writing. The Engineer will make such corrections and interpretations of the Contract as are necessary, in his judgment, to fulfill the purposes of the Contract that are evident from examining the Contract as a whole.

If the Contract includes an item that does not have a corresponding specification for either performance or payment purposes, the Contractor shall notify the Engineer of that fact in writing at least 2 weeks prior to ordering materials for or commencing work on the item. If the Department’s documents do not contain such a specification, the Engineer shall, if possible, derive an appropriate specification from applicable AASHTO Specifications or, if necessary, ASTM Specifications. If neither of those sources provides a suitable specification, the Contractor shall seek guidance from the Engineer with regard to the item, and the Engineer will formulate a reasonable specification for the item. When compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall refer such issues to the Engineer for a decision before proceeding with the pertinent work.

1.05.05—Cooperation by Contractor: The Contractor will be supplied by the Department with copies of the plans, and the Contractor shall have available on the Project site at all times during the prosecution of the Project, a copy of the Contract plans and specifications. The Contractor shall give the Project constant attention to facilitate the progress thereof, shall cooperate with the Department, and shall promptly comply with all orders and directions of the Engineer.

The Contractor shall at all times during Project construction have on the Project site one of its employees who is thoroughly experienced in the type of work being performed, to supervise the work and accept directions from the Engineer. The Contractor shall always notify the Engineer of the identity of said employee representative in advance of the employee's assignment to that position. The Contractor's representative must have full authority to promptly execute and carry out the orders and directions of the Engineer within the terms of the Contract, and to supply such materials, equipment, tools, labor and incidentals as may be required by the Contract or by the Engineer.

Voluntary Partnering: The Connecticut Department of Transportation ("Department") wants to establish a cohesive partnership with the Contractor and its principal subcontractors on the Project, so that the partnership can draw on the strengths of each organization in order to identify and pursue the partners' mutual Project goals. Chief among those will be the effective and efficient completion of the Project, within budget, on schedule, and in accordance with applicable plans, specifications, and other Contract provisions.

If the Contractor believes at any point before or during Project construction that the creation of formal partnering between itself and the Department, with the use of a third-party facilitator, would help the Contractor and the Department ("Partners") to reach these goals, the Contractor may submit a written request to the District Engineer of the District in which the Project will be constructed for the establishment

of formal partnering between the Parties. If the Contractor makes such a request, the Department will engage in that partnering.
Any costs incurred by the Partners jointly in connection with Project partnering activities, to the extent that those costs are recognized as legitimate and appropriate by both Partners, will be shared equally between them. Any other costs incurred because of partnering activities will be borne by the Partner that incurred them.
If the Contractor and the Department decide to pursue a formal partnering initiative, they Contractor and The Department will arrange first to meet in order to select a third-party partnering facilitator and to plan a partnering development and team-building workshop. After they agree upon the services to be performed by the facilitator and the range of compensation for the facilitator that would be acceptable to them, the Contractor will contract accordingly for the services of said facilitator. The Department will reimburse the Contractor for 50% of the payments made under that contract, so long as the activities paid for were appropriate and within the contemplation of the Partners.
At the Partners' initial partnering meeting, the Partners will also determine who should attend the first partnering workshop, what the workshop's agenda will be, how long the workshop should last, and when and where it will be held. Unless the Partners agree otherwise, attendance at the first partnering workshop will be mandatory for the Department's District Engineer for the Project and the Department's other key Project personnel, the Contractor's on-Site Project manager and other key supervisory Project personnel, and, if the Contractor agrees to it, the key supervisory personnel of the Contractor's principal Project subcontractors. The Partners will also request that the Project design engineers and key local government personnel send Regional/District and Corporate/State-level managers to the workshop and direct them to participate in Project partnering activities as and when requested to do so by the Partners.
With the agreement of the Partners, follow-up Project partnering workshops will be held periodically until the Department closes out the Contract.
If the Partners agree on a formal partnering charter for the Project, the establishment of that charter will not change the legal relationship of the Partners to the Contract; it will not alter, supplement, or eliminate any of the Partners' rights or obligations under the Contract.
1.05.06—Cooperation with Utilities (Including Railroads): The Engineer may anticipate that a Project construction activity will require the removal, repair, replacement or relocation of a utility appurtenance. In such an instance, the Engineer, in advance of the commencement of such activity, will notify the affected utilities, either directly or through the local government, of the anticipated nature and timing of said activity. The Engineer will endeavor to have all necessary adjustments of public or private utility fixtures, pipelines, and other appurtenances within or adjacent to the limits of Project construction made as soon as practicable, when such changes are required by the State or local government.
Whenever the Engineer determines that the relocation or adjustment of poles or the overhead plant of public or private utilities or railroad facilities is dependent upon the completion of certain required Contract activities, the Contractor shall complete those activities within a reasonable length of time.
Temporary and permanent changes required by the State or local government in water lines, gas lines, sewer lines, wire lines, service connections, water or gas meter boxes, water or gas valve boxes, light standards, cableways, signals and all other utility (including railroad) appurtenances within the site of the proposed Project construction are to be made by others at no expense to the Contractor, except as otherwise provided for in the Special Provisions or as noted on the plans.
When the Contractor is required by the Engineer to relocate utility appurtenances, such work will be paid for as extra work unless specific bid items for such work appear in the Contract.
If the Contractor, for its convenience or for any other reason, desires a change in the location of a water line, gas line, sewer line, wire line, service connection, water or gas meter box, valve box, light standard, cableway, signal or any other utility (including railroad) appurtenances, the Contractor shall satisfy the Department that the proposed relocation will not interfere with the Contractor's or other contractors' Project operations or their fulfillment of the requirements of the plans, and that said change will not create an obstruction or hazard to traffic. If the requested change of location is acceptable to the Engineer, the Contractor shall make its own request for such relocation work to the utility companies, pipe owners or other parties likely to be affected by said work. Such relocation work shall be done at the Contractor's sole expense.
The Contractor shall schedule its operations in such a manner as to minimize interference with the operations of the utility companies or local governments in effecting the installation of new facilities, as shown on the plans, or the relocation of their existing facilities. The Contractor shall consider in its bid all

permanent and temporary utility appurtenances in their present or relocated positions and any installation of new facilities required for the Project. The Department will not make any additional compensation to the Contractor for delays, inconvenience or damage sustained by the Contractor due to

(i) interference with Project construction caused by the location, condition or operation of utility (including railroad) appurtenances or

(ii) the installation, removal, or relocation of such appurtenances; and the Contractor may not make a claim for any such compensation.

1.05.07—Coordination with Work by Other Parties: The Contractor shall make every effort to perform its work so as not to interfere with other work for the State or other parties. In the case of a dispute with another contractor working for the Department regarding their work for the State, or in the case of a conflict between their planned operations or the needs of their projects, the Contractor shall bring that dispute or conflict to the Engineer's attention, and the Engineer shall decide how it shall be resolved. The Engineer's decision shall be binding upon all of the contractors working for the Department who are involved in the matter.

The Contractor shall, as far as possible, schedule and otherwise plan and arrange its work, and place and dispose of its Project materials, so as not to interfere with the operations of other contractors working for the State. The Contractor shall, as necessary to accomplish this goal, endeavor to coordinate and schedule its work in the way which will interfere least with the work of other parties.

If the Contractor's work or activities under the Contract come into conflict with other activities or work for the State, any financial or other liability arising from such conflicts shall be the Contractor's; and the Contractor shall protect and save harmless the State from any and all damages or claims, and the costs of defending same, which may arise because of inconvenience, delay, financial hardship, or injuries caused to the Contractor or to other contractors as a result of such conflicts, unless:

(a) The Contractor notifies the Engineer of such conflicts as soon as the likelihood of such a conflict becomes apparent; or, if such likelihood could not have been foreseen earlier, then as soon as the conflict becomes apparent.

(b) The Contractor waits for direction from the Engineer as to how the conflict should be avoided or resolved, and the Contractor does not proceed with the work involved in the conflict until the Engineer has provided the Contractor with such direction.

(c) The Contractor follows the directions given by the Engineer for avoiding, resolving, or minimizing the conflict.

The Contractor shall be responsible for the completion of its Contract work, regardless of any interference with, or delay of, that work which may be caused by the presence or activities of other contractors working for the State.

1.05.08—Schedules and Reports: When a project coordinator is not required by the Contract the following shall apply:

Baseline Bar Chart Construction Schedule: Within 20 calendar days after contract award the Contractor shall develop a comprehensive bar chart as a baseline schedule for the project. The bar chart schedule shall be submitted to the Engineer for approval and shall be based on the following guidelines:

1. The bar chart schedule shall contain a list of activities that represents the major activities of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The bar chart schedule shall contain sufficient detail to describe the progression of the work in a comprehensive manner. As a guide, 10 to 15 bar chart activities should be provided for each $1 million of contract value.

The following list is provided as an example only and is not meant to be all-inclusive or all-applicable:

General Activities Applicable to all projects

Project Constraints

-Winter shutdowns
-Environmental permits/application time of year restrictions
-Milestones
-Third Party approvals
-Long lead time items (procurement and fabrication of major elements)
-Adjacent Projects or work by others

Award

Notice to Proceed

Signing (Construction, temporary, permanent by location)

Mobilization
Permits as required
Field Office
Utility Relocations
Submittals/shop drawings/working drawings/product data
Construction of Waste Stock pile area
Clearing and Grubbing
Earthwork (Borrow, earth ex, rock ex etc.)
Traffic control items (including illumination and signalization)
Pavement markings
Roadway Construction (Breakdown into components)
Drainage (Breakdown into components)
Culverts
Plantings (including turf establishment)
Semi-final inspection
Final Cleanup
As required the following may supplement the activities listed above for the specific project types indicated:
a. For bridges and other structures, include major components such as abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.
Temporary Earth Retention Systems
Cofferdam and Dewatering
Structure Excavation
Piles/test piles
Temporary Structures
Removal of Superstructure
Bearing Pads
Structural Steel (Breakdown by fabrication, delivery, installation, painting etc.)
Bridge Deck
b. Multiple location projects such as traffic signal, incident management, lighting, planting and guiderail projects will be broken down first by location and then by operation. Other major activities of these types of projects should include, but are not limited to:
Installation of anchors
Driving posts
Foundations
Trenching and Backfilling
Installation of Span poles/mast arms
Installation of luminaries
Installation of cameras
Installation of VMS
Hanging signal heads
Sawcut loops
Energizing equipment
c. Facility Projects − Facilities construction shall reflect the same breakdown of the project as the schedule of values:
Division 2 − Existing Conditions
Division 3 − Concrete
Division 4 − Masonry
Division 5 − Metals
Division 6 − Wood, Plastic, and Composites
Division 7 − Thermal and Moisture Protection
Division 8 − Openings

SECTION 1.08
PROSECUTION AND PROGRESS

1.08.01—Transfer of Work or Contract: The Contractor shall perform with its own organization Contract work with a value under the Contract of at least 50% of the original total Contract value. If the Contractor sublets, sells, transfers, or otherwise disposes of any part of the Contract work without the Commissioner's prior written consent, the Contractor will not be relieved of any Contractual or other legal responsibility in connection therewith. Such an unauthorized act by the Contractor shall constitute a material breach of the Contract, and the Commissioner may, in such a case, terminate the Contract without further compensation to the Contractor.

The Contractor shall include the following alternative dispute resolution clause in all of its Project subcontracts:

"*For any dispute arising out of the agreement between the Contractor and a subcontractor, including claims of late payment or non-payment, which cannot be settled within 60 days of the subcontractor submitting a written claim to the Contractor, either party may bring the dispute before an alternative dispute resolution entity for resolution. If the parties do not agree upon a particular dispute resolution entity for that purpose, the dispute shall be resolved under the auspices and construction arbitration rules of the American Arbitration Association, or under the rules of any other alternative dispute resolution entity approved by the Department either generally or for the specific dispute. The Department may not be made a party to formal arbitration regarding such a dispute. These rights and restrictions may not be waived, and if these provisions are not included in the Contractor's subcontracts for the Project, these provisions shall nonetheless be read into them.*"

The Contractor shall not knowingly enter into any lower-tier transaction on a Department project with any person or entity which, under any federal or state law or regulation, or by voluntary agreement, is currently debarred or disqualified from bidding for construction contracts or participating in construction projects in any jurisdiction within the United States, unless after disclosure of such ineligibility, such participation is authorized by appropriate federal and State authorities, including the Commissioner.

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of its right, title, or interest therein, to any individual or entity without the written consent of the Commissioner. No payment will be made for such work until written consent is provided by the Commissioner.

The Contractor shall pay the subcontractor for work performed within 30 days after the Contractor receives payment for the work performed by the subcontractor. Withholding retainage by the Contractor, subcontractor or lower tier subcontractors is not allowed.

Payment for work that has been performed by a subcontractor does not eliminate the Contractor’s responsibilities for all the work as defined in 1.07.12, “Contractor’s Responsibility for Work.”

Payment for work that has been performed by a subcontractor also does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor’s items of work. Failure of a subcontractor to meet its maintenance, warranty or defective work responsibilities may result in administrative action on future Department contracts.

For any dispute regarding prompt payment, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.
Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is nonresponsible as a bidder for a Department contract.
1.08.02—Establishment of Construction Field Office: Prior to the start of Project construction, and within 10 calendar days after the signing of the Contract by the parties, the Contractor shall propose in writing to the Engineer a field office location. The proposal shall include the office telephone number to be used, the nearest utility pole number, and the distance from that pole to the proposed field office. The office shall be made acceptable to the Engineer and available for use, including all utility hookups, local permits and inspections, within 30 days of the Engineer's order to establish the office. Such order shall not be deemed the "Notice to Proceed."
1.08.03—Prosecution of Work: The Contractor shall commence construction operations with that part of the Project designated for such commencement in the progress schedule which it has submitted to the Department, unless the Engineer directs the Contractor to commence with a different part of the Project. The work shall be conducted in such manner and with sufficient materials, equipment and labor as are necessary to ensure completion of the Project in accordance with the Contract within the time set forth in the Contract. The Contractor shall notify the Engineer of its intention to commence or recommence any Project operation at least 48 hours in advance of doing so. The Contractor shall also give the Engineer such advance notice of any intent to discontinue any Project operation, unless emergency conditions make it impracticable to give such notice so far in advance. The Engineer retains the right to disallow such commencement, recommencement or discontinuance of operations.
1.08.04—Limitation of Operations: The Contractor shall plan and perform the Project work in such a manner and in such sequence as will cause as little interference as is practicable with vehicular, railroad, aircraft, pedestrian or other traffic. The Contractor shall cooperate with any utilities involved in or affected by the Project operations, and shall schedule its operations in accordance with 1.05.06.
The Contractor shall give the Engineer 7 days' advance written notice of any proposed changes in Project activities that will alter vehicular traffic patterns, causing lane shifts, detours, temporary closure of a lane, permanent closure of a lane or lane reductions, or any other alteration of railroad, aircraft, pedestrian or other traffic patterns affecting usage of such a transportation facility by the traveling public. This advance notification will allow the Department to publish news releases and provide public radio announcements to inform the public of revised traffic patterns or possible traffic delays. Failure of the Contractor to provide such timely notice will subject the Contractor to stop work orders until such time as the 7 days of required notice have run from either the Contractor's giving of the relevant notice or the Department's discovery of the pertinent alteration of traffic conditions.
1.08.05—Personnel and Equipment: The Contractor shall assign to the Project only personnel who are careful and competent. The Engineer may demand the removal of any person employed by the Contractor on the Project who is, in the opinion of the Engineer, guilty of misconduct on a Department project or incompetent or negligent in the performance of his duties on a Department project or any portion thereof, or who neglects or refuses to comply with directions given by the Engineer in connection with the Project. Following such a demand for his removal, such person shall not work again on the Project without the prior written consent of the Engineer. Should the Contractor, following such a demand for removal, continue to employ or again employ such person on any Department project without the required consent of the Engineer, the Commissioner may withhold all estimated payments that are or may become due to the Contractor for the Project, or the Engineer may shut down the Project until the Contractor has complied with the Engineer's orders concerning that person. The use of convict labor on projects funded in whole or in part by the federal government is prohibited.
The Contractor shall furnish whatever equipment is necessary for the Project to be performed in a manner and at a rate of progress that is acceptable to the Engineer. Equipment used on any portion of the Project shall not be used in any way that may cause injury to the roadway, adjacent property, or other property on or adjacent to the Project site, unless such damage is allowed by the Engineer for the performance of the Project.
The Contractor may submit to the Engineer a request to use equipment or methods other than those specified in the Contract. If the Engineer so directs, there shall be a trial of such equipment or methods. If the results of the trial are satisfactory to the Engineer, the Contractor may begin using the proposed

equipment or method on the Project. Failure of the equipment or method to meet the specified Contract performance standards in the course of the specified trial, or, in the absence of such standards, a failure to perform to the satisfaction of the Engineer, shall be cause for rejection of any such method or equipment, and any work performed with either. Such rejected equipment or work shall be removed immediately from the Project site.

1.08.06—Suspensions of Work Ordered by the Engineer: The Engineer may suspend the Project wholly or in part, for such period or periods as the Engineer considers to be in the best interests of the State, including, but not limited to, the interests of public necessity, convenience, or safety.

During such periods of suspension, and subject to any related directions from the Engineer, the Contractor shall store all materials and equipment in a way that will keep them from obstructing or impeding the traveling public unnecessarily, and that will keep the materials from being damaged; shall take all reasonable measures to prevent damage to the work performed; shall provide suitable drainage of the roadway and Project site by opening ditches, shoulder drains, etc., as appropriate; and shall erect temporary structures to prevent damage to the Project or to other property, and to protect the public, where and when necessary.

The Contractor shall maintain the Project site and all roadways and buildings thereon in a condition safe for travel or occupancy, and shall maintain all required barricades, signs, and lights during the period of suspension:

(1) If the Engineer orders in writing that performance of all or any portion of the Project shall be suspended, or that it shall be delayed for an unreasonable period of time (not customary, within the scope of possibilities that an experienced contractor should know might occur on a construction project, or inherent in the nature of construction activities), and if the Contractor believes that additional compensation or Contract time is due to it as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for a related Contract adjustment within 7 calendar days of the Contractor’s receipt of a direction from the Engineer to resume work. The request shall set forth the specific reasons and support for the requested adjustment.

(2) Upon his receipt of the Contractor’s request, the Engineer will evaluate the request. If the Engineer agrees that the expenditures or time required for the Contractor’s performance of the Contract have increased as a result of such suspension or delay, and if the suspension or delay was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or subcontractors at any approved tier, and was not caused by weather, the Engineer will make an appropriate adjustment (excluding any profit) of the written terms of the Contract. The Engineer will give the Contractor written notice of his determination as to whether or not the requested adjustment of the Contract is warranted and will be made.

(3) No Contract adjustment will be made unless the Contractor has submitted the request for adjustment within the time prescribed.

(4) In addition to the other limits and requirements imposed by this article, no Contract adjustment will be allowed under this article to the extent

(a) that the Project work would have been suspended or delayed by any cause other than the ones identified in the Contractor’s request, or

(b) that the requested adjustment or type of adjustment is provided for or barred by another provision of the Contract.

(With regard to Items 1-4 above, refer to 23 CFR, 635.109, "Standardized Changed Condition Clauses," Required FHWA Contract Specification.)

1.08.07—Determination of Contract Time: Unless the Contract requires the Project completion by a specified date, the number of calendar days allowed for the completion of the Project will be fixed by the Department, will be stated in the Contract, and will be known (with any subsequent adjustments) as the "Contract time." If at any time the Contractor submits a schedule showing completion of the work more than 30 calendar days in advance of the Contract completion date, the Department will issue a no-cost construction order revising the allowable Contract time to that shown on the Contractor's schedule.

When the Contract time is stated on a calendar-day basis, that time shall be the number of consecutive calendar days contained in the Contract period designated in the Contract, excluding the time period from each December 1 through the following March 31 (the “winter shutdown period”). The Contract time will begin to run on the date designated in the Engineer's "Notice to Proceed" as the date for commencement of the Project, and the time will be computed as herein provided on a consecutive-day basis, including all

Saturdays, Sundays, holidays, and non-work days from April 1 through November 30 of each included year.

Time will not be charged for days in the winter shutdown period, except for time used in working on planting projects and any other projects with regard to which the Standard Specifications or Project bid documents provide otherwise. If the Engineer so approves, the Contractor may work on the Project during the winter shutdown period with no charge being made against the Contract time.

If the time specified for completion of the Project, with time extensions, is due to expire before December 1 of a given year, but the Project has not been completed by that December 1, the time charged to the Contractor will continue through the winter shutdown period.

The total elapsed time in calendar days, computed as described above, from the commencement date specified in the Engineer's "Notice to Proceed" to the “Substantial Completion” date specified in the Engineer’s "Notice of Substantial Completion" shall be considered as the time used in the performance of the Contract work.

Suspension involving cessation of work on all items, except minor construction not affected by or connected with the cause of suspension, shall be considered as total suspension. In case of a total suspension of the Project ordered by the Engineer, not due to any fault of the Contractor, the elapsed time during which the Project is suspended will not be charged against the Contract time. Work of an emergency nature ordered by the Engineer for the convenience or safety of the public or the protection of the Project work, if performed during a period of total suspension, will not be charged against Contract time. No such time allowance will be granted in case of partial suspension; provided, however, that the Contractor may request and the Engineer may grant permission to perform specific limited operations during such a partial suspension, in which case Contract time chargeable for those operations shall be negotiated and agreed to in writing before such operations may commence.

1.08.08—Extension of Time: The Contractor may present to the Engineer a request in writing for an extension of Contract time if the time necessary for completion of the Project has been increased due to extra or added work or delays resulting from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, except for weather or seasonal conditions (unless extraordinary and catastrophic). Such causes include, but are not limited to, natural catastrophes, acts of the State in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the State, the presence of utility facilities (including railroads), fires, strikes, floods, or delays by suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of either the Contractor or such suppliers.

The Contractor's plea that insufficient Contract time was allowed under the Contract before commencement of the Project is not a valid reason for extending the Contract time. Requests for an extension of time, with adequate substantiation, must be presented within 60 calendar days from the event that is the basis of the request or from the first effect of such an event on the Project. The Contractor will be responsible for providing all the documentation necessary to support the reasonableness of the additional time requested. This shall include a Critical Path Method Schedule Analysis and accompanying narrative that includes the specific dates and number of days for which the extension is sought, the basis or bases for the extension, and the schedule analysis illustrated in a graphic representation of the schedule impacts such as a bar chart or other type of graphical schedule. The critical path is a sequence of activities in a project wherein none of the activities can be delayed without affecting the final project end date.

Such requests will be considered by the Engineer and granted to the extent that the Engineer deems to be fair and reasonable. Requests will not be considered if based on delays caused solely by conditions existing at the time the bids were received and of which the Contractor might reasonably be expected to have had full knowledge at the time, or upon delays caused by failure on the part of the Contractor to anticipate properly the requirements of the Project as to materials, labor, or equipment. For all Project delays or time increases, except as provided below, additional Contract time is the sole remedy that the Contractor may have, and such periods of additional Contract time shall be deemed "Non-Compensable Delays." For delays caused by the State in its Contractual capacity, the Contractor may, in addition to a time extension, request additional compensation to reimburse it for damages sustained as a direct result of such delay, and such periods of extended Contract time may be deemed "Compensable Delays."

The period of compensable delay is limited as follows:

(1) it may not include time more than 60 days prior to the Engineer’s receiving written notice from the Contractor, with adequate substantiation, of its intent to claim damages for the delay, and

(2) it may not include periods of delay for which the State was responsible, but during which the

Contractor experienced concurrent delays for which the State was not responsible.

Damages for periods of Project delay for which the State had sole responsibility shall be limited to the increased costs incurred by the Contractor (which shall not include lost profits), which the Contractor substantiates and which the Contractor shows were caused by such delays.

If an approved extension of Contract time extends beyond November 30, the number of days of the approved extension remaining on that date will not begin to run again until the following April 1.

The Critical Path Method Schedule Analysis shall include at a minimum:

1. The manner in which the Contractor planned to construct the Project, in terms of activities, logical interrelationships of activities, work sequences, activity durations, and calendars.
2. The actual duration and sequences of the activities, based on what actually occurred on the Project.
3. The variances between the planned and actual performance of the work, listed in a chronological and cumulative manner, summing to the net total delay on the Project at the time of the request.
   a. The causes of the variances between the planned and actual performance of the work, specifically allocating legal responsibility for each to either the Department or the Contractor.
   b. The effects of the variances in work sequences, activity durations and Resources on the incurred costs of the affected party or parties.
4. An identification analysis of the causes of any concurrent delays on the Project.
5. Statements as to whether the time extension days sought are compensable or non-compensable, along with a specific statement of any compensation requested in connection with the time extension. Any request for a time extension that does not include a corresponding request for compensation will be assumed to be a request for a non-compensable time extension.
6. All associated analysis documents, worksheets, schedules and contemporaneous documents supporting the Critical Path Method Schedule Delay Analysis.

1.08.09—Failure to Complete Work on Time: Time is an essential element of the Contract. Since the prosecution of the Project may obstruct traffic, interfere with business, and otherwise inconvenience the public, it is important that the Project be pressed vigorously to completion. The cost to the Department of the administration of the Contract, including engineering, inspection and supervision, will also be increased as the time for Project completion is lengthened. Therefore, for each calendar day that any work shall remain uncompleted after the Contract time has expired, the per diem sum of liquidated damages specified in the Contract shall be deducted from any money due to the Contractor. Liquidated damages are not a penalty, but are a reasonable estimate of the damages caused by such delay.

If the last day of the initial Contract time or the initial Contract date determined for Substantial Completion is before December 1 in the given year, liquidated damages as specified in the Contract shall be assessed against the Contractor per calendar day (including any days during a winter shutdown period) from that day until the date on which the Project is substantially completed.

The Engineer has the right to deduct the amount of the liquidated damages assessed against the Contractor from any estimated payment for work performed under the Contract or under any other State contract, or from any other sums owed by the State to the Contractor; or to claim and recover such sums by process of law.

1.08.10—Termination of Contract for Cause: The Commissioner may give notice in writing to the Contractor and its surety of any delay, neglect, or default of the Contractor which the Commissioner believes has occurred, including one or more of the following:

1. Failure to begin the Project on the date specified in the Notice to Proceed.
2. Failure to perform the Project with sufficient personnel, equipment or materials to ensure timely Project completion.
3. Unsuitable performance of the Project or failure to perform Project work in accordance with the Contract.
4. Failure or refusal to remove or correct work rejected by the Engineer.
5. Discontinuance of suitable prosecution of the Project for a period of 72 hours, excluding Sundays and holidays, without written authorization to do so from the Engineer.
6. Failure to recommence discontinued work within 48 hours (excluding Sundays and holidays) after being ordered to do so by the Engineer.
7. Insolvency, filing for bankruptcy, or any act or occurrence which may render the Contractor financially incapable of completing the Project.

8. Failure to satisfy any final judgment for a period of 30 calendar days.
9. Making of any assignment for the benefit of creditors.
10. Violation of any provisions of the Contract.
11. Any other cause which, in the judgment of the Commissioner, warrants termination, including, but not limited to, violations of the antitrust or criminal laws, and attempts to deceive or defraud the Department in material matters.

If the Contractor or surety within a period of 10 calendar days after such notice does not proceed in conformance with the directions set forth in the notification, or fails to present a remedial plan of operation satisfactory to the Commissioner, then the Commissioner may, at his discretion, order the surety to complete the Project or, without violating the Contract, take the right to control and prosecute the Project out of the hands of said Contractor and surety. No termination of the Contract for such cause will be deemed to have occurred, however, unless the Commissioner himself or herself (and not merely a designated representative of his or hers) expressly declares it in a writing to the Contractor.

The Department may acquire or rent whatever materials or equipment are necessary in order to complete the Project and may seize and use for purposes of the Project (with any appropriate compensation to the Contractor) any material or equipment that the Contractor acquired or purchased expressly for the Project in accordance with a specific Contract requirement.

The Department may also enter into an agreement, either by negotiation or public letting, for the completion of the Contract according to the terms and provisions thereof, or use such other methods or combinations thereof as in the Commissioner's opinion shall be required or desirable for the completion of the Contract in an acceptable manner. All costs and charges incurred by the Department, in connection with completing the Project under the Contract, or as a result of the Contractor's default, shall be deducted from any monies due to or which may become due to the Contractor. In case such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the surety shall be liable for, and shall pay to the State, the amount of the excess.

1.08.11—Final Cleaning Up: The Project will not be considered complete and will not be accepted until the rights of way, borrow pits, and all other ground, both public and private, occupied by the Contractor in connection with the Project has been cleared of all surplus and discarded materials, rubbish and temporary structures. The Contractor must drain all borrow pits where practicable. All property, both public and private, which has been damaged during the prosecution of the Project, shall be restored by the Contractor to an appearance and condition acceptable to the Engineer.

All ditches, waterways, drainage structures and culverts constructed under the Contract shall be cleaned and cleared of obstructions by the Contractor, and shall be left in a condition acceptable to the Engineer. When so directed by the Engineer, the Contractor shall clean all existing ditches, waterways, drainage structures and culverts of obstructions resulting from Project operations.

1.08.12—Final Inspection: If the Engineer determines that the work may be substantially complete, a Semi Final Inspection will be held as soon as practical. After the Semi Final Inspection is held and the Engineer determines that the requirements for Substantial Completion have been satisfied the Engineer will prepare a “Notice of Substantial Completion.”

When the Contractor has completed all work listed in the “Notice of Substantial Completion” the Contractor shall prepare a written notice requesting a Final Inspection and a “Certificate of Acceptance of Work.” The Engineer will hold an Inspection of the Project as soon as practical after the Engineer determines that the Project may be completed. If the Engineer deems the Project complete, said inspection shall constitute the Final Inspection, and the Engineer will notify the Contractor in writing that the Final Inspection has been performed.

If the inspection discloses any unsatisfactory or incomplete Project work, the Engineer will notify the Contractor of such deficiencies. The Contractor shall immediately correct the deficiencies. Upon such correction, another inspection will be made that shall then constitute the Final Inspection, provided that the work has been satisfactorily completed.

On projects consisting of 2 or more individual, geographically-separated sections of roadways, sites, or physically-separated buildings or portions of buildings, a partial final inspection of individual, fully completed sections will be performed by the Engineer if the Contractor so requests.

If at any time during the prosecution of the Project the Contractor substantially completes a unit or portion of the Project, such as, but not limited to, a structure, an interchange, a building, a portion of a site, a branch circuit in highway illumination that has been in satisfactory and continuous operation for a period of at least 30 days, or a section of road or pavement, then, to the extent that said portion’s stability and

integrity are not dependent upon the completion of other Contract work, the completed unit or portion of the Project may be opened:

(1) to vehicular or pedestrian traffic under the provisions of 1.07.11; or

(2) to railroad, aircraft, pedestrian or other traffic, or to occupancy, at the direction of the Engineer.

A final inspection of the substantially-completed unit or portion of the Project will be arranged by the Engineer. Upon evidence of such completion, including issuance of a Certificate of Compliance for any building, and upon agreement by the Engineer, the Contractor will be relieved of the responsibility for that work which was placed upon it by 1.07.12. The Contractor shall be responsible for all damages to the completed unit or portion of the Project that may be caused by or that may result from the operations of the Contractor or its subcontractors, or their employees; and the Contractor shall take such precautions and shall provide such protection as may be necessary to avoid possible damage to said unit or portion of the Project. The acceptance of the completed unit or portion shall in no way affect any other requirements governing the completion and acceptance of the Project as a whole.

1.08.13—Termination of the Contractor's Responsibility: The Contractor's responsibility for nonadministrative Project work will be considered terminated when the final inspection has been held, any required additional work and final cleaning-up have been completed, all final operation and maintenance manuals have been submitted, and all of the Contractor’s equipment and construction signs have been removed from the Project site. When these requirements have been met to the satisfaction of the Engineer, the Commissioner will accept the work by certifying in writing to the Contractor that the nonadministrative Project work has been completed.

1.08.14—Acceptance of Project: The Project will be accepted by the Commissioner when all Project work has been completed, as defined by the requirements of 1.08.13, and the following have been submitted to the satisfaction of the Engineer:

1. Supporting information necessary to substantiate pay quantities, such as cost-plus backup documentation;
2. Reports and forms required on all Federal Aid Projects;
3. Warranties, guaranties, final operation and maintenance manuals, and documentation to the effect that training and start-up support required by the Contract have been completed;
4. Any other documents required by the Contract.

DIVISION II

CONSTRUCTION DETAILS

EARTHWORK

SECTION 2.01

CLEARING AND GRUBBING

2.01.01—Description

2.01.02—Materials (Vacant)

2.01.03—Construction Methods

2.01.04—Method of Measurement

2.01.05—Basis of Payment

2.01.01—Description: This work shall consist of clearing the ground of trees, stumps, brush, rubbish and all objectionable material in accordance with these specifications or as directed by the Engineer. This work shall also include the clearing of the ground necessary for the construction and installation of drainage, structures, ditches, channels, fences and other appurtenances. Included in this work shall be the preservation from injury or defacement of vegetation and objects designated to remain.

2.01.02—Vacant

2.01.03—Construction Methods: The Contractor shall mark all trees, shrubs and plants to be removed in accordance with the plans and these specifications. The Engineer shall have 7 days to field review the markings and make any adjustments prior to the start of the clearing operation. Within the excavation lines all trees shall be cut off and stumps removed to a depth of not less than 12 in below the graded surface.

Within the fill lines where an embankment is to be made not more than 5 ft deep, trees, stumps, roots, etc., shall be removed. Where the embankments to be made exceed 5 ft deep, trees, stumps, roots, etc., shall be cut off to within 6 in of the ground surface.

In areas where clearing is necessary for the construction and installation of various appurtenances, all trees and stumps shall be cut flush with the ground; and all dead or uprooted trees, brush, roots or otherwise objectionable material shall be removed as directed unless otherwise indicated on the plans.

Prior to clearing operations, a meeting must be held. Those attending the meeting should include the Contractor, the Engineer, the designer, local tree warden or equivalent, and the District Environmental Coordinator. All clearing issues shall be resolved to the satisfaction of the Engineer before any trees are cut.

All trees scheduled to be removed outside of the proposed gutter or curb lines shall be visibly marked or flagged by the Contractor at least seven days prior to cutting of such trees.

The Engineer will inspect the identified trees within 7 days of the marking of the trees and verify the limits of clearing and grubbing prior to the Contractor proceeding with his cutting operation.

All branches of trees extending within the roadway shall be trimmed as directed to provide a 16-ft minimum vertical clearance including selective trimming of such trees as directed.

The Contractor shall dispose of all such trees, stumps, brush, etc., in a satisfactory manner and shall remove all rubbish and refuse from within the highway limits.

2.01.03—Construction Methods: The Contractor shall mark all trees, shrubs and plants to be removed in accordance with the plans and these specifications. The Engineer shall have 7 days to field review the markings and make any adjustments prior to the start of the clearing operation. Within the excavation lines all trees shall be cut off and stumps removed to a depth of not less than 12 in below the graded surface.

Within the fill lines where an embankment is to be made not more than 5 ft deep, trees, stumps, roots, etc., shall be removed. Where the embankments to be made exceed 5 ft deep, trees, stumps, roots, etc., shall be cut off to within 6 in of the ground surface.

In areas where clearing is necessary for the construction and installation of various appurtenances, all trees and stumps shall be cut flush with the ground; and all dead or uprooted trees, brush, roots or otherwise objectionable material shall be removed as directed unless otherwise indicated on the plans.

Prior to clearing operations, a meeting must be held. Those attending the meeting should include the Contractor, the Engineer, the designer, local tree warden or equivalent, and the District Environmental Coordinator. All clearing issues shall be resolved to the satisfaction of the Engineer before any trees are cut.

All trees scheduled to be removed outside of the proposed gutter or curb lines shall be visibly marked or flagged by the Contractor at least seven days prior to cutting of such trees.

The Engineer will inspect the identified trees within 7 days of the marking of the trees and verify the limits of clearing and grubbing prior to the Contractor proceeding with his cutting operation.

All branches of trees extending within the roadway shall be trimmed as directed to provide a 16-ft minimum vertical clearance including selective trimming of such trees as directed.

The Contractor shall dispose of all such trees, stumps, brush, etc., in a satisfactory manner and shall remove all rubbish and refuse from within the highway limits.

2.01.04

All excavations made below subgrade surface by the removal of trees, stumps, etc., shall be filled with suitable material, which shall be compacted thoroughly in accordance with the provisions governing formation of embankments.

All fences, stonewall fences and ornamental and utilitarian domestic accessories, such as, but not limited to garden pools, arbors, stair railings, fireplaces, sheds and incinerators, within the highway limits shall be removed as directed. However, the removal of materials in stonewalls, that are to be removed and not used in a new stonewall fences, will be paid for according to the provisions of Section 2.02.

All road signs, mail boxes, etc., shall be removed and reset as directed.

2.01.04—Method of Measurement: When no price for “Clearing and Grubbing” is asked for on the proposal form, the cost of the work as described above shall be included in the cost of the grading items and no direct payment for “Clearing and Grubbing” will be made.

When a price is asked for on the proposal form on a lump sum basis, this shall include all the work as described above, which may be necessary to properly complete the Project, unless the item is included under another Project pay item.

Should the Project be increased in length or the scope of work be increased due to construction changes beyond the requirements hereinabove, any additional work required will be paid for as extra work. Should the Project be decreased in length, a suitable credit, mutually agreed upon and based on the reduction in actual work or scope, will be taken by the State.

The work, material, tools, equipment and labor incidental to the disposal of trees, stumps, etc., will not be measured for payment.

2.01.05—Basis of Payment: Payment for this work will be at the Contract lump sum price for “Clearing and Grubbing,” except as noted above, and shall include all equipment, tools and labor incidental to the completion of this item.

All costs incidental to the disposal of trees, stumps, etc., will be included in the lump sum price of “Clearing and Grubbing.”

Pay Item	Pay Unit
Clearing and Grubbing	l.s

SECTION 2.02
ROADWAY EXCAVATION, FORMATION OF EMBANKMENT AND DISPOSAL OF SURPLUS MATERIAL

2.02.01—Description: Roadway excavation shall consist of the removal and satisfactory disposal, in the manner herein required, of all material taken from within the limits of the work contracted for, the removal of which is necessary for the construction of the roadway, subgrade, shoulders, slopes, entrances, retaining walls, gutters, channels, swales and other miscellaneous construction to the dimensions and limits shown on the plans or as ordered and shall include the necessary excavation for pervious structure backfill outside of structure excavation limits. It shall also include the formation of embankments, the disposal of surplus or unsuitable material, removal of old foundations, concrete or masonry walls, crib walls, bin walls, stone wall fences or farm wall fences and filling of cellar or other holes, and in the absence of such items in the contract, the clearing and grubbing and the shaping and cleaning of slopes and of shoulders.

Classification: Roadway excavation shall be classified for the purpose of payment as "Earth," "Rock," "Channel Excavation—Earth," or "Channel Excavation—Rock," in accordance with the following definitions. The classifications applying to any particular project shall be as indicated on the proposal form.

Earth Excavation shall include all materials removed as indicated or directed except water, "Rock," "Channel Excavation—Earth," and "Channel Excavation—Rock."

Rock Excavation shall include rock in definite ledge formation and boulders, or the portion of boulders, 1 c.y. or more, in volume.

Channel Excavation—Earth shall include all materials other than water or "Channel Excavation—Rock" removed from the existing new or temporary water courses as indicated on the plans or as directed.

Channel Excavation—Rock shall include rock in definite ledge formation and boulders of 1 c.y. or more in volume removed from existing, new or temporary water courses, as indicated on the plans or as directed.

2.02.03—Construction Methods: Excavation shall be made in accordance with the requirements of the plans and as ordered by the Engineer. The Contractor shall, when necessary in excavation areas, provide and maintain ditches which are adequate to prevent free water from becoming incorporated in material to be used to form embankments, such ditching to be at the sole expense of the Contractor. Where buildings have been removed to clear the way for construction or where old foundations, concrete or masonry walls exist, they shall be removed to 2 ft below the directed or finished

grading; and all cellar and other holes shall be filled with suitable material.

1. Sod and other organic matter shall be disposed of as directed by the Engineer. In the event the Engineer does not direct the disposal of unsuitable material in accordance with Subarticle 2.02.03-8, the Contractor has the option of disposing of the unsuitable material as specified within Subarticle 2.02.03-10.

2. Frozen material, otherwise suitable for formation of embankments, shall be placed on embankment slopes or disposed of as directed by the Engineer. The Engineer may direct the removal of any portion of an accepted layer which has become frozen after placement and compaction. This frozen material shall be placed on embankment slopes or disposed of as directed by the Engineer. The removal and placement of frozen material shall be at the sole expense of the Contractor.

3. Topsoil shall be excavated within pavement and shoulder limits at grade points and to an elevation 3 ft below finish grade and elsewhere as directed. The material excavated may be used in the construction of embankments, if permitted by the Engineer, and shall be thus used if the Engineer so directs. In all cases, the use of topsoil in constructing embankments shall be restricted to locations where the surface of the underlying material is dry, its distance above the free water surface at the time of filling is more than 3 ft, and its distance below finish pavement grade is more than 5 ft.

4. Excavation of Rock: When rock is encountered, it shall be excavated to the slope lines and depths indicated on the plans.

The Contractor shall presplit the rock along the proposed rock slopes to the lines and inclinations shown on the plans except as otherwise provided in the specifications. Presplitting will be required where the backslope is designed at an inclination 1 (vertical) on 1 (horizontal) or steeper or where the cut in rock is 10 ft or more, measured on the inclination of the proposed slope from the bottom of excavation to the natural surface of

sound rock. The maximum vertical height of slope face which can be presplit at the same time shall be 50 ft.

The presplitting holes shall follow the required rock slope lines and inclinations. Hole drilling shall commence only when solid rock is encountered and exposed to the satisfaction of the Engineer. Unless otherwise permitted by the Engineer, presplitting holes shall have a spacing of 3 ft, center-to-center, and a diameter not greater than 3 in. The holes shall be extended from the top of solid rock surface to the toe of finished rock slope, unless lesser depths are specified on the plans. The proper angle of drilling shall be maintained at all times so all presplit holes lie essentially in the same plane and are paralleled to each other. No holes shall deviate more than 6 in at any place in the plane of the specified slope line nor in its vertical alignment. If any cut is presplit by vertical stages (lifts), the presplit holes may be offset, for each stage, a distance not more than

24 in inside the previously presplit face. Presplit holes shall be lightly loaded with a continuous column charge manufactured especially for presplitting. All space in each hole not occupied by the explosive charge shall be filled with clean stone chips less than 3/8 inch in size or approved equal. Charges near the top of hole shall be reduced sufficiently to eliminate overbreak and heaving. The top charge shall not be less than 3 ft below the top of the drill hole. The methods of detonation shall be such that a uniform plane of rupture of the rock occurs from top to bottom and between presplit holes. If necessary, the Contractor shall adjust the methods as outlined above so as to result in a uniform plane of rupture in the rock.

Unless otherwise approved by the Engineer, presplit holes shall be drilled at least 50 ft ahead of, and shall be detonated prior to the drilling and blasting, the general pattern holes within the section of any lift of rock to be excavated. The presplitting shall be performed so as to produce a uniform plane of rupture in the rock such that the resulting rock face will not be affected by subsequent blasting and excavation operations.

In the general pattern, blasting following presplitting operations, no portion of any blast hole shall be drilled closer than 4 ft to the presplit face. No portion of any blast hole larger than 3 in in diameter shall be permitted closer than 12 ft to the presplit face. The spacing of blast holes, distribution and type of explosives, methods of detonation, and the blasting techniques shall be adjusted by the Contractor according to the characteristics and structure of the rock encountered so as not to fracture the rock beyond the presplit face. Prior to any blasting, the Department will call a blasting conference at which the Contractor shall be represented to determine the methods to be used and the required protection to insure the utmost safety during blasting operations. The Contractor shall be responsible for all damage due either directly or indirectly to such operation.

The Contractor shall schedule his operations so that all rock excavation within a distance of 100 ft of bridge or other large structures, or any portion thereof, is completed to the required slope lines and depths before any structure work is started.

All loose and unstable material, even if located beyond the payment lines, and all breakage and slices shall be removed as directed and as the excavation for each vertical stage (lift) progresses. It shall be, at all times, the responsibility of the Contractor to perform all phases of this work to produce the required rock slope faces to the satisfaction of the Engineer.

Where indicated on the plans or as ordered by the Engineer, rock shall be excavated without the use of explosives. Excavation methods by the use of drilling, splitting, wedging or other approved methods not involving the use of explosives shall be utilized. The method selected by the Contractor shall allow excavation to the slope line(s) and depth(s) as shown on the plans and shall not affect in any way the material or structures outside the excavation line or grade.

5. Placement of Embankment Material: All excavated material and reclaimed waste obtained within the limits of the Project shall be used in the formation of embankments, except as provided elsewhere herein or as ordered by the Engineer.

Overhaul will not be allowed; but excavated material shall be transported where directed, provided the designated point of deposit is not more than 100 yd beyond the limits of the work contracted for, unless stated otherwise in the special provisions or plans.

When embankments are to be constructed on slopes steeper than 1:3, the slope of the existing ground on which the embankment is to be placed shall be plowed deeply or cut into steps before the filling is begun.

Embankments shall be constructed of earth, rock, reclaimed waste or a mixture thereof containing no more than 2% by weight of asphalt cement. The embankment shall be constructed by depositing successive layers of fill for the full width of the embankment, unless a partial width is permitted by the Contract or by the Engineer. If glass or clinker, or both, are included in reclaimed waste, their individual particles shall be no larger than 1 in. Glass or clinker, or both, shall be thoroughly mixed with other embankment materials such that their content anywhere in the embankment shall not exceed 25% by weight, with the exception that material placed within 5 ft from the face of the slope shall be free of glass and clinker. No embankment layer shall be deposited on surfaces of snow or ice, nor shall it be placed on frozen or unstable surfaces except under the conditions permitted elsewhere herein. If the Contractor is permitted to continue work, he shall remove, at no cost to the State, any frozen embankment material unless otherwise directed by the Engineer.

The depth of each layer, before compaction, shall not exceed 12 in except as permitted hereinafter by these specifications, or with the permission of the Engineer.

The embankment shall be crowned or pitched to provide drainage at the close of each day's operations.

Where filling in 12-in layers is impracticable, as in the case of filling in water or over slopes too steep for the operation of equipment, the embankment may be constructed in a single layer to the minimum elevation at which equipment can be operated, as determined by the Engineer; and above this elevation, the embankment shall be constructed as specified herein.

Embankments to an elevation 3 ft above the free water surface at the time of filling, shall be constructed of rock or free-draining material, or a mixture of both. Free-draining material shall meet the requirements of Article M.02.07.

In fills where the top of the proposed pavement will be less than 4 feet above an existing flexible pavement, and the existing pavement is not required to be removed, it shall be scarified as directed by the Engineer.

In fills where the top of the proposed pavement will be less than 3 ft above an existing concrete pavement, including all bituminous resurfacing thereon, the concrete pavement shall be removed.

2.02.03

In fills where the top of the proposed pavement will be between 3 and 4 ft above an existing concrete pavement, the concrete pavement shall be broken in such a manner that complete fractures are obtained. Intact fragments, undamaged after breaking, shall not be larger than 2 s.f.

When present pavement not in cut or fill is removed, as called for on the plans or directed, the area shall be backfilled with a suitable earth material which shall be free from admixture of subsoil, refuse, stumps, roots, rocks brush, weeds and other material which will prevent the formation of a suitable seed bed.

Wherever portions of existing concrete pavement are to be removed, such removals shall be made to neat lines. The areas in which such concrete surfaces are to be removed will be delineated by the Engineer before such work is done. Where no break or joint exists in the concrete pavement at the line of delineation, a kerf, at least 2 in, but no more than 3 in deep, shall be made in the concrete with an approved concrete cutting saw. The concrete shall then be removed from within the delineated area exercising extreme care to avoid “breakbacks” beyond the kerf, break or joint. Concrete pavement remaining in place shall have vertical edges, and that portion below the kerf shall be reasonably smooth.

Wherever portions of existing bituminous concrete pavement are to be removed, they shall be removed to neat lines as shown on the plans or as directed by the Engineer. Where the delineated limits of the areas in which such bituminous surfaces are to be removed are adjacent to existing bituminous concrete pavement that is to remain in place, the line of delineation shall be cut by a method approved by the Engineer.

When the embankment material consists predominantly of rock fragments and/or fragments of reclaimed waste of such size that material cannot be placed in horizontal layers of the thickness specified above without crushing or further breaking down the pieces resulting from the excavation methods, such material may be placed in the embankments in horizontal layers not exceeding 3 ft thick. Large stones or fragments of reclaimed waste shall not be placed in nests but shall be distributed over the area; and the interstices shall be filled with spalls, finer fragments or earth to form a solid, compact mass.

The entire area of each layer shall be leveled off by suitable grading equipment and shall be compacted as hereinafter specified.

In portions of embankments where piles are to be driven, the Contractor shall not place any material which might interfere with pile driving operations. The correction of any

condition which interferes with the pile driving operations in embankments constructed under the contract shall be made by the Contractor at no cost to the State.

Rock fill or reclaimed waste containing fragments with their greatest dimension over 12 in shall not be placed above an elevation which is 2 ft below the top of the embankment. Particles with their greatest dimension over 5 in shall not be placed within 12 in of the elevation of the top of the prepared subbase unless otherwise specifically authorized.

Prior to the formation of any embankment, the Contractor may submit a plan in a form acceptable to the Engineer for grading operations detailing the location of embankment material sources and points of deposit for the entire Project in order to qualify for payment for overhaul as hereinafter provided. Failure to submit such a plan will be construed as a waiver of any and all rights to payment for overhaul.

6. Compaction: The entire area of each layer of the embankment and the subgrade in the excavated areas shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.

The dry density after compaction shall not be less than 95% of the dry density for that soil when tested in accordance with AASHTO T 180, Method D. Each layer of the embankment and the subgrade shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

7. Stability: If after full compliance with the requirements of these specifications with regard to excavation, placement and compaction density requirements, a stable embankment or subgrade has not been obtained, the Contractor shall proceed to perform such corrective work as is necessary to produce a stable embankment or subgrade. This work may include, but not necessarily be limited to control of moisture to within limits suitable for obtaining the required stability, blending with rock or granular material from any Project excavation or borrow, or free draining material or any combination thereof; removal and replacement with acceptably compacted material or a combination of these methods approved by the Engineer. Any of the foregoing methods may be supplemented by suspending embankment operations and allowing the material to dry.

When embankments are constructed of material from Project excavation and the Engineer determines that the material properly compacted is not sufficiently stabilized, the cost of corrective measures directed by the Engineer shall be paid for at applicable Contract unit prices, or in the absence thereof, as extra work.

If the corrective work on embankments constructed of Project excavation is necessary, and requires departure from the plan for grading operations to obtain material at locations other than shown on the aforementioned plan which result in increased net costs to the

Contractor, such increased costs will be paid as extra work, except that no payment will be made for overhaul for any corrective material for the first 1/2 mile of increased hauling distance.

When embankments are constructed of borrow, they shall be stable. In this case however, the methods and material used to obtain such stability shall be determined by the Contractor and performed at its expense.

8. Surplus Excavated Material: All surplus excavated material shall be used where directed by the Engineer, to uniformly widen embankments, to flatten slopes, to fill low places in the right of way, or for such other purposes as the Engineer may direct, provided the area designated for deposit does not conflict with Subarticle 2.02.03-5.

Any surplus or unsuitable material not required, nor permitted to be used for such purposes, shall be disposed of in accordance with Subarticle 2.02.03-10.

9. Fences: The Contractor shall erect either the permanent or temporary fence, to the satisfaction of the Engineer, at all points where the land is used for pasturing and where the existing fences are affected by the grading operations. Permanent or temporary fences shall be erected prior to the removal or destruction of any part of the existing fence, and any temporary fence erected shall be removed when no longer required. There will be no direct payment for any temporary fence erected, but the cost thereof shall be considered as included in the cost of the grading operations; permanent fences will be paid for at the Contract unit price for this item.

2.02.04

10. Disposal of Unsuitable Material: When the Engineer has not directed otherwise, the Contractor has the option to dispose of unsuitable excavated material by either or both of the following methods:

(a) By removing such material from within the limits of the highway and disposing of such material at point or points as the Contractor shall determine provided this does not create any detrimental effects to the Project and the Engineer does not object to the area selected for disposal.

(b) By disposing of such material within the limits of the highway in accordance with the details and requirements shown on the plans and the following requirements:

Not less than 15 days prior to disposing of any such material within Project limits, the Contractor shall submit to the Engineer for his approval a proposal delineating the locations and extent of the areas in which he intends to dispose of such material. The proposal shall describe the nature of the material and the methods to be employed in placing and covering the material. The proposal will be reviewed for its effects on the completed construction and the environment. The proposal shall be amended as required by the Engineer. No such material shall be disposed of within Project limits until the proposal has been approved by the Engineer.

All work shall be done in accordance with the approved proposal.
Suitable material excavated for the disposal of the unsuitable excavated material shall be placed in the embankment in accordance with the requirements of Section 2.02 or shall be used to cover the unsuitable excavated material.
The State does not guarantee nor imply that the areas available for disposal of unsuitable excavated material within Project limits will be adequate for the disposal of all unsuitable excavated material to be removed. The Contractor shall dispose of all unsuitable excavated material in excess of that which can be placed within the permitted areas.
11. Slopes: Earth slopes with a degree of slope from 2:1 to 5:1 shall be tracked unless the Engineer directs that they shall not be tracked. Tracking shall consist of traversing the slopes with cleated tracks so that the cleat indentations are horizontal. Where topsoil is to be placed on slopes, the tracking shall be done prior to the installation of the topsoil. Tracking is not to be construed to be used for slope compaction. Its sole purpose is to provide indentations in the slope to help reduce soil erosion. Other methods of achieving the desired results may be used, with the permission of the Engineer.
2.02.04—Method of Measurement: Payment lines for earth excavation will coincide with the slope and subgrade lines or the top of the payment lines for ditch excavation, whichever applies, as shown on the plans or as ordered.
Payment lines for unsuitable material excavation will be the area designated by the plans, special provisions or the Engineer as unsuitable material below the subgrade in cut sections, below the original ground line in fill sections and beyond the normal payment lines for ditch and channel excavation.
Unsuitable material within the slope and subgrade lines or the top of the normal payment lines for ditch and channel excavation will be measured as earth excavation, ditch excavation or channel excavation.
Any stockpiling, drying or re-excavation necessary to utilize such material on the Project will not be measured for payment, but will be included in the payment for unsuitable material.
Also measured for payment will be the volume of earth moved in cutting or plowing of steps on steep slopes, as described in Article 2.02.03, and the removal of existing flexible pavement where shown on the plans or ordered by the Engineer.
The stockpiling, re-excavation and final placement of material will not be measured for payment, unless such has been made a part of the Contract or unless the State has created conditions different from those that existed or could have been foreseen or anticipated when the Contract was bid.
Payment limits for Channel Excavation—Earth will coincide with the side slopes and bottom of channel as shown on the plans or as directed.
Payment lines for Channel Excavation-Rock will coincide with the depth shown on the

plans or to the depth ordered. Payment lines for slopes will be extended to a limit of 12 in outside of and parallel to the slope lines shown on the plans, or as ordered, to include rock actually removed within this limit. In case of natural faults or fissures which make the removal of additional rock necessary for reasons of safety, or which produce slides clearly not attributable to the Contractor's method of operation, the slope payment lines will be fixed to coincide with the natural faults or fissures of the rock.

Payment lines for rock excavation, where presplitting bedrock is required by these specifications, will extend to the slope and depth line shown on the plans or as directed, to include only the rock actually removed within this limit.

Payment lines for rock excavation, where presplitting bedrock is not required by these specifications, will coincide with the depth shown on the plans or to the depth directed; and payment lines for the slopes will be extended to a limit of 1 ft outside of and parallel to the slope lines shown on the plans, or as directed, to include rock actually removed within this limit. Where removal of rock is necessary for reasons of safety or due to conditions clearly not attributable to the Contractor's method of operation, the payment lines will be fixed to coincide with limits ordered by the Engineer.

Presplitting of bedrock performed in accordance with these specifications will not be measured for payment.

Where removal of rock is necessary for reason of safety or due to conditions clearly not attributable to the Contractor's methods of operation, the payment lines for rock excavation where presplitting is required will be fixed to coincide with limits ordered by the Engineer. Payment lines for Rock Excavation (No Explosives), where mechanical means of removal are required by these specifications, will extend to the slope and depth line(s) shown on the plans or as directed, to include only the rock actually removed within these limits.

Concrete and masonry foundation walls, or portions thereof, to be removed will be measured for payment by the volume in cubic yards, in place, before removal.

Existing concrete pavement and concrete base over 5 s.y., including any bituminous surfacing material immediately thereon, will be measured in place before removal.

Existing concrete and cement masonry structures over 1 c.y., will be measured in place before removal.

When rock is encountered, and its removal is to be paid for as "Rock Excavation" or "Channel Excavation—Rock," the Contractor shall strip or expose the rock to such an extent that in the Engineer's opinion the necessary measurements can be taken. The Contractor shall notify the Engineer at least 2 days prior to disturbing any of the rock to allow ample time to obtain the necessary measurements. If the Contractor shall fail to give such notice, or remove any rock prior to the taking of the measurements, the Engineer will presume that measurements taken at the time the Engineer first sees the

material in question will give a true quantity of excavation.
The amount of excavation will be determined by the average end area method.
The work of scarifying existing pavement will not be measured for payment, but the cost shall be considered as included in the general cost of the Contract.
The work of cutting concrete pavement will be measured for payment by the number of linear feet of saw cut made with an approved concrete saw to the lines delineated by the Engineer on the concrete pavement.
The cutting of bituminous concrete pavement will be measured for payment by the number of linear feet of cut made by an approved method to the lines delineated on the plans or as directed by the Engineer. Cuts made necessary by the Contractor's operation, such as, but not limited to, patching, bituminous concrete samples, continuance of previous runs, faulty work or faulty materials will not be measured for payment.
Bituminous parking areas are considered as bituminous concrete pavement.
The work, materials, tools, equipment and labor incidental to the disposal of unsuitable excavated material or breaking concrete pavement will not be measured for payment.
2.02.05—Basis of Payment: Roadway excavation will be paid for at the Contract unit price per cubic yard for "Earth Excavation," "Rock Excavation," "Rock Excavation (No Explosives)," "Channel Excavation—Earth," or "Channel Excavation—Rock" as the case may be, in accordance with the classification given herein and subject to the method of measurement described above. The price shall include all equipment, tools and labor incidental to the completion of the excavation, the formation and compaction of embankments, and the disposal of surplus or unsuitable material in accordance with the provisions of the plans and of these specifications.
The removal of concrete pavement or concrete base will be paid for at the Contract unit price per square yard for "Removal of Concrete Pavement," including any bituminous surfacing material immediately thereon. The removal of concrete or cement masonry structures over 1 c.y., other than retaining walls or bridge structures, will be paid for at the Contract unit price per cubic yard for "Rock Excavation" or "Unclassified Excavation," as the case may be.
The removal of drainage structures outside of the limits of Roadway and Structure Excavation will be paid for under the "Trench Excavation" items.
Concrete and masonry foundation walls or portions thereof ordered removed will be paid for at the Contract unit price per cubic yard for "Rock Excavation" or "Unclassified Excavation," as the case may be.
The removal of retaining walls and bridge substructures will be paid for under the item "Removal of Existing Masonry."
The removal of crib walls, bin walls, stone wall fences or farm wall fences will be paid for as Earth Excavation.

The removal of all pavement or pavement bases other than concrete will be paid for at the Contract unit price per cubic yard for “Earth Excavation.”

The work of cutting concrete pavement will be paid for at the Contract unit price per linear foot for “Cut Concrete Pavement” including any bituminous surfacing material immediately thereon, which price shall include all materials, equipment, tools and labor incidental thereto.

The work of cutting bituminous concrete pavement will be paid for at the Contract unit price per linear foot for “Cut Bituminous Concrete Pavement” which price shall include all materials, equipment, tools and labor incidental thereto.

Unsuitable material excavation outside of the limits of earth, unclassified, ditch and channel excavation will be paid for at the Contract unit price per cubic yard for “Unsuitable Material Excavation,” which price shall include all equipment, tools, labor and material incidental thereto.

All costs incidental to the disposal of unsuitable excavated material will be included in the price for “Earth Excavation.”

When no item for “Channel Excavation—Rock” appears in the proposal and rock, meeting the description given under “Channel Excavation—Rock” in Article 2.02.01 is encountered in the channel excavation, the rock so encountered and removed will be classified and treated as “Channel Excavation—Rock,” and its removal will be paid for at 300% of the Contract unit price per cubic yard for “Channel Excavation—Earth.”

All costs incidental to breaking concrete pavement will be considered as being included in the general cost of the Contract.

Pay Item Pay Unit

Rock Excavation (No Explosives) c.y.

Earth Excavation c.y.

Rock Excavation c.y.

Channel Excavation—Earth c.y.

Channel Excavation—Rock c.y.

Cut Concrete Pavement l.f.

Cut Bituminous Concrete Pavement l.f.

Removal of Concrete Pavement s.y.

Unsuitable Material Excavation c.y.

SECTION 2.03
STRUCTURE EXCAVATION
2.03.01—Description
2.03.03—Construction Methods
2.03.04—Method of Measurement
2.03.05—Basis of Payment

2.03.01—Description: With the exceptions noted below, structure excavation shall include the removal of all material of whatever nature, the removal of which is necessary for the construction of foundations of bridges, box culverts, retaining walls outside the earth excavation payment limits, and other structures shown on the plans; the placing of all necessary fill with the exception of pervious structure backfill hereinafter specified; and the wasting of excavated material which is not required for backfilling or embankment, or which is unsuitable for that purpose.

This item shall also include dewatering; the design and construction of all cofferdams and related environmental controls used in dewatering operations required for the execution of the work; the repair, reconstruction and removal of cofferdams and related environmental controls used in dewatering operations; and the removal of all obstructions necessary for the construction of cofferdams. However, dewatering and the construction of a cofferdam will not be required under any structure excavation item for any foundation or structure that has an item for "Cofferdam and Dewatering" shown on the **2.03.03** plans and in the proposal estimate for a given location. In such instances, the provisions of Section 2.04 shall govern for the items described in 2.03.05 (b) below.

"Structure Excavation—Earth" and "Structure Excavation—Rock" are defined as follows:

1. "Structure Excavation—Earth" shall include removal of all materials, other than water or "Structure Excavation—Rock."

2. "Structure Excavation—Rock" shall include the removal of rock in definite ledge formation; boulders or portions of boulders that have a volume of 1 c.y. or greater; and masonry structures of 1 c.y. or more in volume, except retaining walls and bridge substructures, the removal of which is covered by Section 9.74.

2.03.03—Construction Methods:

1. Dimensions and Elevations of Footings: The elevations of the bottom of footings, as shown on the plans, shall be considered as approximate only, and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be necessary to secure a satisfactory foundation.

2. Preparation of Foundations: All rock or other suitable foundation material shall be cleared of all overlying material, cleaned and cut to a firm surface, either level, stepped or serrated, as directed by the Engineer. All seams shall be cleaned out and filled with concrete, mortar or grout. Any over-breakage in rock more than 6 in below the plan

grade for the bottom of the footing not authorized by the Engineer shall be replaced by the Contractor with Class “A” Concrete at the Contractor’s expense.
When the structure is to rest on a material other than rock, special care shall be taken not to disturb the material below the bottom of the excavation, and the final removal of the foundation material to grade shall not be made until just before the forms for concrete or masonry are placed. Any foundation material disturbed below plan grade or revised plan grade shall be dressed and compacted at the Contractor’s expense. This shall not apply, however, when a granular fill foundation course is required.

3. Cofferdams: If a cofferdam is required under this item, it will be designed and constructed in accordance with the provisions of Subarticles 2.04.03-1 and 2.04.03-3.

4. Dewatering: If a cofferdam is required under this item, dewatering will be performed in accordance with the provisions of Subarticle 2.04.03-2.

5. Inspection: After each excavation is completed, the Contractor shall notify the Engineer and no construction shall be started until the Engineer has approved the depth of the excavation and the character of the foundation material.

6. Fill Adjacent to Structures: All spaces excavated and not occupied by the abutments, piers, other permanent work or pervious structure backfill shall be filled to the surface of the surrounding ground with suitable material. Such backfill shall be thoroughly compacted and neatly graded.
Fill placed around arches, rigid frames, box culverts and piers shall be deposited on both sides of the structure to approximately the same elevation at the same time.
Each layer of backfill shall be spread to a thickness not exceeding 6 in deep after compaction and shall be thoroughly compacted by the use of power rollers or other motorized vehicular equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes or which is not in proper working order in all respects shall not be used within the area described above.

Special attention shall be given to compaction in places close to walls where motorized vehicular compaction equipment cannot reach. Within 3 ft of the back face of walls and within a greater distance at angle points of walls, each layer of backfill shall be compacted by mechanical rammers, vibrators or pneumatic tampers.
The dry density of each layer of backfill after compaction shall not be less than 95% of the dry density for that material when tested in accordance with AASHTO T 180, Method D. In conducting this test, material retained on the 3/4-in sieve size shall be replaced with material retained on the No. 4 sieve, as noted as an option in the specifications for this test. Adequate provision shall be made for the drainage of all fill in accordance with the provisions of the plans, or as ordered by the Engineer.
Each layer of backfill shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

No fill shall be placed against any structure until the Engineer has given permission to do so and in no case until after the permitted time for removal of forms.

2.03.04—Method of Measurement: The Contractor shall notify the Engineer before starting any excavation, so that elevations and the measurements of the excavation area may first be obtained. When ledge rock is encountered, the Contractor shall notify the Engineer and shall strip or expose the rock to such an extent that in the Engineer's opinion the necessary measurements can be taken for "Structure Excavation—Rock." If the Contractor fails to give such notice(s), or removes any material prior to the taking of measurements, the Engineer may presume that measurements taken at the time the Engineer first saw the material in question indicates the true quantity of excavation.

Vertical payment limits will be measured for payment as follows:

1. Structure Excavation—Earth will be measured in place by taking the difference in elevation between the existing ground surface or the bottom of roadway excavation or channel excavation, whichever is lower, and the surface of the completed structure excavation at plan grade or approved revised plan grade.

Structure excavation in roadway cuts, or embankment areas where the removal of unsuitable material is indicated on the plans, shall include only the portion below the bottom of the unsuitable material or subbase, if any, or the subgrade, shoulder foundation or cut slope lines, as the case may be or as may be more specifically shown on the plans.

2. Structure Excavation—Rock will be measured in place by taking the difference in elevation between the existing ledge rock or bottom of roadway excavation or channel excavation, whichever is lower, and the bottom of the actual completed and accepted structure excavation, except that any excavation to a depth greater than 6 in below the plan grade or revised plan grade, will not be measured for payment.

Horizontal payment limits for "Structure Excavation—Earth" and "Structure Excavation—Rock" will be measured between plumb lines 2 ft outside of the neat lines of the original foundations only, unless otherwise shown on the plans and unless the size of the footing is increased more than 2 ft in length or width (or both), in which case the area of the excavation that extends beyond the original Contract payment limits, will be used for determining the additional amount of excavation.

2.03.05—Basis of Payment: Payment for this work will be made at the Contract unit price per cubic yard for:

2.04.01

Rock (complete)," whichever applies, in whole or in part, which price shall include all materials, tools, and equipment; all work related to cofferdams, including their design, construction, dewatering, repair, removal of obstructions, and any required reconstruction; all labor necessary to complete the excavation in accordance with the requirements of the plans or as ordered by the Engineer; the preparation of foundations as described under Article 2.03.03; all necessary filling, except as otherwise provided

in the Contract; and the removal of all surplus or unsuitable material resulting from the excavations. Any suitable surplus material shall be placed in the embankments, if so ordered by the Engineer, without additional compensation.

(b) "Structure Excavation—Earth (Excluding Cofferdam and Dewatering)" or "Structure Excavation—Rock (Excluding Cofferdam and Dewatering)," whichever applies in whole or in part, which price shall include all materials, tools, equipment and labor necessary to complete the excavations in accordance with the requirements of the plans or as ordered by the Engineer. It shall also include the preparation of foundations as described under Article 2.03.03, the necessary filling, except as otherwise provided in the Contract, and the removal of all surplus or unsuitable material resulting from the excavations. Any suitable surplus material shall be placed in the embankments, if so ordered by the Engineer, without additional compensation.

Should it become necessary to change the dimensions of the footings from those shown on the plans or to excavate below the elevation shown on the plans, payment will be made in accordance with the following provisions:

1. The length or width (or both) may be increased horizontally not more than 2 ft and the depth of excavation increased not more than 2 ft without change in the unit price as specified above.
2. If the depth of the excavation is increased more than 2 ft, but not more than 10 ft below the original plan grade, payment for excavation below an elevation 2 ft below the elevation shown on the plans and within the horizontal payment limits as specified above, will be at the Contract unit price plus 100% thereof.
3. When the size of the footing is increased horizontally more than 2 ft in length or width, or both, excavation actually required outside the horizontal payment limits defined above will be paid for at the Contract unit price plus l00% thereof.
4. In the event the depth of the excavation has to be increased to a depth greater than 10 ft below the original plan elevation, the excavation actually made below the 10-ft limit will be considered extra work and will be paid for in accordance with Article l.04.05.

Pay Item	Pay Unit
Structure Excavation—Earth (Complete)	c.y.
Structure Excavation—Rock (Complete)	c.y.
Structure Excavation—Earth (Excluding Cofferdam and Dewatering)	c.y.
Structure Excavation—Rock (Excluding Cofferdam and Dewatering)	c.y.

SECTION 2.04
COFFERDAM AND DEWATERING

2.04.01—Description: Work under this item shall consist of the design and construction of cofferdams as and where shown and specifically designated as such on the plans; necessary dewatering, adjustments, repair or reconstruction; and the removal of temporary cofferdams and related facilities.

2.04.03—Construction Methods:

1. Cofferdams: Cofferdams shall be carried to adequate depths and heights, shall comply with Section 1.10, and shall be safe and watertight as necessary for the proper performance of the work which must be done inside them. Cofferdams shall be constructed so that the work can be safely carried to an elevation 2 ft lower than the elevation shown on the plans for the bottom of the structure footing, or, if a granular fill foundation is shown on the plans, to an elevation 2 ft lower than the bottom of the granular fill foundation. The interior dimensions of the cofferdams shall be sufficient for the unobstructed and satisfactory completion of all necessary substructure work, such as pile driving, form building, inspection and pumping. Cofferdams which become tilted or displaced prior to the completion of all work to be done within them, shall be righted, reset, or enlarged as may be necessary to provide the clearance for the unobstructed performance of all necessary work, and such corrections and adjustments of cofferdams shall be at the sole expense of the Contractor. Cofferdams shall be completely dewatered as required to complete the work entirely in the dry, except as specified below.

When conditions are encountered that render it impractical to dewater the cofferdam, the Engineer may require the placing of underwater concrete of such dimensions as will be necessary to allow the Contractor to complete the substructure in the dry. The placement of underwater concrete shall comply with Subarticle 6.01.03-6.

Cofferdams must be constructed to protect uncured masonry and concrete against damage from a sudden rising of the water and prevent damage to structure foundations by erosion. No part of the cofferdam which extends into the substructure may be left in place without written permission from the Engineer.

At least 30 calendar days prior to the start of constructing or installing a cofferdam, the Contractor shall submit to the Engineer detailed plans and computations of its proposed cofferdam(s) prepared by a professional Engineer licensed in the State. The furnishing of such plans and methods shall not serve to relieve the Contractor of its responsibility for the safety of the work and the successful completion of the Project. The Contractor's proposal must meet all requirements established in regulatory permits for the Project and must also meet the requirements of Section 1.10.

2. Dewatering: Pumping from the interior of any cofferdam shall be done in such a manner as to preclude the possibility of water moving through uncured masonry or concrete. During the placement of concrete or masonry, and for at least 24 hours

thereafter, any pumping shall be done from a suitable sump located outside the horizontal limits and below the elevation of the work being placed or as directed by the Engineer. The pumped water must be discharged in accordance with the requirements of Section 1.10. Pumping to dewater a cofferdam shall not start until any underwater concrete has sufficiently set to withstand the hydrostatic pressure created by pumping.

3. Removal of Cofferdams: Unless the Engineer directs otherwise, the Contractor shall remove all parts of the cofferdam after completion of the required work. This shall be done in such a way as not to disturb or otherwise damage any permanent construction. Sheet piling used in constructing the cofferdam may be left in place with the approval of the Engineer, provided the piling is cut off at elevations approved in advance by the Engineer, and the cut off portions are removed from the Site.

2.04.05

2.04.04—Method of Measurement: Work under this item will be measured for payment by the number of linear feet of cofferdam designated numerically on the plans.

2.04.05—Basis of Payment: Payment for this work will be made at the Contract unit price per linear foot for "Cofferdam and Dewatering," measured as described above, which price shall include all costs of design, materials, equipment, labor, work, and any related environmental controls used in dewatering operations, which are required for the construction of cofferdams shown in the plans; of any repair, correction, adjustment or reconstruction of such cofferdams required by the plans; removal of obstructions; pumping and dewatering; removal of such cofferdams and related environmental controls used in dewatering operations.

If the Engineer requires the Contractor to construct an additional cofferdam not shown on the plans, or to enlarge a cofferdam beyond the dimensions of same as designated on the plans, or if the Engineer accepts the Contractor's proposal to do so as being essential for the purposes of the Contract, the Department will revise the Contract to indicate those changes and to designate the revised dimensions of cofferdam deemed necessary by the Engineer. If the total number of linear feet of any given cofferdam as designated in the revised Contract is greater than the quantity as designated on the original Contract plans, the Department will pay the Contractor for the revised quantity of such linear feet at the Contract unit price, subject to the provisions of Articles 1.04.02 and 1.04.03.

To the extent that the Engineer allows the addition or enlargement of a cofferdam for the convenience or other benefit of the Contractor, but does not deem that addition or enlargement essential for the performance of the Contract work, the Department will make no additional payment for the cofferdam or portion of the cofferdam which the Engineer does not so deem essential. The Department will not in any event pay the Contractor for fewer linear feet of a cofferdam than were designated on the original Contract plans unless the Department eliminates that cofferdam in its entirety from the Contract.

Even if, however, the Contractor's plan for an additional cofferdam or enlargement of a cofferdam deemed essential by the Engineer includes a previously-existing structure, in no case will a previously-existing natural or built structure, such as an abutment or an embankment, be measured for payment in calculating the revised number of linear feet of cofferdam on the Project.

Any common cofferdam wall required for staged construction will be measured for payment only once. In no case will a given length or portion of cofferdam be measured for payment purposes more than once.

Pay Item	Pay Unit
Cofferdam and Dewatering	l.f.

SECTION 2.05
TRENCH EXCAVATION
2.05.01—Description
2.05.03—Construction Methods
2.05.04—Method of Measurement
2.05.05—Basis of Payment

2.05.01—Description: Trench excavation shall consist of the removal and satisfactory disposal of all materials, the removal of which is necessary for the proper completion of the work, to the dimensions shown on the plans or as ordered, and backfilling, all in accordance with these specifications for the following:

1) The construction of pipe culverts, endwalls, catch basins, drop inlets, manholes, underdrains and outlets, sewers, service pipes.

2) The removal of storm water drainage structures, storm water pipes and appurtenances beyond the limits of the roadway and structure excavation.

3) The removal of miscellaneous items such as abandoned underground tanks, pipelines, etc.

Classification:

(1) Trench excavation will be allowed only for the construction of the structures and the removals definitely specified above; and no compensation will be made for any other class of excavation, as specified elsewhere herein, that may be necessary for construction or removal.

(2) Rock in Trench: Rock, insofar as it applies to trench excavation, shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures, reinforced concrete pipe, Portland cement concrete pavement or base, of 1/2 c.y. or more in volume, removed as indicated or directed from within the payment lines for trench excavation.

2.05.03—Construction Methods: Trench excavation shall be made in accordance with the requirements of the plans or as ordered. The Contractor shall furnish and employ such shores, braces, pumps, etc., as may be necessary for the protection of property, proper completion of the work and the safety of the public and employees of the Contractor and the Department. All bracing, etc., shall be removed when no longer required for the construction or safety of the work.

When a drainage structure is to be eliminated, it shall be completely removed and all pipes plugged with cement masonry or removed completely.

Where the plans or Contract show that a drainage structure is to be abandoned, the structure shall be removed to a depth 2 ft below the subgrade or to the depth shown on the plan. The floor of the structure shall be broken and all pipes shall be plugged with cement masonry.

Wherever portions of existing concrete pavement that would otherwise remain in place must be removed in conjunction with trench excavation, such removals shall be made

to neat lines. The areas in which such concrete pavements are to be removed will be delineated by the Engineer before such work is done. Where no break or joint exists in the concrete pavement at the line of delineation, a full depth cut shall be made in the concrete with a concrete cutting saw approved by the Engineer. The concrete shall then be removed from within the delineated area, exercising extreme care to avoid “breakbacks” beyond the sawcut or joint. Concrete pavement remaining in place shall have vertical edges.

Wherever the concrete pavement to be removed has been overlaid with bituminous concrete and the adjacent bituminous concrete pavement is to remain in place, the bituminous pavement shall be removed to a neat line that is 1 ft beyond the neat line for the concrete pavement removal.

Wherever portions of existing full-depth bituminous concrete pavement are to be removed in conjunction with trench excavation, they shall be removed to neat lines. Where the limits of the areas in which such bituminous pavement is to be removed are adjacent to existing bituminous concrete pavement that is to remain in place, the limits shall be cut by a method approved by the Engineer.

After the excavation is completed, the Contractor shall notify the Engineer; and no masonry, pipe or other material shall be placed in the excavated area until the Engineer has approved the depth of excavation and the character of the foundation material.

When backfilling is required, the material used shall be of a quality satisfactory to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. All backfill shall be placed in layers of not more than 6 in deep after compaction and shall be thoroughly compacted by means of mechanical rammers or vibrators or by pneumatic tampers. Hand tampers shall be used only upon written permission of the Engineer. Unless otherwise ordered by the Engineer, the backfill shall be brought to the surface of the surrounding ground and neatly graded.

All suitable material removed in making the excavation shall be used for backfill if required. All surplus or unsuitable material shall be removed and disposed of as directed. Should additional material be required for backfilling, it may be obtained from the Project excavation or from borrow pits, gravel pits, or elsewhere as the Engineer may direct.

Each layer of backfill shall be compacted to optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

Fill placed around pipes shall be deposited on both sides to approximately the same elevation at the same time. Rock fill or stones larger than 2 in shall not be placed closer than 2 ft from the pipes on the sides and the top.

No backfill shall be placed against any structure until permission has been given by the Engineer.

2.05.04—Method of Measurement: Except as noted below, the depth of trench

excavation will be measured in its original position by taking the difference between the ground surface at the time the trench is excavated and that after the excavations are complete. Before starting any excavation, the Contractor shall notify the Engineer so that elevations and measurements of the work may be obtained. Any work done prior to such notification will not be paid for.

Trench excavation in roadway cuts will include only that portion outside of the limits of roadway excavation and will not include open ditches.

Payment limits will be as described hereinafter.

There will be no measurement for payment for the cost of plugging existing pipes.

Horizontal Payment Limits: Except as noted below for installations of pipe and pipe arches, fabricated from structural plates, payment lines will be vertical for pipe culverts, pipe-arches, sewers, and service pipes, and will be the width to which the material is actually removed, except that in no case, even though the actual excavation is wider, will the width between payment lines be more than the following:

(a) 2 ft greater than the nominal inside diameter of circular pipe, or nominal inside span of elliptical pipe or pipe-arch for such diameters or spans of less than 30 in.

(b) 3 ft greater than the nominal inside diameter of circular pipe or the nominal inside span of elliptical pipe or pipe-arch for such diameters or spans that are 30 in or greater.

For pipes and pipe-arches, fabricated from structural plates specified in Subarticle M.08.01-5, payment lines will be vertical and between the actual horizontal limits to which the material is removed except that the width between payment lines will not be more than 4 ft greater than the nominal inside diameter or nominal horizontal inside span.

For endwalls, manholes, drop inlets and catch basins, payment lines will be vertical and 2 ft outside of the neat lines of the foundations in each direction horizontally.

In case it is necessary to excavate to a greater width than that specified above due to of the removal of existing structures, such additional excavation will be considered as trench excavation and will be measured and paid for as such.

For the removal of underground obstructions such as pipelines, tanks, drainage structures, etc., payment lines shall be vertical and 2 ft outside of the underground item measured horizontally in each direction.

If rock is encountered, the Contractor shall strip it of sufficient overlying material to allow for proper measurement and shall then notify the Engineer that the rock surface is ready for measurement. If the Contractor shall fail to give such notice, the Engineer will presume that the measurements taken at the time the Engineer first saw the material in question will give the true quantity of excavation.

Vertical Payment Limits: Where pipe bedding is used, the lower vertical payment limit will be as shown on the plans. There will be no direct payment for the excavation

necessitated by the shaping of the bedding, but the cost shall be included in the cost per linear foot for the pipe culvert specified.

The upper vertical payment limit will be that prescribed below; except, when in the opinion of the Engineer, roadway excavation cannot be made prior to or simultaneously with the trench excavation, then the upper vertical payment limit will be the surface existing at the time the trench excavation is made.

Vertical Payment Limits Other Than in Fills: Payment lines will extend vertically from the bottom of the trench to the bottom of the roadway excavation.

If trench excavation is not located within the limits of roadway excavation, payment lines will extend vertically from the bottom of the trench to the existing ground surface.

Vertical Payment Limits in Fills: For the various drainage installations, the vertical payment lines will extend from the bottom of the completed and accepted trench to the lowest of the following upper limits:

a. Bottom of subbase.

b. In the case of culverts, 1 ft above the top of the pipe.

c. In the case of drainage structure other than culverts, 1 ft above the top of the uppermost culvert pipe placed in the structure.

d. In the case of culvert installations transverse to the roadway extending down fill slopes, the vertical payment limit will be the depth below bottom of loam or embankment surface, as the case may be, and measured perpendicular to the bottom of the trench.

2.05.05

Vertical payment limits will be as described above except that in no case will the depth measurement used for payment be greater than that actually excavated.

If gravel fill or borrow are used for trench backfill, they will be measured in place within the payment limits described herein.

Trench excavation will not be measured for payment for resetting manholes, catch basins, drop inlets, junction boxes or utility structures and appurtenances, but the cost will be included in the payment for the specified reset item.

The work of cutting concrete pavement and cutting bituminous concrete pavement will be measured in accordance with Article 2.02.04.

2.05.05—Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for “Trench Excavation 0 feet - 4 feet Deep,” “Trench Excavation 0 feet - 10 feet Deep,” “Trench Excavation 0 feet - 15 feet Deep” or “Trench Excavation 0 feet - 20 feet Deep,” as the case may be.

When rock, meeting the description given under Article 2.05.01 is encountered within the payment lines for trench excavation, its removal will be classified and paid for at the Contract unit price per cubic yard for “Rock in Trench Excavation 0 feet - 4 feet Deep,”

“Rock in Trench Excavation 0 feet - 10 feet Deep,” “Rock in Trench Excavation 0 feet - 15 feet Deep” or “Rock in Trench Excavation 0 feet - 20 feet Deep,” as the case may be. Those portions of trench excavation classified and paid for as “Rock in Trench Excavation” of the various depths will be the actual volumes of rock excavated within the payment lines at the applicable bottom depth. Those portions of trench excavation above the rock will be the actual volume of earth excavated within the payment lines at the applicable bottom depth for rock in trench.

Where no item or items for “Rock in Trench Excavation” at the applicable depth appear in the proposal and rock is encountered in trench excavation, its removal will be paid for as follows:

a. In trench excavation 0 feet - 4 feet deep, at 500% of the Contract unit price for “Trench Excavation 0 feet - 4 feet Deep.”

b. In trench excavation 0 feet - 10 feet deep, at 400% of the Contract unit price for “Trench Excavation 0 feet - 10 feet Deep.”

c. In trench excavation 0 feet - 15 feet deep, at 300% of the Contract unit price for “Trench Excavation 0 feet - 15 feet Deep.”

d. In trench excavation 0 feet - 20 feet deep at 150% of the Contract unit price for “Trench Excavation 0 feet - 20 feet Deep.”

When payment is made for trench excavation in fill, no such excavation will be classified as “Rock in Trench.”

Excavation necessary for the removal of pipe culverts, or other installations, described herein, will be paid for as trench excavation at the applying depth.

The above prices shall include all materials, tools, equipment and labor necessary to complete the excavation in accordance with the plans or as ordered. The prices shall also include backfilling where required and the disposal of surplus material. No additional payment will be made for shoring, bracing, pumping, bailing or for material or equipment necessary for the satisfactory completion of the work. When it becomes necessary, in the opinion of the Engineer, to install sheet piling for the support of existing facilities, pavement, utilities, or for other constraints, the sheeting items will be paid in accordance with Section 7.13, 7.14 or 7.15.

If gravel fill or borrow are used for trench backfill, payment will be made at their respective Contract unit prices, or in the absence of such items in the Contract, as extra work.

There will be no direct payment for the plugging of existing pipes, removal and disposal of metal or plastic pipes or for the breaking up of floors in drainage structures being abandoned. The cost shall be included in the Contract unit prices of the drainage and excavation items.

Payment for the work of “Cut Concrete Pavement” and “Cut Bituminous Concrete

Pavement" will be made in accordance with Article 2.02.05 except that the cut made in the bituminous concrete overlay 1 ft beyond the neat line for concrete pavement removal is not included under "Cut Concrete Pavement" and will be paid for as "Cut Bituminous Concrete Pavement."

Pay Item	Pay Unit
Trench Excavation ( ) Deep	c.y.
Rock-in-Trench Excavation ( ) Deep	c.y.

SECTION 2.08
FREE-DRAINING MATERIAL

2.08.01—Description: Free-draining material shall consist of material meeting the requirements stated elsewhere herein. This material shall be furnished and placed in accordance with these specifications and as indicated on the plans, special provisions, or as ordered by the Engineer for the stabilization or embankments, or for fill in free water areas, or wherever specified.

2.08.02—Materials: Material for this work shall meet the requirements of Article M.02.07.

2.08.03—Construction Methods: The Contractor shall notify the Engineer at least 3 days prior to obtaining free-draining material from any source so that an examination may be made of the material and the necessary measurements may be taken.

The limits of the proposed source shall be shown to the Engineer; and prior to the taking of measurements, the Contractor shall be required to clear the area of all unsuitable material. No payment will be made for any material removed outside of the area measured or which was not used in the Contract work. No excavation shall be made within the confines of a source after the Engineer has taken the original measurements, except for material to be used for the purposes hereinbefore indicated, except with the permission of the Engineer. The Contractor may, with the approval of the Engineer, obtain free-draining material, if available, from within the roadway excavation limits subject to the provisions of Article 1.04.07.

If the Contractor elects to obtain free-draining material from a commercial pit, it will be necessary to have a section of the pit set off for its use solely, so that the amount of material removed may be accurately determined. During the period between the original and the final release by the Engineer, no material shall be taken from a measured pit except by the Contractor and for use only in the work under the Contract.

2.08.04

If the Contractor elects to use stone from a quarry or reclaimed miscellaneous aggregate, the Contractor shall use only the materials from stockpiles which have been approved for use.

Free-draining material will be permitted only to the extent necessary to construct embankments to 3 ft above free water, or to promote free drainage in areas specified on the plans, in the special provisions, or as directed by the Engineer.

Free-draining material shall be placed in accordance with the provisions for the formation of embankment of Section 2.02.

2.08.04—Method of Measurement: The amount of free-draining material to be paid for will be determined by the average end area method based on the results obtained from cross-sectional elevations taken before and after the free-draining material has been excavated.

When material is drawn from a quarry stockpile or stockpile formed from reclaimed miscellaneous aggregate, the material shall be weighed on scales furnished by and at the expense of the Contractor. The scales shall be of a type satisfactory to the Engineer and shall be sealed at the expense of the Contractor as often as the Engineer may require. All weighing shall be done in the presence of a representative of the Department. From the weight so obtained, the volume shall be computed based on a specific gravity of 2.92 for the aggregate and smaller particles. For material having a different specific gravity, an appropriate correction shall be made.

2.08.05—Basis of Payment: Payment will be made at the Contract unit price per cubic yard for "Free-Draining Material," complete in place, which price shall include furnishing and placing the material and all equipment, tools and labor necessary thereto.

Pay Item Pay	Unit
Free-Draining Material	c.y.

SECTION 2.09
SUBGRADE

2.09.01—Description: The area upon which the pavement structure and paved shoulders are placed, including the shoulder base courses and subbase shall be known as the subgrade. This is the plane coincident with the bottom of the subbase and the edge of pavement, as shown on the plans and cross-sections or as ordered by the Engineer. The work of formation of subgrade shall be performed at this plane.

Where precast concrete barrier curb is to be permanently installed, the work of formation of subgrade shall be performed on the area under the precast concrete barrier curb.

Where shoulders are to be reconstructed and the existing subbase is to remain, the work of formation of subgrade shall be performed at the plane coincident with the surface of the existing subbase.

After all grading has been substantially completed and all drains laid, the subgrade shall be brought to the lines, grades and cross-sections shown on the plans.

When no item for “Clearing and Grubbing” and no grading items appear in the proposal, the work of clearing waterways, ditches, drainage structures and culverts, as described in Article 2.01.03, shall be performed as part of this work.

2.09.03—Construction Methods: All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material.

In cut areas, the surface shall be uniformly compacted by use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 lb./in of contact width and weigh not less than 10 tons. Vibratory units shall have a static weight of not less than 4 tons. The amount of compactive effort shall be as directed by the Engineer, but shall be at least 4 complete passes of the compacting equipment being used.

The dry density after compaction shall be as specified in Subarticle 2.02.03-6.

Where multiple compacting units are to be used, that unit which exerts the larger compactive effort shall make the initial passes. Any portion of the subgrade not accessible to larger compacting units shall be compacted, as directed by the Engineer, to a degree equal to that obtained on the other portions of the subgrade with equipment and by methods appropriate to the size of the inaccessible area.

After compacting, the subgrade shall be true to required line and grade. There will be no direct payment for any materials required to bring the subgrade to the line, grade and cross-section shown on the plans.

The Contractor shall protect the completed subgrade from damage by exercising such precautions as the Engineer deems necessary. The subgrade surface shall be maintained in such condition as to permit proper drainage. It shall be checked and approved by the Engineer prior to placing any pavement structure and shoulders thereon.

2.09.04—Method of Measurement: Payment lines for formation of subgrade will be coincident with the outside edges of the pavement or where paved shoulders are constructed, with the outside edges of the shoulder. Where precast concrete barrier curb is permanently installed, measurement for payment will include the area under the precast concrete barrier curb. Payment for formation of subgrade will be allowed when such work is done in providing connections to public roads. Payment for formation of subgrade will not be allowed for work at private drives, in areas where traffic bound gravel is constructed or in areas where existing pavement is used as a base for resurfacing with bituminous concrete.

The area computed for payment will not include the area of any bridge floor where the type of construction is such as to eliminate any necessity for the work described herein.

2.09.05—Basis of Payment: Formation and protection of subgrade, including all work provided for hereinbefore, will be paid for at the Contract unit price per square yard for "Formation of Subgrade," which price shall include all materials, equipment, tools and labor necessary thereto.

There will be no specific payment for the work of scarifying existing stone or gravel roads as described in Article 2.02.03, but the cost of such work shall be considered included in the payment for the item providing for the formation of subgrade.

When no item for "Formation of Subgrade" appears in the proposal, the cost of this work shall be included in the Contract unit price for the pavement item or items involved.

Pay Item Pay	Unit
Formation of Subgrade	s.y.

SECTION 2.10
WATER POLLUTION CONTROL (SOIL EROSION)

2.10.01—Description: This work shall consist of measures to control water pollution and soil erosion through the use of berms, dikes, dams, sediment basins, erosion control matting, gravel, mulches, grasses, slope drains, ditches, channels, riprap, grading to control surface runoff and other erosion control devices or methods.

If the Contractor proposes changes in construction or scheduling which would affect the designed pollution controls, plans for revised pollution controls shall be submitted for the Engineer's approval before starting construction.

The Contractor shall submit a plan showing erosion and sedimentation controls above and beyond those called for in the plans and specifications, necessitated by its proposed sequence of operations and construction activities. The construction shall not proceed until the erosion and sedimentation control plans have been approved by the Engineer. The Engineer may order additional control measures if the measures mentioned above prove insufficient.

2.10.02—Materials: The materials shall consist of items meeting the pertinent articles of the Standard Specifications and approved by the Engineer, or other items approved by the Engineer, such as:

(a) Soil tackifiers, erosion control matting, burlap, and plastic sheets. All materials shall be clean and free from noxious weeds, contaminants, and debris deleterious to plant growth. Erosion control matting shall be as specified in Section M.13.

(b) Slope drains or ditches may be constructed of pipe, rubble, riprap, sod, burlap, plastic sheets, Portland cement concrete, bituminous concrete, or other material approved by the Engineer.

(c) Seeding shall be as specified in Sections 9.50 and M.13.

2.10.03—Construction Method: The Engineer has the authority to control the surface area of earth material exposed by construction operations and to direct the Contractor to immediately provide permanent or temporary pollution control measures to prevent contamination of adjacent streams, watercourses, lakes, ponds or other areas of water impoundment. Every effort shall be made by the Contractor to prevent erosion on the Site and abutting property.

All slopes shall be stabilized by mulching, seeding or otherwise protected as the work progresses to comply with the intent of this specification.

All seeding shall include mulch or other protective covering approved by the Engineer. When hay is used as a mulch with seeding, it shall be a minimum of 2 in deep and held down with a tackifier.

When wood fiber mulch is used, it shall be applied in a water slurry at a rate of 2000 lb./ac with or immediately after the application of seed, fertilizer and limestone.

All damaged slopes shall be repaired as soon as possible. The Engineer shall limit the surface area of earth material exposed if the Contractor fails to sufficiently protect the slopes to prevent pollution.
The Contractor shall at all times have on hand the necessary materials and equipment to provide for early slope stabilization and corrective measures to damaged slopes.
Temporary channels, ditches and outfalls shall be protected prior to directing water into them to prevent erosion.

The erosion control features installed by the Contractor shall be maintained by the Contractor, and such installations shall be removed if ordered by the Engineer.
Maintenance of erosion control measures by the Contractor shall include the clean out of accumulated sediment.
The Contractor shall operate all equipment and perform all construction operations so as to minimize pollution. The Contractor shall cease any of its operations which will increase pollution during rain storms.
The Contractor shall give the Engineer sufficient notice of impending shutdowns to enable the Engineer and Contractor to examine the Project and to implement erosion and pollution control work.
2.10.04—Method of Measurement: Measurement for payment of work and materials involved with the construction, application and installation of water pollution controls will be as provided for under the applicable Contract items.
Temporary slope protection will be measured for payment by the number of square yards of slope protected in accordance with this specification and as directed by the Engineer. When no applicable Contract item appears in the proposal for any additional measures not shown on the plans, the additional work and materials required for those measures shall be measured for payment as provided for under Article 1.09.04—Extra and Cost-Plus Work. All extra work performed on an agreed-price basis shall be incorporated through construction orders and paid for on an item-by-item basis.
The sum of money shown on the estimate and in the itemized proposal as “Estimated Cost” for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the Contract.
2.10.05—Basis of Payment: Work will be paid for under the applicable Contract items or as provided for under Article 1.09.04—Extra and Cost-Plus Work. No payment will be made for the clean out of accumulated sediment for either permanent or temporary erosion control measures.
Temporary pollution control measures that are made necessary by the Contractor’s

negligence, carelessness, failure to install permanent controls as a part of the work as scheduled and are ordered by the Engineer, or are made necessary by the Contractor's failure to perform the sequence and scheduling of work as part of the schedule as given in the Preconstruction Conference or as later amended and approved, will be ordered by the Engineer to be accomplished and performed by the Contractor at its own expense.
On areas off the right-of-way that are selected by the Contractor and which include but are not necessarily limited to borrow pits (other than commercially operated sources), Contractor's haul roads, disposal areas, storage, maintenance, batching areas, etc., temporary control work shall be the responsibility of the Contractor and shall be performed by the Contractor at its expense in a manner approved by the Engineer. No direct payment will be made for this work, the cost is to be included in other items of the Contract. Temporary control work on the aforesaid areas which are specifically designated for contractual operations by the State shall be paid for under the provisions of this specification.

2.11.01
Temporary slope protection will be paid for at the Contract unit price per square yard for "Temporary Slope Protection," which price shall include the installation and removal, where necessary, of the protective material and all equipment, materials, tools and labor incidental thereto.

Pay Item	Pay Unit
Water Pollution Control	est.
Temporary Slope Protection	s.y.

SECTION 2.11
ANTI-TRACKING PAD

2.11.01—Description: This work shall consist of furnishing, installing, maintaining and removing a crushed stone anti-tracking pad on geotextile filter fabric. All areas affected by the anti-tracking pad shall be restored to the original or plan contours. If shown on the plans or ordered by the Engineer, the restored areas shall be stabilized with turf establishment.

2.11.02—Materials:

The crushed stone shall meet the grading requirements of Article M.01.01 for 2-in (No. 3) coarse aggregate.

Geotextile filter fabric shall meet the requirements of Section 7.55 and Subarticle M.08.01-19.

Topsoil, if necessary, shall meet the requirements of Article M.13.01.

Seed, if necessary, shall meet the requirements of Article M.13.04.

Fertilizer, if necessary, shall meet the requirements of Article M.13.03.

Mulch, if necessary, shall meet the requirements of Article M.13.05.

2.11.03—Construction Methods: Clear area of anti-tracking pad of all vegetation and excavate to a minimum depth of 4 in. Place geotextile filter fabric over the full width and length of excavated area and cover with No. 3 crushed stone to a minimum depth of 4 in. The anti-tracking pad shall be uniformly graded to produce the entry and exit path to the Site for all construction equipment. The pad shall be maintained of sufficient grading and stone surface to capture all soils and sediment from equipment tires prior to such exiting from the Site.

Crushed stone shall be replenished or replaced as necessary or as ordered by the Engineer to assure sufficient capture of sediment at the construction Site. Any sediment or crushed stone tracked off the Site shall be immediately cleaned, swept and removed by the Contractor at no cost to the State.

2.11.04—Method of Measurement: This work will be measured for payment by the number of square yards of accepted anti-tracking pad completed as shown on the plans or as ordered by the Engineer.

2.11.05—Basis of Payment: Payment for this work will be made at the Contract unit price per square yard for “Anti-Tracking Pad,” which shall include furnishing and placing all material, including the geotextile; for maintaining the anti-tracking pad during the Project construction period; for removing the anti-tracking pad after completion of the Project; for restoring the Site, including any required turf establishment; and for all labor, equipment, tools, and incidentals required to complete the work as well as the cleaning

and sweeping of any sediment or crushed stone tracked off the Site.

Clearing and grubbing required to install the anti-tracking pad will be paid under the item “Clearing and Grubbing.”

Pay Item	Pay Unit
Anti-Tracking Pad	s.y.

price per square yard for “Anti-Tracking Pad,” which shall include furnishing and placing all material, including the geotextile; for maintaining the anti-tracking pad during the Project construction period; for removing the anti-tracking pad after completion of the Project; for restoring the Site, including any required turf establishment; and for all labor, equipment, tools, and incidentals required to complete the work as well as the cleaning and sweeping of any sediment or crushed stone tracked off the Site.

Clearing and grubbing required to install the anti-tracking pad will be paid under the item “Clearing and Grubbing.”

Pay Item	Pay Unit
Anti-Tracking Pad	s.y.

SECTION 2.12
SUBBASE

2.12.01—Description: The subbase shall consist of a clean soil-aggregate mixture of bank or crushed gravel, crusher run stone, reclaimed miscellaneous aggregate containing no more than 2% by weight of asphalt cement or any combinations thereof, placed where shown on the plans or where directed by the Engineer and constructed in accordance with these specifications.

2.12.02—Materials: All materials for this work shall meet the requirements of Articles M.02.02 and M.02.06.

2.12.03—Construction Methods: The prepared foundation for the subbase shall be carefully shaped to the required cross section and compacted as specified in Article 2.02.03. Where underdrains and outlets are specified on the plans or ordered by the Engineer, they shall be in place and functioning before any subbase material is placed. The subbase material shall be spread uniformly upon the required grade, in courses not to exceed 6 in thick after final compaction. However, if the required thickness of subbase does not exceed 8 in it may be placed in a single course.

After each course has been placed as specified above, its entire area shall be compacted with equipment specifically manufactured for that purpose. The use of hauling and spreading equipment shall not be considered as a substitute for compacting equipment. Compaction shall be continued until the entire course is uniformly compacted to the required minimum density. The dry density after compaction shall not be less than 95% of the dry density for that subbase material when tested in accordance with AASHTO T 180, Method D. If a subbase course is formed from reclaimed miscellaneous aggregate containing bituminous concrete, the wet density after compaction on this course shall not be less than 95% of the wet density for that subbase when tested in accordance with AASHTO T 180, Method D.

Each layer of subbase shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer. Should the foundation material beneath the subbase become churned up and mixed with subbase material at any time, the Contractor shall, without additional compensation, remove the mixture and replace it with new subbase material to the required thickness shown on the plans or as previously required by the Engineer. Such replaced subbase material shall be compacted to the required minimum density.

2.12.04—Method of Measurement: Subbase will be measured horizontally in place

2.12.05

after final grading and compaction. The thickness will be as indicated on the plans, or as ordered by the Engineer, and within the following tolerances:

Less than 24 in: minus 1 in to plus 3/4 in

24 in and greater: minus 2 in to plus 1 in

Measurements to determine the thickness will be made by the Engineer at intervals of 500 ft, or less, along lanes and shall be considered as representative of the lane. For purposes of these measurements, a shoulder will be considered a lane.

If deficient thicknesses are found, the Engineer will make such additional measurements considered necessary to determine the longitudinal limits of the deficiency. Areas not within allowable tolerances shall be corrected, as ordered by the Engineer, without additional compensation to the Contractor.

2.12.05—Basis of Payment: This work will be paid at the Contract unit price per cubic yard for "Subbase," which price shall include all materials, equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Subbase	c.y.

SECTION 2.14
COMPACTED GRANULAR FILL

2.14.01—Description: Work under this item shall consist of furnishing and placing compacted granular fill as foundation for structures where shown on the plans or directed by the Engineer.

2.14.02—Materials: Gravel or reclaimed miscellaneous aggregate shall meet the requirements of Article M.02.02. Admixtures and surface protective materials used to prevent the gravel from freezing must meet the approval of the Engineer.

2.14.03—Construction Methods: After all excavation has been completed, gravel or reclaimed miscellaneous aggregate shall be deposited in layers not exceeding 8 in deep over the areas. In exceptional cases, the Engineer may permit the first layer to be thicker than 8 in. Each layer shall be leveled off by the use of blade graders or bulldozers with adequate power for the work involved. The entire area of each layer shall be compacted by use of vibratory, pneumatic tire or tread type compaction equipment approved by the Engineer. The compaction shall be continued until the dry density over the entire area of each layer is not less than 95% of the dry density achieved by AASHTO T 180, Method D.

If a layer is formed from reclaimed miscellaneous aggregate containing bituminous concrete, the wet density after compaction on this layer shall not be less than 95% of the wet density for that compacted granular fill when tested in accordance with AASHTO T 180, Method D. In this test, material retained on the 3/4-in sieve shall be replaced with material retained on the No. 4 sieve, as noted as an option in the specifications for this testing.

Each layer of compacted granular fill shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

The embankment adjacent to the compacted granular fill shall be placed simultaneously with the compacted granular fill, and at no time shall there be a difference of more than 2 ft in elevation between the classes of material. The embankment material to be placed simultaneously with the compacted granular fill shall extend at least 20 ft in every direction beyond the limits of the compacted granular fill, except that where a narrower width is shown on the plans, such narrower width of material shall be placed as prescribed above.

2.14.04—Method of Measurement: Compacted granular fill will be measured in place after compaction, by the average end area method.

2.14.05—Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for “Compacted Granular Fill,” complete in place, which price shall include all materials, equipment, tools and labor incidental thereto.

The cost of water and work involved in puddling, admixtures and protective materials shall be included in the Contract unit price per cubic yard for “Compacted Granular Fill.”

Pay Item	Pay Unit
Compacted Granular Fill	c.y.

SECTION 2.19
SEDIMENTATION CONTROL SYSTEM

2.19.01—Description: This work shall consist of furnishing, placing, maintaining and removing sedimentation control systems as shown on the plans or as directed by the Engineer. Maintaining shall include the clean out of accumulated sediment.

2.19.02—Materials: The sedimentation control system materials for this work shall meet the following requirements:

Hay bales shall be made of hay with 40 lbs minimum weight and 120 lbs maximum weight, and shall be held together with twine or wire.

Geotextile shall meet the requirements of Sections 7.55 and M.08.

2.19.03—Construction Methods: Sedimentation Control Systems shall be installed by the Contractor in locations shown on the plans or as directed by the Engineer.

Hay bales systems shall be installed lengthwise along the contour with ends of adjacement bales tightly abutting each other. All hay bales shall be installed so that bindings are oriented around the sides, rather than along the tops and bottoms. Each hay bale shall be entrenched 4 in deep and backfilled, with the backfilled soil placed toward the potential silt source. They shall be held in place by 2 wooden stakes in each hay bale and each wooden stake shall be driven 18 in deep into the ground. Gaps shall be filled with hay or straw to prevent water or debris escaping between the bales.

Geotextile systems shall be installed along the contour so that the bottom 6 in of the fabric is buried by either trenching or by laying the 6-in section horizontally on the shall have be exposed at least 30 in high as installed. Spacing between posts shall not exceed 10 ft and all wooden posts shall be driven a minimum of 12 in deep into the ground. When joints between sections of geotextile sedimentation control systems are necessary, geotextile shall be spliced together only at a support post, with a minimum 6-in overlap, and shall be securely sealed.

When trench excavation of a hay bale or geotextile fence is obstructed by an occasional stone or tree root, provide a smooth transition between the trench bottom and the obstrction.

Clean out of accumulated sediment shall be accomplished when 1/2 of the original height of the hay bales or geotextile fence systems as installed becomes filled with sediment, or as ordered by the Engineer.

Hay bales or geotextile fence systems shall be maintained or replaced until they are no longer necessary for the purpose intended or are ordered removed for the Site at the completion of the Project when full stabilization has occurred, unless specifically authorized by the Engineer to be left in place.allowed to remain in toe of slope areas unless ordered removed by the Engineer.

2.19.04—Method of Measurement: This work will be measured for payment by the actual number of linear feet of “Sedimentation Control System” or “Sedimentation

Control (Type) System" installed and accepted. Measurement shall be made along the center-line of the top of the system. Replacement systems will not be measured for payment.

2.19.05—Basis of Payment: Payment for this work will be made at the Contract unit price per linear foot for "Sedimentation Control System" or "Sedimentation Control (Type) System" complete in place, which price shall include all materials, equipment, tools and labor incidental to the installation, maintenance, replacement, removal and disposal of the system and surplus material. No payment shall be made for the clean out of accumulated sediment.

Pay Item	Pay Unit
Sedimentation Control System	l.f.
Sedimentation Control (Type) System	l.f.

SECTION 3.04
PROCESSED AGGREGATE BASE

3.04.01--Description: The base shall consist of a foundation constructed on the prepared subbase or subgrade in accordance with the lines, grades, compacted thickness and typical cross-section as shown on the plans.

3.04.02--Materials: All materials for this work shall meet the requirements of Article M.05.01.

3.04.03--Construction Methods: The same type of coarse aggregate shall be used throughout a Project unless otherwise permitted by the Engineer.

Prior to placing the processed aggregate base, the prepared subbase or subgrade shall be maintained true to line and grade, for a minimum distance of 200 ft in advance of the work. The aggregate courses shall not be placed more than 500 ft ahead of the compaction and binding operation on that particular course.

The processed aggregate base shall be spread uniformly by a method approved by the Engineer. The thickness of each course shall not be more than 4 in after compaction, unless otherwise ordered.

After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 lbs/in of contact width and shall have a weight not less than 10 tons. Vibratory units shall have a static weight of not less than 4 tons. Water may be used during the compaction and binding operation and shall be applied from an approved watering device. The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 in and progress towards the middle, parallel with the centerline of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of super-elevation and special cross slope shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. The amount of compactive effort shall in no case be less than 4 complete passes of the compacting and binding operations. All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the road. The dry density of each layer of processed aggregate base after compaction shall not be less than 95% of the dry density for that material tested in accordance with AASHTO T 180, Method D.

Should the subbase or subgrade material become churned up or mixed with the processed aggregate base at any time, the Contractor shall, without additional compensation remove the mixture. The Contractor shall add new subbase material, if required, and reshape and recompact the subbase in accordance with the requirements of Article 2.12.03. New aggregate material shall be added, compacted and bound, as hereinbefore specified, to match the surrounding surface.

Any surface irregularities which develop during, or after work on each course, shall be corrected by loosening material already in place and removing or adding aggregate as required. The entire area, including the surrounding surface, shall be re-compacted and rebound until it is brought to a firm and uniform surface satisfactory to the Engineer.

3.04.04--Method of Measurement: Processed Aggregate Base will be measured horizontally in place after final grading and compaction. Materials placed beyond the horizontal limits indicated on the plans will not be measured for payment.

The total thickness shall be as indicated on the plans, or as ordered by the Engineer, within a tolerance of -3/4 in to +1/2 in. Measurements to determine the thickness will be taken by the Engineer at intervals of 500 ft or less, along lanes, and shall be considered representative of the lane. For the purpose of these measurements, a shoulder will be considered a lane.

If a thickness measurement is taken and found deficient, additional measurements considered necessary by the Engineer will be taken to determine the longitudinal limits of the deficiency. Areas not within allowable tolerances shall be corrected, as ordered by the Engineer, without additional compensation to the Contractor.

3.04.05--Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for “Processed Aggregate Base,” complete in place, which price shall include all materials, tools, equipment and work incidental thereto.

Pay Item Pay	Unit
Processed Aggregate Base	c.y.

SURFACE COURSES OR PAVEMENTS
SECTION 4.01
CONCRETE FOR PAVEMENT

4.01.01—Description: This pavement shall consist of Portland cement concrete, with or without reinforcement, in accordance with the lines, grades, thickness, and typical cross section as shown on the plans.

4.01.02—Materials: The materials for this work shall meet the requirements for concrete pavement under M.03. Reinforcing steel shall be as specified in M.06.01.

4.01.03—Construction Methods:

A. Material Documentation, Transportation and Testing: All material delivered to the Project shall be documented, transported and tested in accordance with Subarticle 6.01.03-3 Transportation and Delivery of Concrete and Subarticle 6.01.03-4 Acceptance Testing and Test Specimens. The plastic properties for concrete pavement shall meet the requirements for standard mix properties as specified in Subarticle 6.01.03-4a.
In addition, the air content of the plastic concrete shall be determined in accordance with AASHTO Method T 152, Pressure Method. No alternative method is acceptable.

B. Placing Concrete:
All forms, slip form pavers, and other equipment used in the placing, curing and finishing of concrete shall be of a design acceptable to the Engineer.

1. Forms: Forms shall be set by the Contractor to true line and grade.
The specified grade shall be set and compacted prior to the setting of forms.
Conditioning of Subgrade or Base Course: The subgrade or base course shall be brought to proper cross section. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade. The finished grades shall be maintained in a smooth and compacted condition until the pavement is placed.

2. Slip Form Paving: When slip form paving, the subgrade, or the surface of the subbase over which the tracks of the slip form paver will travel shall not vary more than ± 3/16 in from the grade established by the Engineer.
Except when the Contractor elects to place reinforcement in a two-layer procedure, the slip form paving equipment shall spread, consolidate, screed and float finish the freshly placed concrete in a single pass in a manner such that a minimum of hand floating will be required. The operations of depositing, spreading, consolidating and finishing shall be such that, insofar as possible, continuous operation of the paver will be maintained. Frequent starting and stopping of the paver shall be kept to a minimum.

3. Placement: Where concrete is to be placed adjoining a previously constructed

lane of pavement, and hauling units and mechanical equipment will be operated upon that previously constructed lane of pavement, that lane shall have attained the strength specified for opening the pavement to vehicular traffic. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after the concrete is tested in accordance with Subarticle 4.01.03-D and has attained a modulus of rupture of 400 psi.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies, by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 5 seconds in any location.

Concrete shall be deposited as close to expansion and contraction joints as possible without disturbing them, but shall not be dumped from the discharge bucket or hopper on to a joint assembly unless the hopper is well centered on the joint assembly.

Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.

In order that the concrete may be properly protected from rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete.

4. Placing Reinforcement: If mechanical means are used to place pavement reinforcement or pavement fabric, the mechanical placement equipment shall be capable of positioning the reinforcement or fabric within the tolerances specified.

When reinforced concrete pavement is placed in 2 layers, the entire width of the bottom layer shall be struck off and consolidated to such length and depth that the sheet of fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off and screeded.

Any portion of the bottom layer of concrete which has been in place for more than 45 minutes without being covered with a top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in a single layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete after spreading, by mechanical or vibratory means.

Reinforcing steel shall be free from dirt, oil, paint, grease, mill scale, and loose or thick rust, which could impair bond of the steel with the concrete.

5. Finishing:

(a) Sequence: The sequence of operations shall be the strike-off and consolidation floating and removal of laitance, and final surface finish. Work bridges or other devices necessary to provide access to the pavement surface for the purpose of finishing, straight-edging, and making corrections as hereinafter specified, shall be provided by the

Contractor.

In general, the addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted. If the application of water to the surfaces is permitted, it shall be applied as a fog spray by means of approved spray equipment.

(b) Finishing at Joints: The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material, under and around all load transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated.

(c) Hand Finishing: Unless otherwise specified, hand finishing methods will not be permitted except under the following conditions:

i. In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade when the breakdown occurs.

ii. Narrow widths or areas of irregular dimensions where operations of the mechanical equipment is impractical may be finished by hand methods.

Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used. A second screed shall be provided for striking off the bottom layer of concrete if reinforcement is used.

(d) Floating: After the concrete has been struck off and consolidated it shall be further smoothed, trued, and consolidated by means of a float.

(e) Final Finish: When all irregularities have been removed, and the edges of the slabs and joints given their initial edging, the pavement shall be subjected to the following 2-stage texturing treatment:

i. **Dragging with Burlap:** The burlap shall be at least 3 ft wide and a length of 2 ft greater than the width of the lane or lanes being placed. The burlap shall not have frayed edges and shall be kept wet and clean of accumulations of dried concrete particles or other foreign materials, which might leave distinctive undesirable marks. The burlap shall be drawn longitudinally along the surface in a slow manner so as to have an even texture. When not in use, the burlap shall not be allowed to rest on the pavement.

ii. **Texturing with Tines:** As soon as possible, after the pavement surface has been dragged with the burlap, mechanical equipment shall be used to texture the surface with deep transverse grooves. The equipment shall consist of a self-propelled device capable of applying a textured finish transverse to the centerline of the pavement. The texturing shall be done with tines 0.03 in thick, 0.08 in wide, and 4 to 6 in long, with an average spacing of 1/2 in on centers.

The transverse grooving shall be performed when the condition of the concrete is optimum. This condition will prevail when the grooves can be formed to a depth of 1/8 to 1/4 in with relative ease and without the walls of the grooves closing back in on each

other. Other adjustments to the tining procedure may be permitted by the Engineer to obtain grooves of the proper width and depth.

The tined grooving shall extend from edge to edge of the pavement, and shall be perpendicular to the centerline of the pavement. The tining mechanism shall be aligned so as to prevent overlapping of grooves in any 2 successive passes. The depth of the grooves formed in the surface by the tines shall be checked randomly with a tire tread depth-measuring gage furnished by the Contractor to ensure compliance with the required limits of 1/8 to 1/4 in. The original surface of the concrete shall serve as the datum for the depth measurements.

(f) Edging at Forms and Joints: After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints shall be worked with an approved tool and rounded to the radius required by the plans.

A well-defined and continuous radius shall be produced and a smooth, dense mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting the tool during use.

At all joints, any tool marks appearing on the slab adjacent to the joints shall be eliminated by brooming the surface. In doing this, the rounding of the corner of the slab shall not be disturbed. All concrete on top of the joint filler shall be completely removed. All joints shall be tested with a straight edge before the concrete has set, and correction shall be made if either side of the joint is higher than the other or if they are higher or lower than the adjacent slabs.

6. Joints: Joints shall be constructed of the type and dimensions, and at the locations required by the plans or specifications. All joints shall be protected from the intrusion of injurious foreign material until sealed.

(a) Longitudinal Joint: Deformed steel tie bars of specified length, size, spacing and material shall be placed perpendicular to the longitudinal joints; they shall be placed by approved mechanical equipment or rigidly secured on chairs or other approved supports to prevent displacement. Tie bars shall be coated with epoxy meeting AASHTO M 284. When shown on the plans and when adjacent lanes of pavement are constructed, steel side forms shall be used which will form a keyway along the construction joint. Tie bars may be bent at right angles against the form of the first lane constructed and straightened into final position before the concrete of the adjacent lane is placed, or in lieu of bent tie bars, approved 2-piece connectors may be used.

Longitudinal formed joints shall consist of a groove or cleft, extending downward from, and normal to, the surface of the pavement. These joints shall be formed by an approved mechanically or manually operated device to the dimensions and line indicated on the

plans and while the concrete is in a plastic state. The groove, or cleft, shall be filled with either a pre-molded strip or poured material.

The longitudinal joint, however formed, shall be continuous. There shall be no gaps in either transverse or longitudinal joints at the intersection of the joints.

Longitudinal sawed joints shall be cut by means of approved concrete saws to the depth, width and line shown on the plans. Suitable guidelines or devices shall be used to assure cutting the longitudinal joint on the true line as shown on the plans. The longitudinal joint shall be sawed within 36 hours of placement and before any other equipment or vehicles are allowed on the pavement. The sawed area shall be thoroughly cleaned and the joint shall immediately be filled with sealer.

(b) Transverse Expansion Joints: The expansion joint fillers shall be continuous from edge to edge, shaped to the subbase and to the keyway along the edge. Preformed joint filler shall be furnished in lengths equal to the pavement width or equal to the lane width. Damaged or repaired joint filler shall not be used unless approved by the Engineer.

The expansion joint filler shall be held in a vertical position. An approved installing bar, or other device shall be used if required to secure preformed expansion joint filler at the proper grade and alignment during placing and finishing of the concrete. Finished joints shall not deviate more than 1/4 in along horizontal alignment from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

(c) Transverse Contraction Joints: Transverse contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement and, when shown on the plans, shall include transfer assemblies.

i. Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place until the concrete has attained its initial set and shall then be removed without disturbing the adjacent concrete, unless the device is designed to remain in the joint.

ii. Sawed contraction joints shall be created by sawing grooves in the surface of the pavement of the dimensions and at the spacing and lines shown on the plans with an approved concrete saw. After each joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly cleaned.

Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours.

All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both during the day and night, regardless of weather conditions. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints

shall be sawed in sequence. If extreme conditions exist, which make it impractical to prevent erratic cracking by early sawing, the contraction joint groove shall be formed prior to initial set of concrete as provided above. The Engineer will review procedures and methods to correct random cracking.

iii. Transverse formed contraction joints shall comply with the requirements for the longitudinal formed joint.

(d) Transverse Construction Joints: Transverse construction joints shall be constructed when there is an interruption of more than 30 minutes in the concreting operations. No transverse joint shall be constructed within 10 ft of an expansion joint, contraction joint, or plane of weakness. If sufficient concrete has not been mixed at the time of interruption to form a slab at least 10 ft long, the excess concrete back to the last preceding joint shall be removed and disposed of as directed.

(e) Load Transfer Devices: Load transfer devices shall meet the requirements of Article M.03.08.

(f) Sealing Joints: Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including the Contractor's equipment. Just prior to sealing, each joint shall be thoroughly cleaned of all foreign material, including membrane curing compound and the joint-faces shall be clean and surface dry when the seal is applied.

The sealing material shall be applied to each joint opening to conform to the details shown on the plans or as directed by the Engineer. Material for seal applied hot shall be stirred during heating so that localized overheating does not occur. The pouring shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. The use of sand or similar material as a cover for the seal will not be permitted. Poured joint-sealing material shall not be placed when the air temperature in the shade is less than 50° F, unless approved by the Engineer.

Preformed elastomeric gaskets for sealing joints shall be of the cross sectional dimensions shown on the plans. Seals shall be installed by suitable tools, without elongation, and secured in place with an approved lubricant adhesive which shall cover both sides of the concrete joints. The seals shall be installed in a compressed condition and shall at time of placement be below the level of the pavement surface by approximately 1/4 in. The seals shall be a single piece for the full width of each transverse joint.

7. Curing: Immediately after the finishing operations have been completed and as soon as marring of the concrete will not occur, the entire surface of the newly placed concrete shall be covered and cured in accordance with any of the methods below. Liquid Membrane – Forming Cure is the preferred method of curing. Moist curing and cover sheet curing must be approved by the Engineer prior to paving operations. In all cases in which curing requires the use of water, the curing shall have prior right to all water

supply or supplies. Failure to use, or lack of water to adequately take care of curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 30 minutes between stages of curing or during the curing period.

When concrete is being placed and the air temperature may be expected to drop below 35_{0} F a sufficient supply of straw, hay, grass, or other suitable blanketing material shall be provided along the work and any time the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete. During the period of time such protection is used, the Contractor shall be responsible for the uality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

(a) Liquid Membrane-Forming Cure: The liquid curing compound shall be as specified in Subarticle M.03.04-3. When resin-based curing compound is used, it shall be applied following the final finishing immediately after the disappearance of the water sheen and before any surface checking or marked dehydration of the concrete occurs. When water-soluble, linseed oil-based compound is used, it shall be applied immediately following the final finishing.

The compound shall be applied by an approved self-propelled mechanical pressured sprayer delivering a fine, even spray with uniform coverage. This equipment shall be provided with a suitable device for adequate agitation of the compound to prevent settlement. For the sides of concrete pavement exposed after removal of the forms and for areas where the use of self-propelled equipment is not practical, approved hand-held spray bars delivering a fine, even spray may be used; and the compound shall be drawn from a tank equipped with an approved device to prevent settlement or by a method which will prevent settlement.

If the compound is applied in 2 applications, the second application shall follow the first application within 30 minutes. The compound shall be applied in a continuous, uniform film at not less than 1 gal per 150 sf.

If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, the Contractor shall be required to apply a new coat of material to the affected areas equal in curing value to that specified for the original coat. The treated surface shall be protected by the Contractor from injury for a period of at least 7 days. All traffic, either foot or otherwise, will be considered as injurious to the film of the applied compound.

The Contractor shall have on the Project sufficient approved cover sheet or cotton mats for the protection of the pavement in case of rain or breakdown of the spray equipment. The cotton mats shall be maintained in a wet condition during the period of use, as

elsewhere herein specified.
Transverse joints shall be protected from the compound by means or methods approved by the Engineer.

(b) Moist Curing: After the surface of the concrete has been given its final finish, it shall be protected by covering it with moist mats of the size and quality specified in Subarticle M.03.04-2. These mats shall be laid longitudinally over the surface of the finished pavement by unrolling from the supported roll so as not to bring an excessive weight upon or to mar the new surface of the pavement. After placing, these mats shall be saturated and kept saturated for a period of 7 days, at the end of which time they may be removed, and no further wetting or artificial curing will be required.

(c) Cover Sheet Curing: As soon as practicable after the finishing operations, paper or polyethylene cover sheets as specified in Sub-article M.03.04-4 shall be placed in such a manner that the surface of the concrete shall not be marred. The adjoining covers shall overlap at least 18 in, and the lap shall be securely fastened down to form a closed joint. On removal of the forms, the edges shall be covered down to the bottom of the pavement. The cover sheets shall remain in place for a period of 7 days.
In the event that hair-checking develops before the cover can be placed, the procedure set forth shall be modified at the direction of the Engineer. Moist curing mats shall then be used for the initial 24 hours of the curing period, and the cover sheets placed for the remainder of the curing period.
Before reusing paper or polyethylene covers, they shall be checked for holes or tears, and any such perforations shall be repaired. Covers which have become unserviceable will be rejected by the Engineer.

C. Protection of Pavement: The Contractor shall protect the pavement and its appurtenances against public traffic and traffic caused by his own employees and agents until the pavement is opened to traffic.
Any damage to the pavement occurring prior to the opening of the pavement to traffic by the State shall be repaired or the pavement replaced.

D. Riding Surface Tests:

1. Surface Test (Profilograph) and Correction: The finished surface of all mainline pavement shall be tested and corrected to a smoothness as described herein. Mainline pavement is defined as all pavement for traffic lanes and climbing lanes, but excluding concrete base, acceleration and deceleration lanes, and all taper sections, pavement widening, shoulders, and side street returns. Pavement on horizontal curves having a baseline radius of curvature of 6 degrees or greater and superelevation transitions of such curves will also be excluded.
The surface smoothness of pavement not classified as mainline pavement shall be determined by the Surface Test (straightedge) as described hereinafter. The smoothness

of the pavement surface will be determined by using a California Type Profilograph over each designated lane to develop a Profile Index. The equipment shall be furnished and maintained by the Contractor, and will be operated by the Engineer in accordance with Department test methods.

The Contractor shall furnish paving equipment and employ methods that produce a riding surface having a Profile Index of 12 in/mi, or less. The profile will terminate 50 ft from each pressure relief joint or existing pavement which is joined by the new pavement. Pavement profiles will be taken 3 ft from and parallel to each edge of pavement for pavement placed at a 12-ft width or less. When pavement is placed at a greater width than 12 ft, the profile will be taken 3 ft from and parallel to each edge and at the approximate locations of each planned longitudinal joint. Additional profiles may be

taken only to define the limits of an out of tolerance surface variation.

During the initial paving operations, either when starting up or after a long shut down period, the pavement surface will be tested with the profilograph as soon as the concrete has cured sufficiently to allow testing. Membrane curing damaged during the testing operation shall be repaired by the Contractor as directed by the Engineer. The purpose of this initial testing is to aid the Contractor and the Engineer in evaluating the paving methods and equipment. Once the initial pavement smoothness, paving methods, and paving equipment are acceptable to the Engineer, the Contractor may proceed with the paving operation. Subsequent to the aforementioned initial testing, daily profiles of each day's paving will be run as soon as possible, preferably during the next working day following placement of the pavement.

A daily average Profile Index will be determined for each day's paving. A day's paving is defined as a minimum of 1000 lf of full-width pavement placed in a single day. If less than 1000 lf is paved, the day's production shall be grouped with the subsequent day's production. If an average Profile Index of 20 in/mi is exceeded in any daily paving operation, the paving operation will be suspended and will not be allowed to resume until corrective action is taken by the Contractor. In the event that paving operations are suspended as a result of the average Profile Index exceeding 20 in/mi, subsequent paving operations will be tested in accordance with the initial paving testing procedures.

For the purpose of determining pavement sections where corrective work or pay adjustments will be necessary, the pavement will be evaluated in 0.1-mi sections. Within each 0.1-mi section, all areas represented by high points with deviations in excess of 0.5 in per25 ft or less shall be removed by the Contractor with an approved grinding device or a device consisting of multiple saws. The final texture of the concrete pavement shall be such that texture, appearance, and skid resistance are comparable to adjacent sections that do not require corrective work. The use of a bush hammer or other impact device will not be permitted. Deviations in excess of 0.5 in will be determined from the

profilogram in accordance with Department Test Methods.
After removing all individual deviations in excess of 0.5 in per 25 ft, additional cutting shall be performed if necessary to reduce the Profile Index.
On those 0.1-mi sections where corrections are necessary, second profilograph runs will be performed to verify that corrections have produced an average Profile Index 20 in/mi or less. If the initial average Profile Index is less than 12 in/mi, only the areas in excess of 0.5-in deviations will be re-profiled for correction verification.
After removing all individual deviations in excess of 0.5 in, as stated above, additional correction shall be performed if necessary to reduce the average Profile Index to 20 in/mi or less. All corrective work shall be completed prior to determinations of pavement thickness.

2. Surface Test (Straightedge) and Corrections: As soon as the concrete has hardened sufficiently, the pavement surface, except as specified herein above for mainline pavement, shall be tested by the Contractor with an approved 10-ft straightedge placed both transversely and longitudinally to the centerline at sufficient intervals to check the surface profile. Areas showing high spots of more than 1/8 in, exclusive of tining corrugations, shall be marked by the Engineer and removed by the Contractor to an elevation where the area or spot will not show surface deviations in excess of 1/8 in when tested with a 10-ft straightedge. Correction of surface irregularities and resulting surface finish shall meet the requirements specified herein for mainline pavement.

E. Flexural Testing of Concrete: The flexural strength of the concrete pavement shall be monitored by the evaluation of compressive strength cylinders. The compressive strength specimens shall be cast and cured in the field in accordance with ASTM C31. After proper curing, these cylinders shall be transported to the Division of Materials Testing for strength evaluation.

F. Opening to Traffic: Vehicular traffic shall be excluded from the pavement until sufficient curing has taken place. The pavement shall be opened to traffic with the attainment of a compressive strength of 3,500 psi.
Any damage to the pavement from traffic or any other causes, occurring prior to acceptance of this Contract, shall be repaired by the Contractor at its own expense.
In order to expedite the opening of a pavement, or part thereof, to traffic, the Engineer may direct the Contractor to supply a concrete with a higher cement factor, or to substitute TYPE III Portland Cement for the type being used. The mix design for this concrete must be approved by the Engineer. The State will only pay the extra cost per ton for the cement used.
If the Contractor wants to increase the early strength of the pavement in order to facilitate its plan for the paving sequence, substitution of TYPE III Portland Cement, or use of a concrete with a higher cement factor may be allowed. The mix design for these

types of concrete must be approved by the Engineer. The extra costs for the cement used shall be borne by the Contractor.

4.01.04—Method of Measurement: It is the intent of these specifications that the pavement shall be constructed strictly in accordance with the thickness and widths shown on the plans. The State will not be liable for payment for any thickness and widths in excess of that required.

A. Pay Adjustment for Surface Smoothness: Payment to the Contractor will be based on the average Profile Index per 0.1-mi section according to the following table:

AVERAGE PROFILE INDEX	CONTRACT UNIT PRICE ADJUSTMENT
Inches per mile per 0.1-mile section	Percentage of pavement unit bid price
0 to 6	106
over 6 to 8	104
over 8 to 10	102
over 10 to 12	100
over 12 to 14	98
over 14 to 16	96
over 16 to 18	94
over 18 to 20	92
over 20	see below

When the average Profile Index exceeds 12 in/mi per 0.1-mi section, but does not exceed 20 in/mi per 0.1-mi section, the Contractor may elect to accept a Contract unit price adjustment in lieu of reducing the average Profile Index.

The unit bid price adjustment will be computed using the designed thickness of Portland Cement pavement or as adjusted under Article 4.01.04. This unit bid price adjustment will apply to the total area of the 0.1-mi long section for the lane width represented by the profile (usually 12 ft wide). No payment will be made for any pavement which has an average profile index in excess of 20 in/mi until corrective work has been completed by the Contractor and the pavement re-profiled to verify that the average Profile Index has been reduced to 20 in/mi or less.

B. Pay Adjustment for Pavement Thickness:

1. Determination of Pavement Thickness: The pavement thickness shall be measured after surface correction is completed.

The thickness of fixed form pavement shall be determined by using measurements or elevations, or both, obtained by the Contractor and submitted to the Engineer prior to the placement of concrete. Thickness measurements using cores tested in accordance with AASHTO T 148 shall remain the option of the Engineer.

The thickness of slip form pavement will be determined by average caliper measurements of cores tested in accordance with AASHTO T 148.

For the purpose of establishing an adjusted unit price for pavement, units to be considered separately are defined at 1,000 lf of pavement in each traffic lane starting at the end of the pavement bearing the smaller station number. The last unit in each lane shall be 1,000 ft plus the fractional part of 1,000 ft remaining. A core will be taken at random by the Department in each unit. When the measurement of the core from a unit is not deficient more than 0.2 in from the plan thickness, full payment will be made. When such measurement is deficient more than 0.2 in and not more than 1.0 in from the plan thickness, 2 additional cores at intervals not less than 300 ft will be taken and used in the average thickness for that unit. If the average measurement of these 3 cores is not deficient more than 0.2 in from the plan thickness, full payment will be made. If the average thickness of the 3 cores is deficient more than 0.2 in, but not more than 1.0 in from the plan thickness, an adjusted unit price as provided in Subarticle 4.01.04-B.2 will be paid for the area represented by these cores.
Other areas such as intersections, entrances, crossover ramps, etc., will be considered as a single unit, and the thickness of each unit will be determined separately. Small irregular unit areas may be included as part of another unit. At such points as the Engineer may select in each unit, a core will be taken for each 1,000 s.y. of pavement, or fraction thereof, in the unit. If the core so taken is not deficient more than 0.2 in from the plan thickness, full payment will be made. If the core is deficient in thickness by more than 0.2 in, but not more than 1.0 in from the plan thickness, 2 additional cores will be taken from the area represented and the average of the 3 cores determined. If the average thickness of the 3 cores is deficient more than 0.2 in, but not more than 1.0 in from the plan thickness, an adjusted unit price as provided in Subarticle 4.01.04-B.2 will be paid for the area represented by these cores.

Other areas such as intersections, entrances, crossover ramps, etc., will be considered as a single unit, and the thickness of each unit will be determined separately. Small irregular unit areas may be included as part of another unit. At such points as the Engineer may select in each unit, a core will be taken for each 1,000 s.y. of pavement, or fraction thereof, in the unit. If the core so taken is not deficient more than 0.2 in from the plan thickness, full payment will be made. If the core is deficient in thickness by more than 0.2 in, but not more than 1.0 in from the plan thickness, 2 additional cores will be taken from the area represented and the average of the 3 cores determined. If the average thickness of the 3 cores is deficient more than 0.2 in, but not more than 1.0 in from the plan thickness, an adjusted unit price as provided in Subarticle 4.01.04-B.2 will be paid for the area represented by these cores.
In calculating the average thickness of the pavement, measurements that are in excess of the specified thickness by more than 0.2 in will be considered as the specified thickness plus 0.2 in, and measurements that are less than the specified thickness by more than 1.0

in will not be included in the average.

When the measurement of any core is less than the specified thickness by more than 1.0 in, the actual thickness of the pavement in this area will be determined by taking additional cores at (not less than) 10-ft intervals parallel to the centerline in each direction from the affected location until in each direction a core is found that is not deficient by more than 1.0 in. Areas found deficient in thickness by more than 1.0 in shall be evaluated by the Engineer, and if so judged that the deficient areas warrant removal, they shall be removed and replaced with concrete of the thickness shown on the plans. Exploratory cores for deficient thickness will not be used in averages for adjusted unit price. The cost of all thickness measurements made to determine average thickness variation or to isolate areas that are deficient by more than 1.0 in, including filling holes with concrete, will be deducted from any monies due or that may come due to the Contractor under the Contract at the rate of $50.00 per core.

2. Determination of Adjusted Payments: After the thickness of pavement has been determined on the basis of core measurements as hereinbefore described, the following rules for payment shall be applied.

Where the average thickness of pavement is deficient in thickness by more than 0.2 in, but not more than 1.0 in, payment will be made at an adjusted price as specified in the following table.

Concrete Pavement Deficiency Deficiency in Thickness Determined by Cores	Proportional part of Contract Price Allowed
Inches	Percentage
0.00 to 0.20	100
0.21 to 0.30	80
0.31 to 0.40	72
0.41 to 0.50	68
0.51 to 0.75	57
0.76 to 1.00	50

When the thickness of pavement is deficient by more than 1 in, the Engineer will determine whether the area of such deficiency will be left in place or replaced in accordance with the provisions of Article 1.05.03. All additional work required and any delay to the Contractor's operation as a result of these specifications will not be cause for additional compensation for an extension of time.

On all sections of pavement which have to be removed, the Contractor shall bear the entire cost of the initial construction and the removal of the pavement including all concrete, reinforcement steel and joint material. Measured for payment hereunder will be

only the items of construction entering into the replacement of the concrete pavement to the specified thickness.

C. Measurement for Payment: This work will be measured for payment as follows:

1. Concrete for Pavement: The quantity of concrete included under this item will be the number of cubic yards of accepted concrete for pavement contained in the theoretical computed volume of the pavement having the required thickness and widths, but subject to adjusted proportional payment or non-payment as stated hereinbefore.

2. Fabric or Bar Mat Reinforcement: This material will be measured by the number of square yards of completed and accepted reinforced concrete pavement.

3. Transverse Expansion Joint: This material will be measured by the number of linear feet of completed and accepted transverse expansion joint.

4. Contraction Joint: This material will be measured by the number of linear feet of completed and accepted contraction joint.

5. Longitudinal Joint Support Assembly: This material will be measured by the number of joint support assemblies actually incorporated in the completed and accepted concrete pavement. If multilane construction methods are used, 2 longitudinal joint tie bars will be measured as 1 longitudinal joint support assembly.

6. Expansion Joint Filler: This material, when not part of a transverse joint assembly, will be measured by the number of linear feet of expansion joint filler of the type and thickness specified and of the width required, actually installed and accepted.

4.01.05—Basis of Payment: Payment for the concrete pavement will be made as follows:

1. Concrete: This work will be paid for at the Contract unit price per cubic yard for "Concrete for Pavement," complete in place, which price shall include all equipment, tools, labor, work incidental thereto and all materials, except reinforcement and joints. No direct payment will be made for the concrete testing equipment, the instruction in its use, in-situ testing, the concrete in or curing of the required test beams and cylinders as specified hereinbefore, but the cost of this work shall be considered included in the general cost of the work.

The transporting and testing of beams and cylinders will be done by the Department without expense to the Contractor.

2. Reinforcement: The reinforcement for the concrete pavement will be paid for at the Contract unit price per square yard of pavement for "Mat Reinforcement for Concrete Pavement," complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

3. Joints: The expansion joints and the contraction joints will be paid for respectively at the Contract unit prices per linear foot for "Transverse Expansion Joint" and for "Transverse Contraction Joint," complete in place, which price shall include all joint filler

where required, all joint seal, load transfer devices, and all other material, equipment, tools, labor and work incidental thereto.

Longitudinal joints and dummy joints including seal, will not be paid for directly, but the cost thereof shall be considered as included in the general cost of the work.

4. Longitudinal Joint Support Assembly: The devices required in connection with longitudinal construction joints will be paid for at the Contract unit price each for "Longitudinal Joint Support," complete in place, which price shall include all materials, supports, equipment, tools, labor and work incidental thereto.

5. Expansion Joint Filler: The expansion joint filler, other than that which is a part of the transverse joint assembly, will be paid for at the Contract unit price per linear foot for "Expansion Joint Filler" of the type and thickness specified, complete in place, which price shall include all joint filler, joint seal and all other materials, equipment, tools, labor and work incidental thereto.

6. Type III Portland Cement: When such material is substituted for other Portland Cement at the direction of the Engineer in order to expedite the opening of pavement to traffic, it will be paid for at the actual unit cost per barrel to the Contractor for the quantity actually incorporated in the pavement less the actual unit cost per barrel to the Contractor for an equal quantity of the Portland Cement so replaced, which cost shall include all equipment, labor, storage, transportation and work incidental to its inclusion in the concrete and incorporation in the finished pavement.

Pay Item Pay	Unit
Concrete for Pavement	c.y.
Mat Reinforcement for Concrete Pavement	s.y.
Transverse Expansion Joints	l.f.
Transverse Contraction Joints	l.f.
Longitudinal Joint Support	ea.
Type and Thickness Expansion Joint Filler	l.f.

SECTION 4.06
BITUMINOUS CONCRETE

4.06.01—Description: Work under this Section shall include the production, delivery and placement of a non-segregated, smooth and dense bituminous concrete mixture brought to proper grade and cross section. This Section shall also include the method and construction of longitudinal joints. The Contractor shall furnish ConnDOT with a Quality Control Plan (QCP) as described in Article 4.06.03.

The following terms as used in this specification are defined as:

Bituminous Concrete: A concrete material that uses a bituminous material (typically asphalt) as the binding agent and stone and sand as the principal aggregate components. Bituminous concrete may also contain any of a number of additives engineered to modify specific properties and/or behavior of the concrete material. For the purposes of this Section, references to bituminous concrete apply to all of its sub-categories, for instance those defined on the basis of production and placement temperatures, such as hot-mix asphalt (HMA) or warm-mix asphalt (WMA), or those defined on the basis of composition, such as those containing polymer-modified asphalt (PMA).

Course: A lift or multiple lifts comprised of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: All material placed in a single lift and as defined in Article 4.06.03.

Disintegration: Wearing away or fragmentation of the pavement. Disintegration will be evident in the following forms: Polishing, weathering-oxidizing, scaling, spalling, raveling, potholes or loss of material.

Dispute Resolution: A procedure used to resolve conflicts resulting from discrepancies between the Engineer and the Contractor's density results that may affect payment.

Hot Mix Asphalt (HMA): A bituminous concrete mixture typically produced at 325° F.

Lift: An application of a bituminous concrete mixture placed and compacted to a specified thickness in a single paver pass.

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications. All PMA mixtures shall incorporate a qualified warm mix technology.

Production Lot: All material placed during a continuous daily paving operation.

Quality Assurance (QA): All those planned and systematic actions necessary to provide confidence that a product or facility will perform as designed.

Quality Control (QC): The sum total of activities performed by the vendor (Producer, Manufacturer, and Contractor) to ensure that a product meets contract requirements.

Superpave: A bituminous concrete mix design used in mixtures designated as “S*” where “S” indicates Superpave and * indicates the sieve related to the nominal maximum aggregate size of the mix.
Segregation: A non-uniform distribution of a bituminous concrete mixture in terms of gradation, temperature, or volumetric properties.

Warm Mix Asphalt (WMA): A bituminous concrete mixture that can be produced and placed at reduced temperatures than HMA using a qualified additive or technology.

4.06.02—Materials: All materials shall meet the requirements of Section M.04.

1. Materials Supply: The bituminous concrete mixture must be from 1 source of supply and originate from 1 Plant unless authorized by the Engineer. Bituminous Concrete plant Quality Control Plan (QCP) requirements are defined in Section M.04.

2. Recycled Materials: Reclaimed Asphalt Pavement (RAP), Crushed Recycled Container Glass (CRCG), Recycled Asphalt Shingles (RAS), or crumb rubber (CR) from recycled tires may be incorporated in bituminous concrete mixtures in accordance with Section M.04 and the Project Specifications. CRCG and RAS shall not be used in the surface course.

4.06.03—Construction Methods:

1. Material Documentation: All vendors producing bituminous concrete must have their truck-weighing scales, storage scales and mixing plant automated to provide a detailed ticket which shall be given to the Engineer. Delivery tickets shall include the following information:

a. State of Connecticut printed on ticket.
b. Name of producer, identification of plant, and specific storage bin (silo) if used.
c. Date and time of day.
d. Mixture Designation; Mix type and level Curb mixtures for machine-placed curbing must state “curb mix only.”
e. If RAP is used, the plant printouts shall include the RAP dry weight, percentage and daily moisture content.
f. If RAS is used, the plant printouts shall include the RAS dry weight and percentage daily moisture content.
g. The delivery ticket for all mixes produced with Warm Mix Technology must indicate the additive name, and the injection rate (water or additive) incorporated at the HMA plant. The delivery ticket for all mixes produced with pre-blended WMA additive must indicate the name of the WMA Technology.
h. Net weight of mixture loaded into truck (When RAP and/or RAS is used the moisture content shall be excluded from mixture net weight).
i. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).

j. Tare weight of truck – Daily scale weight.
k. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
l. Truck number for specific identification of truck.
m. Individual aggregate, Recycled Materials, and virgin asphalt high/target/low weights. For drum plants and silo loadings, the plant printouts shall be produced at 5 minute intervals maintained by the vendor for a period of 3 years after the completion of the Project.
n. For every mixture designation the running daily total delivered and sequential load number.
The net weight of mixture loaded into the truck must be equal to the cumulative measured weight of its components.

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the weighing or recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for 1 hour, but for no longer, provided that each load is weighed on Stateapproved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not fixed within 48 hours, mixture will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.
The State reserves the right to have an inspector present to monitor batching and/or weighing operations.
2. Transportation of Mixture: Trucks with loads of bituminous concrete being delivered to State projects must not exceed the statutory or permitted load limits referred to as gross vehicle weight (GVW). The Contractor shall furnish a list of all vehicles and allowable weights transporting mixture.
The State reserves the right to check the gross and tare weight of any delivery truck. A variation of 0.4% or less in the gross or tare weight shown on the delivery ticket and the certified scale weight shall be considered evidence that the weight shown on the delivery ticket is correct. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4%, the Engineer will recalculate the net weight. The Contractor shall take action to correct the discrepancy to the satisfaction of the Engineer.
If a truck delivers mixture to the Project and the ticket indicates that the truck is overweight, the load will not be rejected but a "Measured Weight Adjustment" will be taken in accordance with Article 4.06.04.
The mixture shall be transported from the mixing plant in trucks that have previously been cleaned of all foreign material and that have no gaps through which mixture might

inadvertently escape. The Contractor shall take care in loading trucks uniformly so that segregation is minimized. Loaded trucks shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The front and rear of the cover must be fastened to minimize air infiltration. The Contractor shall assure that all trucks are in accordance with this specification. Non-conforming trucks will not be allowed to be loaded until re-inspected and found satisfactory to the Engineer.

Truck body coating and cleaning agents must not have a deleterious effect on the transported mixture. The use of solvents or fuel oil, in any concentration, is strictly prohibited for the coating of the inside of truck bodies. When acceptable coating or agents are applied, truck bodies shall be raised immediately prior to loading to remove any excess agent in an environmentally acceptable manner.

3. Paving Equipment: The Contractor shall have the necessary paving and compaction equipment at the Project Site to perform the work. All equipment shall be in good working order and any equipment that is worn, defective or inadequate for performance of the work shall be repaired or replaced by the Contractor to the satisfaction of the Engineer. During the paving operation, the use of solvents or fuel oil, in any concentration, is strictly prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices).

Refueling of equipment is prohibited in any location on the paving Project where fuel might come in contact with bituminous concrete mixtures already placed or to be placed. Solvents for use in cleaning mechanical equipment or hand tools shall be stored clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

Pavers: Each paver shall have a receiving hopper with sufficient capacity to provide for a uniform spreading operation and a distribution system that places the mix uniformly, without segregation. The paver shall be equipped with and use a vibratory screed system with heaters or burners. The screed system shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screed units as part of the system shall have auger extensions and tunnel extenders as necessary. Automatic screed controls for grade and slope shall be used at all times unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed to compensate for irregularities in the preceding course or existing base. The controls shall maintain the proper transverse slope and be readily adjustable, and shall operate from a fixed or moving reference such as a grade wire or floating beam.

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Roller types shall include steel-wheeled, pneumatic or a combination thereof

and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the number of impacts per foot during the compaction process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be self-propelled and equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 lb./in$_2$ uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size, pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels.

Lighting: For paving operations, which will be performed during hours of darkness, the paving equipment shall be equipped with lighting fixtures as described below, or with approved lighting fixtures of equivalent light output characteristics. Lighting shall maximize the illumination on each task and minimize glare to passing traffic. The Contractor shall provide generators on rollers and pavers of the type, size, and wattage, to adequately furnish electric power to operate the specified lighting equipment. The lighting options and minimum number of fixtures are listed in Tables 4.06-1 and 4.06-2:

TABLE 4.06-1: Paver Lighting

Option	Fixture Configuration	Fixture Quantity	Requirement
1	Type A	3	Mount over screed area
	Type B (narrow) or Type C (spot)	2	Aim to auger and guideline
	Type B (wide) or Type C (flood)	2	Aim 25 feet behind paving machine
2	Type D Balloon	2	Mount over screed area

Type A: Fluorescent fixture shall be heavy duty industrial type. Each fixture shall have a minimum output of 8,000 lumens. The fixtures shall be mounted horizontally, and be designed for continuous row installation.
Type B: Each floodlight fixture shall have a minimum output of 18,000 lumens.
Type C: Each fixture shall have a minimum output of 19,000 lumens.
Type D: Balloon light – each balloon light fixture shall have minimum output of 50,000 lumens and emit light equally in all directions.

TABLE 4.06-2: Roller Lighting

Option	Fixture Configuration*	Fixture Quantity	Requirement
1	Type B (wide)	2	Aim 50 feet in front of and behind roller
	Type B (narrow)	2	Aim 100 feet in front of and behind roller
2	Type C (flood)	2	Aim 50 feet in front of and behind roller
	Type C (spot)	2	Aim 100 feet in front of and behind roller
3	Type D Balloon	1	Mount above the roller

*All fixtures shall be mounted above the roller.
Type B: Each floodlight fixture shall have a minimum output of 18,000 lumens.
Type C: Each fixture shall have a minimum output of 19,000 lumens.
Type D: Balloon light – each balloon light fixture shall have minimum output of 50,000 lumens and emit light equally in all directions.

Material Transfer Vehicle (MTV): A MTV shall be used when placing a bituminous concrete surface course as indicated in the Contract. A surface course is defined as the total thickness of the same bituminous concrete mix that extends up to and includes the final wearing surface whether it is placed in a single or multiple lifts, and regardless of any time delays between lifts.

The MTV must be a self-propelled vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery truck to the paver. The MTV must continuously remix the bituminous concrete mixture throughout the placement process.

The use of a MTV will be subject to the requirements stated in Article 1.07.05—Load Restrictions. The Engineer may limit the use of the vehicle if it is determined that the use of the MTV may damage highway components, utilities, or bridges. The Contractor shall submit to the Engineer at time of pre-construction the following information:

1. The make and model of the MTV to be used.
2. The individual axle weights and axle spacing for each separate piece of paving equipment (haul vehicle, MTV and paver).
3. A working drawing showing the axle spacing in combination with all 3 pieces of equipment that will comprise the paving echelon.

4. Test Section: The Engineer may require the Contractor to place a test section whenever the requirements of this Section or Section M.04 are not met.

The Contractor shall submit the quantity of mixture to be placed and the location of the test section for review and acceptance by the Engineer. The equipment used in the construction of a passing test section shall be used throughout production.

If a test section fails to meet specifications, the Contractor shall stop production, make necessary adjustments to the job mix formula, plant operations, or procedures for placement and compaction. The Contractor shall construct additional test sections, as allowed by the Engineer, until all the required specifications are met. All test sections shall also be subject to removal as set forth in Article 1.06.04.

5. Transitions for Roadway Surface: Transitions shall be formed at any point on the roadway where the pavement surface deviates, vertically, from the uniform longitudinal profile as specified on the plans. Whether formed by milling or by bituminous concrete mixture, all transition lengths shall meet the criteria below unless otherwise specified.

Permanent Transitions: A permanent transition is defined as any transition that remains as a permanent part of the work. All permanent transitions, leading and trailing ends shall meet the following length requirements:

Posted Speed Limit or Structure	Permanent Transition Length Required
> 35 mph	30 feet per inch of vertical change (thickness)
35 mph or less	15 feet per inch of vertical change (thickness)
Bridge overpass	75 feet before / after end expansion joint
Bridge underpass	75 feet before / after parapet face

In areas where it is impractical to use the above described permanent transition lengths, the use of a shorter permanent transition length may be permitted when approved by the Engineer.

Temporary Transitions: A temporary transition is defined as a transition that does not remain a permanent part of the work.

All temporary transitions shall meet the following length requirements:

Posted Speed Limit	Temporary Transition Length Required
> 50 mph	Leading Transition: 15 feet per inch of vertical change (thickness) Trailing Transition: 6 feet per inch of vertical change (thickness)
40, 45 or 50 mph	Leading and Trailing: 4 feet per inch of vertical change (thickness)
35 mph or less	Leading and Trailing: 3 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in place over the winter shutdown period or during extended periods of inactivity (more than 14 calendar days) shall meet the greater than 50 MPH requirements shown above.

6. Spreading and Finishing of Mixture: Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by sweeping or by other means acceptable to the Engineer. The bituminous concrete mixture shall not be placed whenever the surface is wet or frozen. The Engineer will verify the mix temperature by means of a probe or infrared type of thermometer. A probe type thermometer, verified by the Department on an annual basis, must be used in order to reject a load of mixture based on temperatures outside the range stated in the placement QCP.

Placement: The bituminous concrete mixture shall be placed and compacted to provide

a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mix, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the plant.

In advance of paving, traffic control requirements shall be set up daily, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The Contractor shall inspect the newly placed pavement for defects in the mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impractical due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a uniform specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non uniform thickness, i.e. wedge or shim course, shall not be subject to thickness and area adjustments.

a) Thickness: Where the total thickness of the lift of mixture exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

TABLE 4.06-3: Thickness Tolerances

Mixture Designation	Lift Tolerance
S1	+/- 3/8 inch
S0.25, S0.375, S0.5	+/- 1/4 inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this Section.

b) Area: Where the width of the lift exceeds that shown on the plans by more

than the specified thickness of each lift, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating the adjustment in Article 4.06.04.

c) Delivered Weight of Mixture: When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type the quantity of tons representing the overweight amount will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting a sufficient distance back from the previous run, existing bituminous concrete pavement or bituminous concrete driveways to expose the full thickness of the lift. A brush of tack coat shall be used on any cold joint immediately prior to additional bituminous concrete mixture being placed.

Tack Coat Application: Immediately before application, the area to be tacked shall be cleaned by sweeping or by other means acceptable to the Engineer. A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set) prior to any paving equipment or haul vehicles driving on it. All surfaces in contact with the bituminous concrete that have been in place longer than 3 calendar days shall have an application of tack coat. The tack coat shall be applied by a non-gravity pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gal/s.y. for a non-milled surface and an application rate of 0.05 to 0.07 gal/s.y. for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 0.03 to 0.05 gal/s.y. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall not be heated in excess of 160° F and shall not be further diluted.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.03 and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage.

When placing a lift with a specified thickness less than 1 1/2 in, or a wedge course, the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve. The procedure to be used shall be documented in the Contractor's QCP for placement and demonstrated on the first day of placement.

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic mode may damage highway components, utilities, or adjacent property, the Contractor shall provide alternate compaction equipment. The Engineer may allow the Contractor to

operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting.
Rollers operating in the dynamic mode shall be shut off when changing directions.
These allowances will not relieve the Contractor from meeting pavement compaction requirements.
Surface Requirements: The pavement surface of any lift shall meet the following requirements for smoothness and uniformity. Any irregularity of the surface exceeding these requirements shall be corrected by the Contractor.
a) Smoothness: Each lift of the surface course shall not vary more than 1/4 in from a Contractor-supplied 10 ft straightedge. For all other lifts of bituminous concrete, the tolerance shall be 3/8 in. Such tolerance will apply to all paved areas.
b) Uniformity: The paved surface of the mat and joints shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.
7. Longitudinal Joint Construction Methods: The Contractor shall use Method I- Notched Wedge Joint (see Figure 4.06-1) when constructing longitudinal joints where lift thicknesses are between 1 1/2 and 3 in, except for S1 mixes. Method II Butt Joint (see Figure 4.06-2) shall be used for lifts less than 1 1/2 in or greater than 3 in, and S1 mixes. During placement of multiple lifts of bituminous concrete, the longitudinal joint shall be constructed in such a manner that it is located at least 6 in from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. Each longitudinal joint shall maintain a consistent offset from the centerline of the roadway along its entire length. The difference in elevation between the two faces of any completed longitudinal joint shall not exceed 1/4 in at any location.
Method I - Notched Wedge Joint:
A notched wedge joint shall be constructed as shown in Figure 4.06-1 using a device that is attached to the paver screed and is capable of independently adjusting the top and bottom vertical notches. The device shall have an integrated vibratory system.
The taper portion of the wedge joint must be placed over the longitudinal joint in the lift immediately below. The top vertical notice must be located at the centerline or lane line in the final lift. The requirement for paving full width “curb to curb” as described in Method II may be waived if addressed in the QCP and approved by the Engineer.
The taper portion of the wedge joint shall be evenly compacted using equipment other than the paver or notch wedge joint device.
The taper portion of the wedge joint shall not be exposed to traffic for more than 5 calendar days.
The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat

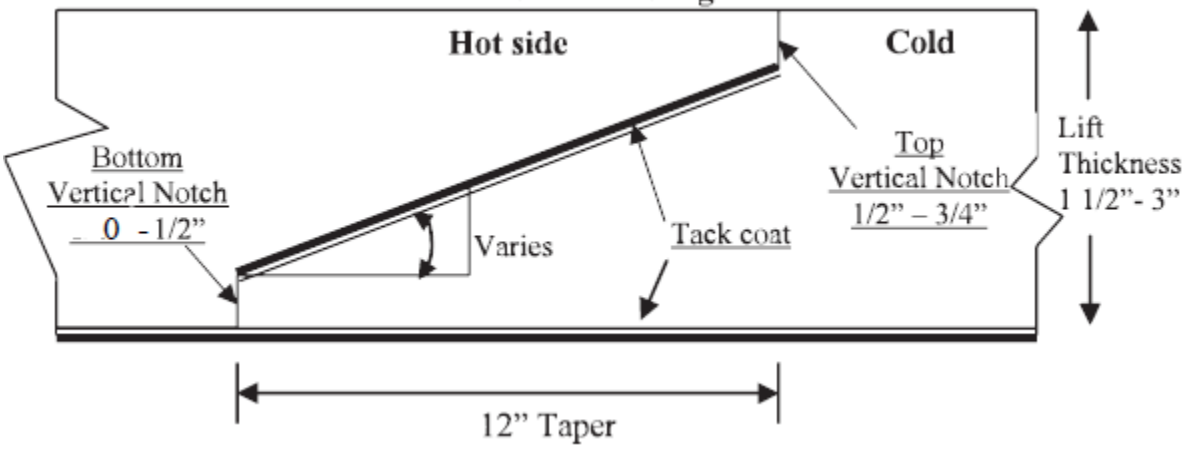
must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance described in Subarticle 4.06.03-7 does not apply to joint construction.

Any exposed wedge joint must be located to allow for the free draining of water from the road surface.
The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.
If Method I, Notched Wedge Joint cannot be used on lifts between 1.5 and 3 in, Method III Butt Joint may be substituted according to the requirements below for “Method III – Butt Joint with Hot Pour Rubberized Asphalt Treatment.”

Method II - Butt Joint:

When adjoining passes are placed, the Contractor shall utilize equipmentthat creates a near vertical edge (refer to Figure 4.06-2).u

FIGURE 4.06-1: Notched Wedge Joint



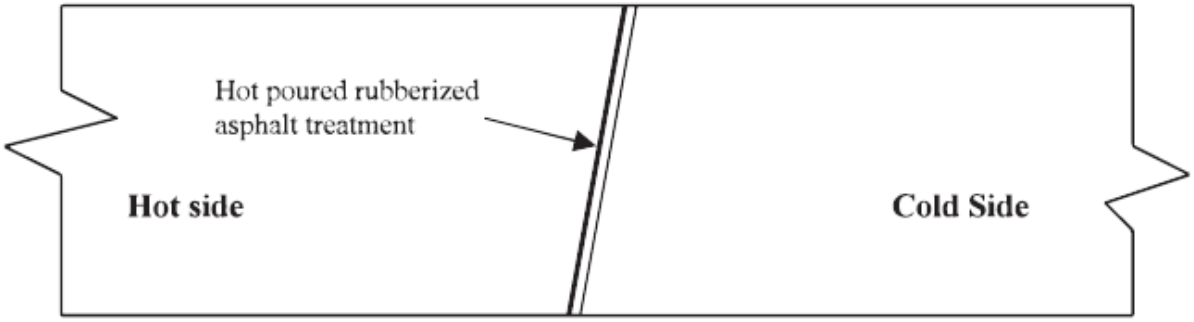
The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be set so there is an overlap onto the cold side of the joint.
The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width “curb to curb.”

Method III - Butt Joint with Hot Poured Rubberized Asphalt Treatment:

If Method I Notched Wedge Joint cannot be used due to physical constraints in certain limited locations; the Contractor may submit a request in writing, for approval by the Engineer, to utilize Method III Butt Joint with Hot Poured Rubberized Asphalt Treatment as a substitution in those locations. There shall be no additional measurement or payment made when the Method III joint is substituted for the Method I wedge joint. When

required by the Contract or approved by the Engineer, Method III (see Figure 4.06-3) shall be used.

FIGURE 4.06-3: Butt Joint with Hot Poured Rubberized Asphalt Treatment
(Not to Scale)



All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a rubberized joint seal material meeting the requirements of ASTM D6690, Type 2. The joint sealant shall be placed on the face of the "cold side" of the butt joint as shown above prior to placing the "hot side" of the butt joint. The joint seal material shall be applied in accordance with the manufacturer's recommendation so as to provide uniform coverage and avoid excess bleeding onto the newly placed pavement.

8. Contractor Quality Control (QC) Requirements: The Contractor shall be responsible for maintaining adequate quality control procedures throughout the production and placement operations. Therefore, the Contractor must ensure that the materials, mixture and work provided by subcontractors, suppliers and producers also meets Contract specification requirements.

This effort must be documented in a Quality Control Plan (QCP) which shall also address the actions, inspection, or sampling and testing necessary to keep the production and placement operations in control, to determine when an operation has gone out of control and to respond to correct the situation in a timely fashion.

The Standard QCP for production shall consist of the quality control program specific to the production facility.

There are 3 components to the QCP for placement: a Standard QCP, a Project Summary Sheet that details Project-specific information, and if applicable a separate Extended Season Paving Plan as required in Section 9 "Temperature and Seasonal Requirements."

The Standard QCP for both production and placement shall be submitted to the Department for approval each calendar year, a minimum of 30 days prior to production or

placement. Production or placement shall not occur until all QCP components have been approved by the Engineer.

Each QCP shall include the name and qualifications of a Quality Control Manager (QCM). The QCM shall be responsible for the administration of the QCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the Project during paving operations. All Contractor sampling, inspection and test reports shall be reviewed and signed by the QCM prior to submittal to the Engineer. The QCP shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Approval of the QCP does not relieve the Contractor of its responsibility to comply with the Project specifications. The Contractor may modify the QCP as work progresses and must document the changes in writing prior to resuming operations. These changes include but are not limited to changes in quality control procedures or personnel. The Department reserves the right to deny significant changes to the QCP.

QCP for Production: Refer to M.04.03-1.

QCP for Placement: The Standard QCP, Project Summary Sheet, and Extended Season Paving Plan shall be in the format provided by the Engineer. The format is available at http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf.

The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that bituminous concrete placement meets the requirements as outlined in its QCP during all phases of the work. The Contractor shall document these activities for each day of placement.

The Contractor shall submit complete field density testing and inspection records to the Engineer within 48 hours of the test in a manner acceptable to the Engineer.

The Contractor may obtain 1 mat core and 1 joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the location of each process control core to the Engineer for approval prior to taking the core. The core holes shall be filled to the same requirements described in Subarticle 4.06.03-10.

9. Temperature and Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into 2 seasons, “In-Season” and “Extended-Season.” In-Season paving occurs from May 1 to October 14, and Extended Season paving occurs from October 15 to April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

• Bituminous concrete mixes shall not be placed when the air or subbase temperature is below 40° F regardless of the season.

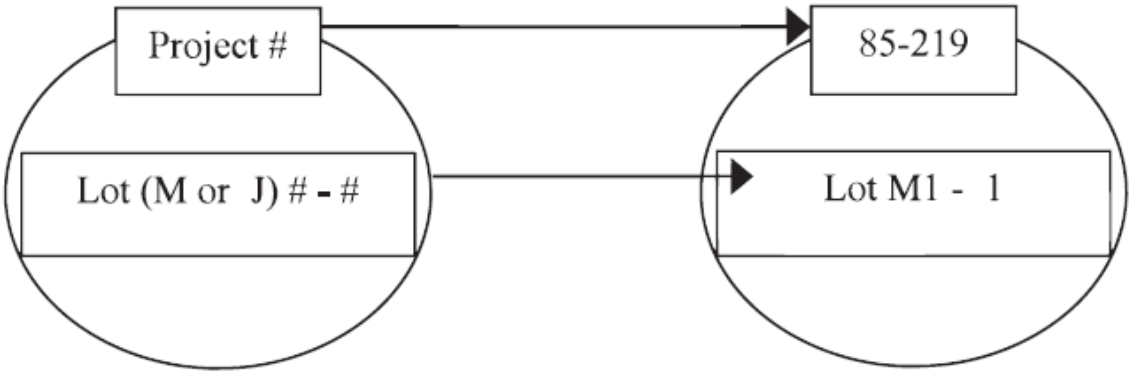
• Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the Project that addresses minimum delivered mix temperature considering WMA, PMA or other additives, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

10. Density Testing of Bituminous Concrete Using Core Samples: This procedure describes the frequency and the method the Contractor shall use to obtain pavement cores for acceptance from the Project.

Coring shall be performed on each lift specified to a thickness of 1 1/2 in or more. All material placed in a lift shall be compacted to the degree specified in Tables 4.06-8 and 4.06-9. The density of each core will be determined using the production lot's average maximum theoretical specific gravity (Gmm) established during the testing of the parent material at the plant. When there was no testing of the parent material or any Gmm exceeds the specified tolerances in the Department's current QA Program for Materials, the Engineer will determine the maximum theoretical density value to be used for density calculations. Bituminous concrete HMA S1 mixes are excluded from the longitudinal joint density requirements.

The Contractor shall extract cores (4 or 6 in diameter for S0.25, S0.375 and S0.5 mixes, 6 in diameter for S1.0 mixtures - wet sawed) from sampling locations determined by the Engineer. The Engineer must witness the extraction and labeling of cores, as well as the filling of the core holes. The cores shall be labeled by the Contractor with the Project number, lot number, and sub-lot number on the top surface of the core. When labeling the core lot number, include whether the core is from a mat lot or joint lot by using an "M" for a mat core and "J" for a joint core. For example, a core from the first sub-lot of the first mat lot shall be labeled with "Lot M1 – 1." The first number refers to the lot and the second number refers to the sub-lot. See Figure 4.06-4. The side of the cores shall be labeled with the core lot number and date placed. The Project inspector will fill out a MAT-109 containing the same information to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the Department's Central Testing Lab in a safe manner to ensure no damage occurs to the cores. The Contractor shall use a container approved by the Engineer. In general the container shall consist of an attached lid container made out of plastic capable of being locked shut and shall be tamper proof. The Contractor shall use foam, bubble wrap, or another suitable material to prevent the cores from being damaged during transportation. Once the cores and MAT-109 are in the container, the Engineer will secure the lid using a security seal. The security seal's identification number must be documented on the MAT-109. The Central Lab will break the security seal and take possession of the cores upon receipt.

FIGURE 4.06-4: Labeling of Cores



Frequency of sampling shall be in accordance with the following tables:

TABLE 4.06-4: Testing Requirement for Bridge Density Lot

Length of Each Structure (Feet)	MAT - No. of Cores	Joint - No. of Cores
≤ 500	See Table 4.06-5(A or B)	See Table 4.06-5(A or B)
501 - 1500	3	3
1501 - 2500	4	4
2501 and greater	5	5

All material placed on structures less than or equal to 500 ft long shall be included as part of a standard lot as follows:

TABLE 4.06-5A: Testing Requirement for Density Lots ≥ 500 Tons

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Lot without Bridge(1)	4		4		2000
Lot with Bridge(s)(1)(2)	4 plus	1 per structure (≤ 300')	4 plus	1 per structure (≤ 300')	2000
		2 per structure (301'-500')		2 per structure (301'-500')	

TABLE 4.06-5B: Testing Requirement for Density Lots < 500 Tons

Lot Type	No. of Mat Cores	No. of Joint Cores	Target Lot Size (Tons)
Lot without Bridge(1)	3	3	1 per lift
Lot with Bridge(s) (1)(2)	3	3	1 per lift

Notes for Tables 4.06-5A and 4.06-5B:

(1) The number of "Required Paver Passes for Full Width" shall be used to determine the sub-lot sizes within the lot. The number of paver passes for full width is determined by the Contractor.

(2) If a non-bridge mat or joint core location randomly falls on a structure, the core is to be obtained on the structure in addition to the core(s) required on the structure.

A density lot will be complete when the full designed paving width of the established lot length has been completed and shall include all longitudinal joints that exist between the curb lines regardless of date(s) paved. Quantity of material placed on structures less than or equal to 500 ft long is inclusive of the standard lot. Prior to paving, the total length of the Project to be paved shall be split up into lots that contain approximately 2000 tons each. Areas such as highway ramps may be combined to create one lot. In general, combined areas should be set up to target a 2000 ton lot size. One (1) adjustment will apply for each lot. The tons shall be determined using the yield calculation in Article 4.06.04. The last lot shall be the difference between the total payable tons for the Project and the sum of the previous lots.

After the compaction process has been completed, the material shall be allowed to cool sufficiently to allow the cutting and removal of the core without damage. The Contractor shall core to a depth that allows extraction so that the uppermost layer being tested for density will not be affected.

A mat core shall not be taken any closer than 1 ft from the edge of a paver pass. If a random number locates a core less than 1 ft from any edge, locate the core so that the sample is 1 ft from the edge.

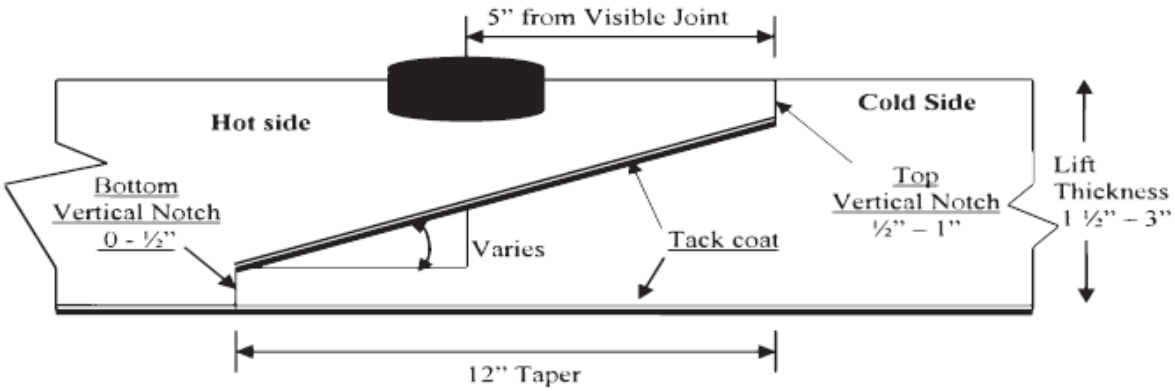
When Method I, Notched Wedge Joint cores shall be taken so that the center of the core is 5 in from the visible joint on the hot mat side. Refer to Figure 4.06-5.

When Method III Butt Joint with Hot Poured Rubberized Asphalt Treatment is used, cores shall be taken from the hot side so the edge of the core is within 1 in of the longitudinal joint.

All cores must be cut within 5 calendar days of placement. Any core that is damaged or obviously defective while being obtained will be replaced with a new core from a location within 2 ft measured in a longitudinal direction.

Each core hole shall be filled within 4 hours upon core extraction. Prior to being filled, the hole shall be prepared by removing any free water and applying tack coat using a brush or other means to uniformly cover the cut surface. The core hole shall be filled using a bituminous concrete mixture at a minimum temperature of 240°F containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete fill shall be compacted to 1/8 in above the finished pavement.

FIGURE 4.06-5: Notched Wedge Joint Cores (Not to Scale)



11. Acceptance Inspection, Sampling and Testing: Inspection, sampling, and testing to be used by the Engineer shall be performed at the minimum frequency specified in Section M.04 and stated herein.

Sampling for acceptance shall be established using ASTM D3665, or a statistically based procedure of random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required acceptance sampling, testing and inspection during all phases of the work in accordance with Section M.04. The Department will perform verification testing on the Contractor's acceptance test results. Should binder content, theoretical maximum density (Gmm), or air void results exceed the specified tolerances in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures, the Department will investigate to determine an assignable cause. Contractor test results for a subject lot or sub lot may be replaced with the Department's results for the purpose of assessing adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing on the cores in accordance with AASHTO T 331.

12. Density Dispute Resolution Process: The Contractor and Engineer will work in partnership to avoid potential conflicts and to resolve any differences that may arise during quality control or acceptance testing for density. Both parties shall review their sampling and testing procedures and results and share their findings. If the Contractor disputes the Engineer's test results, the Contractor must submit a written request to initiate the Dispute Resolution Process within 7 calendar days of the notification of the test results. No request for dispute resolution will be allowed unless the Contractor provides quality control results within the timeframe described in Subarticle 4.06.03-9 supporting its position. No request for Dispute Resolution will be allowed for a Density Lot in which any core was not taken within the required 5 calendar days of

placement. Should the dispute not be resolved through evaluation of existing testing data or procedures, the Engineer may authorize the Contractor to obtain a new set of core samples per disputed lot. The core samples must be extracted no later than 14 calendar days from the date of Engineer's authorization.

The number and type (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and type of the cores taken for acceptance. The location of each core shall be randomly located within the respective original sub lot. All such core samples shall be extracted and filled using the procedure outlined in Article 4.06.03. The results from the dispute resolution cores shall be added to the results from the acceptance cores and averaged for determining the final in-place density value.

13. Corrective Work Procedures: Any portion of the completed pavement that does not meet the requirements of the specification shall be corrected at the expense of the Contractor. Any corrective courses placed as the final wearing surface shall match the specified lift thickness after compaction.

If pavement placed by the Contractor does not meet the specifications, and the Engineer requires its replacement or correction, the Contractor shall:

a) Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:

• Limits of pavement to be replaced or corrected, indicating stationing or other criteria that are readily distinguishable.

- Proposed work schedule.
- Construction method and sequence of operations.
- Methods of maintenance and protection of traffic.
- Material sources.
- Names and telephone numbers of supervising personnel.

b) Perform all corrective work in accordance with the Contract and the approved corrective procedure.

14. Protection of the Work: The Contractor shall protect all sections of the newly finished pavement from damage that may occur as a result of the Contractor's operations for the duration of the Project. Prior to the Engineer's authorization to open the pavement to traffic, the Contractor is responsible to protect the pavement from damage.

15. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the bituminous concrete pavement to the lines delineated on the plans or as directed by the Engineer. The cut shall provide a straight, clean, vertical face with no cracking, tearing or breakage along the cut edge.

4.06.04—Method of Measurement:

1. HMA S* or PMA S*: The quantity of bituminous concrete measured for payment will be determined by the documented net weight in tons accepted by the Engineer in

accordance with this Section and Section M.04.

2. Adjustments: Adjustments may be applied to bituminous concrete quantities and will be measured for payment using the following formulas:

Yield Factor for Adjustment Calculation = 0.0575 Tons/SY/inch

Actual Area (SY) = [Measured Length (ft) x Avg. of width measurements (ft)] ÷ 9 s.f./SY

Actual Thickness (t) = Total tons delivered / [Actual Area (SY) x 0.0575 Tons/SY/inch]

a) Area: If the average width exceeds the allowable tolerance, an adjustment will be made using the following formula. The tolerance for width is equal to the specified thickness (inches) of the lift being placed.

Tons Adjusted for Area (T_A) = [(L x Wadj)/9] x (t) x 0.0575 Tons/SY/inch = (-) Tons

Where: L = Length (ft)

(t) = Actual thickness (inches)

Wadj = (Designed width (ft) + tolerance /12) - Measured Width)

b) Thickness: If the actual thickness is less than the allowable tolerance, the Contractor shall submit a repair procedure to the Engineer for approval. If the actual thickness exceeds the allowable tolerance, an adjustment will be made using the following formula:

Tons Adjusted for Thickness (T_T) = A x tadj x 0.0575 = (-) Tons

Where: A = Area = {[L x (Design width + tolerance (lift thickness)/12)] ÷ 9}

tadj = Adjusted thickness = [(Design thickness + tolerance) - Actual thickness]

(Note: Design thickness, tolerance and Actual thickness in inches)

c) Weight: If the quantity of bituminous concrete representing the mixture delivered to the Project is in excess of the allowable gross vehicle weight (GVW) for each vehicle, an adjustment will be made using the following formula:

Tons Adjusted for Weight (T_W) = GVW – DGW= (-) Tons

Where: DGW = Delivered gross weight as shown on the delivery ticket or measured on a certified scale.

d) Mixture Adjustment: The quantity of bituminous concrete representing the production lot will be adjusted based on test results and values listed in Tables 4.06-6 and 4.06-7. The Department's Division of Material Testing will calculate the daily adjustment value for T_{SD}.

The adjustment values in Table 4.06-6 and 4.06-7 will be calculated for each sub lot based on the Air Void and Liquid Binder Content test results for that sub lot. The total adjustment for each day's production (lot) will be computed using tables and the following formulas:

Tons Adjusted for Superpave Design (T_{SD}) = [(AdjAVt + AdjPBt) / 100] x Tons

Percent Adjustment for Air Voids =

$AdjAV_t = [AdjAV_1 + AdjAV_2 + AdjAV_i + \cdots + AdjAV_n)] / n$

Where: $AdjAV_t$ = Total percent air void adjustment value for the lot

$AdjAV_i$ = Adjustment value from Table 4.06-7 resulting from each sub lot or the average of the adjustment values resulting from multiple tests within a sub lot, as approved by the Engineer.
n = number of sub lots based on Table M.04.03-1

TABLE 4.06-6: Adjustment Values for Air Voids

Adjustment Value ($AdjAV_i$) (%)	S0.25, S0.375, S0.5, S1 Air Voids (AV)
+2.5	3.8 - 4.2
+3.125 x (AV-3)	3.0 - 3.7
-3.125 x (AV-5)	4.3 -5.0
20 x (AV-3)	2.3 - 2.9
-20 x (AV-5)	5.1 - 5.7
-20.0	less than or equal to 2.2 or greater than or equal to 5.8

Positive air void adjustment values will not be calculated for any test that fails to meet gradation or binder content tolerances of the JMF in Table M.04.03-5.

Percent Adjustment for Liquid Binder =

$$AdjPB_t = [(AdjPB_1 + AdjPB_2 + AdjPB_i + \ldots + AdjPB_n)] / n$$

Where: $AdjPB_t$ = Total percent liquid binder adjustment value for the lot
$AdjPB_i$ = Adjustment value from Table 4.06-7 resulting from each sub lot
n = number of binder tests in a production lot

TABLE 4.06-7: Adjustment Values for Binder Content

Adjustment Value ($AdjAV_i$) (%)	S0.25, S0.375, S0.5, S1 Pb (refer to Table M.04.02-5)
0.0	Equal to or above the min. liquid content
-10.0	Below the min. liquid content

e) Density Adjustment: The quantity of bituminous concrete measured for payment in a lift of pavement specified to be 1 1/2 in or greater may be adjusted for density. Separate density adjustments will be made for each lot and will not be combined to establish 1 density adjustment. If either the Mat or Joint adjustment value is “remove and replace,” the density lot shall be removed and replaced (curb to curb).
No positive adjustment will be applied to a Density Lot in which any core was not taken within the required 5 calendar days of placement.

Tons Adjusted for Density (T_D) =

$[\{(PA_M \times 0.50) + (PA_J \times 0.50)\} / 100] \times$ Density Lot Tons

Where: T_D = Total tons adjusted for density for each lot

PA_M = Mat density percent adjustment from Table 4.06-8

PA_J = Joint density percent adjustment from Table 4.06-9

TABLE 4.06-8: Adjustment Values for Pavement Mat density

Average Core Result Per Mat Density	Percent Adjustment (Bridge and Non-Bridge)[1][2]
97.1 - 100	-1.667 x (ACRPD-98.5)
94.5 - 97.0	+2.5
93.5 - 94.4	+2.5 x (ACRPD-93.5)
92.0 - 93.4	0
90.0 - 91.9	-5 x (92-ACRPD)
88.0 - 89.9	-10 x (91-ACRPD)
87.0 - 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

Notes:

(1) ACRPD = Average Core Result Percent Density

(2) All Percent Adjustments to be rounded to the second decimal place. For example, 1.667 is to be rounded to 1.67.

TABLE 4.06-9: Adjustment Values for Pavement Joint Density

Average Core Result Percent Joint Density	Percent Adjustment (Bridge and Non-Bridge)[1][2]
97.1 - 100	-1.667 x (ACRPD-98.5)
93.5 - 97.0	+2.5
92.0 - 93.4	+1.667 x (ACRPD-92)
91.0 - 91.9	0
89.0 - 90.9	-7.5 x (91-ACRPD)
88.0 - 88.9	-15 x (90-ACRPD)
87.0 - 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

Notes (for Table 4.06-9):

(1) ACRPD = Average Core Result Percent Density

(2) All Percent Adjustments to be rounded to the second decimal place. For example, 1.667 is to be rounded to 1.67.

3. Transitions for Roadway Surface: The installation of permanent transitions will

be measured under the appropriate HMA or PMA item used in the formation of the transition.

The quantity of material used for the installation of temporary transitions will be measured for payment under the appropriate item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement will not be measured for payment.

4. Cut Bituminous Concrete Pavement: The quantity of bituminous concrete pavement cut will be measured in accordance with Article 2.02.04.

5. Material for Tack Coat: The quantity of tack coat will be measured for payment by the number of gallons furnished and applied on the Project and approved by the Engineer. No tack coat material shall be included that is placed in excess of the application rates described in Subarticle 4.06.03-6.

a. Container Method - Material furnished in a container will be measured to the nearest 1/2 gallon. The volume will be determined by either measuring the volume in the original container by a method approved by the Engineer or using a separate graduated container capable of measuring the volume to the nearest 1/2 gallon. The container in which the material is furnished must include the description of material, including lot number or batch number and manufacturer or product source.

b. Truck Method - The Engineer will establish a weight per gallon of the tack coat based on the density at 60°F for the material furnished. The number of gallons furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor, or from the automated metering system on the delivery vehicle.

6. Material Transfer Vehicle (MTV): The furnishing and use of a MTV will be measured separately for payment based on the actual number of surface course tons delivered to a paver using the MTV.

4.06.05—Basis of Payment:

1. HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for “HMA S*” or “PMA S*”.

All costs associated with providing illumination of the work area are included in the general cost of the work.

All costs associated with cleaning the surface to be paved, including mechanical sweeping, are included in the general cost of the work. All costs associated with constructing longitudinal joints are included in the general cost of the work.

All costs associated with obtaining cores for acceptance testing and dispute resolution are included in the general cost of the work.

2. Bituminous Concrete Adjustment Costs: This adjustment will be calculated using the formulas shown below if all of the measured adjustments in Article 4.06.04 are

not equal to zero. A positive or negative adjustment will be applied to monies due the Contractor.

Production Lot: [$T_T + T_A + T_W + T_{SD}$] x Unit Price = Est. (P)

Density Lot: T_D x Unit Price = Est. (D)

Where: Unit Price = Contract unit price per ton per type of mixture

T_T = Total tons adjusted for thickness (see Article 4.06.04)

T_A = Total tons adjusted for area

T_W = Total tons adjusted for weight

T_{SD} = Total tons adjusted for Superpave design

T_D = Total tons adjusted for density

Est. ( ) = Pay Unit in dollars representing incentive or disincentive

The Bituminous Concrete Adjustment Cost item, if included in the bid proposal or estimate, is not to be altered in any manner by the Bidder. If the Bidder should alter the amount shown, the altered figure will be disregarded and the original estimated cost will be used for the Contract.

3. Transitions for Roadway Surface: The installation of permanent transitions will be paid under the appropriate HMA or PMA item used in the formation of the transition. The quantity of material used for the installation of temporary trnsitions will be paid under the appropriate pay item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is included in the general cost of the work.

4. The cutting of bituminous concrete pavement will be paid in accordance with Article 2.02.05 for “Cut Bituminous Concrete Pavement.”

5. Material for tack coat will be paid for at the Contract unit price per gallon for “Material for Tack Coat.”

6. The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for “Material Transfer Vehicle.”

Pay Item Pay	Unit
HMA S*	ton
PMA S*	ton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	gal.
Material Transfer Vehicle	ton

SECTION 5.03
REMOVAL OF SUPERSTRUCTURE

5.03.01 —Description
5.03.02 —Vacant 5.03.03—
Construction Methods 5.03.04—
Method of Measurement 5.03.05—
Basis of Payment

5.03.03 —Description: This work shall include the full or partial removal and disposal of superstructure(s), as indicated on the plans.

5.03.04 —Vacant 5.03.03—

Construction Methods:

1. Submittals:

The Contractor shall prepare and submit written procedures and working drawings, in accordance with 1.05.02. The submittals shall address the following:

- proposed equipment and removal method(s)
- operating and storage location(s) of equipment and materials
- containment and disposal of debris, including lead paint where required
- installation and removal of
    a. debris shields
    b. working platforms
    c. falsework
- temporary support(s) for maintenance of traffic
- modification to and restoration of the structure to remain in place

2. Removal: Superstructures which are to be fully or partially removed by the Contractor shall be removed to the limits shown on the plans or as directed by the Engineer. Where components to be removed are designated on the plans for salvage, the Contractor shall carefully remove, preserve, deliver to and unload the components at the location specified in the Contract.

General removal may be performed by excavator-mounted demolition equipment or other methods except where prohibited on the plans or as directed by the Engineer.

If partial removal of concrete is required, it shall be sawcut to the neat lines as indicated on the plans. Near reinforcing steel that is to remain, the Contractor must use limited methods for removal, such as fifteen (15) pound hammers or other methods accepted by the Engineer.

Reinforcing steel shall be cut and removed where shown on the plans. Reinforcing steel to remain shall be cleaned of all concrete and corrosion products by oil-free abrasive blasting, high-pressure water blasting or other methods accepted by the Engineer. The reinforcing steel and concrete surfaces shall be free from dirt, oil, cement fines (slurry), or any material that may interfere with the bond of the proposed concrete. Tightly-bonded light rust on the reinforcing surface is acceptable.

Where stage construction requires concrete to be removed adjacent to the existing superstructure that will continue to support live load, the Contractor shall cut the concrete in accordance with the accepted working drawings at the demolition limit shown on the plans to minimize disturbance to the section that is to remain in place.

When the existing structure is to carry traffic during the staged construction of the new work, the Contractor shall alter the structure as required by the plans. The structure and approaches shall be kept in a safe and satisfactory condition for the use of traffic at all times until the new structure is completed and open to traffic. The Contractor shall take all precautions and do such work as may be necessary to prevent damage to the structure or approaches due to the construction operations. When no longer required for traffic, the temporary alteration to the structure shall be removed in accordance with the requirements of the plans or as directed by the Engineer.

3. **Disposal of Debris:** The Contractor shall properly dispose of all construction debris either off-Site, or on-Site in accordance with 2.02.03-5.

4. **Damage Mitigation:** When removing the superstructure or a portion thereof, the Contractor shall take necessary precautions to prevent debris from dropping to areas below the superstructure, onto adjacent traffic lanes or onto adjacent property. Any damage to adjoining areas, including but not limited to new construction, public utility installations, abutting property and to the portions of the structure that will remain shall be repaired by the Contractor in accordance with 1.05.11.

5.03.04—Method of Measurement: This work, being paid on a lump sum basis, will not be measured.

5.03.05—Basis of Payment: Prior to beginning work, the Contractor shall submit a proposed schedule of values for review and concurrence by the Engineer.

This work will be paid for at the Contract lump sum price for “Removal of Superstructure,” at the location designated, which price shall include all equipment, tools and labor incidental to the full or partial removal of the superstructure (including saw cutting and the erection and removal of temporary falsework or supports of any kind) and shall include the proper disposal thereof.

Payment for the full or partial removal of bridge substructure(s) will be made at the Contract unit price per cubic yard for "Removal of Existing Masonry," in accordance with 9.74.05.

Pay Item	Pay Unit
Removal of Superstructure	l.s.

SECTION 6.01

CONCRETE FOR STRUCTURES

6.01.04—Method of Measurement
6.01.05—Basis of Payment

5.03.05 —Description: This item shall include concrete for use in new construction, surface repair or structural repair of bridges and culverts, walls, catch basins, drop inlets and other incidental construction. The concrete shall be composed of Portland cement, pozzolans, fine and coarse aggregate, admixtures and water, prepared and constructed in accordance with these specifications, at the locations and of the form dimensions and class shown on the plans, or as directed by the Engineer. The use of concrete from dry batch or central mixed plants is permitted for all concrete mixtures.

5.03.06 —Materials: The materials for this work shall meet the requirements of M.03. Surface or structural repair concrete shall be documented on the delivery ticket, as required in 6.01.03-II-3(a), as having the plastic properties necessary for confined placement to ensure appropriate workability for consolidation within the forms.

5.03.07 —Construction Methods:

I. Concrete Quality Control (QC) Requirements: For all bridge deck and bridge parapet construction, the Contractor must demonstrate to the Engineer that the materials and work that will be provided by their field staff, subcontractors, and suppliers meets Contract specification requirements.

This effort shall be documented with a **Concrete Quality Control Plan (CQCP)** and shall address the communication with all parties, on-site inspection, sampling and testing frequency necessary to keep the production, placement and finishing operations in control, to determine when an operation has gone out of control and anticipated procedure to correct the situation in a timely manner.

1. General – provide an overview of the means and methods anticipated to perform the work including any anticipated conditions that may need additional attention (such as seasonal conditions requiring heating or cooling of concrete)
2. Contractor Organization – address authority levels/duties by position and name of persons holding those positions; include those who have decision making authority with regard to quality control, materials, sampling and testing who can be contacted by the Engineer
3. Concrete Mix Design – identify concrete supplier(s); provide copies of all applicable mix designs to field staff; and address submittal timeframe
4. Transportation and Delivery of Concrete – identify the supplier's plant capacity and ability to ensure continuous delivery to the Project to meet the requirements of the mix design and a corrective procedure if it does not meet Project requirements; include a provision for the addition of admixtures and follow up testing
5. Placement and Finishing of Concrete – identify and describe:
   - placement equipment
   - placement method(s) to be used (chute, pump, hopper or other)
   - starting point and direction of placement (logistical sequencing)
   - slip forming, formwork, stay-in-place forms or other forming method(s)

- joint construction method(s)
- process and documentation that the elevations, base, forms, reinforcement (including support chairs and ties), utility inserts or any other appurtenance installations have been inspected by the Contractor prior to concrete placement
- equipment and method(s) to be used for vibrating and consolidating concrete
- procedure for verifying adequate consolidation and how segregation will be addressed
- schedule and method(s) to be used for finishing all exposed surfaces

6. Curing of Concrete – describe schedule and method(s) for curing of concrete and how the method(s) will be monitored and maintained

7. Contractor QC testing – identify person(s) or firms responsible for Contractor QC testing and provide copies of their certification(s) (see 6.01.03-II-5), and testing facility location(s). In addition, describe the process used for communication between the QC testing personnel and the Contractor project staff; describe what measures will be taken when test results are out of compliance; this shall include what increased frequency of testing is to be performed to verify that concrete properties are in compliance; the threshold at which time placement ceases; describe what protective measures will be used in case of unforeseen weather

8. The CQCP shall include the name and qualifications of a Quality Control Manager (QCM) provided by the Contractor. The QCM shall be responsible for the administration of the CQCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the Project during concreting operations and must communicate directly with the concrete supplier. The QCM shall be certified as either a Concrete Transportation Construction Inspector by the American Concrete Institute (ACI) or a NETTCP Concrete Inspector.

9. The CQCP must include a provision for pre-placement meeting(s) to be held with representatives of the Engineer, the concrete supplier, the QCM and the Contractor's field staff supervising the work.

(a) Timing and number of the meeting(s) will be determined by the complexity of the mix design or placement.

(b) Non-Standard mix designs that require trial placements will be discussed at the Preconstruction Meeting to remind the Contractor of the time needed for testing. Additional meeting(s) should be scheduled at least 90 days prior to first use of non-standard mix designs, to allow suppliers to perform trial batches and testing.

(c) Discussions shall include the configuration and specific application that the concrete will be used for, plastic properties and workability, any mix design challenges, trial placement procedures and subsequent trial results, timing and quantities. Refer to 6.01.03-II-6(e) for additional requirements.

10. The CQCP shall be submitted to the Engineer and concrete supplier for review and comment a minimum of 30 days prior to production or placement. Production and placement shall not occur until all comments of the Engineer and supplier have been addressed by the Contractor.

Changes to the CQCP based on data not available at time of submittal may be added via addendum.

11. The Contractor shall provide the Engineer QC test results within 48 hours after testing or inspection in a format acceptable to the Engineer. The Contractor shall also maintain complete records of all QC tests.

12. Review of the CQCP does not relieve the Contractor of its responsibility to comply with the Project Specifications. The Contractor may modify the CQCP as work progresses and must document the changes in writing prior to resuming operations. These changes include but are not limited to changes in quality control procedures or personnel.

II. New Construction:

13. Falsework and Forms: Falsework is considered to be any temporary structure which supports structural elements of concrete, steel, masonry or other material during the construction or erection. Forms are to be considered to be the enclosures or panels which contain the fluid concrete and withstand the forces due to its placement and consolidation. Forms may in turn be supported on falsework. This work shall consist of the construction and removal of falsework and forms that are designed by the Contractor in the execution of the work, and whose failure to perform properly could adversely affect the character of the Contract work or endanger the safety of adjacent facilities, property, or the public. Forms shall be mortar tight. Forms and falsework shall be of sufficient rigidity and strength to safely support all loads imposed and to produce in the finished structure the lines and grades indicated in the Contract documents. Forms shall also impart the required surface texture and rustication and shall not detract from the uniformity of color of the formed surfaces. Forms shall be made of wood, steel or other material approved by the Engineer.

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

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

As a minimum, dead loads shall include the weight of the falsework and all construction material to be supported. The combined unit weight of concrete, reinforcing and pre-stressing steel, and forms that is supported shall be assumed to be not less than:

1. Normal-weight concrete: 0.16 kip/ft3
2. Lightweight concrete: 0.13 kip/ft3

Live loads shall consist of the actual weight of any equipment to be supported, applied as concentrated loads at the points of contact and a uniform load of not less than 0.02 kip/ft2 applied over the area supported, plus 0.075 kip/ft applied at the outside edge of deck overhangs.
The horizontal load used for the design of the falsework bracing system shall be the sum of the horizontal loads due to equipment; construction sequence including unbalanced hydrostatic forces from fluid concrete and traffic control devices; stream flow, when applicable; and an allowance for wind. However, in no case shall the horizontal load to be resisted in any direction be less than 2% of the total dead load.
For post-tensioned structures, the falsework shall also be designed to support any increase in or redistribution of loads caused by tensioning of the structure. Loads imposed by falsework onto existing, new, or partially completed structures shall not exceed those permitted in 6.01.03-II-12, Application of Loads.
(c) Working Drawings: The working drawings for falsework and formwork shall be prepared in accordance with 1.05.02 whenever the falsework or formwork exceeds 14.0 feet high or whenever vehicular, marine, or pedestrian traffic may travel under or adjacent to the falsework or formwork. Working drawings shall include the sequence, method and rate of placement of the concrete. Manufacturer catalog cuts or written installation procedures shall be provided for any clips, braces, hangers or other manufactured parts used with the formwork or falsework.
(d) Construction: Forms and falsework shall be built true to lines and grades shall be strong, stable, firm, mortar-tight and adequately braced or tied, or both. They shall be designed and constructed to withstand all loads and pressures including those imposed by plastic concrete, taking full account of the stresses due to the rate of placement, effect of vibration and conditions brought about by construction methods. Forms and falsework shall be constructed to compensate for variations in camber of supporting members and allow for deflections.
Falsework and formwork shall be chamfered at all sharp corners, unless otherwise ordered or permitted, and shall be given a slight bevel or draft in the case of projections to ensure satisfactory removal. Materials for falsework and formwork and their supports, ties and bracing, shall be of the type, quality and strength to achieve the structural requirements. Form material in contact with concrete shall provide the finished concrete surface smoothness as specified in 6.01.03-II-10, Finishing Concrete Surfaces, and shall have a uniform appearance.
Falsework and formwork shall be treated with form oil or other release agent approved by the Engineer before the reinforcing steel is placed or self-releasing forms approved by the Engineer may be used. Release agents which will adhere to or discolor the concrete shall not be used.
Falsework and formwork for concrete surfaces exposed to view shall produce a smooth surface of uniform texture, free of voids, indentations, protrusions and bulges. Panels lining falsework and formwork shall be arranged so that the joint lines form a symmetrical pattern conforming to the general lines of the structure. The same type of form-lining material shall be used throughout each element of a structure. Falsework and formwork shall be sufficiently rigid so that the undulation of

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

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

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

(e) Vacant

(f) Bridge Decks: After erection of beams and prior to placing falsework and forms, the Contractor shall take elevations along the top of the beam at the points shown on the plans or as directed by the Engineer. The Contractor shall calculate the haunch depths and provide them to the Engineer a minimum of 7 days prior to installing the falsework and forms. The Contractor shall also provide calculations for the setting of the overhang brackets based on the final beam deflection. These calculations shall be based on the final proposed deck grade and parapet elevations. Falsework or formwork for deck forms on girder bridges shall be supported directly on the girders so that there will be no appreciable differential settlement during placing of the concrete. Girders shall be either braced and tied to resist any forces that would cause rotation or torsion in the girders caused by the placing of concrete for diaphragms or decks, or shown to be adequate for those effects.

Unless specifically permitted, welding of falsework support brackets or braces to structural steel members or reinforcing steel shall not be allowed.

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

The metal forms shall be designed on the basis of the dead load of the form, reinforcement and the plastic concrete, including the additional weight of concrete [considered to be equivalent to the weight imposed by an additional concrete thickness equal to 3% of the proposed deck thickness, but not to exceed 0.3 inch] due to the deflection of the metal forms, plus 50 psf for construction loads. The allowable stress in the corrugated form and the accessories shall not be greater than 0.725 times the yield strength of the furnished material and the allowable stress shall not exceed 36,000 psi. The span for design and deflection shall be the clear distance between edges of the beams or girders less 2 inches and shall be measured parallel to the form flutes. The maximum deflection under the weight of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form span or 0.5 inches, whichever is less. In no case shall the loading used to estimate this deflection be less than 120 psf. The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the foregoing limits. The form support angles shall be designed as a cantilever and the horizontal leg of the form support angle shall not be greater than 3 inches.

No stay-in-place metal forms shall be placed over or be directly supported by the top flanges of beams or girders. The form supporting steel angles may be supported by or attached to the top flanges. Stay-in-place metal forms shall not be used in bays where longitudinal slab construction joints are located, under cantilevered slabs such as the overhang outside of fascia members, and bridges where the clearance over a salt-laden body of water is less than 15 feet above mean high water level. Welding to the top flanges of steel beams and girders is not permitted in the areas where the top flanges are in tension, or as indicated on the plans. Alternate installation procedures shall be submitted addressing this condition.

Drilling of holes in pre-stressed concrete beams or the use of power-actuated tools on the

prestressed concrete beams for fastening of the form supports to the pre-stressed concrete beams will not be permitted. Welding of the reinforcing steel to the pre-stressed units is not permitted. All edges of openings cut for drains, pipes, and similar appurtenances shall be independently supported around the entire periphery of the opening. All fabricated stay-in-place metal forms shall be unloaded, stored at the Project Site at least 4 inches above the ground on platforms, skids or other suitable supports and shall be protected against corrosion and damage and handled in such a manner as to preclude damage to the forms. Damaged material shall be replaced at no additional cost to the State.

Any exposed form or form support metal where the galvanized coating has been damaged, shall be thoroughly cleaned, wire brushed, then coated with 2 coats of Zinc Dust – Zinc Oxide primer, FS No. TT-P-641d, Type II or another product acceptable to the Engineer.

The forms shall be installed from the topside in accordance with the manufacturer's recommended installation procedures. The form supports shall ensure that the forms retain their correct dimensions and positions during use at all times. Form supports shall provide vertical adjustment to maintain design slab thickness at the crest of corrugation, to compensate for variations in camber of beams and girders and to allow for deflections.

Stay-in-place metal forms shall have a minimum depth of the form valley equal to 2 inches. The forms shall have closed tapered ends. Lightweight filler material shall be used in the form valleys. All field cutting shall be done with a steel cutting saw or shears including the cutting of supports, closures and cutouts Flame cutting of forms is not permitted.

All welding shall be performed by Department-certified welders in accordance with the Welding subarticle in 6.03. Welding of forms to supports is not permitted.

The steel form supports shall be placed in direct contact with the flange of stringer or floor beam flanges and attached by bolts, clips, welding where permitted, or other approved means. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. The forms shall be securely fastened to form supports with self-drilling fasteners and shall have a minimum bearing length of 1 inch at each end. In the areas where the form sheets lap, the form sheets shall be securely fastened to one another by fasteners at a maximum spacing of 18 inches.

The ends of the form sheets shall be securely attached to the support angles with fasteners at a maximum spacing of 18 inches or 2 corrugation widths, whichever is less.

The depth of the concrete slab shall be as shown on the plans and the corrugated forms shall be placed so that the top of the corrugation will coincide with the bottom of the deck slab. No part of the forms or their supports shall protrude into the slab. All reinforcement in

the bottom reinforcement mat shall have a minimum concrete cover of 1 inch unless noted otherwise on the plans.

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

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

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

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

Open joints shall be placed at locations designated on the plans and shall be formed by the insertion and subsequent removal of templates of wood, metal or other suitable material. The templates shall be so constructed that their removal may be readily accomplished without damage to the work. Filled joints shall be made with joint filler, the materials for which shall meet the requirements of the plans and of these specifications.

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

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

(k) Anchorages: Anchor bolts and systems shall be set to the requirements of the plans and Contract. Anchor bolts and systems shall be clean and free of dirt, moisture or other foreign materials at the time of installation. The anchor bolts and systems shall be installed prior to placing concrete. With the Engineer's approval, the Contractor may install anchorages after placement and setting of the concrete or in formed holes. The anchorages shall be installed into drilled or formed holes having a diameter and a depth suitable to receive the bolts in

accordance with the grout manufacturer's requirements. Such holes shall be located to avoid damage to the existing reinforcement. All holes shall be perpendicular to the plane surface. The Contractor shall take every precaution necessary to prevent damage to the concrete due to freezing of water or grout in anchor bolt holes.

(l) Ornament or Reverse Moulds: Ornamental work, when so noted on the plans, shall be formed by the use of reverse moulds. These moulds shall be produced by a qualified manufacturer approved by the Engineer. They shall be built in accordance with the general dimensions and appearance shown on the plans. The Contractor shall submit all detailed drawings, models, or carvings for review by the Engineer before the moulds are made. The Contractor shall be responsible for their condition at all times, and shall be required to remove and replace any damaged or defective moulds at no additional cost to the State. The surfaces of the moulds shall be given a coating of form release agent to prevent the adherence of concrete. Any material which will adhere to or discolor the concrete shall not be used.

Form Liners, if required, shall be installed as specified elsewhere.

(m) Removal of Falsework and Forms: The Contractor shall consider the location and character of the structure, the weather, the materials used in the mix, and other conditions influencing the early strength of the concrete when removing forms and falsework. Methods of removal likely to cause damage to the concrete surface shall not be used. Supports shall be removed in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. For structures of 2 or more spans, the sequence of falsework release shall be as specified in the Contract or approved by the Engineer. Removal shall be controlled by field-cured cylinder tests. The removal shall not begin until the concrete has achieved 75% of the design compressive strength. To facilitate finishing, side forms carrying no load may be removed after 24 hours with the permission of the Engineer, but the curing process must be continued for 7 days.

When the results of field-cured cylinder tests are unavailable, the time periods listed in Table 6.01.03-1, exclusive of days when the temperature drops below 40° F, may govern the removal of forms.

Table 6.01.03-1 Time Restrictions for Removal of Formwork

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

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

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

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

(b) Hot Weather Protection: When the ambient air temperature is above 90° F, the forms, which will come in contact with the mix shall be cooled to below 90° F for a minimum of 1 hour prior to and 1 hour after completion of the concrete placement by means of a water spray or other methods satisfactory to the Engineer.

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

1. Placement: The forms, reinforcing steel, steel beam flanges, and other surfaces which will come in contact with the mix shall be heated to a minimum of 40° F, by methods satisfactory to the Engineer, for a minimum of 1 hour prior to, and maintained throughout, concrete placement.

2. Curing: For the first 6 days, considered the initial cure period, the concrete shall be maintained at a temperature of not less than 45° F and the air temperature surrounding the structure shall be maintained at a temperature of not less than 60° F. When the concrete mix includes pozzolans or slag, the initial cure period shall be increased to 10 days. After the initial cure period, the air surrounding the structure shall be maintained above 40° F for an additional 8 days. If external heating is employed, the heat shall be applied and withdrawn gradually and uniformly so that no part of the concrete surface is heated to more than 90° F or caused to change temperature by more than 20° F in 8 hours. The Engineer may reduce or increase the amount of time that the structure must be protected or heated based on an indication of in-place concrete strength acceptable to the Engineer.

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

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

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

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

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

1. State of Connecticut printed on ticket
2. Name of producer, identification of plant
3. Date and time of day
4. Type of material
5. Cubic yards of material loaded into truck
6. Project number, purchase order number, name of Contractor (if Contractor other than producer)
7. Truck number for specific identification of truck
8. Individual aggregate, cement, water weights and any admixtures shall be printed on plant tickets
9. Water/cement ratio, and
10. Additional water allowance in gallons based on water/cement ratio for mix

A State inspector may be present to monitor batching or weighing operations. The Contractor shall notify the Engineer immediately if, during the production day, there is a malfunction of the recording system in the automated plant or weigh scales. Manually written tickets containing all required information may be allowed for up to 1 hour after malfunction provided they are signed by an authorized representative of the producer.

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

If the concrete mix arrives at the Project with a slump lower than allowed by specification, water may be considered as a means to temper concrete to bring the slump back to within specification.

This tempering may only be done prior to discharge with the permission of the Engineer. The quantity of water in gallons added to the concrete cannot exceed the allowance shown on the delivery ticket.

The concrete shall be completely discharged into the forms within 1-1/2 hours from the batch time stamped on the delivery ticket. This time may be extended if the measured temperature of the concrete is below 90°F. This time may also be reduced if the temperature of the concrete is over 90°F. Rejected concrete shall be disposed of by the Contractor at no cost to the State.

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

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

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

5.04 Acceptance Testing and Compressive Strength Specimens: Concrete samples are to be taken at the point of placement into the forms or molds. Representatives of the Engineer will sample the mix.

Table 6.01.03-2 Plastic Properties of Portland Cement Concrete

Standard Mix Class	Air Content	Slump[3]	Concrete Temperature
PCC0334Z[1] (3300 psi)	6.0 +/- 1.5%	As submitted	60°-90° F
PCC0336Z[1] (3300 psi)			
PCC0446Z[1] (4400 psi)			
PCCXXX8Z[1]	7.5 +/- 1.5%	As submitted	
Modified Standards[2]	6.0 +/- 1.5% [2]	As submitted	
Special Provision Mix[4]	As specified	As submitted	
[1] "Z" denotes the Exposure Factor 0, 1 or 2 as described in Table M.03.02-1a			
[2] Modifications to Standard Mixes, including mixes placed by pumping, shall be reviewed by the Engineer prior to use. These include but are not limited to the use of chemical admixtures such as high range water reducing (HRWR) admixtures and the use of coarse aggregate sizes for that class not specified in M.03.			
[3] If the only modification is the addition of HRWR, the maximum allowable slump shall be 7 inches.			
[4] All concrete mixes with a mix design strength not shown in the table must be approved by the Engineer on a case-by-case basis. Limits on the plastic properties and strength requirements of these mixes are listed in the Specifications.			

The Contractor shall provide and maintain facilities on the Project Site, acceptable to the Engineer, for sampling, transporting the initial sample, casting, safe storage and initial curing of the concrete test specimens as required by AASHTO T-23. This shall include but not be limited to a sampling receptacle, a means of transport of the initial concrete sample from the location of the concrete placement to the testing location, a level and protected area of adequate size to perform testing, and a specimen storage container capable of maintaining the temperature and moisture requirements for initial curing of Acceptance specimens. The distance from the location of concrete placement to the location of testing and initial curing shall be 100 feet or less, unless otherwise approved by the Engineer. The specimen storage container described in this section is in addition to the concrete cylinder curing box provided for elsewhere in the Contract.

After initial curing, the test specimens will be transported by Department personnel and stored in the concrete cylinder curing box until they can be transported to the Division of Materials Testing for strength evaluation.

(c) Sampling Procedure for Pumping: It is the responsibility of the Contractor to provide concrete that meets specification at the point of placement.
Samples of concrete shall be taken at the discharge end of the pump at the point of placement with the exception of underwater concrete. The Contractor may submit an alternate location to provide a sample from the discharge end of the pump with verification showing that the characteristics of the mix will not be altered from that of which would have been attained at the point of placement. The Engineer will review the documentation and other extenuating circumstances when evaluating the request.

In the case of underwater concrete the Contractor shall submit the proposed sampling location with the submittals required in 6.01.03-II-6(f).

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

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

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

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

The sample shall be taken at the point of placement into the forms or molds from 1 or more of the same truck loads that an Acceptance sample is taken from.

A minimum of 2 of cylinder results will be used to determine in-place strength. Compression testing shall be performed in accordance with AASHTO T 22 by personnel approved by the Engineer.

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

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

placed. All water that has ponded within the forms shall also be removed. Temporary form spreader devices shall not be left in place.

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

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

(a) **Sequence of Placement:** The sequence of placement shall be in accordance with the Contract or as permitted by the Engineer. Concrete for integral horizontal members, such as caps, slabs, or footings shall not be placed until the concrete for the columns, substructure, culvert walls and similar vertical members has achieved sufficient strength as stated in 6.01.03-II-1(m).

The concrete in arches shall be placed in such a manner as to load the formwork uniformly and symmetrically. The base slab or footings of cast-in-place box culverts shall reach sufficient strength before the remainder of the culvert is constructed.

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

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

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

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

Aluminum shall not be permanently incorporated into the concrete unless otherwise specified. When placing operations involve dropping the concrete more than 5 feet, the Contractor shall take action to prevent segregation of the mix and spattering of mortar on

steel and forms above the elevation of the lift being placed. This restriction shall not apply to cast-in-place pilings.

When using stay-in-place forms, concrete shall not be dropped more than 3 feet above the top of the forms, and the concrete shall be discharged directly over the beams or girders.

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

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

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

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

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

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

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

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

A Pre-Placement Meeting shall be held on the project site with Contractor, Engineer and concrete supplier 48 hours before the concrete deck pour. The Pre-Placement Meeting will document and include discussion on the following topics:

1. **Schedule:**
   (a) Deck pour sequence
   (b) Daily start and finish times for concrete delivery
   (c) Anticipated completion time
2. **Key Personnel**:
   (a) Concrete placement foreman
   (b) Total number of personnel involved in deck pour and their roles during the pour
   (c) Concrete supplier
   (d) Concrete pump truck operator/service
   (e) Discuss QC/QA
3. **Placement:**
   (a) List of approved delivery trucks per pour
   (b) Pre-wetting forms prior to placement
   (c) Placement sequence
   (d) Rate of concrete placement and vibrator process
   (e) Monitor concrete temperature during placement
   (f) Transverse joint bulkheads
   (g) Approved concrete low-permeability mix design
4. **Curing:**
   (a) Curing materials (burlap, quilted blankets, etc.)
   (b) Means for pre-soaking curing materials.
   (c) Foggers
   (d) Soaker hoses
   (e) White Plastic Sheeting
   (f) Water source and supply tanks

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

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

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

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

(f) Underwater Placement: Concrete may only be placed under water within a cofferdam unless otherwise specified in the Contract or allowed by the Engineer. Placement shall begin following inspection and acceptance of the depth and character of the foundation material by the Engineer. Underwater concrete mixes are considered non-standard designs and shall be submitted to the Engineer for approval. Typically a minimum of 10% additional cement than comparable non-underwater mixes will be required.

Underwater concrete shall be placed continuously with the surface of the concrete kept as horizontal as practical. To ensure thorough bonding, each succeeding layer shall be placed before the preceding layer has taken initial set. For large concrete placements, more than 1 tremie or pump shall be used to ensure compliance with this requirement.

Mass concrete placement requirements, outlined in 6.01.03-II-6(g), do not apply to underwater concrete.

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

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

(g) Mass concrete placement: Mass concrete placement shall be defined as any placement, excluding underwater concrete placement, in which the concrete being cast has dimensions of 5 feet or greater in each of 3 different directions. For placements with a circular cross-section, a mass concrete placement shall be defined as any placement that has a diameter of 6 feet or greater and a height of 5 feet or greater. For all mass concrete placements, the mix temperature shall not exceed 85° F as measured at point of discharge into the forms. Any special concrete mix design proposed by the Contractor to meet the above temperature requirements shall be submitted to the Engineer for review.

7. Finishing Plastic Concrete: Unless otherwise specified in the Contract, after concrete has been consolidated and prior to final curing, all surfaces of concrete that are not placed against forms shall be

struck-off to the planned elevation or slope. The surface shall be finished by floating with an acceptable tool. While the concrete is still in a workable state, all construction and expansion joints shall be tooled with an edger. Joint filler shall be left exposed. For requirements on float finish, refer to 6.01.03-II-10, Finishing Concrete Surfaces.

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

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

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

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

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

1. Dragging: The surface shall be finished by dragging a seamless strip of damp burlap over the surface. The burlap to be dragged shall consist of sufficient layers and have sufficient length in contact with the concrete to slightly groove the surface. The burlap shall be drawn longitudinally along the surface in a slow manner so as to leave an even texture. The burlap shall be kept damp, clean, and free of particles of hardened concrete. The Contractor may propose an alternate material for the Engineer's consideration.

2. Tining: Tining shall be in a transverse direction using a wire broom, comb, or float having a single row of tines or fins. The tining grooves shall be between 1/16 inch and 3/16 inch wide and between 1/8 inch and 3/16 inch deep, spaced 1/2 inch to 3/4 inch on centers. Tining shall be discontinued 12 inches from the curb line on bridge decks. The area adjacent to the curbs shall be given a light broom finish longitudinally. As an alternative,

tining may be achieved using a machine designed specifically for tining or grooving concrete pavements.
The transverse grooving shall be performed when the grooves can be formed to a maximum depth of 3/16 inch with relative ease and without the walls of the grooves closing in on each other. The tining shall be aligned so as to prevent overlapping of grooves in any 2 successive transverse passes. The Contractor shall measure the depth of the grooves in the presence of the Engineer with an appropriate device to ensure compliance.
(b) Surface Testing and Correction: The completed surface shall be constructed in accordance with grades and cross slopes shown on the plans. The entire surface shall be checked by the Contractor in the presence of the Engineer, with an acceptable 10 foot straightedge.
1. The surface shall not vary more than +/- 1/8 inch over 10 feet for decks which will not be covered with an overlay.
2. The surface shall not vary more than +/- 1/4 inch over 10 feet for decks which will be covered with an overlay.
Variances greater than these, which, in the opinion of the Engineer, may adversely affect the riding qualities of the surface shall be corrected, and this shall be done at the expense of the Contractor.
The Contractor shall submit a corrective procedure to the Engineer for review and approval. The procedure shall correct such irregularities by methods such as, but not limited to, concrete planing or grooving.
8. Bearing Surfaces: Concrete surfaces under metallic masonry plates and elastomeric bearings shall have a float finish. After the concrete has set, the area which will be in contact with the masonry plate shall be ground as necessary to provide full and even bearing. The finished surface shall not vary from a straightedge laid on the surface in any direction within the limits of the masonry plate by more than 0.0625 inch. Surfaces which fail to conform shall be ground or filled until acceptable to the Engineer.
9. Curing Concrete: All newly placed concrete shall be cured so as to prevent loss of water by use of the methods specified. The Engineer may request that the Contractor furnish a curing plan.
The duration of the initial and final curing period in total shall continue uninterrupted for a minimum of 7 days.
(a) Curing Methods:

1. Forms-In-Place Method: Formed surfaces of concrete may be cured by retaining the forms in place without loosening. During periods of hot weather, water shall be applied to the forms until the Engineer determines that it is no longer required.
2. Water Method: Exposed concrete surfaces shall be kept continuously wet by ponding, spraying, or covering with materials that are kept continuously and thoroughly wet. Such materials may consist of cotton mats, multiple layers of burlap, or other approved materials that do not discolor or otherwise damage the concrete.
3. Waterproof Cover Method: This method shall consist of covering exposed surfaces with a waterproof sheet material to prevent moisture loss from the concrete. The concrete shall be wet at the time the cover is installed. The sheets shall be of the widest practicable width and adjacent sheets shall overlap a minimum of 6.0 inches to form a waterproof cover of the entire concrete surface and shall be adequately secured. Broken or damaged sheets shall be immediately repaired and the concrete shall be remoistened.
(b) Additional Requirements for Bridge Decks:
Curing Plan: The Contractor shall submit to the Engineer, at least 14 days prior to the placement of concrete for the bridge deck, a detailed curing plan that describes the following:
A. the initial and final curing durations,
B. equipment and materials to be used for curing concrete and monitoring concrete temperature,
C. and proposed primary and secondary water and heat sources
1. Initial Curing Period: A water fog spray shall be used by the Contractor from the time of initial placement until the final curing period begins. The amount of fog spray shall be strictly controlled so that accumulations of standing or flowing water on the surface of the concrete shall not occur.
Should atmospheric conditions render the use of fog spray impractical, the Contractor shall request approval from the Engineer to use a curing compound that meets the requirements of M.03 in lieu of a fog spray. The application shall be in accordance with the manufacturer’s recommendation and be compatible with the membrane waterproofing.
2. Final Curing: After completion of finishing and as soon as any bleed water has dissipated and the concrete reaches sufficient strength to avoid marring, the Final curing period shall begin and the entire concrete surface shall be covered with water-retaining materials such as cotton mats, multiple layers of burlap, or other materials approved by the Engineer. Materials used shall be kept saturated by means of an acceptable sprinkler or wetting system.

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

3. Temperature Monitoring: The internal temperature of the concrete shall be monitored with a calibrated continuous recording thermometer for a minimum of 7 days. The air temperature at the concrete surface or the air temperature between the concrete surface and its protective covering shall be monitored with a minimum of 1 recording thermometer. The number and placement of the thermometers will be determined by the Engineer. A minimum of 2 thermometers per concrete placement shall be provided by the Contractor. The following types of thermometers shall be used to monitor curing temperatures:

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

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

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

The cavities produced by form ties and all other holes, broken corners or edges, and other defects shall be cleaned, saturated with water, pointed and trued with a mortar conforming to M.11.04. Cement similar in color to the exposed surface being repaired shall be added to the mortar. Mortar used in pointing shall be used within 1 hour of mixing. The concrete shall be finished as defined below if required and the cure continued as previously specified in 6.01.03-II-9, Curing Concrete.

Finishing work shall not interrupt the curing period unless permitted by the Engineer. The curing period may be extended to provide the minimum total number of days required. Concrete surface finishes shall be classified as follows:

(a) Float Finish: This finish shall be achieved by placing an excess of material in the form and removing or striking off of such excess forcing the coarse aggregate below the mortar surface. Concave surfaces in which water will be retained will not be allowed. After the concrete has been struck off, the surface shall be thoroughly worked and floated. Before this last finish has set, the surface shall be lightly stripped with a fine brush to remove the

surface cement film, leaving a finegrained, smooth, but sanded texture. Curing, as specified elsewhere, shall follow. Any surfaces that will support appurtenances such as light standards, railing, or fences shall be finished in accordance with 6.01.03-II-8, Bearing Surfaces.

(b) Rubbed Finish: The initial rubbing shall only be allowed within 3 days after placement. The entire surface shall be thoroughly wet with a brush and rubbed with a No. 16 Carborundum Stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth, dense surface without pits or irregularities. The paste formed by the rubbing may be finished by stripping with a clean brush, or it may be spread uniformly over the surface and allowed to re-set. If all or portions of the rubbed surface are unacceptable to the Engineer or a rubbed finish is not provided within 3 days after removal of forms, the Contractor will be directed to provide a grout clean down finish.

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

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

The surface to be treated shall be thoroughly wetted with a sufficient amount of water to prevent the absorption of water from the grout. Grout shall then be applied to the wetted surface before setting of the grout occurs. Grout which has set shall not be re-tempered and shall be disposed of by the Contractor at no cost to the State.

The grout shall be uniformly applied over the entire surface, completely filling all air bubbles and holes. Immediately after applying the grout, the surface shall be floated with a suitable float, scouring the surface vigorously. While the grout is still plastic, all excess grout shall be removed. After the final rubbing is completed and the surface has dried, it shall be rubbed to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks. Wetting, application and removal of excess grout shall be completed in 1 work shift.

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

11. Mortar, Grout, Epoxy and Joint Seal:

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

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

The mortar or grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, under structural members, and at other locations specified. After placing, all surfaces of mortar or grout shall be cured as previously specified in 6.01.03-II-9(a)-2, for a period of not less than 3 days.

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

(c) Joint Seal: This work consists of sealing joints where shown on the plans or as otherwise directed by the Engineer. Before placement of the sealing material, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust or other foreign matter. Projections of concrete into the joint space shall be removed. The joint shall be clean and dry before the sealing compound is applied. The joint sealant shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. The sealing compound shall be flush with, or not more than 1/8 inch above the adjacent surface of concrete, cutting off all excess compounds after the application. The joints shall be sealed in a neat and workmanlike manner and when the work is completed, the joints shall effectively seal against infiltration of moisture and water. The Contractor shall arrange for, and have present at the commencement of the joint-sealing

operation, a technically competent manufacturer's representative knowledgeable in the methods of installation of the sealant. The Contractor shall also arrange to have the representative present at such other times as the Engineer may request.
(d) Closed Cell Elastomer: The closed cell elastomer shall be of the thickness specified and installed as shown on the plans and shall be in accordance with M.03.08-6.
12. Application of Loads: Loads shall not be applied to concrete structures until the concrete has attained sufficient strength and, when applicable, sufficient pre-stressing and post tensioning has been completed, so that damage will not occur. The means to determine when the concrete has attained sufficient strength shall be the use of Progression cylinders as defined elsewhere in this specification, or other means approved in advance by the Engineer.
(a) Earth Loads: The placement of backfill shall not begin until the concrete is cured and has reached at least 80% of its specified strength unless otherwise permitted by the Engineer. The sequence of placing backfill around structures shall minimize overturning or sliding forces and flexural stresses in the concrete.
(b) Construction Loads: Light materials and equipment may be hand carried onto bridge decks only after the concrete has been in place at least 24 hours providing curing is not interfered with and the surface texture is not damaged.
Prior to the concrete achieving its specified compressive strength, any other live or dead loads imposed on existing, new, or partially completed portions of structures, shall not exceed the reduced load carrying capacity of the structure, or portion of structure. The Contractor may be required to submit calculations to the Engineer that verify these requirements are being met. The compressive strength of concrete (f' c) to be used in computing the load-carrying capacity shall be the smaller of the actual field compressive strength at the time of loading or the specified design strength of the concrete. The means to determine the actual field compressive strength shall be approved by the Engineer.
For post-tensioned structures, no live or dead loads shall be allowed on any span until the steel for that span has been tensioned.
(c) Precast concrete or steel girders shall not be placed on substructure elements until the substructure concrete has attained 85% of its specified strength.
No load shall be allowed on mortar or grout that has been in place less than 72 hours.
(d) Traffic Loads: The concrete deck will not be opened to traffic until at least 14 days after the last placement of deck concrete and until such concrete has attained its specified strength.

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

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

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

Destructive testing of any kind on the placed concrete structure will not be allowed.

III. Additional Requirements for Surface Repairs and Structural Repairs

1. Work Area Access and Shielding: Prior to removal of existing concrete, the Contractor shall provide access to the anticipated work areas so that the inspector and the Contractor may together determine and delineate the exact limits and locations of the work.

The Contractor shall design, furnish, install and remove a shield(s) to prevent debris from entering areas adjacent or beneath the work. The Contractor shall submit working drawings

to the Engineer in accordance with 1.05.02. The shield(s) shall be maintained by the Contractor and remain in place during all phases of the repair work.

2. Concrete Removal: The perimeter of each area to be repaired shall be saw cut as shown on the plans. All concrete within that area shall be removed to at least 1 inch beneath any visible reinforcing steel and to sound concrete. The reinforcing steel shall not be damaged or its bond in the surrounding concrete. The Contractor must use fifteen (15) pound hammers or other methods accepted by the Engineer. In addition to removal of concrete to a depth of 1 inch below reinforcing steel, localized areas of removal may be required if embedded galvanic anodes are specified in the Contract, to allow a minimum of 2 inches of concrete cover over the anodes.

Any steel reinforcing scheduled to be left in place that is damaged during the concrete removal process shall be replaced in accordance with 6.02 to the satisfaction of the Engineer and at the expense of the Contractor.

Corroded, missing, or broken reinforcing steel shall be replaced in accordance with 6.02 and as shown on the plans or as directed by the Engineer.

The Contractor shall perform the work in a manner that prevents debris from entering roadway lanes or areas below the structure. All debris shall be removed from the Site and disposed of by the Contractor.

3. Surface Preparation: All newly exposed surfaces of concrete shall be sandblasted and be visibly free from oil, solvent, grease, loose particles, or any other foreign matter. Exposed reinforcing steel shall be sandblasted in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.

4. Installation of Embedded Galvanic Anodes: After sandblasting reinforcing steel, galvanic anodes shall be embedded where shown on the plans and in accordance with the Contract.

5. Welded Wire Fabric in Vertical and Overhead Surface Repairs: Prior to installing formwork, steel welded wire fabric meeting the requirements of M.06.01-3 shall be installed at the proper depth in those areas as shown on the plans or directed by the Engineer. The fabric shall be tied to exposed reinforcing steel or anchored to sound concrete using means approved by the Engineer.

6. Formwork: Forms and support systems shall be designed in accordance with 6.01.03-II-1. Forms shall be so designed so that access is from the top of the formwork. If access is not possible from the top of the formwork, the Contractor shall submit a method of concrete placement for review by the Engineer.

7. Concrete Placement and Curing: Bonding compounds shall not be used before or during the placement of the concrete. Exposed surfaces shall be wetted with water immediately prior to placement. There shall be no excessive water on the surface or in the formwork. Light rust on sandblasted reinforcing steel can be anticipated and is acceptable.
The temperature of the air and surface to be repaired at the time of placement and curing shall be a minimum of 45° F. Concrete shall be placed and consolidated immediately with appropriate vibratory equipment. Forms shall be kept moist and shall be left in place for a minimum of 7 days or as shown on the plans.
8. Form Removal and Sequence of Repair: Form removal shall be in accordance with 6.01.03-II-1(m) unless otherwise noted on the plans. The Contractor shall follow the sequence of repairs shown on the plans.
9. Finishing: Immediately following curing and form stripping, the exposed faces shall be finished in accordance with Subarticle 6.01.03-II-10(c) Grout Clean-Down Finish.
10. Sounding of Completed Repairs: Cured and finished areas may be sounded by the Engineer to detect the presence of subsurface voids or delamination. Such areas shall be removed and replaced by the Contractor at its expense until an acceptable repair is in place as determined by the Engineer.
11. Sealing Concrete Surfaces: After all repairs have been accepted, penetrating sealer shall be applied in accordance with the Contract to the repaired areas as well as all contiguous areas to the repair or as directed by the Engineer.
6.01.04—Method of Measurement: This work will be measured for payment as follows:
1. Concrete used for new construction: The quantity of concrete used for new construction will be the actual volume in cubic yards of the specified class, with the exception of underwater concrete, completed and accepted within the neat lines as shown on the plans or as ordered by the Engineer. Parapets will be measured for payment by the number of linear feet of parapet, completed and accepted. The length of parapet will be measured along the centerline of the top of the parapet.
When concrete is placed against bedrock, a maximum of 6 additional inches beyond the neat lines can be measured for payment.
No deduction will be made for panels, form liners, reinforcing bars, structural steel shapes or for pile heads. There will be no deduction made for the volume occupied by culvert and drainage pipes, scuppers, weep holes, public utility structures or any other opening, unless the surface area of any such single opening is 9 s.f. or more.
In the case of culverts or drainage pipes, the computation of the surface area will be based on the nominal

diameter of the pipe, disregarding the thickness of the shell.
Miscellaneous materials necessary for completion of the work such as felt, mortar, grout, epoxy and joint seal will not be measured for payment.
Incidental work such as forming for anchor bolts, utilities, keyways, and sampling and testing will not be measured for payment.
The work to produce and administer the Concrete Quality Control Plan (CQCP) will not be measured for payment.
2. Underwater Concrete: When underwater concrete is used, it will be measured by the volume in cubic yards within the actual horizontal limits of the cofferdam and between the elevations established by the Engineer.
3. Concrete used for Surface or Structural Repairs: The quantity of concrete used for surface repairs or structural repairs will be the actual volume completed and accepted. Welded wire fabric used in repair areas will not be measured for payment.
4. Joint Filler: This material will be measured by the area in square feet of the joint filler, of the type and thickness specified, installed and accepted.
5. Closed Cell Elastomer: This material will be measured by the volume in cubic inches of elastomer, of the thickness specified, installed and accepted.
6.01.05—Basis of Payment: Payment for this work will be made as follows:
1. Concrete: Progress payments may be allowed for completed major labor elements of work such as forming, placing and curing. Prior to placement, the Contractor shall submit a proposed schedule of values for review and approval by the Engineer.
Payment for any lot of concrete allowed to remain in place will be adjusted when the field and laboratory testing of the material is completed. The quantity of concrete in each lot for new construction will be a maximum of 75 c.y. Payment for each lot of concrete will be adjusted based on the results of the acceptance testing performed by the Engineer.
The pay factors listed in Table 6.01.05-1 apply for Standard and Modified Standard Mix classes with regard to entrained air content.

Table 6.01.05-1 Entrained Air Content Pay Factors

Specified Entrained air (%)*				Pay factor (%)
6.0 +/- 1.5%		7.5 +/- 1.5%		1.00 (100)
4.3 and 4.4	7.6 and 7.7	5.8 and 5.9	9.1 and 9.2	0.98 (98)
4.1 and 4.2	7.8 and 7.9	5.6 and 5.7	9.3 and 9.4	0.96 (96)
3.9 and 4.0	8.0and 8.1	5.4 and 5.5	9.5 and 9.6	0.94 (94)
3.7 and 3.8	8.2 and 8.3	5.2 and 5.3	9.7 and 9.8	0.92 (92)
3.5 and 3.6	8.4 and 8.5	5.0 and 5.1	9.9 and 10.0	0.90 (90)
Concrete lots with less than 3.5% or greater than 8.5% entrained air will be rejected.		Concrete lots with less than 5.0% or greater than 10% entrained air will be rejected.		
*Air content measured at time and point of placement				

Table 6.01.05-2a Compressive Strength Pay Factors

Compressive Strength (%)	Pay factor (%)
95 or greater	1.00 (100)
90 to 94.9	0.95 (95)
85 to 89.9	0.90 (90)
*Measured at 28 days	
Concrete lots with less than 85% specified strength will be rejected.	

The pay factors listed in Table 6.01.05-2b apply for Standard and Modified Standard Mix classes with regard to surface resistivity when specified in accordance with AASHTO T 358 using 4 inch × 8-inch cylinders.

Table 6.01.05-2b Permeability Pay Factors

Surface Resistivity (kΩ-cm)*	Pay factor (%)
37 or greater	1.1 (110)
29 to 36.9	1 (100)
25 to 28.9	0.85 (85)
21 to 24.9	0.75 (75)
*Measured at 56 days	
Concrete lots with resistivity values less than 21 will be rejected.	

The payment adjustment value for entrained air, 28-day strength, and permeability if applicable, for any lot of concrete for new construction that is allowed to remain in-place is determined using the formulas listed in Table 6.01.05-3a. An Index Price of $400.00 per c.y. will be used to calculate each adjustment, except for Parapet Concrete, for which an Index Price of $100 per l.f. will be used. The sum of the individual adjustment values will be deducted from the cubic yard or linear foot payment for the appropriate item.

Table 6.01.05-3a Payment Adjustment Formulas for New Construction

Adj (air) = (1 - air pay factor) × Index Price × lot size (c.y. or l.f.)
Adj (strength) = (1 - strength pay factor) × Index Price × lot size (c.y. or l.f.)
Adj (permeability) = (1 – permeability pay factor) × Index Price × lot size (c.y. or l.f.)
Total Adjustment = Adj (air) + Adj (strength) + Adj (permeability)

The payment adjustment value for entrained air and 28-day strength for any lot of repair concrete that is allowed to remain in-place is determined using the formulas listed in Table 6.01.05-3b. An index price of $200.00 per c.f. shall be used to calculate each adjustment. The total adjustment value will be the sum of each individual adjustment value and will be deducted from the cubic foot payment for the appropriate item.

Table 6.01.05-3b Payment Adjustment Formulas for Repair Concrete

Adj (air) = (1 - air pay factor) × $200/c.f. × lot size (c.f.)
Adj (strength) = (1 - strength pay factor) × $200/c.f. × lot size (c.f.)
Total Adj = Adj (air) + Adj (strength)

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

No direct payment will be made for any labor, equipment or materials used during the sampling and testing of the concrete for Progression or Acceptance. The cost shall be

considered as included in the general cost of the work or as stated elsewhere in the Contract. The work of transporting the concrete test specimens, after initial curing, for Acceptance testing will be performed by the Department without expense to the Contractor. This material used for new construction will be paid for at the Contract unit price per cubic yard or linear foot less any adjustments, for the specified class, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including Concrete Quality Control Plan, heating, all admixtures, joint sealer, roofing felt, and any miscellaneous materials such as metal flashing and metal used in expansion joints and bearings.

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

3. Concrete Used For Structural Repairs or Surface Repairs: The material used for structural repairs or surface repairs will be paid for at the Contract unit price per cubic foot less any adjustments, complete in place, which price shall include saw cutting, removing concrete, sandblasting, cleaning, forming, placing, curing, stripping, and finishing new surfaces, and all materials, equipment, tools, labor and clean-up incidental thereto.

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

5. Closed Cell Elastomer: Closed cell elastomer will be paid for at the Contract unit price per cubic inch for “Closed Cell Elastomer” of the thickness specified, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

Embedded galvanic anodes, deformed steel bars, and penetrating sealer, will be paid for separately.

Pay Item	Pay Unit
Footing Concrete	c.y.
Footing Concrete (Mass)	c.y.
Abutment and Wall Concrete	c.y.
Abutment and Wall Concrete (Mass)	c.y.
Column and Cap Concrete	c.y.
Column and Cap Concrete (Mass)	c.y.
Bridge Deck Concrete	c.y.
Bridge Deck Concrete (SIP Forms)	c.y.

Parapet Concrete	l.f.
Bridge Sidewalk Concrete	c.y.
Approach Slab Concrete	c.y.
Barrier Wall Concrete	c.y.
Underwater Concrete	c.y.
Surface Repair Concrete	c.f.
Structural Repair Concrete	c.f.
Class PCCXXXYZ	c.y.
(Thickness and Type) Joint Filler for Bridges	s.f.
(Thickness) Closed Cell Elastomer	c.i.

SECTION 6.02
REINFORCING STEEL

5.03.08 —**Description:** Work under this item shall consist of furnishing and placing reinforcing steel and splicing materials, of the type and size designated, as shown on the plans, as directed by the Engineer and in accordance with these specifications.

5.03.09 —**Materials:** The materials for this work shall meet the requirements of Article M.06.01.

5.03.10 —**Construction Methods:**

7. Shop Drawings: Prior to fabricating any materials, the Contractor shall submit shop drawings of the reinforcing steel and splicing materials, with material lists, material designations, placement diagrams, bending diagrams and manufacturer's literature for mechanical connections, for review and approval, in accordance with Article 1.05.02. Any expenses incidental to the revision of materials furnished in accordance with shop drawing and order lists to make them comply with the requirements of the plans, specifications or special provisions shall be borne by the Contractor.

8. Fabrication:

(a) Cutting and Bending: Bar reinforcement shall be cut and bent to the shapes shown on the plans. Fabrication tolerances shall be in accordance with the requirements of ACI 315. All bars shall be bent cold, unless otherwise permitted.

Coated bars shall not be field cut, unless permitted by the Engineer. If allowed, field cutting of coated bars shall be performed using hydraulic-powered cutters or friction cutting tools to minimize coating damage and field touch-up. Flame cutting of coated bars will not be permitted. Field cut coated bars shall be repaired immediately.

Bars partially embedded in concrete shall not be field bent, except as shown on the plans or permitted by the Engineer.

(b) Hooks and Bend Dimensions: The dimensions of hooks and the diameters of bends measured on the inside of the bar shall be as shown on the plans. When the dimensions of hooks or the diameter of bends are not shown, they shall be in accordance with the ACI 318, "Building Code Requirements for Reinforced Concrete" as amended by ASTM A767 for galvanized bars.

(c)Identification: Bar reinforcement shall be shipped in standard bundles, tagged and marked in accordance with the CRSI "Manual of Standard Practice."

3. Handling, Storing and Surface Condition of Reinforcement: Steel reinforcement shall be stored above the surface of the ground on platforms, skids, or other supports and shall

be protected as far as practical from mechanical injury and surface deterioration caused by exposure to conditions producing rust.

Epoxy-coated and galvanized reinforcing steel shall be handled and stored by methods that will not damage the coating. All systems for handling coated reinforcement shall have adequately padded contact areas wherever possible. All bundling bands shall be padded and all bundles shall be lifted with a strong back, multiple supports, or platform bridge so as to prevent bar-to-bar abrasion from sags in the bar bundle. Bars or bundles on wooden or padded supports. Epoxy-coated reinforcing steel, stored at the job Site, shall be protected by covering with opaque polyethylene or other suitable protective material. Provisions shall be made for adequate ventilation to prevent condensation under the covering. Since the epoxy coating is flammable, the epoxy coated reinforcing shall not be exposed to any fire or flame.

Prior to placement of concrete, all reinforcement shall be free from dirt, loose rust or scale, mortar, paint, grease, oil, or other materials that would reduce bond. Reinforcement shall be free from injurious defects such as cracks and laminations. Bonded rust, surface seams, surface irregularities, or mill scale will not be cause for rejection, provided the minimum dimensions, cross section area, and tensile properties of a hand wire brushed specimen meet the physical requirements for the size and grade of steel specified.

4. Placing and Fastening:

(a) **General:** Steel reinforcement shall be accurately placed as shown on the plans and firmly held in position during the placing and setting of concrete. Bars shall be tied at all intersections, except where the spacing is less than 12 in between intersections, alternate intersections shall be tied. Bars shall be tied at all intersections around the perimeter of each mat, regardless of spacing.

Bundled bars shall be tied together at not more than 6-ft centers. Lap splices shall have a minimum of 2 ties or be tied 12 in apart for the length of the splice, whichever requires the greater number of ties. For epoxy-coated reinforcement, tie wires and metal clips shall be epoxy, plastic or nylon coated. For galvanized reinforcement, tie wires and metal clips shall be plastic coated or galvanized.

With the exception of tie down bars, welding (tack welding) will not be permitted for assembly of reinforcement, unless shown on the plans. Tie down bars shall be placed as shown on the plans and a top longitudinal reinforcing bar tied to these bars. When

welding coated bars an appropriate protective mask must be worn, safety equipment used and suitable ventilation provided.

If wire fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.

(b) **Support Systems:** Reinforcing steel shall be supported in its proper position by use of precast mortar blocks, wire bar supports, supplementary bars (tie-down bars), side form spacers or other approved devices. Such devices shall be sufficiently strong and properly placed at frequent intervals so as to maintain the cover between the reinforcing and the surface of the concrete. The reinforcing steel cover shall be no less than that shown on the plans and no greater than that shown plus 1/4 in.

Platforms for the support of workers and equipment during concrete placement shall be supported directly on the forms and not on the reinforcing steel.

(c) Precast Mortar Blocks: Precast mortar blocks shall have a compressive strength not less than that of the concrete in which they are to be embedded. The face of the blocks in contact with forms for exposed surfaces shall not exceed 2 in x 2 in and shall have a color and texture that will match the concrete surface. Precast mortar blocks shall not be used on exposed surfaces of precast concrete members. When used on vertical or sloping surfaces, such blocks shall have an embedded wire for securing the block to the reinforcing. When used in slabs, either such a tie wire or, when the weight of the reinforcing is sufficient to firmly hold the blocks in place, a groove in the top of the block may be used. For epoxy-coated bars, such tie wires shall be epoxy, plastic or nylon coated. For galvanized bars, such tie wires shall be plastic coated or galvanized.

(d) Wire Supports: Wire bar supports, such as ferrous metal chairs and bolsters, shall conform to industry practice as described in the CRSI “Manual of Standard Practice of the Concrete Reinforcing Steel Institute.” All bolsters or chairs which bear against the forms for exposed surfaces shall be equipped with snug fitting, high density, polyethylene tips which provide 1/2-in minimum clearance between the metal and any exposed surface. For epoxy-coated reinforcement, all wire bar supports and bar clips shall be epoxy or plastic coated. For galvanized reinforcement, chair and bar supports shall be hot-dip galvanized, after fabrication, in accordance with ASTM A123.

The maximum spacing of slab bolster rows and high chair rows for concrete deck slabs shall be 4 ft unless otherwise directed by the Engineer.

(e) Repair of Coated Reinforcing Steel:

Epoxy-coated Reinforcing Steel - In addition to the requirements of ASTM D3963,

all damage (i.e., scratches, nicks, cracks) to the epoxy coating of the bar reinforcement, visible to the unaided eye with corrective vision, caused during shipment, storage or placement shall be repaired by the Contractor at the Project Site with approved patching material. Ends of bars that have been sheared, saw cut or cut by other means shall be coated with approved patching material. The areas on the bars and tie down bars damaged by welding shall be repaired with approved patching material.

Patching of damaged areas shall be performed in accordance with the patching material manufacturer's recommendations. Any singular damaged surface area (prior to repair with approved patching material), shall not exceed 2% of the total surface area of the bar. The total bar surface area covered by patching material shall not exceed 5% of the total surface area of the bar. Should either of these limits be exceeded the bar shall be removed from the work and replaced with an acceptable bar. All patching material shall be fully cured prior to placing concrete.

The patching material shall be compatible with the epoxy coating, inert in concrete, and suitable for repairs in the field. The patching material shall be prequalified, as required for the coating material, and shall be either identified on the container as meeting the requirements of Annex A1 of ASTM D3963 or shall be accompanied by a Materials Certificate certifying that the material meets the requirements of said Annex A1.

Galvanized Reinforcing Steel - All damage (i.e. scratches, nicks, cracks) to the galvanized coating on bar reinforcement, visible to the unaided eye with corrective vision, caused during shipment, storage or placement shall be repaired by the Contractor at the job Site in accordance with ASTM A780, Annex A2 - "Repair using Zinc-Rich Paints." Ends of bars that have been sheared, saw cut or cut by other means shall be coated with zinc-rich paint. The area on the bars and tie down bars damaged by welding shall be repaired with zinc-rich paint.

Field coating of damaged areas shall be performed in accordance with the zinc-rich paint manufacturer's recommendations. The zinc-rich paint shall be as specified in FS TT-P-641, Type 1 and shall be brush applied to achieve a dry film thickness of 3 to 6 mils. All touchup paint shall be fully cured prior to placing concrete.

5. Splicing of Bars:

(a) General: All reinforcement shall be furnished in the full lengths indicated on the plans unless otherwise permitted. Except for splices shown on the plans, splicing of bars will not be permitted without written approval of the Engineer. Splices shall be staggered as far as possible.

(b) Lapped Splices: Lapped splices shall be of the lengths shown on the plans.
In contact lap splices, the bars shall be placed in contact and tied together in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.
In non-contact lap splices, the bars shall be placed as shown on the plans and tied to adjacent bars in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.
(c) Welded Splices: Welded splices shall be used at the locations shown on the plans. Welding shall conform to AWS publication "Structural Welding Code, Reinforcing Steel, AWS D1.4" and applicable special provisions.
Welded splices shall not be used on epoxy-coated or galvanized bars. No welding shall be performed adjacent to epoxy-coated or galvanized bars to cause any heating of the coating.
(d) Splices made with Dowel Bar Mechanical Connections: Splices made with dowel bar mechanical connections shall be used at the locations shown on the plans. The minimum size of the bars and the length of the lap splices for the dowel bar mechanical connections shall be as shown on the plans.
The mechanical connections shall be installed in accordance with the manufacturers recommendations. All tools and equipment required to install and field inspect the connections shall be provided by the Contractor. The Contractor shall take all measures necessary to prevent concrete from adhering to the threaded portions of the mechanical connections.
After installing the coated mechanical connectors, all damaged areas on the coated connectors shall be repaired in accordance with Subarticle 6.02.03-4(e).
6. Splicing of Welded Wire Fabric: Welded wire fabric reinforcement shall be lap spliced as shown on the plans.
7. Substitutions: Substitution of different size bars will be permitted only when authorized by the Engineer. The substituted bars shall have an area equivalent to or larger than the area shown on the plans.
8. Inspection: Reinforcement in any member or component shall be placed, inspected and approved by the Engineer before placing of concrete begins. Concrete placed prior to approval of the reinforcement may be rejected and its removal required.

6.02.04—Method of Measurement:
1. General: No measurement will be made for payment for any clips, wire, separators,

wire chairs, precast mortar blocks and other material used for fastening and supporting the reinforcement in the correct position.

2. Bar Reinforcement: Uncoated, epoxy coated, galvanized and weldable bar reinforcement shall be classified as “Deformed Steel Bars,” “Deformed Steel Bars - Epoxy Coated,” “Deformed Steel Bars - Galvanized” and “Deformed Steel Bars - Weldable” respectively.

This work will be measured for payment by the number of pounds of bar reinforcement installed and accepted. The weight of reinforcing steel shall be computed using the values tabulated in Subarticle M.06.01-2. No allowance shall be made for the weight of the epoxy or galvanized coatings.

Tie down bars will not be measured for payment.

If short bars are used when full length bars might reasonably be required, only the amount which would be obtained if full length bars were used will be measured for payment. No allowance will be made for lap splices not contemplated by the plans unless approved by the Engineer.

If bars are substituted upon the Contractor’s request and as a result more reinforcing steel is used than specified, only the amount specified will be included for payment.

3. Welded Wire Fabric: This work will be measured for payment by the number of pounds of welded wire fabric installed and accepted.

The weight of welded wire fabric will be computed from the values published in the CRSI “Manual of Standard Practice.”

4. Dowel Bar Mechanical Connections: Uncoated, epoxy coated and galvanized dowel bar mechanical connections shall be classified as “Dowel Bar Splicer System,” “Dowel Bar Splicer System - Epoxy Coated” and “Dowel Bar Splicer System - Galvanized” respectively.

This work will be measured for payment by the number of dowel bar mechanical connections installed and accepted.

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

1. Bar Reinforcement: This work will be paid for at the Contract unit price per pound for “Deformed Steel Bars,” “Deformed Steel Bars - Epoxy Coated,” “Deformed Steel Bars - Galvanized” or “Deformed Steel Bars - Weldable” complete in place and accepted, including shop drawings, furnishing, fabricating and placing reinforcing steel, welding splices and all materials, equipment, tools, labor and work incidental thereto.

2. Welded Wire Fabric: This work will be paid for at the Contract unit price per pound for “Welded Wire Fabric,” complete in place and accepted, including shop

drawings, furnishing, fabricating and placing welded wire fabric and all materials, equipment, tools, labor and work incidental thereto.

3. Dowel Bar Mechanical Connections: This work will be paid for at the Contract unit price each for “Dowel Bar Splicer System,” “Dowel Bar Splicer System - Epoxy Coated” or “Dowel Bar Splicer System - Galvanized” complete in place and accepted, including shop drawings, furnishing, fabricating and placing dowel bar mechanical connections and all materials, equipment, tools, labor and work incidental thereto.

Pay Item	Pay Unit
Deformed Steel Bars	lb.
Deformed Steel Bars -	Epoxy Coated lb.
Deformed Steel Bars - Galvanized	lb.
Deformed Steel Bars - Weldable	lb.
Welded Wire Fabric	lb.
Dowel Bar Splicer System	ea.
Dowel Bar Splicer System - Epoxy Coated	ea.
Dowel Bar Splicer System - Galvanized	ea.

SECTION 6.035
HELICAL PILES

1. **General:**

1.1 Purpose of Specification:

The purpose of this specification is to detail the furnishing of all designs, materials, tools, equipment, labor and supervision, and installation necessary to install Helical Piles as detailed on the drawings, including connection details, This shall include provisions for load testing that may be part of the scope of work.

1.2. Scope of Work:

This work consists of furnishing all necessary engineering and design services (if required), supervision, labor, tools, materials, and equipment to perform all work necessary to install the Helical Piles at the Bass Road Bridge Over Merrick Brook (#04772) for the Town of Scotland Connecticut, per the specifications described herein, and as shown on the drawings. The Contractor shall install a Helical Pile that will develop the load capacities as detailed on the drawings. This may also include provisions for load testing to verify Helical Pile capacity and deflection, if part of the scope of work. The responsibilities and duties of the respective parties for this project are summarized in Table – 1.

Table 1 - Helical Piles Tasks and Responsibilities

Task #	Task	Responsible Party
1	Site investigation , Geotechnical Investigation, Site Survey	CEE (done)
2	Develop and Design Overall Scope of Work – design loads, locations, spacing	CEE
3	Define service life of piles (corrosion protection)	CEE
4	Define number of test piles	CEE
5	Develop pile connection details for static and seismic conditions	CEE
6	Prepare Drawings	CEE
7	Develop Specifications	CEE
8	Evaluate Bids for the work (in combination with the Town	CEE & Town
9	Inspect piling during installation (log results)	CEE

1.3 Qualifications of the Helical Pile Contractor:

The Helical Pile Contractor shall be experienced in performing design and constructin of Helical Piles and shall furnish all materials, labor, and supervision to perform the work. The Contractor shall be trained and certified by CHANCE Civil Construction in the proper methods of design and installation of Helical Piles. The Contractor shall provide names of on-site personnel materially involved with the work, including those who carry documented certification from CHANCE Civil Construction. At a minimum, these personnel shall include foremean, machine operator, and project engineer / manager.

The Helical Pile Contractor shall not sublet the whole or any part of the contract without the express written permission of the Owner.

1.4 Allowable Tolerances:

Centerline of Helical Piles shall not be more than 3 inches from the indicated plan location.

Helical Pile plumbness shall be within 3 degrees of design alignment.

Top elevation of Helical Pile shall be within + 1 inch to -2 inches of the design vertical elevation.

1.5 Quality Assurance:

1.5.1 Helical Piles shall be installed by authorized CHANCE Civil Construction certified Contractor. These contractors shall have satisfied the certified requirements relative to the technical aspects of the product and installation procedures as therein specified. Certification documents shall be provided upon request to the Owner or their representative.

1.5.2 The Contractor shall employ an adequate number of skilled workers who are experienced in the necessary crafts and who are familiar with the specified requirements and methods needed for proper performance of the work of this specification.

1.5.3 All Helical Piles shall be installed in the presence of a designated representative of the Owner unless said representative informs the

Contractor otherwise. The designated representative shall have the right of access to any and all field installation records and test reports.

1.5.4 Helical Pile components as specified therein shall be manufactured by a facility whose quality systems comply with ISO (International Organization of Standards) 9001 requirements. Certificates of Registration denoting ISO Standards Number shall be presented upon request to the Owner or their representative.

2. Submittals:

2.1 Construction Submittals:

2.1.1 The Contractor or Engineer shall prepare and submit to the Owner, for Review and approval, working drawings and design calculations for the Helical Piles intended for use at least 14 calendar days prior to the start of construction. All submittals shall be signed and sealed by a Registered Professional Engineer currently licensed in the State of Connecticut.

2.1.2 The Contractor shall submit a detailed description of the construction procedures proposed for use to the Owner for review. This shall include a list of major equipment to be used.

2.1.3 The Contractor shall submit shop drawings for all Helical Pile components, including corrosion protection and pile top attachment to the Owner for review and approval. This includes Helical Pile lead/starter and extension section identification (manufacturer's catalog numbers).

2.1.4 The Contractor shall submit to the Owner copes of calibration reports for each torqued indicator or torque motor, and all load test equipment to be used on the project. The calibration tests shall have been performed within forty-five (45) working days of the date submitted. Helical Pile installation and testing shall not proceed until the Owner has received the calibration reports. These calibration reports shall include, but are not limited to, the following information:

Name of project and Contractor
Name of Testing Agency
Identification (Serial Number) of the device calibrated.
Description of the calibrated testing equipment

Date of calibration
Calibration data.

2.1.5 Work shall not begin until all the submittals have been received and approved by the Owner. The Contractor shall allow the Owner a reasonable time to review, comment, and return the submittal package after a complete set has been received. All costs associated with incomplete or unacceptable submittals shall be the responsibility of the Contractor.

2.2 Installation Records:

The Contractor shall provide the Owner copies of Helical Pile installation records within 24 houjrs after each installation is completed. Records shall be prepared in accordance with the specified division of responsibilities as noted in Table-1. Formal copies hall be submitted on a weekly basis. These installation records shall include, but are not limited to, the following information:

Name of project and Contractor
Name of Contractor's supervisor during installation
Date and time of installation
Name and model of installation equipment
Type of torque indicator used
Location of Helical Pile by assigned identification number
Actual Helical Pile Type and configuration – including lead section (number and size of helix plates), number and type of extension sections (manufacturer's SKU numbers)
Helical Pile Installation duration and observations
Total length of installed Helical Pile
Installation torque at one-foot intervals for the final 10 feet
Comments pertaining to interruptions, obstructions, or other relevant information
Rate load capacities

2.3 Closeout Submittals:

2.3.1 Warranty: Warranty documents specified herein

2.3.2 Project Warranty" Refer to Conditions of the Contract for project warranty as stated in the Contract for project warranty provisions.

2.3.3 Manufacturer's Warranty: Submit, for Owner's Acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights the Owner may have under Contract Document.

3. PRODUCTS AND MATERIALS

3.1 Central Steel Shaft:

The central steel shaft, consisting of lead sections, helical extensions, and plain extensions, shall be Type SS (Square Shaft) as manufactured by CHANCE Civil Construction (Centralia and Independence, MO).

SS175 – 1 ¾" shaft shall be hot rolled Round Cornered Square (RCS) solid steel bars meeting the dimensional and workmanship requirements of ASTM A29. The bar shall be High Strength Low Alloy (HSLA), low to medium carbon steel grade with improved strength due to fine grain size. Torque strength rating: 11,000 ft-lb, with a minimum yield strength of 90 ksi.

3.2 Helix Bearing Plate:

Shall be hot rolled carbon steel sheet, strip, or plate formed on matching metal dies to true helical shape and uniform pitch. Bearing plate material shall conform to ASTM A656 or A1018 with minimum yield strength of 80 ksi and a plate thickness of 1/2 inch.

3.3 Bolts:

The size and type of bolts use to connect the central steel shaft sections together shall conform to the following ASTM specification: 7/8" diameter bolt per ASTM A193 Grade B7

3.4 Couplings:

For type SS175 shaft material, the coupling shall be formed as an integral part of the plain and helical extension material as hot upset forged sockets.

3.5 Plates, Shapes, or Pile Caps:

Depending on the application, the pile cap shall be a welded assembly consisting of structural steel plates and shapes designed to fit the pile and transfer the applied load. Structural steel plates and shapes for HELICAL PILE top attachments shall conform to ASTM A36 or ASTM A572 Grade 50.

4. EXECUTION

4.1 Site Conditions:

4.1.1 Prior to commencing Helical Pile installation, the Contractor shall inspect the work of all other trades and verify that all said work is completed to the point where Helical Piles installation may commence without restriction.

4.1.2 The Contractor shall verify that all Helical Piles may be installed in accordance with all pertinent codes and regulations regarding such items as underground obstructions, right-of-way limitations, utilities, etc.

4.1.3 In the event of a discrepancy, the Contractor shall notify the Owner. The Contractor shall not proceed with Helical Pile installation in areas of discrepancies until said discrepancies have been resolved. All costs associated with unresolved discrepancies shall be the responsibility of the Owner.

4.2 Installation Equipment:

4.2.1 Shall be rotary type, hydraulic power torqed motor with clockwise and counter-clockwise rotation capabilities. The torque motor ahall be capable of continuous adjustment to revolutions per minute (RPM's) during Helical Pile installation. Percussion drilling equipment shall not be permitted. The torque motor shall have torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed.

4.2.2 A torque indicator shall be used during Helical Pile installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling.

4.2.3 The torque indicator shall be capable of providing continuous measurement of applied torque throughout the installation, and shall be capable of torque measurements in increments of at least 500 ft-lbs. The torque indicator shall be calibrated prior to pre-production testing or the start of the work. Torque indicators shall be recalibrated, if in the opinion of the Owner and / or the Contractor reasonable doubt exists as to the accuracy of the torque measurements.

4.3 Installation Procedures:

4.3.1 The Helical Pile installation technique shall be such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

4.3.2 The lead section shall be positioned at the location as shown on the working drawings. The Helical Pile sections shall be engaged and advanced into the soil in a smooth, continuous manner at a rate of rotation of 5 to 20 RPM's. Extension sections shall be provided to obtain the required minimum overall length and installation torque as shown on the working drawings. Connect sections together using coupling bolt(s) and nuts torqued to 40 ft-lbs. Sufficient down pressure shall be applied to uniformly advance the Helical Pile sections approximately 3 inches per revolution. The rate of rotation and magnitude of down pressure shall be adjusted for different soil conditions and depths.

4.4 Termination Criteria:

4.4.1 The torque as measured during the installation shall not exceed the torsional strength rating of the central steel shaft.

4.4.2 The minimum installation torque and minimum overall length criteria as shown on the working drawings shall be satisfied prior to terminating the Helical Pile installation.

4.4.3 If the torsional strength rating of the central steel shaft and / or installation equipment has been reached prior to achieving the minimum overall length required, the Contractor shall have the following options:

- Terminate the installation at the depth obtained subject to the review and acceptance of the Owner, or:
- Remove the existing Helical Pile and install a new one with fewer and / or smaller diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Owner. If re-installing in the same location, the top-most helix of the new Helical Pile shall be terminated at least (3) three feet beyond the terminating depth of the original Helical Pile.

4.4.4 If the minimum installation torque as shown on the working drawings is not achieved at the minimum overall length, and there is no maximum length constraint, the Contractor shall have the following options:

- Install the Helical Pile deeper using additional extension sections, or:
- Remove the existing Helical Pile and install a new one with additional and / or larger diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Owner. If re-installing in the same location, the top-most helix of the new Helical Pile shall be terminated at least (3) three feet beyond (deeper) than the terminating depth of the original Helical Pile.
- De-rate the load capacity of the Helical Pile and install additional Helical Pile(s). The de-rated capacity and additional Helical Pile location(s) shall be subject to the review and acceptance of the Owner.

4.4.5 If the Helical Pile is refused or deflected by a subsurface obstruction, the installation shall be terminated and the pile removed. The obstruction shall be removed if feasible, and the Helical Pile re-installed. If the obstruction cannot be removed, the Helical Pile shall be installed at an adjacent location, subject to review and acceptance by the Owner.

4.4.6 If the torsional strength rating of the central steel shaft and or installation equipment has been reached prior to proper positioning of the last plain extension section relative to the final elevation, the Contractor may remove the last plain extension and replace it with a shorter length extension. If it is not feasible to remove the last plain extension, the

Contractor may cut said extension shaft to the correct elevation. The Contractor shall not reverse (back-out) the Helical Pile to facilitate extension removal.

4.4.7 The average torque for the last three feet of penetration shall be used as the basis of comparison with the minimum installation torque as shown on the working drawings. The average torque shall be defined as the average of the last three readings recorded at one foot intervals.

5. MEASUREMENT AND PAYMENT:

HELICAL PILE work will be paid for in three pay items:

Helical Piles will be paid for per Helical Pile with Add / Deduct for Helical Piles meeting the design capacity shall be paid for on a per foundation basis, with a predetermined length as shown on the drawings, with an “add / deduct” amount per lineal foot to accommodate field changes.

Description	Quantity	Units
Mobilization / Demobilization	1	Lump Sum
Helical Pile Installation	12	Each
Obstructions	Varies	Per Hour
Add / Deduct	Varies	Per Lineal Foot

SECTION 5.04
RIPRAP

5.04.01 —Description: Riprap shall consist of angular shaped stones used to protect foundations of piers, abutments, walls, slopes of embankments and waterways from water damage.

—**Materials:**

Stone: The stone for this work shall be the type called for on the plans and shall meet the requirements of M.12.02.
Bedding: The bedding material for riprap shall conform to the specifications of the material indicated on the plans.

i. —Construction Methods: The area to be protected by riprap shall be accurately shaped prior to placing of any bedding material or riprap. Where bedding material is called for, it shall be placed on the prepared area and compacted to the depth, lines and grades indicated on the plans.

ii. The riprap shall be placed to its full course thickness in one operation in such a manner as to produce a reasonably well-graded mass of rock without causing displacement of the underlying material. The finished surface shall be free from pockets of small stones and clusters of larger stones. Placing this material by methods likely to cause segregation of the various sizes of stone will not be permitted. Rearranging of individual stones by mechanical or hand methods will be required to the extent necessary to obtain a reasonably well-graded distribution of the specified stone sizes. The completed course shall be of the specified thickness and to the lines and grades as shown on the plans or as ordered by the Engineer.

- —Method of Measurement: The quantity of riprap measured for payment shall be the number of cubic yards whose length and width is measured in place as accepted and the thickness as shown on the plans.
- —Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for the type of riprap indicated, complete in place, including all materials, equipment, tools and labor incidental thereto.

Excavation and bedding material will be measured and each paid for under its particular pay item.

Pay Item	Pay Unit
(Type) Riprap	c.y.

SECTION 9.75
MOBILIZATION AND PROJECT CLOSEOUT

9.75.01—Description: This item consists of

1. all work necessary for moving Project personnel and equipment to the Project Site;
2. all work necessary for the establishment of the Contractors' field offices, buildings and other facilities necessary for Contract performance;
3. the preparation of work plans and other documents that must be submitted by the Contractor to the Department prior to the start of physical Project construction. These initial submittals are identified elsewhere in the Contract and may include Project schedules, Project management plans, staging and storage areas, safety plans, quality control plans, erosion and sedimentation control plans, and other documents addressing general Project sequencing or management;
4. demobilization of plant and equipment;
5. completion of all physical work, and
6. completion of administrative closeout items as required by the Contract.

The work entailed in this item shall not be subcontracted in whole or part.

9.75.04—Method of Measurement: This work will be measured for payment in the manner described hereinafter; however, the total Contract amount earned will not include payments for mobilization that were earned during the period covered by the current monthly estimate, but will include those payments for mobilization that were previously earned and certified for payment.

1. When the first Project payment estimate is reviewed by the Engineer, 25% of the lump sum bid price for this item or 2.5% of the total original Contract price, whichever is less, will be certified for payment as a part of that estimate.
2. When the Contractor's initial Project submittals are accepted by the Engineer, 50% of the lump sum bid price for this item or 5% of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.
3. When the Contractor's initial Project submittals are accepted by the Engineer, and 15% of the total original Contract price has been earned by the Contractor, 70% of the lump sum price of this item or 7% of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.

4. When 30% of the total original Contract price has been earned by the Contractor, 85% of the lump sum price of this item or 8.5% of the total original Contract price, whichever is less, minus any previous payments made to the Contractor for this item, will be certified for payment.

5. When the requirements of 1.08.13 have been satisfied by the Contractor, 95% of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment.

6. When the requirements of 1.08.14 have been satisfied by the Contractor, 100% of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment. When this payment is made, the Contractor should have received full Contract payment for this item.

Nothing herein shall be construed to limit or preclude the Department from making partial payments to the Contractor that are provided for elsewhere in this Contract.

9.75.05—Basis of Payment: The work under this item will be paid for at the Contract lump sum price for “Mobilization and Project Closeout,” which price shall include materials, equipment, tools, transportation, labor and all work incidental thereto.

Payment for this item shall be made only once; i.e., for only one instance of mobilization as described in 9.75.01 above. If the Contractor mobilizes equipment or facilities more than one time during the course of the Project, due to reasons solely the responsibility of the Department, the additional work entailed therein will be paid for as Extra Work under 1.04.05 hereof.

Pay Item	Pay Unit
Mobilization and Project Closeout	l.s.

SECTION 9.79
CONSTRUCTION BARRICADES

9.79.01—Description: Under this item the Contractor shall furnish all construction barricades of the specified type required on the Project to comply with the requirements of NCHRP Report 350 (TL-3), or the AASHTO MASH, and the requirements stated in the item "Maintenance and Protection of Traffic," as shown on the plans and as directed by the Engineer.

9.79.02—Materials: Construction barricades shall consist of the following materials:

The frame shall be of polyvinyl chloride pipe meeting the requirements of ASTM D2241 for PVC 1120 or 1220, SDR 21 (pressure rating 200 psi), ASTM D3034, SDR 35 or an approved equal. All straight members shall be the color white.

Wyes, tees and elbows for joint connections shall be polyvinyl chloride of suitable size and strength for the purpose intended.

Joints shall not be glued and a 3/16 inch nylon rope (or equivalent) shall be threaded loosely through the pipe to keep sections from flying if hit by a vehicle.

Face panels used as horizontal members shall be constructed of a suitable plastic material, 0.060-inch high impact styrene, anodized aluminum of no less than 0.025 inch thickness or a comparable substitute approved by the Engineer.

All hardware shall be in accordance with standard commercial specifications and shall be approved by the Engineer.

Alternate stripes of white and orange retroreflective sheeting shall be applied to the horizontal members as shown on the plans. Only one type sheeting shall be used on a barricade and all barricades on a construction project shall be constructed with the same type of retroreflective sheeting.

Retroreflective sheeting shall meet the requirements of M.18.09.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by wind. Construction barricades shall be approved by the Engineer before they are placed into service.

Materials Certificates shall be required confirming compliance with the requirements set forth in the plans and specifications for these barricades. Prior to using barricades on the Project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the barricades comply with the requirements of NCHRP Report 350 (TL-3) or the AASHTO MASH for Category 2 Devices.

9.79.03—Construction Methods: The Contractor shall furnish a sufficient number of construction barricades required for the traffic patterns for all operations which are being

undertaken concurrently. The barricades shall be constructed in a neat and workmanlike manner to the satisfaction of the Engineer. Ineffective barricades, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State. Barricades that are no longer required shall be removed from the Project and shall remain the property of the Contractor.

9.79.04—Method of Measurement: This work will be measured for payment by the number of construction barricades used on the Project.

9.79.05—Basis of Payment: This item will be paid for at the Contract unit price each for "Construction Barricade" of the type specified and used on the Project. Each barricade will be paid for once, regardless of the number of times it is used on the Project.

Pay Item	Pay Unit
Construction Barricade (Type)	ea.

SECTION 9.80
CONSTRUCTION SURVEYING

9.80.01—Description: Work under this item shall consist of furnishing labor, equipment, tools and materials to perform surveying, staking, verification, recording of data and calculations as necessary to construct the Project, from existing layout to acceptance of the work according to the plans. Work under this item shall conform to Section 20-300b-1 to 20-300b-20 inclusive of the Department of Consumer Protection, Regulations of CT State Agencies and as supplemented herein.

9.80.02—Materials: Stakes used for control staking shall be a minimum of 1 inch × 1 inch wide and a minimum length of 36 inches. Stakes shall be legibly marked and shall be visible from the edge of the travelway. The stakes shall be durable enough to last for the duration of the Contract. In areas where traditional staking cannot be established, the Contractor may use other materials or methods to mark critical locations, as approved or directed by the Engineer.

9.80.03—Construction Methods:

I Submittals:

1. The Contractor shall provide technically qualified survey crews experienced in construction surveying. All Project surveying and staking shall be performed by or under the supervision of either a Connecticut Licensed Land Surveyor or a Level III Survey Technician certified by the National Society of Professional Surveyors.

The name, authority, relevant experience, and qualifications of the person with overall responsibility for construction surveying and staking shall be submitted to the Engineer ten (10) days prior to any physical work.

2. If using Automated Machine Guidance (AMG) methods, the following information shall also be submitted to the Engineer ten (10) days prior to any physical work:

A. A written technology statement that includes:

i. The manufacturer, model, and software version of the AMG equipment.

ii. Verification that the final 3D data which is provided in the Plans is compatible with the AMG equipment.

B. Personnel qualifications:

i. The name, authority, relevant experience, and qualifications of the person with overall responsibility for the AMG system.

ii. The name, authority, and relevant experience of personnel directly responsible for operating the AMG equipment.

C. A Quality Control Plan for mechanical calibration and maintenance of both surveying and AMG
controlled construction equipment. Include the frequency and types of checks performed.

II Equipment Requirements:

1. The Contractor's survey instruments and supporting equipment shall be capable of achieving the specified tolerances in Table 9.80-1.
2. All instrumentation used on the Project shall have been serviced and calibrated within six (6) months prior to use on the Project, and then every year thereafter.
3. The Contractor shall obtain the Engineer's concurrence prior to using construction equipment equipped with Global Navigation Satellite System (GNSS) or Robotic Total Station (RTS) controlled by an AMG system in the construction of subgrade, subbase and base course aggregate courses, or other construction operations.
4. Tools and supplies shall be of the type and quality suitable for survey work.
5. Stakes and hubs shall be of a sufficient length to provide a solid set in the ground, with sufficient surface area above ground for necessary legible and durable markings.

III General Requirements:

1. The Contractor's Construction Schedule shall include dates and sequences of major surveying activities in accordance with 1.05.08.
2. The Department will furnish the initial horizontal control points, vertical control points and data for use in establishing control for completion of the work. The Contractor shall recover and preserve the initial reference and control points and shall notify the Engineer of missing control points.
3. The Department will furnish data relating to horizontal and vertical alignments, theoretical slope staking catch points, and other design data. The Contractor is responsible for reformatting and any additional calculations that may be required for the convenient use of the State-furnished data. The Contractor shall provide immediate notification of apparent errors or omissions in the initial staking or in the State-furnished data.
4. The Contractor shall provide survey data and measurements in the format(s) acceptable to the Engineer and submit on a schedule determined by the Engineer. Field data and supporting documentation will become the property of the Department upon completion of the work.
5. Prior to major surveying activities, a survey coordination meeting shall be held, and the following agenda items shall be discussed and coordinated with the Engineer:

A. Surveying and staking methods;

B. Stake marking;

C. Grade control for courses of material;

D. Referencing;

E. Structure control;

F. Field staking data;

G. Localization of the GNSS systems to the Department-established control points;

H. Protection of existing survey markers; and

I. Other procedures and controls necessary for the work.

6. The Contractor shall not start the physical work until the required survey or three-dimensional (3D) verification data for the affected work has been reviewed by the Engineer. Review of the construction survey does not relieve the Contractor of responsibility for correcting errors and omissions discovered
during the work and for bearing additional costs associated with the error or omission.

7. The Contractor shall maintain legibility of survey markings for the duration of the Project or until notified by the Engineer.

8. Upon completion of the Project, the Contractor shall remove and dispose of all staking material used on the Project.

9. Should the establishment or re-establishment of property acquisition lines, highway lines, or non-access lines be required, the Contractor shall notify the Engineer at least two (2) weeks in advance of need.

10. The Contractor shall provide and maintain safe facilities for convenient access by Department forces to all survey stakes, control points, batter boards, and references.

IV Specific Requirements:

1. Control points: The Contractor shall

A. Relocate initial horizontal and vertical control points in conflict with construction to areas that will not be disturbed by construction operations.

B. Furnish the coordinates, elevations, and support documentation for the relocated points before the initial points are disturbed.

C. Set durable markers for survey control that uniquely identifies the points.

D. Furnish the GNSS localization results at least seven (7) days before beginning construction layout survey work. If necessary, the GNSS localization calibration and associated 3D model shall be broken into two or more zones to maintain the localized relationship between control points and original ground.

2. Centerline establishment: The Contractor shall establish or reestablish centerline at roadway design cross-section locations as necessary to construct the work.

3. Original ground topographic verification: In areas where the plan existing ground elevation and the actual ground elevation are not within a tolerance of ±0.25 feet, the Contractor shall immediately notify the Engineer.

4. Horizontal Slope Limits and Reference Stakes: The Contractor shall

A. At a minimum, set stakes on both sides of centerline at the horizontal slope limit at cross-section intervals.

B. When the slope is designed with a roll at the top and toe, two stakes shall be set on each side of the roadway, one to mark the intersection of the normal cut or fill with existing ground and the other to determine the limit of the roll.

5. Clearing and Grubbing Limits: The Contractor shall set clearing and grubbing limits on both sides of centerline.

6. Finish-grade stakes: The Contractor shall

A. Set finish-grade stakes for grade elevations and horizontal alignment, on centerline and on each shoulder at design roadway cross-section intervals.

B. Reset finish-grade stakes as many times as necessary for construction of the roadway.

C. When the centerline curve radius is less than or equal to 250 feet, use a maximum spacing between stakes of 25 feet.

D. When the centerline curve radius is greater than 250 feet, use a maximum spacing between stakes of 50 feet.

7. Structures: The Contractor shall provide survey and staking data in accordance with the above requirements for Structures as follows:

A. Culverts: Verify and set culvert locations at the inlet, outlet, and inlet basin points according to the plans. If the proposed culvert design does not fit field conditions, notify the Engineer and provide the following:

i. Surveyed ground profile along the culvert centerline;

ii. Slope catch points at the inlet and outlet.

B. Bridges: Set adequate horizontal, vertical, reference and Working Points for bridge substructure and superstructure components. Field verify the girders, bridge chord, bridge tangent, or control lines are as specified on the bridge plans. Also establish and reference the centerline of each pier, bent, and abutment.

The Contractor shall establish the center line of bearings for all bridge abutments and piers, by setting offset hubs or reference points, so located and protected to ensure they remain undisturbed until such time as they are no longer needed. The Contractor shall mark the

location of anchor bolts to be installed, establish the elevation of bearing surfaces and check bearing plates to ensure installation at their proper elevation. Before the erection of structural steel or concrete beams the Contractor shall verify the locations, both vertically and horizontally, of all bearings and the distances between associated bearings.
The Contractor shall be responsible for conducting all surveys to verify the structural steel profile and alignment are as specified. The Contractor must submit survey and verification in a form acceptable to the Engineer a minimum of 7 days prior to installing the falsework and forms.

C. Retaining walls and Reinforced Soil Slopes: The Contractor shall set adequate horizontal, vertical, reference and Working Points to perform the work.

8. Borrow and Waste sites: The Contractor shall

A. Perform field work necessary for initial layout and measurement of borrow or waste sites.

B. Establish site limits and clearing limits.

C. Measure both original and final ground conditions and submit cross-sections as directed by the Engineer.

9. Utility Relocations: The Contractor shall provide additional reference stakes to assist the Engineer and public utility personnel to accurately identify the proposed locations for utility facilities to be relocated. At least 2 weeks prior to the scheduled relocation of public utilities, the Contractor shall stake out the following features throughout the limits of utility relocations at a maximum spacing of 25 feet, unless directed otherwise by the Engineer:

A. Edge of road on the side adjacent to the proposed utility relocations.

B. Both edges of sidewalks, where shown on the plans.

C. Proposed drainage location(s) and invert elevation(s) at proposed utility locations.

D. Finished grade where existing utility facilities will be reset or relocated.

10. Regulated Areas: The Contractor shall install and maintain reference stakes at 25 foot spacing, or as directed by the Engineer, along the permitted permanent or temporary regulated impacted areas depicted in the permit applications. Each stake shall be legibly marked identifying the baseline station and offset, and the feature it represents.

11. Pavement Markings: Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer shall establish and document pavement marking control points from the existing markings within the limits of the proposed pavement markings or pavement marking grooves. These control points shall be used to reestablish the positions of the lanes,

the beginnings and endings of tapers, channelization lines for on- and off-ramps, lane-use arrows, stop bars, driveways, private drives, road entrances, and any lane transitions in the Project area, including all line striping grooving. The Contractor shall use these control points to provide appropriate pre-marking prior to the installation of final markings, including grooves.

The Contractor shall provide and maintain reference stakes or markings immediately off the edge of pavement, at 100 foot intervals and at any point where there is a change in pavement markings. If the Contractor proposes an alternative method to establish and document pavement marking control points, it must be approved by the Engineer.

For roadways where the existing pavement markings need to be reestablished or pavement marking grooves are to be installed on non-limited access roadways, the markings shall be adjusted as directed by the Engineer. These adjustments are to provide wider shoulders to accommodate pedestrian and bicycle traffic while maintaining through travel lane widths of no less than 11 feet.

Unless otherwise noted in the Project documents, lane and shoulder widths for commonly encountered half sections shall be established as shown in the table below:

Centerline to curb or edge of road	Lane width	Shoulder width
12 to 16 feet	11 feet	Remaining Pavement
17 to 20 feet	12 feet	Remaining Pavement

For Projects that only consist of removal and replacement of pavement markings, the requirement for a licensed land surveyor to supervise the staking is waived.

12. Miscellaneous survey and staking: The Contractor shall survey and stake other work such as guiderail, curb and gutter, turf establishment, regulated areas, watercourses and excavation limits for structures. When staking increments are not specified, the Contractor shall propose increments for the Engineer’s review. The Contractor shall maintain or replace these stakes until the Engineer approves their removal.

Table 9.80-1

Construction Survey Staking Tolerances[1]

Staking Phase	Horizontal	Vertical
Control points set from existing control points.[2]	±0.03 feet	±0.01 feet × √N
Centerline points including all points of curvature and references.	±0.06 feet	±0.03 feet
Slope-stake and slope-stake references.[3]	±0.25 feet	±0.25 feet
Culverts, ditches, and minor drainage structures stakes.	±0.25 feet	±0.06 feet
Retaining walls stakes.	±0.06 feet	±0.03 feet
Bridge substructures and superstructure stakes.[4]	±0.03 feet	±0.03 feet
Pavement markings stakes. [5]	±0.50 feet	N/A
Curb and gutter stakes.	±0.06 feet	±0.03 feet
Working Points. [4]	±0.03 feet	N/A
Clearing and grubbing limit stakes.	±1.00 feet	N/A
Roadway subgrade finish stakes.	±0.16 feet	±0.03 feet
Roadway finish grade stakes.	±0.16 feet	±0.03 feet

1 At statistical 95% confidence level. Tolerances are relative to existing control points.

2 N is the number of instrument setups.

3 Take the cross-sections normal to the centerline ±1 degree.

4 Bridge control is established as a local network and the tolerances are relative to that network.

5 This tolerance also applies to alternative methods of establishing and documenting pavement marking control points from the existing markings, such as GPS recording.

9.80.04—Method of Measurement: Construction Surveying, being paid on a lump sum basis, will not be measured for payment. Prior to beginning the work, the Contractor shall submit a proposed schedule of values for review and concurrence by the Engineer.

9.80.05—Basis of Payment: Construction Surveying will be paid for at the Contract lump sum price for "Construction Surveying," based on completed portions of the work. This price shall include all labor, submittals, maintenance, materials, tools, equipment, removal of materials and all work incidental thereto.

Pay Item	Pay Unit
Construction Surveying	l.s.

Bass Road Bridge Repairs Over Merrick Brook

Bass Road Bridge - Looking Northerly
Bridge # 04772 - Scotland Connecticut

General Notes:

1. *This drawing illustrates the proposed repairs to the Bass Road bridge, crossing Merrick Brook in Scotland Connecticut. These repairs will be done to both the west and east abutments.*
   The proposed repairs consist of:
   1 Installation of water management and pollution control measures as shown and as appropriate.
   2. Installation of traffic control measures, including setting up a bypass route for traffic.
   2 Removal of the existing ACROW bridge and storing it onsite.
   3. Removal and disposal of the existing concrete bridge underlying the ACROW bridge, including its abutments and any fill material between the ACROW bridge abutment and the existing concrete bridge.
   4. Installation of helical piles on the west side abutment.
   5. Installation of tieback anchors on the west side abutment.
   6. Identical tasks (1 through 4) on the east side abutment of the bridge.
   7. Replacement of the ACROW bridge on the modified abutments.
   8. Final site cleanup, inspections, and equipment removal from the site.

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Project: 220307

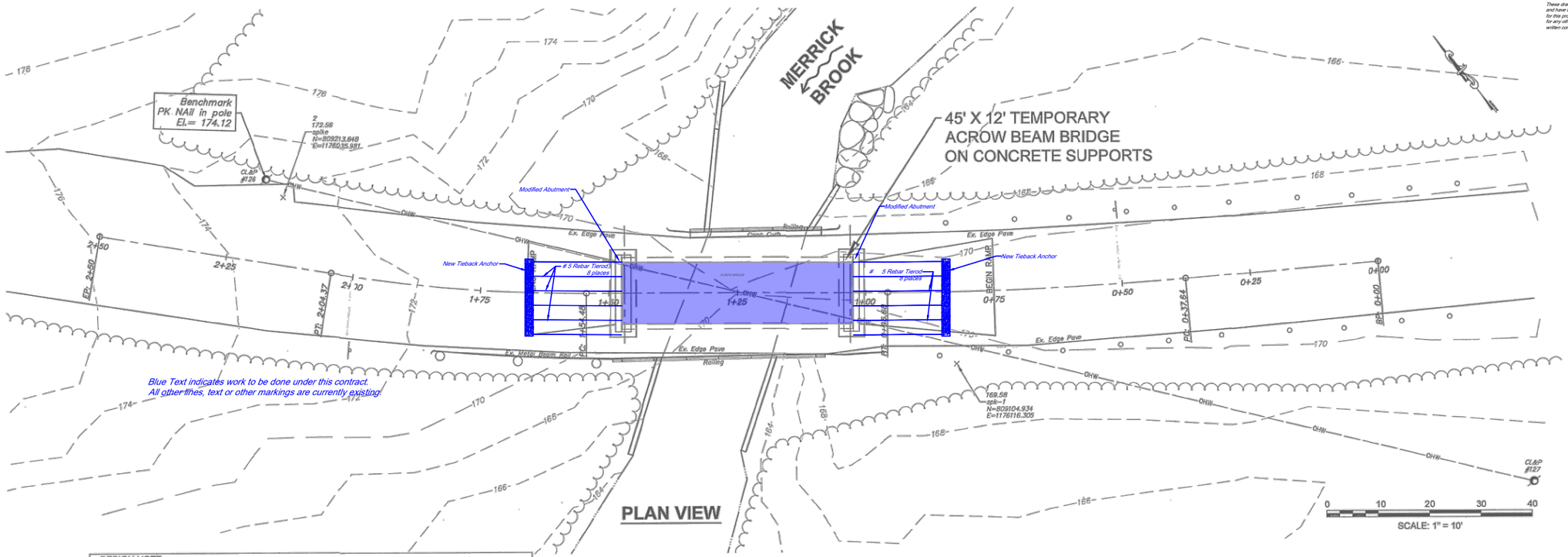
Project: Bass Road Bridge Over Merrick Brook Abutment Repairs
Sheet Title: Cover Sheet
Location: Bass Road, Scotland, Connecticut

Client: Town of Scotland
Address: 9 Devotion Road
Scotland, Connecticut

Scale: None

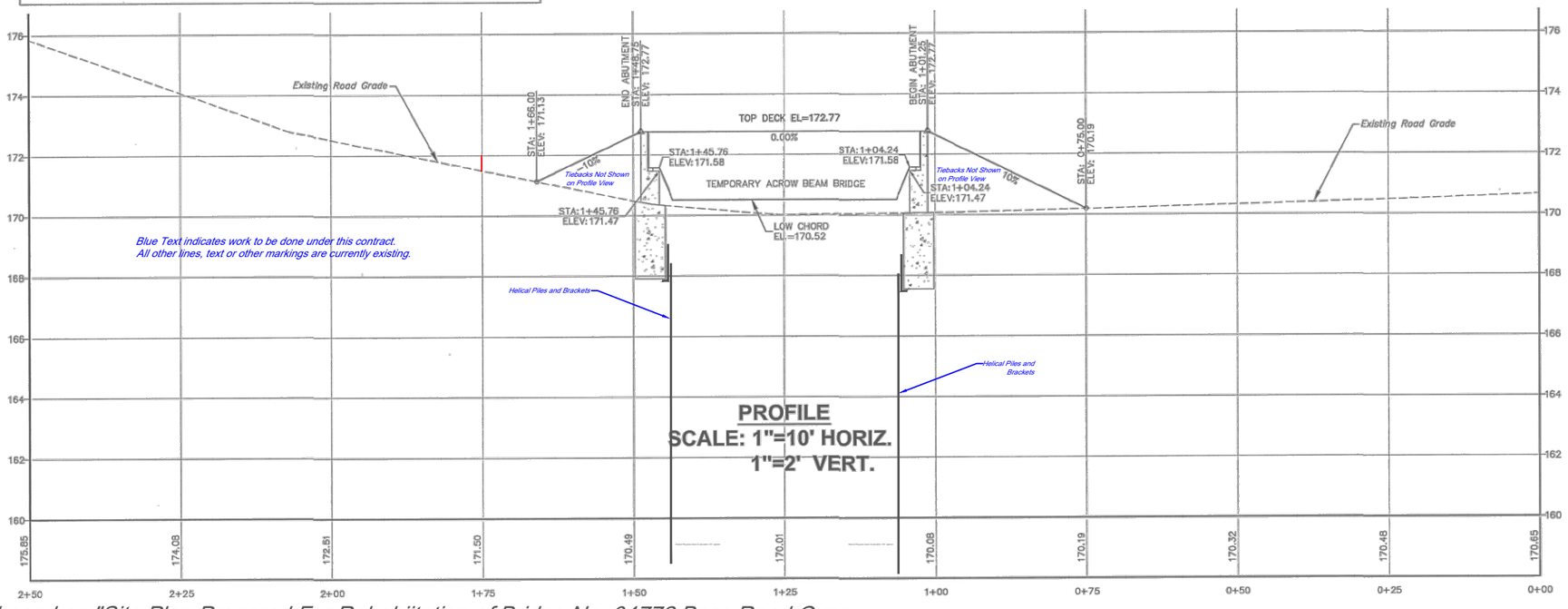
Sheet: C-1

Date: 02/14/2023



BASS ROAD

DESIGN NOTE:
THE PRE-FABRICATED STEEL SUPERSTRUCTURE, REINFORCED CONCRETE STUB ABUTMENTS, APPROACH RAMPS AND PRECAST CONCRETE BARRIER CURBS, AS SHOWN ON THESE PLANS, ARE CONSIDERED TEMPORARY FACILITIES TO SERVE FOR NO LONGER THAN FOUR YEARS AFTER THEIR INSTALLATION, DURING WHICH TIME A PERMANENT REPLACEMENT OF THE EXISTING BRIDGE CAN BE DESIGNED PERMITTED AND CONSTRUCTED.



1. *Drawing based on "Site Plan Prepared For Rehabiitation of Bridge No. 04772 Bass Road Over Merrick Brook Scotland Connecticut drawn by Lenard Engineering, Inc. dated 5/13/20*
2. *Scale reduced slightly to 1" = 10.67'*
3. *Blue text and lines show proposed changes to the abutments.*

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Project: 220307

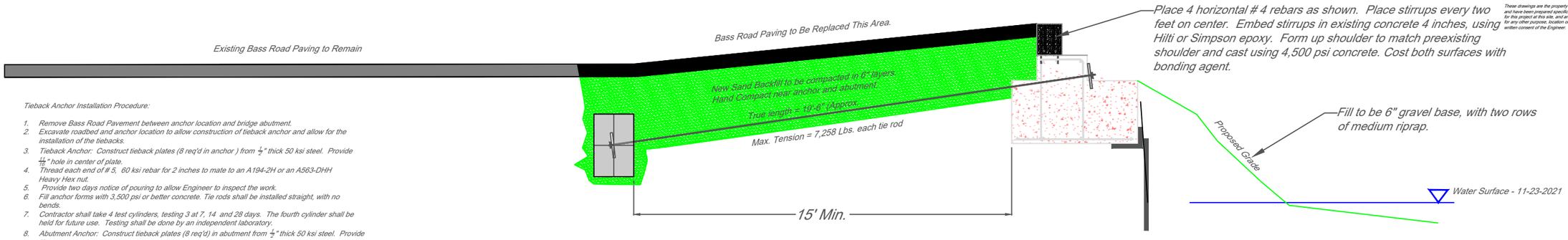
Project: Bass Road Bridge Over Merrick Brook Abutment Repairs
Sheet Title: Plan and Profile
Location: Bass Road, Scotland, Connecticut

Client: Town of Scotland
Address: 9 Devotion Road
Scotland, Connecticut

Scale: As Shown

Sheet: S-1

Date: 02/03/2023

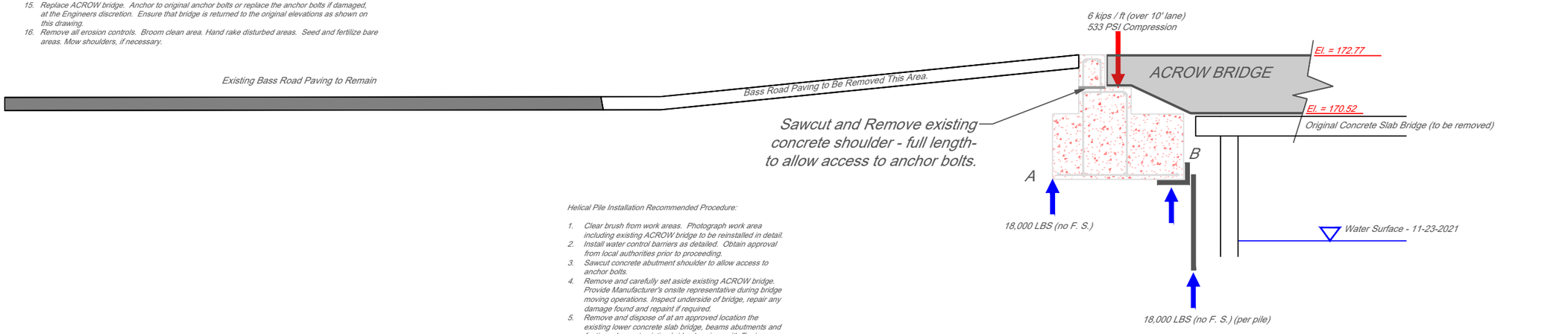


Tieback Installation Section View

Scale: 1" = 2'-0"

Tieback Anchor Installation Procedure:

1. Remove Bass Road Pavement between anchor location and bridge abutment.
2. Excavate roadbed and anchor location to allow construction of tieback anchor and allow for the installation of the tiebacks.
3. Tieback Anchor: Construct tieback plates (8 req'd in anchor) from ½" thick 50 ksi steel. Provide 1⅛" hole in center of plate.
4. Thread each end of # 5, 60 ksi rebar for 2 inches to mate to an A194-2H or an A563-DHH Heavy Hex nut.
5. Provide two days notice of pouring to allow Engineer to inspect the work.
6. Fill anchor forms with 3,500 psi or better concrete. Tie rods shall be installed straight, with no bends.
7. Contractor shall take 4 test cylinders, testing 3 at 7, 14 and 28 days. The fourth cylinder shall be held for future use. Testing shall be done by an independent laboratory.
8. Abutment Anchor: Construct tieback plates (8 req'd) in abutment from ½" thick 50 ksi steel. Provide 1⅛" hole in center of plate.
9. Verify using Hilti rebar scanner (PS300) the location of the rebar in the existing abutment. Avoid existing rebar. Call Engineer if existing rebar is damaged or found in the abutment anchor area.
10. Drill ⅞" hole in abutment to accept tie rod. Sawcut a hole in the top surface of the abutment to allow installation of the tie rod as shown. Place the tie rod into the abutment.
10. Install tie rod nut at abutment after installing anchor plate. Ensure two full threads show after installation of tie rod nut.
11. Pack area behind anchor plate to ensure uniform bearing. Embed lower portion of anchor plate in sawcut hole, using a nonshrink epoxy mortar (Five Star or similar). Shape mortar to drain water away from anchor plate and tie rod.
12. Wrap tie rod in plastic, secured with duct tape for the full lenght of the tie rod, including exposed ends. Place yellow caution tape approximately one foot above the tie rods, then backfill with sand to appropriate subbase depth.
    Compact new backfill in 6" layers to 95 % proctor.
13. Rebuild abutment shoulder as detailed.
14. Pave road bed to match existing pavement in width and depth.
15. Replace ACROW bridge. Anchor to original anchor bolts or replace the anchor bolts if damaged, at the Engineers discretion. Ensure that bridge is returned to the original elevations as shown on this drawing.
16. Remove all erosion controls. Broom clean area. Hand rake disturbed areas. Seed and fertilize bare areas. Mow shoulders, if necessary.

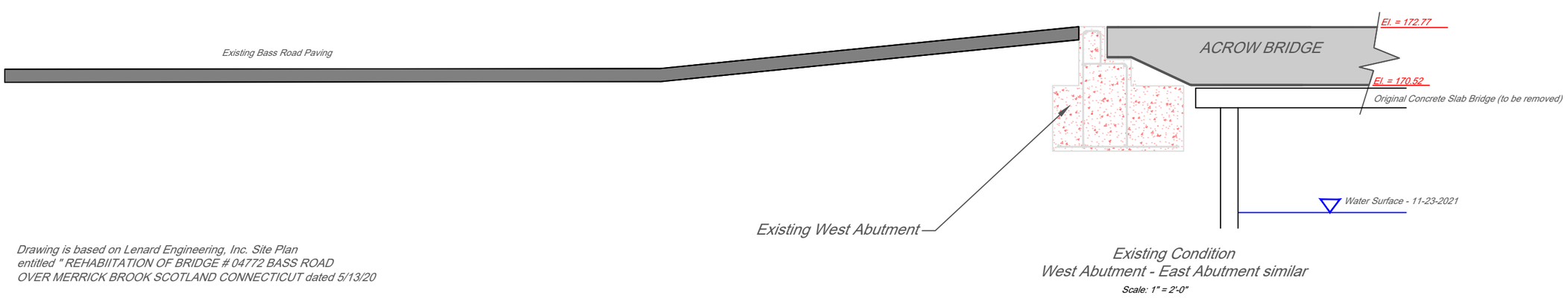


Helical Pile Installation Recommended Procedure

Scale: 1" = 2'-0"

Helical Pile Installation Recommended Procedure:

1. Clear brush from work areas. Photograph work area including existing ACROW bridge to be reinstalled in detail.
2. Install water control barriers as detailed. Obtain approval from local authorities prior to proceeding.
3. Sawcut concrete abutment shoulder to allow access to anchor bolts.
4. Remove and carefully set aside existing ACROW bridge. Provide Manufacturer's onsite representative during bridge moving operations. Inspect underside of bridge, repair any damage found and repaint if required.
5. Remove and dispose of at an approved location the existing lower concrete slab bridge, beams abutments and footings. Inspect existing bridge bearings with Engineer. Replace bridge bearings if required.
6. Excavate to new ACROW bridge abutment, provide sufficient depth below bottom of abutment to install helical piles.
7. Install helical piles to approved depth and torque values. Engineer of Record to inspect helical pile installation. Install one pile at a time. Do not excavate for more than one helical pile installation at a time.
8. Cover helical piles with bank run gravel and medium riprap (30" minimum depth).
9. Remove water control barriers.



Existing Condition
West Abutment - East Abutment similar

Scale: 1" = 2'-0"

Drawing is based on Lenard Engineering, Inc. Site Plan entitled " REHABIITATION OF BRIDGE # 04772 BASS ROAD OVER MERRICK BROOK SCOTLAND CONNECTICUT dated 5/13/20

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Project: 220307

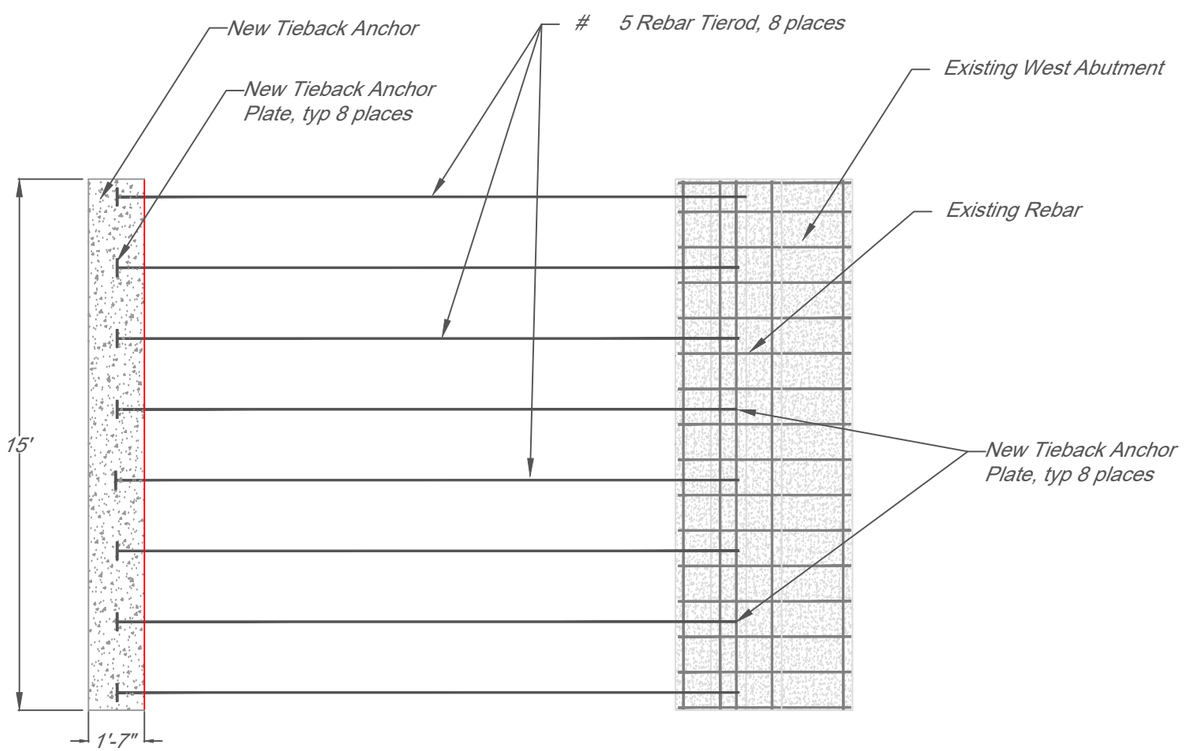
Project: Bass Road Bridge Over Merrick Brook Abutment Repairs
Sheet Title: West Abutment Elevations
Location: Bass Road, Scotland, Connecticut

Client: Town of Scotland
Address: 9 Devotion Road
Scotland, Connecticut

Scale: 1" = 2'-0"

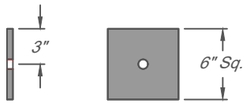
Sheet:
S-2

Date:
02/03/2023



Tieback Installation Plan View At West Abutment

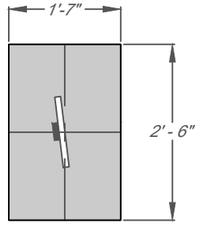
Scale: 1" = 2' - 0"



Typical Anchor Plate - 16 pieces required

1. Make from 60 ksi steel
2. Hole to be $\frac{3}{4}$" diameter.

Scale: 1" = 6"



Tieback Anchor Elevation View

Scale: 1" = 1'-0"

For the helical piles (a total of 12 piles is required for both abutments)

Use Six piles on the south side of the north abutment. These should be spaced six feet apart, running east - west. The piles should be A.B. Chance piles, SS175 Helical piles with:

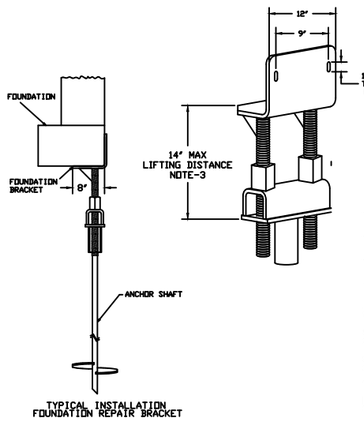
1. Lead section: Part # 1500093 (One 10" helix, One 12" helix).
   Extensions shall match the lead section: Part # C2788225 (5 ft long)
   Transition Piece shall be Part # C1501365 (1 ft long)
   Plain Extension Section: Part # C2788219 (7 ft long) or as field determined and approved.

Total length shall be 15 feet minimum.

2. Connecting Bracket shall be: Chance Helical Direct Jack Underpinning Bracket (50,000 lb working capacity). Part # C150-0733

South abutment design is identical.

DIRECT JACK BRACKET FOR CHANCE HELICAL PILES



-NOTES-

1. HOT DIP GALVANIZE PER ASTM A153-(LATEST REVISION).
2. ASSEMBLE COMPLETE AS SHOWN IN SIDE VIEW.
3. RECOMMENDED ANCHOR SHAFT CUTOFF LEVEL BELOW THE BOTTOM OF THE FOOTING IS 14.5" FOR MAXIMUM LIFT DISTANCE.
4. MATERIAL SPECIFICATIONS: BRACKET BODY : 1/2" THICK STEEL PER ASTM A36 LATEST REV. T-PIPE TUBE BODY : STEEL PER ASTM A572 GRADE 50, LATEST REV. T-PIPE PIPE : STEEL PIPE PER ASTM A500 LATEST REV. LIFTING STUDS: WILLIAMS FORM #11 GRADE 90.
5. SEE ICC EVALUATION SERVICE INC., EVALUATION PERPORT NO. ESR-2794 FOR NOMINAL, DESIGN, AND ALLOWABLE STRENGTH VALUES AND/OR CONDITIONS OF USE CONCERNING INFORMATION PRESENTED ON THIS DRAWING.

BRACKET CATALOG NUMBER	T-PIPE CATALOG NUMBER	PILE MODEL	ASD ALLOWABLE STRENGTH IN AXIAL COMPRESSION (kips)[1,2,3,4]					
			2500 psi CONCRETE[5]		3000 psi CONCRETE[5]		4000 psi CONCRETE[5]	
			FIRM SOIL	SOFT SOIL	FIRM SOIL	SOFT SOIL	FIRM SOIL	SOFT SOIL
C1500738	INCL W/BRKT	SS5/150	47.5	15.5	47.5	15.5	47.5	15.5
C1500840	INCL W/BRKT	RS2875.203	48.3	37.7	48.3	37.7	48.3	37.7
C1500840	INCL W/BRKT	RS2875.276	51.0	42.0	51.0	42.0	51.0	42.0
C1500841	INCL W/BRKT	RS3500.300	60.0	60.0	60.0	60.0	60.0	60.0

[1]Refer to Section 4.1.3 of ESR-2794 for descriptions of fixed condition, pinned condition, soft soil and firm soil.
[2]Strength ratings include an allowance for corrosion over a 50-year service life and presume the supported structure is braced in accordance with IBC Section 1810.2.2
[3]Strength ratings apply to the specific bracket, T-pipe and anchor/pile models listed.
[4]See Section 4.1.2 of ESR-2794 for applicable limit states that must be evaluated by a registered design professional.
[5]Refer to the specified compressive strength of concrete at 28 days.

SHAFT SIZE	CAT. NUMBER	MINIMUM ULTIMATE STRENGTH	WORKING LOAD
SS175	C1500733	100,000 LBS	50,000 LBS

ICC-ES LISTED
ESR-2794

PERFORMANCE TOLERANCE CHART

HUBBELL® POWER SYSTEMS

TITLE: BRACKET, DIRECT JACK

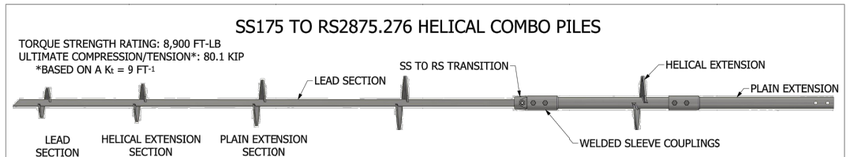
SIZE	DWG NO.	CAT / PART / ASSY NO.	REV
SB	SA1500733	SEE CHART	D

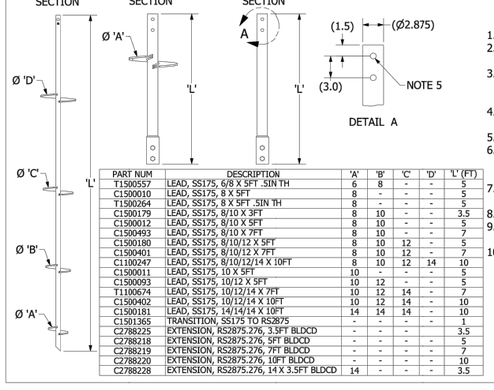
DO NOT SCALE THIS DRAWING | DRN BY JVH | DATE 6/13/19 | SHEET 1 OF 1

THIS SYMBOL IDENTIFIES CRITICAL FEATURES

SS175 TO RS2875.276 HELICAL COMBO PILES

TORQUE STRENGTH RATING: 8,900 FT-LB
ULTIMATE COMPRESSION/TENSION*: 80.1 KIP
*BASED ON A K_t = 9 FT^{-1}





PART NUM	DESCRIPTION	'A'	'B'	'C'	'D'	'L' (FT)
T1500557	LEAD, SS175, 6/8 X 5FT .5IN TH	6	8	-	-	5
C1500010	LEAD, SS175, 8 X 5FT	8	-	-	-	5
T1500264	LEAD, SS175, 8 X 5FT .5IN TH	8	-	-	-	5
C1500179	LEAD, SS175, 8/10 X 3FT	8	10	-	-	3.5
C1500012	LEAD, SS175, 8/10 X 5FT	8	10	-	-	5
C1500493	LEAD, SS175, 8/10 X 7FT	8	10	-	-	7
C1500180	LEAD, SS175, 8/10/12 X 5FT	8	10	12	-	5
C1500401	LEAD, SS175, 8/10/12 X 7FT	8	10	12	-	7
C1100247	LEAD, SS175, 8/10/12/14 X 10FT	8	10	12	14	10
C1500011	LEAD, SS175, 10 X 5FT	10	-	-	-	5
C1500093	LEAD, SS175, 10/12 X 5FT	10	12	-	-	5
T1100674	LEAD, SS175, 10/12/14 X 7FT	10	12	14	-	7
C1500402	LEAD, SS175, 10/12/14 X 10FT	10	12	14	-	10
C1500181	LEAD, SS175, 14/14/14 X 10FT	14	14	14	-	10
C1501365	TRANSITION, SS175 TO RS2875	-	-	-	-	1
C2788225	EXTENSION, RS2875.276, 3.5FT BLDCD	-	-	-	-	3.5
C2788218	EXTENSION, RS2875.276, 5FT BLDCD	-	-	-	-	5
C2788219	EXTENSION, RS2875.276, 7FT BLDCD	-	-	-	-	7
C2788220	EXTENSION, RS2875.276, 10FT BLDCD	-	-	-	-	10
C2788228	EXTENSION, RS2875.276, 14 X 3.5FT BLDCD	14	-	-	-	3.5

* * NOTES * *

1. HOT DIP GALVANIZED PER ASTM A123
2. LEAD AND EXTENSION SECTION LENGTHS AND HELIX SPACINGS ARE NOMINAL
3. PIPE MATERIAL PER ASTM A618 OR A500 GRADE B/C MIN YIELD 50KSI. SOLID SHAFT MATERIAL PER ASTM A29 & A576 MOD SS TO RS ADAPTER MATERIAL DUCTILE IRON
4. HELIX MATERIAL LOW CARBON STEEL MEETING THE GENERAL REQUIREMENTS OF AISI OR ASTM A572, A656, OR A1018
5. COUPLING BOLTS Ø 0.75 INCH HEX HEAD PER SAE J429 GRADE 5.
6. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL FOR ALL MATERIALS AND MANUFACTURING PROCESSES
7. ALL WELDING TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
8. ALL MEASUREMENTS ARE IN INCHES UNLESS SPECIFIED.
9. HARDWARE IS PROVIDED WITH EXTENSIONS AND HELICAL EXTENSION SECTIONS.
10. HELIX SPACING IS THREE DIAMETERS OF LOWER HELIX.

CHANCE®

HUBBELL POWER SYSTEMS, INC.

TITLE: HELICAL PIER SS175 TO RS2875.276 BLDCD

SIZE	CAT / PART / ASSY NO.	DWG NO.	REV
B	SEE CHART	SA2788225	A

DO NOT SCALE THIS DRAWING | DRN BY TMK | DATE 11/22/17 | SHEET 1 OF 1

CE civil engineers
433 Providence - New London Turnpike
North Stonington, CT 06359 Ph: (860) 884-5473
Email: charles@cecivilengineers.com

Project: 220307

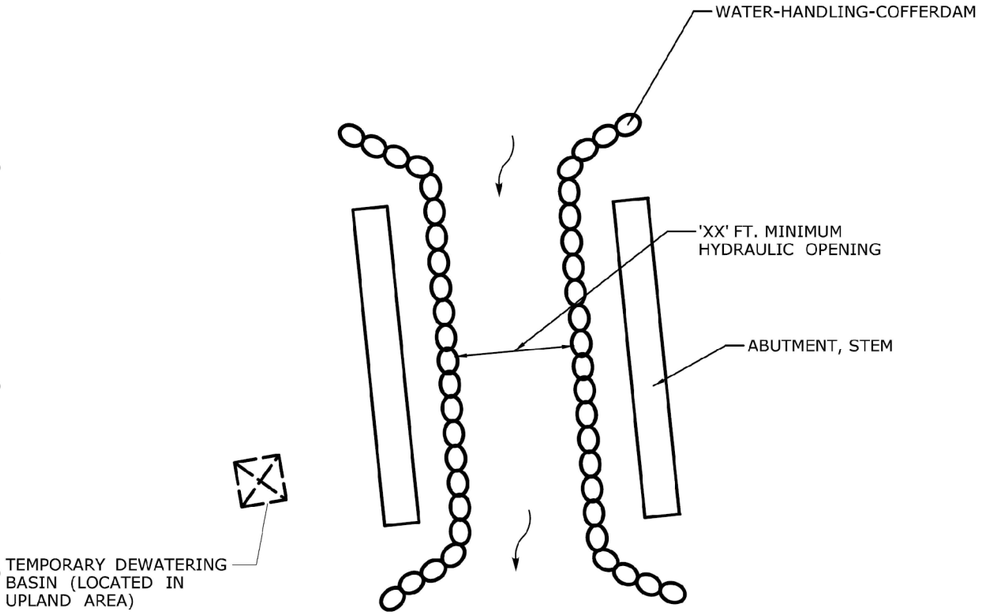
Project: Bass Road Bridge Over Merrick Brook Abutment Repairs
Sheet Title: West Abutment Plan View
Location: Bass Road, Scotland, Connecticut

Client: Town of Scotland
Address: 9 Devotion Road
Scotland, Connecticut

Scale: As Shown

Sheet: S-3

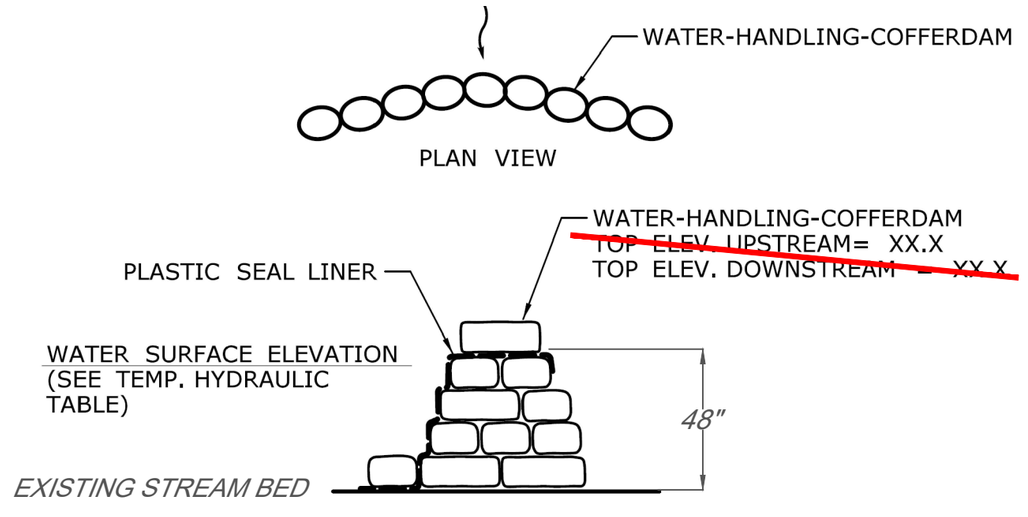
Date: 02/03/2023



WATER HANDLING COFFERDAM - SANDBAGS
No Scale

TEMPORARY HYDRAULIC DATA

Two year Frequency Discharge	*49.50 CFS*
Two year Water Surface Upstream Depth	*32.1 inches*
Two year Water Surface Downstream Depth	*44.0 inches*
Minimum Hydraulic Opening	*24 Feet*



WATER-HANDLING-COFFERDAM
SANDBAGS
(NOT TO SCALE)

1. *The contractor shall maintain water flow through the temporary water handling system as required during construction.*
2. *Equipment shall not be permitted in the stream when the temporary water handling system is not in place without approval from the Engineer.*
3. *Water handling cofferdam shall consist of plastic liner, sandbags, or any other approved system that the contractor elects to use which will safely convey water flows through the the construction area, shall be able to support construction activity and excavation, and shall conform to the permits.*
4. *Temporary dewatering basin pump and discharge shall be located by the contractor and approved by the Engineer prior to the start of construction. "Dirtbag 15' x 15' discharge bag is preapproved.*
5. *Contractor may choose to work on both abutments simultaneously or on each abutment individually.*

CE civil engineers
433 Providence - New London Turnpike
North Stonington, CT 06359 Ph: (860) 884-5473
Email: charles@cecivilengineers.com

Project: 220307

Project: Bass Road Bridge Over Merrick Brook Abutment Repairs
Sheet Title: Cover Sheet
Location: Bass Road, Scotland, Connecticut

Client: Town of Scotland
Address: 9 Devotion Road
Scotland, Connecticut

Scale: None

Sheet:
S-4

Date:
02/03/2023