ADMINISTRATIVE INFORMATION:
This EI is effective with projects submitted for the letting of 01/08/2009.
This EI supersedes EI 03-034.

PURPOSE:
• To revise the existing lightweight concrete superstructure slab, sidewalk and thin
structural application special specifications when the use of high-performance,
lightweight concrete is desired to decrease structural slab dead load, as discussed in the
NYSDOT Bridge Manual.

TECHNICAL INFORMATION:
• Cost Impact - There is no anticipated cost increase when comparing the new special
specifications to the existing specifications for lightweight, High Performance concrete.
• The changes being made to the specifications are minor and are merely an update to the
referenced specifications so that the references agree with the NYSDOT Standard
Specifications of May 4, 2006.

IMPLEMENTATION: When included in a project, these revised specifications will be provided
by the Region with the final Plans, Specifications, and Estimate submittal to the Design Quality
Assurance Bureau. A separate specification for both Metric and US Customary units is being
transmitted by this issuance. The specifications written in US Customary units refer to the
Customary units is due to be issued in 2008.

DISAPPROVED SPECIFICATIONS:

557.0102--18 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH
INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED
557.0502--18 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH
INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED
557.0702--18 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH
SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED
557.0902--18 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH
SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED
557.32----16 LIGHTWEIGHT HIGH-PERFORMANCE OVERLAY
557.34----10 LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE
## DISAPPROVED SPECIFICATIONS (continued):

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>557.41----01</td>
<td>LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL SLABS - BOTTOM FORMWORK REQUIRED</td>
</tr>
<tr>
<td>557.41----05</td>
<td>LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE FOR STRUCTURAL SLABS - BOTTOM FORMWORK REQUIRED</td>
</tr>
<tr>
<td>557.61----18</td>
<td>LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE SIDEWALKS</td>
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## NEW SPECIFICATIONS:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>557.0104--18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED</td>
</tr>
<tr>
<td>557.0504--18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED</td>
</tr>
<tr>
<td>557.0704--18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED</td>
</tr>
<tr>
<td>557.0904--18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED</td>
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<tr>
<td>557.32----18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS</td>
</tr>
<tr>
<td>557.6101--18</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE SIDEWALKS</td>
</tr>
<tr>
<td>557.01040018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED</td>
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<tr>
<td>557.05040018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED</td>
</tr>
<tr>
<td>557.07040018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED</td>
</tr>
<tr>
<td>557.09040018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED</td>
</tr>
<tr>
<td>557.32000018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS</td>
</tr>
<tr>
<td>557.61010018</td>
<td>LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE SIDEWALKS</td>
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</tbody>
</table>
TRANSMITTED MATERIALS:
The following metric and US Customary Special Specifications are transmitted by this Engineering Instruction:

557.0104--18  LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED

557.0504--18  LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

557.0704--18  LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED

557.0904--18  LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

557.32----18  LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS

557.6101--18  LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE SIDEWALKS

557.01040018 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED

557.05040018 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

557.07040018 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED

557.09040018 LIGHTWEIGHT, HIGH-PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

557.32000018 LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS

557.61010018 LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE SIDEWALKS

The Special Specifications issued with this EI will be available on the Toolbox and the Department’s internet site at www.nysdot.gov.

BACKGROUND:  Class HP concrete has been the Department’s standard class of concrete for superstructure slabs since 1996. Special Specifications released with this EI provide an enhancement to this requirement when designers need to specify lightweight concrete.

CONTACT:  Direct any questions concerning this EI or revised specifications to the Field Engineering I office of the Materials Bureau at 518- 457- 5956.
DESCRIPTION. Furnish and place lightweight, high performance (Class HP) concrete to construct superstructure slabs as shown in the contract documents.

MATERIALS. Use materials meeting §557-2. Manufacture lightweight, high-performance concrete according to §501, and the following modifications:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous trial mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§ 701-03) cement. Use a minimum cementitious content of 400 kg/m³. Use 15-20% pozzolan (§711-10, Flyash or §711-12, GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 19 mm to 4.75 mm size designation in Table 1, ASTM C330.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.

   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      • Fine and coarse aggregate (saturated, surface dry condition) content in kg/m³.
      • Cementitious content in kg/m³.
      • Water content in kg/m³.
      • Unit mass of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit mass in accordance with ASTM C567.
      • 28-day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.

   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch masses to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.
B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water, using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system. If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch masses based on trials made with materials to be used in the work.

• If microsilica is added independently - weigh cumulatively in the following order: cement, fly ash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total mass of cementitious material, for each material draw mass.

• If microsilica is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash or GGBFS. Base the batching tolerance of ± 1% on the total mass of cementitious material, for each material draw mass.

E. Compressive Strength Determination. Achieve an average 28-day compressive strength of 25 MPa, or greater, with no individual cylinder compressive strength less than 21 MPa.

F. Density Determination. Produce concrete with an average dry unit mass ranging from 1750 to 1850 kg/m³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §557-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §557-3.01:

1. Use slump, unit mass and air tests as a control measure to maintain a suitable consistency. Perform slump, unit mass and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a-meter) as described in ASTM C173. Air content and slump placement limits are:

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<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content (%)</td>
<td>5.0</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Slump (mm)</td>
<td>65</td>
<td>75-125</td>
<td>125</td>
</tr>
</tbody>
</table>
2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately 5% of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, Fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place concrete according to §557-3.05, except that pumping is not permitted. When an integral wearing surface is required, finish the concrete according to 557-3.07. If the concrete will be overlaid with a separate wearing surface, finish the surface according to 557-3.09.

C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit mass, and air tests.

The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 m³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Curing. Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12 shall apply.

E. Repairs. Make any repairs as per the provisions of §557-3.16. Proposed repairs require Deputy Chief Engineer, Structures approval.

F. Rejection of Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 25 MPa, or an individual cylinder with a compressive strength less than 21 MPa.

G. Loading Limitations. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 25 MPa, or greater, with no individual cylinder less than 21 MPa.

METHOD OF MEASUREMENT. Apply all of the provisions of §557-4.

BASIS OF PAYMENT. Apply all of the provisions of §557-5.
**ITEM 557.32  18 LIGHTWEIGHT, HIGH - PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS**

**DESCRIPTION.** Prepare the surface and place lightweight high-performance concrete for thin structural applications. Limit the depth of the placement to 40-125 mm.

**MATERIAL REQUIREMENTS.** Use materials meeting the requirements of 557-2. Manufacture lightweight high-performance concrete according to §501, and the following modifications:

**A. Design.** Design a lightweight high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous trial mixture of cement, pozzolan (Fly ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding water-reducing admixture, and water as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 400 kg/m³. Use 15-20% pozzolan (§711-10, Flyash or §711-12, GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 10 mm to 2.36 mm size designation in ASTM C330, Table 1.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      - Fine and coarse aggregate (saturated surface dry condition) content in kg/m³.
      - Cement content in kg/m³.
      - Water content in kg/m³.
      - Unit mass of freshly mixed concrete in accordance with ASTM C138.
      - Dry unit mass in accordance with ASTM C567.
      - 28 day compressive strengths.
      - Batch quantities of all materials as they will appear on the batch record.
   b. The Materials Engineer, or their representative, will approve the batch masses prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch masses to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Material Method 9.1, or current Department directives.

**B. Stockpile Handling.** Construct lightweight aggregate stockpile(s) so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system. At the end of the wetting period, or after the rain ceases, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

**C. Sampling of Materials.** The Materials Engineer’s representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.
D. **Batching.** After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch masses based on trials made with materials to be used in the work.

- **If microsilica is added independently** - weigh cumulatively in the following order: cement, Fly ash (or GGBFS), and microsilica. Base the batching tolerance of ±0.5% on the total mass of cementitious material, for each material draw mass.

- **If microsilica is used as part of a blended cement** - weigh cumulatively in the following order: blended cement and Fly ash (or GGBFS). Base the batching tolerance of ±1% on the total mass of cementitious material, for each material draw mass.

E. **Compressive Strength Determination.** Achieve an average compression strength of 25 MPa, or greater, with no individual cylinder compressive strength less than 21MPa.

F. **Density Determination.** Produce concrete with an average dry unit mass ranging from 1750 to 1850 kg/m³ when tested in accordance with ASTM C567.

**CONSTRUCTION DETAILS.**

A. **Concrete Manufacturing and Transporting.** Apply the provisions of §584-3 and 557-3.01 with the following modifications:

1. Use slump, unit mass and air tests as a control measure to maintain a suitable consistency. Perform slump, unit mass and air tests according to Materials Method 9.2. Determine air content by the volumetric method described in ASTM C173. Air content and slump placement limits are:

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<th>Minimum</th>
<th>Desired</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>5.0</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Slump (mm)</td>
<td>65</td>
<td>65-90</td>
<td>100</td>
</tr>
</tbody>
</table>

2. If the lightweight coarse aggregate moisture content is less than saturated surface dry, introduce lightweight coarse aggregate, along with approximately 2/3 of the total mixing water, into the mixer and mix for a minimum of 10 minutes. Add the fine aggregate, admixtures, cement, Fly ash (or GGBFS), microsilica, and remaining mixing water and mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of placement operations to assist in the control of lightweight concrete mixing and placement.

B. **Handling, Placing and Finishing.** Handle and place the lightweight concrete according to 584-3.05 except that pumping will not be permitted. Place the concrete in one lift. Finish the concrete within 10 minutes after placement. In the event a delay prevents finishing within the 10 minute time limit, stop further placement and cover the unfinished concrete with plastic curing covers. Resume placement after the ability to finish the concrete within the 10 minute time limit was been restored. Apply curing within 10 minutes after finishing. Provide uniform, continuous
wetting with wet burlap for 7 days after curing has begun. In cold weather, the requirements of 557-3.12 apply.

**C. Testing.** Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit mass and air tests. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 m³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

**D. Repairs.** Make any repairs as per the provisions of §557-3.13. Proposed repairs require Deputy Chief Engineer, Structures approval.

**E. Rejection of Concrete.** The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 25 MPa, or an individual cylinder with a compressive strength less than 21 MPa.

**METHOD OF MEASUREMENT.** The quantity to be measured for payment will be the number of square meters satisfactorily installed, measured to the nearest 0.1 square meter. No measurement will be made for slab reconstruction concrete.

**BASIS OF PAYMENT.** Include the cost of all labor, materials and equipment necessary to complete the work in the square meter bid price.
DESCRIPTION. Furnish and place lightweight, high-performance (Class HP) concrete to construct sidewalks on a bridge as shown in the contract documents.

MATERIALS. Use materials meeting §555-2. Manufacture lightweight high-performance concrete according to §501, and the following modifications:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 400 kg/m³. Use 15-20% pozzolan (§711-10, Flyash, or §711-12, GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 19 mm to 4.75 mm size designation in Table 1, ASTM C330.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      • Fine and coarse aggregate (saturated surface dry condition) content in kg/m³.
      • Cement content in kg/m³.
      • Water content in kg/m³.
      • Unit mass of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit mass in accordance with ASTM C567.
      • 28 day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.
   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch masses to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system. If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.
D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch masses based on trials made with materials to be used in the work.

- If densified microsilica powder is used and added independently - weigh cumulatively in the following order: cement, Fly ash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total mass of cementitious material, for each material draw mass.

- If densified microsilica powder is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash (or GGBFS). Base the batching tolerance of ± 1% on the total mass of cementitious material, for each material draw mass.

E. Compressive Strength Determination. Achieve an average compression strength of 25 MPa, or greater, with no individual cylinder compressive strength less than 21 MPa.

F. Density Determination. Produce concrete with an average dry unit mass ranging from 1750 to 1850 kg/m³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §555-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §555-3.01:

1. Use slump, unit mass and air tests as a control measure to maintain a suitable consistency. Perform slump, unit mass and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a-meter) as described in ASTM C173. Air content and slump placement limits are:

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<tbody>
<tr>
<td>Slump (mm)</td>
<td>65</td>
<td>75-125</td>
<td>125</td>
</tr>
</tbody>
</table>

2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately % of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place concrete according to §555-3.04, except that pumping is not permitted. Finish the concrete surface according to 557-3.10. When bonding fresh concrete to hardened concrete, follow the provisions of 557-3.06.

C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit mass and air tests.
The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 m³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

**D. Curing.** Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12, Provisions for Concreting in Cold Weather shall apply.

**E. Repairs.** Repair damaged or defective concrete at no additional cost to the state. Damage or defects are defined as, but not limited to; spalling, irregular cracking, tearing, honeycombing, scaling, surface imperfections or irregularities, and lack of smoothness. After the concrete has hardened, the Engineer will examine it for damage as appropriate. Using the Contractor’s straight edge surface irregularities and smoothness requirements will be checked. Surface irregularities greater than 5 mm in 3 m shall be corrected in a manner acceptable to the Department. Repairs to remove excessive concrete or irregularities shall be performed using methods and equipment that does not damage the concrete to remain. Removal of concrete shall be performed to maintain the appropriate cover of reinforcement.

Repairs to remove and replace damaged or defective concrete shall be performed by making all repair areas rectangular in shape and as close to square as possible. Sawcut the perimeter of the repair area to a depth of 20 ± 3 mm. Chip out concrete, using chisel bits only, to a uniform level, removing all damaged or defective concrete. Angle the walls of the repair area at 45º toward the center of the repair, from the bottom of the perimeter sawcut.

Do not undercut existing concrete. Surface preparation, placement, and curing of the repair concrete shall be in accordance with specifications and Department directives for the material used.

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. Small repair areas may be repaired with concrete repair materials appearing on the Department’s Approved List providing the repair materials have similar characteristics as the original concrete.

**F. Rejection of Concrete.** The Engineer will reject any concrete represented by a cylinder set with an average compressive strength less than 25 MPa, or an individual cylinder with a compressive strength less than 21 MPa.

**METHOD OF MEASUREMENT.** The quantity measured for payment will be the number of square meters satisfactorily installed, measured to the nearest 0.1 square meter.

**BASIS OF PAYMENT.** Include the cost of all labor, materials and equipment necessary to complete the work in the square meter bid price.
DESCRIPTION. Furnish and place lightweight, high performance (Class HP) concrete to construct superstructure slabs as shown in the contract documents.

MATERIALS. Use materials meeting §557-2. Perform additional work as follows:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 675 lb/yd³. Use 15-20% pozzolan (§711-10, Flyash, or §711-12 GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 3/4 inch to No. 4 size designation in ASTM C330, Table 1.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      • Fine and coarse aggregate (saturated, surface dry condition) content in lb/yd³.
      • Cementitious content in lb/yd³.
      • Water content in lb/yd³.
      • Unit weight of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit weight in accordance with ASTM C567.
      • 28-day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.

   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch weights to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system.
If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch weights based on trials made with materials to be used in the work.

• If densified microsilica powder is used and added independently - weigh cumulatively in the following order: cement, fly ash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total weight of cementitious material, for each material draw weight.

• If densified microsilica powder is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash (or GGBFS). Base the batching tolerance of ± 1% on the total weight of cementitious material, for each material draw weight.

E. Compressive Strength Determination. Achieve an average 28-day compressive strength of 3600 psi, or greater, with no individual cylinder compressive strength less than 3000 psi.

F. Density Determination. Produce concrete with an average dry unit weight ranging from 110 to 115 lb/ft³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §557-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §557-3.01:

1. Use slump, unit weight and air tests as a control measure to maintain a suitable consistency. Perform slump, unit weight and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a- meter) as described in ASTM C173. Air content and slump placement limits are:

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content (%)</td>
<td>5.0</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Slump (inches)</td>
<td>2 1/2</td>
<td>3-5</td>
<td>5</td>
</tr>
</tbody>
</table>
2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately ¾ of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place concrete according to §557-3.05, except that pumping is not permitted. When an integral wearing surface is required, finish the concrete according to 557-3.07. If the concrete will be overlaid with a separate wearing surface, finish the surface according to 557-3.09.

C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit weight and air tests. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 yd³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Curing. Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12 shall apply.

E. Repairs. Make any repairs as per the provisions of §557-3.16. Proposed repairs require Deputy Chief Engineer, Structures approval.

F. Rejection of Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 3600 psi, or an individual cylinder with a compressive strength less than 3000 psi.

G. Loading Limitations. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 3600 psi, or greater, with no individual cylinder less than 3000 psi.

METHOD OF MEASUREMENT. Apply all of the provisions of §557-4.

BASIS OF PAYMENT. Apply all of the provisions of §557-5.
ITEM 557.32000018 LIGHTWEIGHT, HIGH-PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS

DESCRIPTION. Prepare the surface and place lightweight high-performance concrete for thin structural applications. Limit the depth of placement to 1 1/2 – 5 inches.

MATERIAL REQUIREMENTS. Use materials meeting §557-2. Manufacture lightweight high-performance concrete according to §501, and the following modifications:

A. Design. Design a lightweight high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding water-reducing admixture, and water as designed.

2. Use Type I, I/II II (§701-01) or Type SF (§ 701-03) cement. Use a minimum cementitious content of 675 lb/yd³. Use 15-20% pozzolan (§711-10, Fly ash or §711-12, GGBFS) and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 3/8” to #8 size designation in ASTM C330, Table 1.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.

   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data.

      • Fine and coarse aggregate (saturated surface dry condition) content in lb/yd³.
      • Cement content in lb/yd³.
      • Water content in lb/yd³.
      • Unit weight of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit weight in accordance with ASTM C567.
      • 28 day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.

   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch weights to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Material Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight aggregate stockpile(s) so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system. At the end of the wetting period, or after the rain ceases, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 quart sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.
ITEM 557.32000018  LIGHTWEIGHT, HIGH- PERFORMANCE CONCRETE FOR THIN STRUCTURAL APPLICATIONS

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch weights based on trials made with materials to be used in the work.

• If microsilica is added independently - weigh cumulatively in the following order: cement, fly ash (or GGBFS) and microsilica. Base the batching tolerance of ±0.5% on the total weight of cementitious material, for each material draw weight.

• If microsilica is used as part of a blended cement - weigh cumulatively in the following order: blended cement and fly ash (or GGBFS). Base the batching tolerance of ±1% on the total weight of cementitious material, for each material draw weight.

E. Compressive Strength Determination. Achieve an average compression strength of 3600 psi, or greater, with no individual cylinder compressive strength less than 3000 psi.

F. Density Determination. Produce concrete with an average dry unit weight ranging from 110 to 115 lb/ft³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS.

A. Concrete Manufacturing and Transporting. Apply the provisions of §584-3 and 557-3.01 with the following modifications:

1. Use slump, unit weight and air tests as a control measure to maintain a suitable consistency. Perform slump, unit weight and air tests according to Materials Method 9.2. Determine air content by the volumetric method described in ASTM C173. Air content and slump placement limits are:

<table>
<thead>
<tr>
<th>Air Content (%)</th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>5.0</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Slump (inches)</td>
<td>2 (\frac{1}{2})</td>
<td>(2 \frac{1}{2}-3\frac{1}{2})</td>
<td>4</td>
</tr>
</tbody>
</table>

2. If the lightweight coarse aggregate moisture content is less than saturated surface dry, introduce lightweight coarse aggregate, along with approximately 2/3 of the total mixing water, into the mixer and mix for a minimum of 10 minutes. Add the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and remaining mixing water and mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place the lightweight concrete according to 584-3.05 except that pumping will not be permitted. Place the concrete in one lift. Finish the concrete within 10 minutes after placement. In the event a delay prevents finishing within the 10 minute time limit, stop further placement and cover the unfinished concrete with plastic curing covers. Resume placement after the ability to finish the concrete within the 10 minute time limit was been restored. Apply curing within 10 minutes after finishing. Provide uniform, continuous wetting with wet burlap for 7 days after curing has begun. In cold weather, the requirements of 557-3.12 apply.
C. Testing. Test the concrete according to Materials Method 9.2. The unit weight of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit weight and air tests.

The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 yd³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Repairs. Make any repairs as per the provisions of §557-3.13. In addition, the Engineer will reject any concrete represented by a cylinder set with an average compressive strength less than 3600 psi, or an individual cylinder with a compressive strength less than 3000 psi. Proposed repairs require Deputy Chief Engineer, Structures approval.

METHOD OF MEASUREMENT. The quantity to be measured for payment will be the number of square feet satisfactorily installed, measured to the nearest square foot. No measurement will be made for slab reconstruction concrete.

BASIS OF PAYMENT. Include the cost of all labor, materials and equipment necessary to complete the work in the square foot bid price.
ITEM 557.61010018 LIGHTWEIGHT HIGH-PERFORMANCE CONCRETE SIDEWALKS ON BRIDGES

DESCRIPTION. Furnish and place lightweight, high-performance (Class HP) concrete to construct sidewalks on a bridge as shown in the contract documents.

MATERIALS. Use materials meeting §555-2. Perform additional work as follows:
Manufacture lightweight high-performance concrete according to §501, and the following modifications:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 675 lb/yd³. Use 15-20% pozzolan (§711-10, Flyash or §711-12, GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 3/4 inch to No. 4 size designation in Table 1, ASTM C330.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      • Fine and coarse aggregate (saturated surface dry condition) content in lb/yd³.
      • Cement content in lb/yd³.
      • Water content in lb/yd³.
      • Unit weight of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit weight in accordance with ASTM C567.
      • 28 day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.

   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch weights to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system at the direction of the Materials Engineer. If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use, unless otherwise directed by the Materials Engineer.
C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 quart sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch weights based on trials made with materials to be used in the work.

- If densified microsilica powder is used and added independently - weigh cumulatively in the following order: cement, flyash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total weight of cementitious material, for each material draw weight.

- If densified microsilica powder is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash (or GGBFS). Base the batching tolerance of ± 1% on the total weight of cementitious material, for each material draw weight.

E. Compressive Strength Determination. Achieve an average compressive strength of 3600 psi, or greater, with no individual cylinder compressive strength less than 3000 psi.

F. Density Determination. Produce concrete with an average dry unit weight ranging from 110 to 115 lb/ft³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §555-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §555-3.01:

1. Use slump, unit weight and air tests as a control measure to maintain a suitable consistency. Perform slump, unit weight and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a-meter) as described in ASTM C173. Air content and slump placement limits are:

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<td>9.0</td>
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<td>Slump (inches)</td>
<td>2 1/2</td>
<td>3-5</td>
<td>5</td>
</tr>
</tbody>
</table>

2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately 9% of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients.

   If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling and Placing. Handle and place concrete according to §555-3.04, except that pumping is not permitted. Finish the concrete surface according to 557-3.10. When bonding fresh concrete to hardened concrete, follow the provisions of 557-3.06.
C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit weight and air tests.

The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 yd³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Curing. Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12, Provisions for Concreting in Cold Weather shall apply.

E. Repairs. Repair damaged or defective concrete at no additional cost to the state. Damage or defects are defined as, but not limited to; spalling, irregular cracking, tearing, honeycombing, scaling, surface imperfections or irregularities, and lack of smoothness.

After the concrete has hardened, the Engineer will examine it for damage as appropriate. Using the Contractor’s straight edge surface irregularities and smoothness requirements will be checked. Surface irregularities greater than 3/16 inches in 10 feet shall be corrected in a manner acceptable to the Department.

Repairs to remove excess concrete or irregularities shall be performed using methods and equipment that does not damage the concrete to remain. Removal of concrete shall be performed to maintain the appropriate cover of reinforcement. Repairs to remove and replace damaged or defective concrete shall be performed by making all repair areas rectangular in shape and as close to square as possible. Sawcut the perimeter of the repair area to a depth of 3/4 ± 1/8 inches. Chip out concrete, using chisel bits only, to a uniform level, removing all damaged or defective concrete. Angle the walls of the repair area at 45º toward the center of the repair, from the bottom of the perimeter sawcut.

Do not undercut existing concrete. Surface preparation, placement, and curing of the repair concrete shall be in accordance with specifications and Department directives for the material used.

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. Small repair areas may be repaired with concrete repair materials appearing on the Department’s Approved List providing the repair materials have similar characteristics as the original concrete.

F. Rejection of Concrete. The Engineer will reject any concrete represented by a cylinder set with an average compressive strength less than 3600 psi, or an individual cylinder with a compressive strength less than 3000 psi.

METHOD OF MEASUREMENT. The quantity measured for payment will be the number of square feet satisfactorily installed, measured to the nearest square foot.

BASIS OF PAYMENT. Include the cost of all labor, materials and equipment necessary to complete the work in the square foot bid price.