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New York State Department of Transportation
ENGINEERING INSTRUCTION

EI 98-037

Title: **BRIDGE DECK CONSTRUCTION SPECIFICATION IMPROVEMENTS- IMPLEMENTATION OF RECOMMENDATIONS BY THE BRIDGE DECK TASK FORCE**

Distribution:
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Approved:

Paul J. Mack, Deputy Chief Engineer, Technical Services Division

10/19/98
Date

EFFECTIVE DATE. This instruction is effective on all Department contracts let on or after May 6, 1999. If the changes can be incorporated into ongoing contracts, it is recommended to do so.

PURPOSE. This instruction transmits specification changes for bridge deck construction practices. It also specifies the use of high performance (Class HP) concrete for superstructure slabs and structural approach slabs.

BACKGROUND. The continuing efforts of the New York State Department of Transportation (NYSDOT) to improve all operations resulted in the appointment of a Bridge Deck Task Force in the fall of 1994. It was composed of specialists in structures design, research, materials, and construction. Their intent was to evaluate current bridge deck design and construction practices and develop policies, standards and specifications to provide longer-lasting bridge decks. Final recommendations were issued in an October, 1995 report titled *The "State-of-the-Art" Bridge Deck.*

Design and reinforcement placement revisions were implemented under EI 97-18. Development of Class HP concrete for bridge decks was implemented under EI 96-24. Construction practices were reviewed to tie in with this new material. **EI 98-037** addresses four areas that were considered for improvement:

- Pre-Placement planning
- Placement technical issues
- Curing
- Loading limitations

Pre- Placement Planning:

Pre-placement planning considerations consist primarily of a requirement for a Pre-Placement meeting. The contractor and the Engineer-In-Charge (EIC) will agree on the Pre-Placement plan prior to bridge deck concrete placement. This plan will outline:

- equipment
- crew size and expertise
- personnel assignments
- construction techniques
- safety considerations
- concrete mix design and placement rates
- curing practices
- delivery/ conveyance equipment/ traffic control

The contractor and EIC will discuss these issues prior to placement and a record of this meeting will be kept with the contract documents. The intent is not for the EIC to direct the contractor's operations but to ensure that the highest quality placement is achieved. The equipment should be of the type and quantity necessary to complete the concrete deck placement, with back-up equipment available in the event of breakdowns. Crew size and expertise should be such that all phases of placement are completed properly with no delays occurring to any individual tasks. Construction techniques should be reviewed so that it is clear to both parties what is expected to occur during the placement. Concrete mix design should be reviewed to ensure proper ingredients are included in the mix, specifically that sufficient water reducing set-retarder is maintained for the duration of the placement. Additionally, assurance must be given that the established concrete delivery will be maintained, with back-up plans in place in the event of plant breakdown. Curing practices should be discussed to ensure that this very important process in the placement is commenced in a proper and timely fashion. Proposed routing and positioning of concrete and conveyance equipment shall be discussed. Maintenance and protection of traffic during delivery and placement must be insured. The need for possible additional flagging to reduce traffic speed during stage construction should be addressed.

Placement Technical Issues:

Placement technical issues have been reviewed and modified to improve the quality of the finished concrete deck. The technical issues consist of:

- **Determination of "go/no go" for placement** - Specification revisions allow the EIC the ability to deny commencement of the placement if environmental conditions are not favorable and the contractor has not provided a means to mitigate adverse environmental effects to the concrete. The goal is for placement to occur during a period of low evaporation rate, with high humidity, for optimum hydration. The use of the evaporation chart in the specifications remains in effect. The contractor must satisfy the EIC that a low evaporation rate will be maintained for the duration of the placement before commencement can occur.
- **Placement rate management** - When the contractor's operations result in excessive time elapsed between either the concrete placement and the commencement of finishing operations or the establishment of the appropriate curing application in accordance with the specifications, the Engineer may discontinue the placement operation until corrective actions have been made.
- **Improved consolidation techniques and equipment** - Consolidation of the concrete has been improved by the use of additional vibrators, determined by the contractor's placement rate. Vibrators are required to be covered with rubberized or elastomeric covers to avoid or limit damage to epoxy coated reinforcing.

Curing:

It is well known and documented that curing is a significant factor influencing concrete properties relating to durability, permeability, and compressive strength. Curing specification changes and modifications are:

- **Improved commencement of curing** - Timely establishment of curing will benefit the long term performance and durability of the concrete deck. Revisions to specifications provide that wet burlap be placed within five minutes from the completion of finishing and texturing, and within 30 minutes from the time of concrete placement. Wet curing is further required to commence in 10 minutes from the time of burlap placement.
- **Improved control of curing during breakdown periods** - In the event of a breakdown of placement operations or slow delivery, concrete preceding the finishing machine must be covered with plastic or burlap to mitigate evaporation. This will maintain the proper water content and alleviate possible problems with finishing resulting in a poor surface.

• **Increased duration of curing** - The duration of the curing has been increased to provide better hydration resulting in a more durable bridge deck. The specifications will allow removal of curing in limited areas for limited durations to place concrete sidewalks or safety walks, perform sawcut grooving, or setting of bridge railing and fencing.

Loading Limitations:
The revised specifications allow reduced vehicle loading of the structural slab (during the curing period) seven days after placement and legal loads no sooner than fourteen calender days after the fourteen day curing period.

SPECIFICATIONS CHANGES. Section 555 of the Standard Specifications of January 2, 1990, as addended, and Section 557 of the Standard Specifications of January 2, 1995 will be changed as per the attached.

IMPLEMENTATION. The attached changes to the Standard Specifications, as recommended by the Bridge Deck Task Force, will be inserted into contract proposals by the Main Office Design Quality Assurance Bureau.

COST IMPACT. The cost of the individual changes vary. Many of the specification changes are for processes which are currently in practice however they have never been fully addressed by the specifications. Further, depending on a given contractor, current practice of some requirements are already being performed. The pre-placement requirements should not result in any increased costs. Placement technique issues will directly effect cost due to increased need for labor. The cost of protective covers for vibrators and the use of additional vibrators will vary as a result of each contractors methods and manpower during a concrete placement. The costs of the improvements to curing should be minimal. Overall, a cost increase could be expected from the increased labor and equipment associated with the specification changes however, this increase would be minimal since placement is a small portion of the total deck construction process. Thes costs should be more than offset by the increased bridge deck durability.

CONTACT PERSON. Any questions regarding the construction specification changes should be directed to the Construction Division at (518) 457-6472.

Make the following changes to the Standard Specifications of January 2, 1990 and Addendum No. 1 (Adopted November 18, 1993):

Pages 5-37 through 5-64 and page V-10 and V-11

SECTION 555 - STRUCTURAL CONCRETE

Under **§555- 1 DESCRIPTION.**, ***add*** the following between " Portland Cement concrete" and " as indicated on the plans...":
"and high performance (Class HP) concrete for structures,"

Under **§555- 2.02 Concrete for Structures.**, ***delete*** the entire second paragraph which begins with "Unless otherwise directed by the Engineer..." and ***replace*** with the following:
"Superstructure slab and structural approach slab concrete shall meet the material requirements for Class HP in accordance with Department directives. Unless otherwise directed by the Engineer, all superstructure slab or structural approach slab concrete shall contain a set retarding, water reducing admixture, meeting the requirements of §711-08. The quantity of the admixture shall be sufficient to achieve the minimum retardation consistent with placing conditions such that the slab concrete remains plastic for the duration of placement. The dosage rate used shall be determined by the Contractor in accordance with the manufacturer's recommendation and in concurrence with the Regional Materials Engineer. The dosage shall remain consistent for the duration of the concrete placement except for minor adjustments to meet changing environmental conditions."

Under **§555- 3.04 Handling and Placing Concrete.**, ***add*** "***C. Superstructure Slabs and Structural Approach Slabs.*** A Pre- placement Meeting will be required between the Contractor and the Engineer at least one week prior to the start of any concrete placement for superstructure slabs. The Contractor and the Engineer shall review all aspects of the proposed placement including, but not limited to, the following;

- Equipment proposed for use and for back-up
- Planned workforce and assigned tasks of each designated position, based on experience and expertise
- Proposed construction techniques
- Safety considerations
- Concrete mix design
- Admixtures and performance data; dosage rates shall be approved by the Regional Materials Engineer
- Proposed placement rate, provisions for adverse weather, curing and loading schedules
- Curing Practices to be employed as well as the workforce designated to the curing process
- Delivery / conveyance equipment, including deck finishing machine setup and operation
- Traffic control

No concrete shall be placed until all aspects of the proposed placement is approved by the Engineer. Modifications must be submitted in writing to the Engineer for approval.

No concrete shall be placed until all the provisions of §555 -3.04A are met, environmental conditions are deemed favorable, and satisfactory means to mitigate adverse environmental conditions exist. Favorable environmental conditions are defined as an expected weather forecast suitable for concrete placement during the entire placement duration, the evaporation rate not to exceed 0.25 lbs./s.f./hr, and acceptable curing temperatures are expected for the duration of the curing period.

The contractor shall provide any necessary means to mitigate adverse weather conditions and curing temperatures with the approval of the Engineer. Failure to maintain acceptable environmental conditions will result in the concrete placement being stopped and a bulkhead put in place.

Concrete temperature will be taken from the same sample used for slump and air content tests. These measurements will be taken prior to commencement of concrete placement. If, in the Engineer's opinion, significant changes occur in atmospheric conditions, additional atmospheric measurements and calculations by the contractor will be required. The contractor will supply all instruments necessary to make the required calculations. All instruments will be certified by an independent laboratory, approved by the Engineer, as being in good working order, and as having been calibrated within the 12 months prior to use. The contractors measurements and calculations will be subject to the Engineer's approval.

Vibrating of concrete shall be in accordance with §555-3.04B except as modified herein. All internal vibrators will have a rubberized or elastomeric cover to prevent damage to epoxy coated reinforcing bars. The vibrators and covers will be inspected for defects prior to use and shall be subject to the approval of the Engineer. The number of vibrators required shall be one for every 30 cubic yards of concrete placed per hour, with a minimum of two vibrators in use at all times, and equally spaced across the placement front. One additional vibrator will be available for use as a back-up."

Under **§555- 3.07 Concrete Joints A. Construction Joints.,** ***Delete*** the fifth paragraph which begins with "When joining fresh concrete..." and ***replace*** with the following: "When joining fresh concrete to that which has already set, the concrete in place shall have its surface cut over with a suitable tool to remove all loose and foreign materials. This surface shall be thoroughly blast cleaned to remove all laitance and loosened concrete. The surface shall be thoroughly wetted to provide a saturated surface dry condition at the time of concrete placement. Immediately before placing the new concrete, the forms shall be drawn tightly against the concrete in place. The existing concrete surface shall be thoroughly coated with a thin coating of portland cement mortar bonding grout (705-22), thoroughly brushed into the surface."

Under **§555- 3.08 Finishing. D. Finishing Integral Wearing Surfaces on Superstructure Slabs.,** ***delete*** the sixth paragraph which begins "The specific method..." and ***replace*** with: "The specific method and equipment that the Contractor proposes to use for finishing will be supplied during the Pre-placement Meeting and will be subject to approval by the Regional Construction Engineer."

At the end of the seventh paragraph which begins with "Screed supports shall be..." ***add*** the following: "The screed rail supports shall be spaced at a maximum of 2 ft on center. During stage construction, the screed support system shall be on the stage being placed."

At the end of the twelfth paragraph which begins "Care shall be taken..." ***add*** the following: "In the event the placement is delayed as a result of equipment breakdowns or delivery problems, all concrete in place will be protected from evaporation by covering the surface with wet burlap, curing blankets, or plastic sheets. Excessive delays will require the establishment of a bulkhead and the ceasing of the placement."

Delete the fourteenth paragraph which begins "Prior to texturing..."and ***replace*** with the following: "Prior to texturing, the finished concrete surface shall be examined by the Contractor and the

Engineer using a straight-edge approved by the Engineer. The straight-edge shall not be less than 10 ft long. It shall be furnished by the Contractor, and maintained in good, usable condition, at the placement site at all times. While the concrete is still plastic, surface depressions shall be filled with concrete of the same class as the placement in progress. Surface irregularities greater than 3/16 inch in 10 feet in either the longitudinal, or the transverse direction shall be corrected in a manner acceptable to the Engineer. Thin mortar, or laitance, which may have accumulated ahead of the finishing screeds shall be removed from the work site. They shall not be used to fill depressions."

Delete paragraph number 21 which begins with "After the concrete surface..." and ***delete*** paragraph number 22 which begins with " All corrections shall..." in this subsection.

Under **§555-3.09 Curing.** ***C. Exposed Concrete Surface - Bridge Superstructures,*** ***delete*** the entire section and ***replace*** it with the following:

"§555-3.09 Curing. ***C. Exposed Concrete Surface - Bridge Superstructures and Structural Approach Slabs.*** All exposed surfaces of structural slabs shall be cured in the following manner:

After finishing and plastic concrete texturing operations are completed, the concrete surface shall be completely covered with clean, prewetted burlap in accordance with the requirements of §555-3.09A, except that allowable time period for wet burlap covering shall not exceed five minutes from the completion of texturing, and 30 minutes from the time of concrete placement. Care shall be taken so as not to damage the finished surface and texturing. However, under no circumstances shall the curing be delayed beyond the specified period. Burlap shall meet the requirements of §711-06. It shall be lapped a minimum of 12 inches. Lapped edges are not required to be sealed. Burlap shall be thoroughly saturated over its entire surface area and shall be drained of excess water prior to its application. Burlap shall be kept continuously wet. Continuous burlap wetting shall commence 10 minutes from the time the wet burlap is placed. It shall be protected from displacement in a manner acceptable to the Engineer.

1. Superstructure Slabs After the burlap placement has been fully completed, the concrete surface shall be cured for 14 curing days. The Contractor may use either option listed below. After seven curing days, the Contractor may be permitted to perform incidental work on the structure under the loading limitations of §555-3.10. The burlap may be displaced in limited areas, for short durations, to perform items such as sawcut grooving, placement of sidewalks, safety walks, curbing, bridge rail and fencing. The amount of burlap displaced to perform these operations shall be limited to the immediate area affected by the Contractor's operations. All concrete surfaces exposed during these operations shall be kept in a saturated condition. Removable forms shall remain in place until the minimum curing period is complete.

a. ***Fourteen Day Continuous Wetting:*** Leave all burlap in place for 14 curing days. Provide continuous, uniform wetting for the entire curing period.

b. ***Wet Burlap and Curing Covers:*** Provide continuous uniform wetting for seven curing days. After seven curing days, either of the following methods may be used:

i. Remove all burlap after seven curing days have passed. Apply curing covers conforming to the requirements of §555-3.09 B immediately upon burlap removal. Plastic coated fiber blankets meeting the requirements of §711-03 are not required to be laid

dry. Application and maintenance of covers shall be in accordance with §555-3.09 A. Concrete cured in this manner shall not be exposed to the atmosphere for more than 10 minutes between burlap removal and curing cover placement.

ii. Apply curing covers conforming to the requirements of §555-3.09 B directly over the wet burlap. Plastic coated fiber blankets meeting the requirements of §711-03 are not required to be laid dry. Application and maintenance of covers shall be in accordance with §555-3.09 A. The concrete surface shall be inspected periodically to ensure that its condition remains saturated.

The Contractor shall inform the Engineer of the intended curing procedure at the Pre-placement Meeting.

2. *Structural Approach Slabs, Curbs, Sidewalks and Safety walks on Bridges.*
After the burlap placement has been fully completed, leave all burlap in place for 7 curing days. Provide continuous, uniform wetting for the entire curing period. Forms for curbs, sidewalks, and safety walks shall remain in place until the minimum curing period is complete. Forms for structural approach slabs shall remain in place until sufficient strength is achieved, as determined by the Engineer, to avoid damage to the concrete. After removal of approach slab forms, the formed surfaces shall be cured as per the requirements of §555-3.09B."

Under **§555-3.09 *D. 2. b. Wet Burlap and Curing Covers*** (§555-3.09C2). , ***delete*** the first sentence and ***replace*** with the following: "Except for structural slabs, the required period shall be increased by three curing days."

Under **§555- 3.10 Loading Limitations for Structural Slabs.,** ***delete*** paragraphs ***A***. through ***B.1.*** in their entirety and ***replace*** with the following:
"Superstructure slabs, during the curing period, may be subjected to a vehicle load not to exceed ten tons, or a wheel load not to exceed three tons no sooner than seven calendar days after placement. Full legal loading may commence using either of the following options:

"A. Superstructure slabs may be subjected to full legal loads no sooner than 14 calendar days after completion of the curing period.

B. The Contractor may subject a superstructure slab to its full legal load upon completion of the curing period, or any day thereafter provided that the procedure below is followed:

1. The Contractor shall notify the Engineer at the Pre-placement Meeting of the intention to subject the slab to full legal load prior to the 14th day after completion of curing."

Under **§555- 3.11 Curing and Loading Periods for Structural Approach Slabs.,** ***delete*** the entire section and ***replace*** with the following:

"555-3.11 Loading Limitations for Structural Approach Slabs, Sidewalks and Safety walks on Bridges. The Contractor may subject structural approach slabs, sidewalks, and safety walks to their full legal load upon completion of the 7 day curing period."

Under **§555- 3.13 Damaged or Defective Concrete.,** ***delete*** the entire section and ***replace*** with the following :

"555-3.13 Damaged or Defective Concrete., Damaged or defective concrete shall be defined by and repaired in accordance with the requirements of §502, Portland Cement Concrete Pavement, and §502-3.15, Defective or Damaged Concrete. Vertical and Overhead Patching Material meeting the requirements of §701-08 shall be used for patching vertical and overhead surfaces. After the Structural slab concrete has hardened, the Engineer shall examine it using the Contractor's straight-edge. Surface irregularities greater than 3/16 inches in 10 feet shall be corrected in a manner acceptable to the Engineer. Unless otherwise directed by the Regional Materials Engineer, the concrete used for repairs shall be of the same materials as that used for the original placement. All corrections shall be made at the Contractor's expense."

Under **§555-5 BASIS OF PAYMENT.,** in the fourth line, ***add*** "mechanical connectors where specified" between "flexible water stops" and "asbestos sheet packing".

Make the following changes to the Standard Specifications of January 2, 1995:

Pages 5-68 through 5-75

SECTION 557- SUPERSTRUCTURE SLABS AND STRUCTURAL APPROACH SLABS

Under **§557- 1 DESCRIPTION.** ***delete*** the entire section and replace with " The work shall consist of placing high performance (Class HP) concrete to construct superstructure slabs or structural approach slabs, as required by the plans.

Under **§557- 2 MATERIALS. A. Concrete.,** ***delete*** the entire section and replace with the following:

> ***"A. Concrete.*** This shall meet the material requirements for Class HP in accordance with Department directives.
>
> Unless otherwise directed by the Engineer, all concrete shall contain a set retarding, water reducing admixture, meeting the requirements of §711-08. The quantity of the admixture shall be sufficient to achieve the minimum retardation consistent with placing conditions. The dosage rate used shall be determined by the Contractor in accordance with the manufacturer's recommendation and in concurrence with the Regional Materials Engineer. The dosage shall remain consistent for the duration of the concrete placement except for minor adjustments to meet changing environmental conditions."

Under **§557- 3.06 Handling and Placing Concrete.,** ***delete*** the entire section and ***replace*** with the following:

"557- 3.06 Handling and Placing Concrete. The requirements of § 555- 3.04 shall apply. A Pre- placement Meeting will be required between the contractor and the Engineer at least one week prior to the start of any concrete placement for superstructure slabs. The contractor and the Engineer shall review all aspects of the proposed placement including, but not limited to, the following;

- Equipment proposed for use and for back-up
- Planned workforce and assigned tasks of each designated position, based on experience and expertise
- Proposed construction techniques
- Safety considerations
- Concrete mix design
- Admixtures and performance data; dosage rates shall be approved by the Regional Materials Engineer
- Proposed placement rate, curing and loading schedules
- Curing Practices to be employed as well as the workforce designated to the curing process
- Delivery/ conveyance equipment, including deck finishing machine setup and operation
- Traffic control

No concrete shall be placed until all aspects of the proposed placement are approved by the Engineer. Modifications must be submitted in writing to the Engineer for approval.

No concrete shall be placed until all the provisions of §555 -3.04A are met, environmental conditions are deemed favorable, and satisfactory means to mitigate adverse environmental conditions exist. Favorable environmental conditions are defined as an expected weather forecast suitable for concrete placement during the entire placement duration, the evaporation rate not to exceed 1.2 kg/m²/hr, and acceptable curing temperatures expected for the duration of the curing period.

The contractor shall provide any necessary means to mitigate adverse weather conditions and curing temperatures with the approval of the Engineer. Failure to maintain acceptable environmental conditions will result in the concrete placement being stopped and a bulkhead put in place.

The contractor is responsible to take the necessary measurements and calculate the theoretical evaporation rate. The measurements for air temperature, relative humidity, and wind speed will be taken as near as possible to the final placement location of the concrete.

Concrete temperature will be taken from the same sample used for slump and air content tests. These measurements will be taken prior to commencement of concrete placement. If, in the Engineer's opinion, significant changes occur in atmospheric conditions, additional atmospheric measurements and calculations by the contractor will be required. The contractor will supply all instruments necessary to make the required calculations. All instruments will be certified by an independent laboratory, approved by the Engineer, as being in good working order, and as having been calibrated within the 12 month prior to use. The contractors measurements and calculations will be subject to the Engineer's approval.

Vibrating of concrete shall be in accordance with §555-3.04B except as modified herein. All internal vibrators will have a rubberized or elastomeric cover to prevent damage to epoxy coated reinforcing bars. The vibrators and covers will be inspected for defects prior to use and shall be subject to the approval of the Engineer. The number of vibrators required shall be one for every 30 cubic meters of concrete placed per hour, with a minimum of two vibrators in use at all times, and equally spaced across the placement front. One additional vibrator will be available for use as a back-up."

Under **§557- 3.08 Cold Joints.**, ***delete*** the last line in its entirety.

Under **§557- 3.09 Finishing Integral Wearing Surfaces on Superstructure Slabs.**, ***delete*** the sixth paragraph, which begins with "The specific method..." and ***replace*** with: " The specific method and equipment that the contractor proposes to use for finishing will be supplied during the Pre-placement Meeting and will be subject to approval by the Regional Construction Engineer."

At the end of the seventh paragraph, which begins with "Screed supports shall be ..." ***add*** the following:

"The screed rail supports shall be spaced at a maximum of 600 mm on center. During stage construction, the screed support system shall be on the stage being placed."

At the end of the twelfth paragraph, which begins with "Care shall be taken..." ***add*** the following: "In the event the placement is delayed as a result of equipment breakdowns or delivery problems, all concrete in place will be protected from evaporation by covering the surface with wet burlap,

curing blankets, or plastic sheets. Excessive delays will require the establishment of a bulkhead and the ceasing of the placement."

Delete the fourteenth paragraph which begins "Prior to texturing..." and ***replace*** with:
"Prior to texturing, the finished concrete surface shall be examined by the Contractor and the Engineer using a straight-edge approved by the Engineer. The straight-edge shall not be less than 3 m long. It shall be furnished by the Contractor, and maintained in good, usable condition, at the placement site at all times. While the concrete is still plastic, surface depressions shall be filled with concrete of the same class as the placement in progress. Surface irregularities greater than 5 millimeters in 3 meters in either the longitudinal, or the transverse direction shall be corrected in a manner acceptable to the Engineer.Thin mortar, or laitance, which may have accumulated ahead of the finishing screeds shall be removed from the work site. They shall not be used to fill depressions."

Delete paragraph number 21, which begins with " After the concrete surface..." and delete paragraph number 22 , which begins with "All corrections shall..." from this subsection.

Under **§557- 3.12 Curing *A. General.*, *delete*** the entire section and ***replace*** it with the following:

"557- 3.12 Curing *A. General.* All exposed surfaces of superstructure slabs , and structural approach slabs shall be cured in the following manner:

After finishing and plastic concrete texturing operations are completed, the concrete surface shall be completely covered with clean, prewetted burlap in accordance with the requirements of §555-3.09A, except that allowable time period for wet burlap covering shall not exceed five minutes from the completion of texturing, and 30 minutes from the time of concrete placement. Care shall be taken so as not to damage the finished surface and texturing. However, under no circumstances shall the curing be delayed beyond the specified period. Burlap shall meet the requirements of §711-06. It shall be lapped a minimum of 300 mm. Lapped edges are not required to be sealed. Burlap shall be thoroughly saturated over its entire surface area and shall be drained of excess water prior to its application. Burlap shall be kept continuously wet. Continuous burlap wetting shall commence 10 minutes from the time the wet burlap is placed. It shall be protected from displacement in a manner acceptable to the Engineer."

1. Superstructure Slabs After the burlap placement has been fully completed, the concrete surface shall be cured for 14 curing days. The Contractor may use either option listed below. After seven curing days, the Contractor may be permitted to perform incidental work on the structure under the loading limitations of §557-3.14. The burlap may be displaced in limited areas, for short durations, to perform items such as sawcut grooving, placement of sidewalks, safety walks, curbing, bridge rail and fencing. The amount of burlap displaced to perform these operations shall be limited to the immediate area affected by the Contractor's operations. All concrete surfaces exposed during these operations shall be kept in a saturated condition. Immediately after the work is completed in the affected area, all burlap shall be replaced for the duration of the curing period. Removable forms shall remain in place until the minimum curing period is complete.

a. *Fourteen Day Continuous Wetting:* Leave all burlap in place for 14 curing days. Provide continuous, uniform wetting for the entire curing period.

b. *Wet Burlap and Curing Covers:* Provide continuous uniform wetting for seven curing days. After seven curing days, either of the following methods may be used:

i. Remove all burlap after seven curing days have passed. Apply curing covers conforming to the requirements of §555-3.09 B immediately upon burlap removal. Plastic coated fiber blankets meeting the requirements of §711-03 are not required to be laid dry. Application and maintenance of covers shall be in accordance with §555-3.09 A. Concrete cured in this manner shall not be exposed to the atmosphere for more than 10 minutes between burlap removal and curing cover placement.

ii. Apply curing covers conforming to the requirements of §555-3.09 B directly over the wet burlap. Plastic coated fiber blankets meeting the requirements of §711-03 are not required to be laid dry. Application and maintenance of covers shall be in accordance with §555-3.09 A. The concrete surface shall be inspected periodically to ensure that its condition remains saturated.

The Contractor shall inform the Engineer of the intended curing procedure at the Pre-placement Meeting.

2. *Structural Approach Slabs, Curbs, Sidewalks and Safety walks on Bridges.*
After the burlap placement has been fully completed, leave all burlap in place for 7 curing days. Provide continuous, uniform wetting for the entire curing period. Forms for curbs, sidewalks, and safety walks shall remain in place until the minimum curing period is complete. Forms for structural approach slabs shall remain in place until sufficient strength is achieved, as determined by the Engineer, to avoid damage to the concrete. After removal of approach slab forms, the formed surfaces shall be cured as per the requirements of §555-3.09B."

Under **§557-3.12 B. Curing Temperatures.,** ***delete*** this sentence and ***replace*** with the following:
"Only the requirements of §555-3.09C 1. and 2a shall apply."

Under **§557- 3.13 Damaged or Defective Concrete.,** ***add*** the following: "After the concrete has hardened, the Engineer shall examine it using the Contractor's straight-edge. Surface irregularities greater than 5 millimeters in 3 meters shall be corrected in a manner acceptable to the Engineer. Unless otherwise directed by the Regional Materials Engineer, the concrete used for repairs shall be of the same materials as that used for the original placement. All corrections shall be at the Contractor's expense."

Under **§557- 3.14 Loading Limitations for Superstructure Slabs.,** ***delete*** paragraphs ***A.*** through ***B.1.*** in their entirety and ***replace*** with the following:
"Superstructure slabs, during the curing period, may be subjected to a vehicle load not to exceed nine metric tons, or a wheel load not to exceed three metric tons no sooner than seven calendar days after placement. Full legal loading may commence using either of the following options:

A. Superstructure slabs may be subjected to full legal loads no sooner than 14 calender days after completion of the curing period.

B. The Contractor may subject a superstructure slab to its full legal load upon completion of the curing period, or any day thereafter provided that the procedure below is followed:

1. The Contractor shall notify the Engineer at the Pre-placement Meeting of the intention to subject the slab to full legal load prior to the 14th day after completion of curing."

Under **§557-3.15 Curing and Loading Periods for Structural Approach Slabs.,** ***delete*** the entire section and ***replace*** with the following:

"557-3.15 Loading Limitations for Structural Approach Slabs, Sidewalks and Safety walks on Bridges. The Contractor may subject structural approach slabs, sidewalks, and safety walks to their full legal load upon completion of the 7 day curing period."

Under **§557- 5 BASIS OF PAYMENT.,** in the fourth line, ***add*** "mechanical connectors where specified" between "flexible water stops" and "sheet packing".