
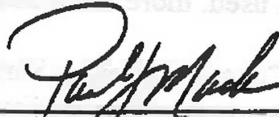


To: MODIFIED BY EI 98-030 EFFECTIVE 1/14/99 SUPERSEDED BY ¹¹ EB 99-066 EFFECTIVE 11/4/99		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 98-013
Title: TRANSMITTAL OF REVISED SPECIFICATIONS FOR CONCRETE OVERLAYS AND SPECIALIZED CONCRETE OVERLAYS OF STRUCTURAL SLABS			
Distribution: <input type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Main Office (30) <input checked="" type="checkbox"/> Consultants (34) <input type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Contractors (39) <input checked="" type="checkbox"/> Regions/Agencies (32) <input type="checkbox"/> _____ ()		Approved:  <hr/> Paul J. Mack, Deputy Chief Engineer, Technical Services Division	

4/9/98
Date

EFFECTIVE DATE. This instruction is effective for Department contracts let on or after September 10, 1998.

PURPOSE. This instruction modifies specifications for the use of bonded concrete overlays, specialized overlays and related specifications. Class DP concrete is presented as an option for Microsilica concrete (MSC) for specialized overlays of structural concrete slabs, at the Contractor's option. This Instruction supersedes special specifications which do not provide options to the Contractor. The new specifications should be used for all projects let on or after September 10, 1998 that call for concrete overlays.

The new specifications include four major improvements:

1. A single full depth placement of Class DP concrete, when 100% of the top mat of bar reinforcement is exposed, is allowed instead of separate placements of Class D slab reconstruction concrete and a MSC overlay.
2. Establishment of a separate pay item for slab reconstruction concrete.
3. High Density Low Slump and Latex Modified concrete for specialized overlays are no longer included in the specification.
4. §578 made consistent with revised §584.

BACKGROUND. Class DP concrete is a modification of the standard Class D concrete, substituting 20% Class F fly ash and 6% microsilica for cement and using a lower water-to-total cementitious ratio of 0.40. Laboratory testing has shown Class DP provides permeability similar to MSC. However, due to its fly ash content, Class DP is easier to finish than MSC and can be placed in layers thicker than 75 mm (3 inches) with a reduced potential for cracking.

The attached specifications allow, at the Contractor's option, a single placement of Class DP overlay concrete when 100% of the top mat of bar reinforcement is exposed. This practice will reduce labor by 50% and eliminate the possibility of bond failure between the overlay and slab reconstruction concrete. The life span of bridge deck overlays constructed in this manner with Class DP concrete is expected at least to equal that of overlays constructed with Class D slab reconstruction concrete and a MSC overlay.

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The new specifications include separate pay items for overlay and slab reconstruction concrete. Previously, the price of both types of concrete were included in a single pay item. The use of separate pay items is appropriate, because there are significant differences in the scope of work for placing slab reconstruction and overlay concrete, and the material cost for MSC can be up to 50% greater than the cost of Class D concrete.

The new §584 specification excludes Latex Modified and High Density Low Slump concretes because these products are seldom used, more labor intensive and more expensive than MSC or Class DP concrete.

For §578 - Bonded Concrete Wearing Surface for Structural slabs, similar changes have been made. In cases where 100% of the top mat of bar reinforcement is exposed, a single lift of Class E concrete may be placed. Separate pay items for slab reconstruction concrete and overlay concrete have also been added.

The specifications also include many editorial changes including more concise, active voice language.

DISAPPROVED ITEM NUMBERS. The following item numbers are superseded and disapproved for use:

578.01	Bonded Concrete Wearing Surface for Structural Slabs
578.01 M	Bonded Concrete Wearing Surface for Structural Slabs
584.0102	High Density Concrete Overlay
584.0102 M	High Density Concrete Overlay
584.1102	Latex Modified Concrete Overlay
584.1102 M	Latex Modified Concrete Overlay
584.1201	Micro-Silica Concrete Overlay
584.1201 M	Micro-Silica Concrete Overlay

DISAPPROVED SPECIFICATIONS. The following specifications are superseded and disapproved for use:

18579.02	REINFORCING BAR EXPOSURE, EVEN PLANE
18579.02 M	REINFORCING BAR EXPOSURE, EVEN PLANE
18584.13	CONCRETE OVERLAY FOR STRUCTURAL SLABS, CLASS HP
18584.14	CONCRETE OVERLAY FOR STRUCTURAL SLABS, CLASS DP
18584.14 M	CONCRETE OVERLAY FOR STRUCTURAL SLABS, CLASS DP
18584.15	CONCRETE OVERLAY FOR STRUCTURAL SLABS, CLASS HP
18584.15 M	CONCRETE OVERLAY FOR STRUCTURAL SLABS, CLASS HP

REVISED SPECIFICATIONS.

Standard Specifications of January 2, 1990:

555	STRUCTURAL CONCRETE
578	BONDED CONCRETE WEARING SURFACE FOR STRUCTURAL SLABS
582	REMOVAL AND REPLACEMENT OF STRUCTURAL CONCRETE
584	SPECIALIZED OVERLAYS FOR STRUCTURAL SLABS

Standard Specifications of January 2, 1995:

555	STRUCTURAL CONCRETE
569	PERMANENT CONCRETE TRAFFIC BARRIER FOR STRUCTURES
578	BONDED CONCRETE WEARING SURFACE FOR STRUCTURAL SLABS
582	REMOVAL AND REPLACEMENT OF STRUCTURAL CONCRETE
584	SPECIALIZED OVERLAYS FOR STRUCTURAL SLABS

IMPLEMENTATION. This EI establishes Class DP concrete as an optional overlay material for all Department contracts let on or after September 10, 1998.

Ongoing construction projects may allow the use of Class DP concrete, by Order-on-Contract, at the discretion of the Region. Contractors will be allowed to substitute Class DP concrete, with Department approval, if a reasonable cost reduction is provided to the State, when warranted.

COST IMPACT. A significant cost reduction should result due to a reduction in construction time and labor costs from the allowance of a single placement of Class DP. The material cost of Class DP concrete should not vary significantly from the cost of MSC. A cost reduction may also be expected on projects which estimate less than 100% reinforcing steel exposure due to the more accurate bidding of separate pay items for slab reconstruction and overlay concrete.

SPECIFICATION DETAILS. The type of overlay will be selected based on the minimum depth of overlay concrete. For 100% steel exposure, overlay concrete depth is measured from the top surface of the exposed top mat of bar reinforcement. For all other conditions, overlay concrete depth is measured from the highest surface of remaining concrete cover immediately prior to overlay concrete placement.

A Class E concrete overlay is to be used when the minimum depth of overlay concrete will be 75 mm (3 inches). For overlay placement depths of 75 mm (3 inches) or more, Class E concrete will provide sufficient protection to the reinforcement. If the minimum overlay depth is to be less than 75mm (3 inches), a specialized concrete overlay (§584) must be used. The minimum allowable thickness for a specialized concrete overlay is 40 mm (1.5 inches). In all situations, the minimum total, final cover, over the top mat of bar reinforcement must always be 60 mm (2.25 inches).

Class HP concrete is an allowable substitution for Class E concrete and Class DP concrete is an allowable substitution for Class D concrete. Only one type of overlay concrete may be used per structure and one type of slab reconstruction concrete per placement per span.

Contractor's Options. The specifications allow the Contractor to select the repair method in certain cases.

A) §578 Bonded Concrete Overlay for Structural Slabs: Title of specification is changed from Bonded Concrete Wearing Surface for Structural Slabs.

Method 1 - Separate Placement.

Class D slab reconstruction concrete and Class E overlay concrete, placed separately.

This is the standard procedure for construction and is allowable for all top mat bar reinforcement

exposure conditions, therefore the Contractor may elect to use this method under any condition. Under this method, Class D slab reconstruction concrete will be paid for under Item 578.03 (M) Slab Reconstruction Concrete, Class D or E. Overlay Concrete will be paid for under Item 578.02 (M) Overlay Concrete, Class E.

Method 2 - Integral Placement.

Class E overlay concrete and Class E slab reconstruction concrete placed in a single lift.

This procedure is allowable only when 100% of the top mat of bar reinforcement is exposed or when all of the following conditions are satisfied:

1. The area of the exposed top mat of bar reinforcement is 5% or less of the placement area, per span.
2. No individual area of the exposed top mat of bar reinforcement exceeds 2.5 square meters (25 square feet).
3. No dimension of any individual area of the exposed top mat of bar reinforcement exceeds 2 meters (6 feet).

Under this method, Class E slab reconstruction concrete will be paid for under Item 578.03 (M) Slab Reconstruction Concrete, Class D or E. Overlay Concrete will be paid for under Item 578.02 (M) Overlay Concrete, Class E. For 100% exposure of the top mat of bar reinforcement, the area of slab reconstruction concrete will be equal to the area of overlay concrete.

B) §584 Specialized Overlays for Structural Slabs:

Method 1 - Separate Placements.

Class D or Class DP slab reconstruction concrete and Microsilica overlay concrete, placed separately.

This is the standard procedure for construction and is allowable for all top mat bar reinforcement exposure conditions, therefore the Contractor may elect to use this method under any condition. Under this method, Class D or DP slab reconstruction concrete will be paid for under Item 584.22 (M) Slab Reconstruction Concrete, Class D, DP or Microsilica Concrete. Overlay Concrete will be paid for under Item 584.20 (M) Overlay Concrete, Microsilica Concrete.

Method 2 - Integral Placement of Microsilica Concrete (Optional).

Microsilica overlay concrete and Microsilica slab reconstruction concrete placed in a single lift.

This procedure is allowable only when all of the following conditions are met:

1. The area of exposed top reinforcing steel is 5% or less of the placement area, per slab.

2. No individual area of the exposed top mat of bar reinforcement exceeds 2.5 square meters (25 square feet).
3. No dimension of any individual area of the exposed top mat of bar reinforcement exceeds 2 meters (6 feet).

Under this method, the Contractor places microsilica concrete in the areas of reinforcing steel exposure (slab reconstruction concrete), integrally with the microsilica overlay concrete. Microsilica Concrete placed by this method will be paid for under Item 584.22 (M) Slab Reconstruction Concrete, Class D, DP or Microsilica Concrete and Item 584.20 (M) Concrete Overlay, Microsilica Concrete.

Method 3 - Integral Placement of Class DP Concrete (Optional).

Class DP overlay concrete and Class DP slab reconstruction concrete, placed in a single lift.

This procedure is allowable only when 100% of the top mat of bar reinforcement is exposed. Class DP Concrete placed by this method will be paid for under Item 584.21 (M) Concrete Overlay, Class DP and Item 584.22 (M) Slab Reconstruction Concrete, Class D, DP or Microsilica Concrete. The area of slab reconstruction concrete will be equal to the area of overlay concrete.

ESTIMATING QUANTITIES. To allow for the use of different overlay materials and placement methods on a structure by structure basis, quantities of slab reconstruction and overlay concrete are estimated independently for each structure. The pay items will be made specific by assigning a two digit suffix to each pay item number corresponding to an individual structure (refer to §101-53).

Only one type of overlay material may be used on an individual structure, but different methods of placement and types of slab reconstruction concrete may be used on individual structures. The same method and materials must be used on any single placement, on any single span.

A) §584 Specialized Overlays for Structural Slabs:

When less than 100% exposure of the top mat of bar reinforcement is estimated, the designer will list estimated quantities for Item 584.22nn (M) Slab Reconstruction Concrete, Class D, DP or Microsilica Concrete and Item 584.20nn (M) Overlay Concrete, Microsilica Concrete. If the quantity of top mat bar reinforcement exposure is less than 5% of the span area, Contractors will have the option of using Method 1 or 2 in preparing their bid. Regardless of which method the Contractor intends to use, a bid is required for both of the above items.

When 100% exposure of the top mat of bar reinforcement is estimated, the designer will list estimated quantities for Item 584.22nn (M) Slab Reconstruction Concrete, Class D, DP or Microsilica Concrete and for the two alternate overlay items, Item 584.20nn (M) Overlay Concrete, Microsilica Concrete and Item 584.21nn (M) Overlay Concrete, Class DP. In each case, the area of overlay concrete will equal the area of slab reconstruction concrete. Contractors will have the option of using Method 1 or 3 in preparing their bid. A bid must be submitted for slab reconstruction concrete and for one of the overlay items, either 584.20nn (M) Overlay Concrete, Microsilica Concrete or 584.21nn (M) Overlay Concrete, Class DP.

B) §578 Bonded Concrete Overlay for Structural Slabs:

A similar procedure for estimating quantities for Item 578.02nn (M) Overlay Concrete, Class E and Item 578.03nn (M) Slab Reconstruction Concrete, Class D or E, is to be used as well.

CONTACT PERSON. If you have any questions on this Instruction or the attached specifications, please contact the Field Engineering 1 office of the Materials Bureau at (518) 457-5956. Questions specific to the manufacture of Class DP concrete should be directed to the Field Engineering 2 office of the Materials Bureau at (518) 457-4582. Any questions related to the use of Class DP concrete in ongoing projects should be directed to Construction Division at (518) 457-6472.

Make the following changes to the Standard Specifications of January 2, 1990:

Pages 5-50

Under §555-3.09A *Curing*, *delete* the fourth paragraph, which begins, "Curing hours will...", and *replace* with:

"Curing hours will be determined with continuous recording thermometers, capable of measuring temperatures in the 30°F to 100°F range, over a 24 hour period. The number and placement of the thermometers will be determined by the Engineer. Provide all equipment, supplies and labor necessary for calibration. Include the cost of calibration in the unit price bid."

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

Pages 5-92 through 5-94 and Page V - 16

Under **§578 BONDED CONCRETE WEARING SURFACE FOR STRUCTURAL SLABS**, *delete* in its entirety and *replace* with:

"SECTION 578 - BONDED CONCRETE OVERLAY FOR STRUCTURAL SLABS

578-1 DESCRIPTION. Prepare the surfaces that will be in contact with slab reconstruction concrete and place slab reconstruction concrete. Prepare the structural slab surface and place a Class E, bonded concrete overlay.

578-1.01 Scope. Concrete removal work will be paid for under the appropriate item(s). Minimum thickness of the overlay concrete is 3 inches. Include the cost of any grade changes necessitated by this requirement in the unit bid price for overlay concrete.

578-1.02 Definitions.

A. Overlay Concrete. Class E Concrete placed over existing and slab reconstruction concrete.

B. Slab Reconstruction Concrete. Concrete placed completely around the exposed top mat of bar reinforcement. Slab reconstruction concrete will be Class D for Method 1 and Class E for Method 2, as described in §578-1.03 Placement Methods.

578-1.03 Placement Methods.

A. Method 1 - Separate Placement. Place Class D slab reconstruction concrete and Class E overlay concrete separately.

B. Method 2 - Integral Placement (Optional). When 100% of the top mat of bar reinforcement is exposed or when all of the following conditions are satisfied, Class E overlay concrete and Class E slab reconstruction concrete may be placed in a single lift:

1. The area of the exposed top mat of bar reinforcement is 5% or less of the placement area, per span.
2. No individual area of the exposed top mat of bar reinforcement exceeds 25 square feet.
3. No dimension of any area of the exposed top mat of bar reinforcement exceeds 6 feet.

578-2 MATERIALS. All material listed under §555-2 with the following:

Bonding Grout. §705-22, with the following: Do not add water once an acceptable consistency is achieved.

578-3 CONSTRUCTION DETAILS.

578-3.01 **Blastcleaning.** §584-3.02.

578-3.02 **Preplacement Wetting.** §584-3.03.

578-3.03 **Bonding Grout Placement.** Mix bonding grout in a mixer that meets §584-2.04D and place in accordance with §584-3.04.

578-3.04 **Handling and Placing Concrete.** §584-3.05.

578-3.05 **Construction Joints.** §584-3.07.

578-3.06 **Finishing and Curing Slab Reconstruction Concrete - Separate Placement.** §584-3.06A.

578-3.07 **Finishing Bonded Concrete Overlay.** §555-3.08D.

578-3.08 **Curing Bonded Concrete Overlay.** §555-3.09 with the following: Cure concrete with wet burlap for 7 days. Provide uniform continuous wetting until concrete curing is complete. The wet burlap and curing cover option is not allowed.

578-3.09 **Opening to Traffic.** Traffic is allowed only after completion of the required curing period.

578-3.10 **Defective or Damaged Concrete.** §584-3.08.

578-4 METHOD OF MEASUREMENT. For placements with 100% exposure of the top mat of bar reinforcement, the number of square feet of slab reconstruction concrete will be equal to the number of square feet of overlay concrete.

For placements with less than 100% exposure of the top mat of bar reinforcement, measure slab reconstruction concrete prior to overlay concrete placement.

A. Method 1 - Separate Placement. Measure slab reconstruction concrete as the number of square feet of Class D slab reconstruction concrete placed. Measure overlay concrete as the number of square feet of plan area of Class E overlay concrete placed.

B. Method 2- Integral Placement (Optional). Measure slab reconstruction concrete as the number of square feet of Class E slab reconstruction concrete placed. Measure overlay concrete as the number of square feet of plan area of Class E overlay concrete placed.

578-5 BASIS OF PAYMENT. Include the cost of all labor, materials and equipment necessary to complete the work in the unit bid price.

Payment will be made under:

Item No.	Item	Pay Unit
578.02nn	Overlay Concrete, Class E	Square Foot
578.03nn	Slab Reconstruction Concrete, Class D or E	Square Foot

nn - serialized item numbers, as per §101-53, denoting each individual structure."

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

Page V - 18

Under §582-3.02 Removal of Unsound Concrete, *delete* "§584-3.04A" and *replace* it with "§584-3.02A."

Page V-18

Under §582-3.03 Preparation of Surface, A., *delete* "§584-3.04" and *replace* it with "§584-3.02."

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

Pages 5-106 through 5-119 and Pages V - 20 through V - 22

Under §584 SPECIALIZED OVERLAYS FOR STRUCTURAL SLABS, *delete* in its entirety and *replace* with:

"SECTION 584 - SPECIALIZED OVERLAYS FOR STRUCTURAL SLABS

584-1 DESCRIPTION. Prepare the surfaces that will be in contact with slab reconstruction concrete and place slab reconstruction concrete. Prepare the structural slab surface and place a specialized concrete overlay.

584-1.01 Scope. Concrete removal work will be paid for under the appropriate item(s). Minimum thickness of overlay concrete is 1½ inches. Include the cost of any grade changes necessitated by this requirement in the unit bid price for overlay concrete. Use only one type of overlay concrete on any one structure.

584-1.02 Definitions.

A. Class DP Concrete. A homogeneous mixture of portland cement, fly ash, microsilica admixture, fine and coarse aggregates, air entraining agent, set retarding water reducing admixture and water.

B. Microsilica Concrete. A homogeneous mixture of portland cement, microsilica admixture, fine and coarse aggregates, air entraining agent, high range water reducing admixture and water.

C. Overlay Concrete. Concrete placed over existing and slab reconstruction concrete. Overlay concrete will be Microsilica concrete for Method 1 and Method 2, and Class DP concrete for Method 3, as described in §584-1.03 Placement Methods.

D. Slab Reconstruction Concrete. Concrete placed completely around the exposed top mat of bar reinforcement. Slab reconstruction concrete will be Class D or Class DP concrete for Method 1, Microsilica concrete for Method 2, and Class DP concrete for Method 3, as described in §584-1.03 Placement Methods.

E. Positive-tie-downs. Anchors drilled into the structural slab and connected to reinforcing steel.

584-1.03 Placement Methods.

A. Method 1 - Separate Placement. Place Class D or Class DP slab reconstruction concrete and Microsilica overlay concrete separately. Use only one type of slab reconstruction concrete on each placement.

B. Method 2 - Integral Placement of Microsilica Concrete (Optional). When all of the following conditions are satisfied, Microsilica overlay concrete and Microsilica slab reconstruction concrete may be placed in a single lift:

1. The area of the exposed top mat of bar reinforcement is 5% or less of the placement area, per span.
2. No individual area of the exposed top mat of bar reinforcement exceeds 25 square feet.
3. No dimension of any area of the exposed top mat of bar reinforcement exceeds 6 feet.

C. Method 3 - Integral Placement of Class DP Concrete (Optional). When 100% of the top mat of bar reinforcement is exposed, Class DP overlay concrete and Class DP slab reconstruction concrete may be placed in a single lift.

584-2 MATERIALS.

584-2.01 General. All materials listed in §555-2 with the following:

A. Air Entraining Admixture. §711-08 with the following: For Microsilica concrete, use only a vinsol resin-based air entraining agent.

B. Microsilica Admixture.

1. Use only one product from the Approved List, either a slurry or a densified powder, for each bridge deck. Provide written certification from the manufacturer that the admixture meets the Materials Bureau's procedural directives for fineness, silica content, total chloride ion content, solids content (slurries), and moisture content (densified powders).

2. Agitate slurry to prevent separation and maintain it at a temperature above 32°F at all times.

3. The Regional Materials Engineer will take a ½ to 1 quart sample directly from the storage container, for each day's placement, for testing by the Department.

C. Bonding Grout. §705-22, with the following: Do not add water once an acceptable consistency is achieved.

584-2.02 Manufacture of Class DP Concrete.

A. Proportioning. The initial ingredient proportions, except for admixtures, are given in TABLE 584-1. Adjust the mixture proportions to account for actual fineness modulus and bulk specific gravities, according to Department instructions.

B. Handling, Measuring and Batching. §501 with the following:

1. Add set retarding, water reducing admixture to Class DP concrete at the batch plant. The Regional Materials Engineer may allow a maximum of 2 additions at the work site. Do not exceed the manufacturer's recommended maximum dosage, regardless of the number of additions. For each addition of set retarding, water reducer; provide an additional 30 mixing revolutions. The maximum total number of revolutions is 190.

2. Add the total amount of mix water required at the batch plant. No further additions of water are allowed.
3. If a densified microsilica powder is used, measure cumulatively in the following order: cement, fly ash and microsilica. For each material draw weight, base the batching tolerance of $\pm\frac{1}{2}\%$ on the total weight of cementitious material.
4. If a microsilica slurry is used, add the slurry using a microsilica slurry deliver system, §584-2.04A. To calculate water cement ratio, include the slurry water and free moisture content of the fine and course aggregates as mix water.

TABLE 584-1	
MIX CRITERIA - CLASS DP CONCRETE	
Cement Content (lbs./c.y.)	536
Fly Ash Content (lbs./c.y.)	145
Microsilica Content (lbs./c.y.)	44
Sand Percent Total Aggregate (solid volume)	45.8
Designed Water/Total Cementitious Content	0.40
Desired Air Content (%)	7.5
Allowable Air Content (%)	6.0 - 9.0
Desired Slump (inches)	4
Allowable Slump (inches)	2 - 5
Type of Coarse Aggregate Gradation	CA 1

The criteria are given for design information and the data is based on a fine aggregate modulus of 2.80 and a CA1 coarse aggregate gradation. Adjust the mixture proportions using actual fineness modulus and bulk specific gravities (saturated surface dry for aggregates). Compute the adjustments according to Department instructions.

584-2.03 Manufacture of Microsilica Concrete.

A. Proportioning. The initial ingredient proportions, except for admixtures, are given in TABLE 584-2. Adjust the mixture proportions to account for actual fineness modulus and bulk specific gravities, according to Department instructions.

B. Handling, Measuring and Batching. §584-2.02B - 2, 3 and 4, with the following: Add high range water reducing admixture to Microsilica concrete at the batch plant. The Regional Materials Engineer may allow a maximum of 2 additions at the work site. Do not exceed the manufacturer's recommended maximum dosage, regardless of the number of additions. For each addition of high range water reducer, provide an additional 30 mixing revolutions. The maximum total number of revolutions is 190.

TABLE 584-2 MIX CRITERIA - MICROSILICA CONCRETE	
Cement Content (lbs./c.y.)	658
Microsilica Content (lbs./c.y.)	60
Sand Percent Total Aggregate (solid volume)	53.0
Designed Water/Total Cementitious Content	0.37
Desired Air Content (%)	6.5
Allowable Air Content (%)	5.0 - 8.0
Desired Slump (inches)	4
Allowable Slump (inches)	2 - 6
Type of Coarse Aggregate Gradation	CA 1

The criteria are given for design information and the data is based on a fine aggregate modulus of 2.80 and a CA1 coarse aggregate gradation. Adjust the mixture proportions using actual fineness modulus and bulk specific gravities (saturated surface dry for aggregates). Compute the adjustments according to Department instructions.

584-2.04 Equipment.

A. Microsilica Admixture Slurry Delivery System. A permanently installed automation system or a two stop, off-line, automated batching system, which has been approved by the Regional Materials Engineer and meets the following requirements:

Meter accuracy*	±1%, by volume
Program quantity	gallons, nearest tenth
Batching tolerance*	±2.0%, by volume
System interlocks	
Print requirements:	
1. Date and time	
2. Truck number (or alternate method relating microsilica to batch ticket)	
3. Delivered quantity (gallons, nearest tenth)	

*Based on volume of microsilica slurry.

Locate the control box/printer for a two stop, off-line batching system at the batch plant operator's work station, unless otherwise approved by the Regional Materials Engineer.

Calibrate the system in accordance with the procedures approved by the Regional Materials Engineer. Recalibrate the system if any part, or all, of the system is moved.

B. Finishing Machine. A finishing machine capable of self propulsion in forward and reverse, raising the screeds above the screeded surface when traveling in reverse, and meeting one of the two sets of requirements below.

1. **Roller Screed.** Must be equipped with a power driven strike-off auger, power driven finishing roller, vibrating pan or roller producing 3000 to 7000 vpm, and pan float.

2. **Dual Oscillating Screed.** Must be equipped with at least 2 oscillating screeds producing between 3000 and 7000 vpm, strike-off auger, and control of each screed's vertical position and tilt angle.

The specific method and equipment used for finishing will be approved by the Regional Construction Engineer before use. Provide access to the machine at the work site for one working day, for inspection by the Engineer. Have a qualified Finishing Machine Operator present at the time of inspection. Two weeks prior to the inspection date, provide the Engineer with a copy of the operating manual for their exclusive use.

Use Supporting rails with no bends or kinks. Support the rails with fully adjustable supports (no shims), spaced a maximum of 1 foot on center. When placing concrete adjacent to a completed placement, set the supporting rails for one side of the finishing machine on the completed placement.

C. Recording Thermometer. A continuous recording thermometer capable of measuring temperatures in the range of 30°F to 100°F for a minimum of 24 hours. Include the cost of calibration in the unit price bid.

D. Bonding Grout Mixer. A mortar mixer with a minimum capacity of 3.5 cubic feet, subject to approval by the Engineer, prior to use.

584-3 CONSTRUCTION DETAILS.

584-3.01 Limitation of Operations.

A. No structural concrete removal work is permitted in areas adjoining new concrete during the new concrete's specified curing period.

B. No loads, other than construction loads which are less than 4000 lbs. and approved by the Engineer, are permitted on areas of the structural slab where concrete has been removed.

C. No loads are permitted on concrete until completion of the specified curing period.

584-3.02 Blastcleaning.

A. Blastclean all surfaces to be in contact with new concrete. Remove all grease and dirt. Remove all rust and mortar which is not firmly bonded to the surface being cleaned. Rust and concrete deposits which are firmly bonded and cannot be removed by blastcleaning may remain. A light coating of orange rust, that forms on steel surfaces after blastcleaning, is not considered detrimental to bond and may remain. Remove all debris created by blastcleaning.

B. Place reinforcing steel supports and positive-tie-downs at a maximum spacing of 4 feet.

C. Repeat blastcleaning if more than 48 hours pass before bonding grout placement begins.

584-3.03 Preplacement Wetting. After blastcleaning has been accepted, thoroughly wet the structural slab surface and all porous surfaces to be in contact with new concrete for at least 12 hours immediately prior to placement. Remove all standing water with oil-free compressed air, and protect the deck from drying, so the concrete remains in a saturated surface dry condition when placing bonding grout.

584-3.04 Bonding Grout Placement.

A. After structural slab wetting and immediately before placing concrete, use stiff, nylon-bristle brooms to brush a thin (approximately 1/8 inch) coating of grout into the prepared surfaces, including any slabs, curbs, longitudinal and transverse joints and reinforcing steel. Do not allow the grout to puddle.

B. Apply the grout with straight handled stiff, nylon-bristle brooms around reinforcing steel, and at joints.

C. Limit the application of grout, according to atmospheric conditions, to that area which will be covered with new concrete before the grout begins to dry. Dry bonding grout appears light grey in color and has a chalky texture. Do not place concrete on dry bonding grout. Concrete placement operations must be interrupted if dry bonding grout is encountered. Install construction dams, wait at least 48 hours, remove dry grout by blast cleaning and place new grout and concrete, all in accordance with this specification.

584-3.05 Handling and Placing Concrete. §555-3.04 and §555-3.06 with the following:

A. Place concrete only when the ambient air temperature and deck surface temperature (after wetting) will be below 85°F during the entire placement.

B. Place overlay concrete only if preplacement wetting has been completed on an area large enough to require one working day for placement, at least one span length.

C. When using concrete transporting devices on a prepared surface, protect exposed reinforcing steel from deformation and prevent contamination of the surface.

D. If operations are delayed for more than 30 minutes, install a construction dam or bulkhead. If placement operations are delayed for more than 60 minutes or if the concrete attains initial set, discontinue placement for at least 48 hours. This restriction does not prohibit continuation of the placement provided a gap is left in the placement. This gap is to be sufficient in length to allow the finishing machine to clear the previously placed concrete and any unacceptable area, as when bonding grout has dried out. Prepare the gap area for concrete placement in accordance with this specification, after the previously placed concrete, on both sides of the gap, has cured for 48 hours.

584-3.06 Finishing and Curing.

A. Slab Reconstruction Concrete - Separate Placement.

1. Finishing. For areas greater than 25 square feet, use either a manually driven vibrator equipped power screed from the Department's Approved List or the same machine to be used to finish the overlay. Areas that are inaccessible to a mechanical screed or are less than 25 square feet may be hand finished. The finishing equipment must be approved by the Engineer prior to use.