Related Instruction
Specialized overlays play a key role in extending the life of a reconstructed structural slab. The purpose of such overlays is to create an impermeable layer of concrete to prevent chlorides from attacking the top mat of bar reinforcement. To ensure that this layer works effectively, it is very important that the overlay is placed in a careful and conscientious manner. When these specialized overlays are improperly placed and/or cured, the resulting layer offers no more, and possibly less, protection to the deck than a normal concrete overlay.

The two types of overlay material available are Microsilica Concrete and Class DP Concrete. Microsilica is the denser and less permeable of the two. Microsilica concrete is more susceptible to cracking especially in thicker placements. This is why Microsilica should be properly cured and not used in placements over 75 mm. Microsilica is also stickier and more difficult to finish. Microsilica concrete requires the use of a High Range Water Reducer (Type F Water Reducing Admixture) also known as a Superplastisizer.

Class DP Concrete is standard Class D concrete modified with flyash and microsilica. It is easier to finish and work with than the Microsilica Concrete. It makes a good substitute to microsilica on decks having 100% rebar mat exposure. Class DP concrete can be used in any situation where Class D concrete is applicable. The use of a High Range Water Reducer is not allowed nor necessary in Class DP concrete.

Three methods of placement are open to the Contractor depending on the material and existing conditions. The methods are as follows:

Method 1 - Separate Placements:

This has been the standard method. When any amount of the top mat of bar reinforcement is exposed, the Contractor will place a layer of slab reconstruction concrete, either Class D or DP, and after the proper curing period, apply a Microsilica Concrete overlay.

Method 2 - Integral Placement of Microsilica Concrete:

One placement of Microsilica Concrete is applied to the bridge deck. This is applicable when there is no exposure of the top mat of bar reinforcement and the overlay thickness is not over 75 mm. This method may also be used when the following conditions exist:

A. The area of the exposed top mat of bar reinforcement is 5% or less of the placement area, per span.
B. No individual area of the exposed top mat of bar reinforcement exceeds 2.5 m².
C. No dimension of any area of the exposed top mat of bar reinforcement exceeds 2 m.

When these conditions are met and this method used, the Microsilica Concrete will serve as the slab reconstruction concrete in the areas of exposed top mat of bar reinforcement. The noted restrictions are necessary due to the increased difficulty in consolidating Microsilica Concrete and increased probability of cracking, especially in deeper placements.

Method 3 - Integral Placement of Class DP Concrete:

One placement of Class DP concrete is applied. This method may be used when 100% of the top mat of bar reinforcement is exposed. This method provides the Contractor with the option of removing the entire top layer of concrete and replacing it with a single placement of Class DP concrete.
concrete which in many situations may be quicker and more cost effective than selective removal. This will also provide a more durable end product since the entire top layer of old concrete is replaced with new, more impermeable Class DP overlay concrete. Class DP requires an extended wet cure as compared to microsilica concrete, 7 days versus 4 days.

To ensure that the overlay is properly placed and cured, it is important that no details are overlooked, no matter how minute they may seem. These overlays are very sensitive and require conformance to all relevant specifications. Sections 555 and 557 of the Construction Inspection Manual should be thoroughly reviewed prior to beginning work on the project.

The following table outlines the sequence of events for the three methods of placement. Following the table are suggestions for improving the quality of the concrete overlay.

<table>
<thead>
<tr>
<th>METHOD 1</th>
<th>METHOD 2</th>
<th>METHOD 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overlay Thickness</strong></td>
<td><strong>Overlay Thickness</strong></td>
<td><strong>Overlay Thickness</strong></td>
</tr>
<tr>
<td>40 mm Min - 75 mm Max.</td>
<td>40 mm Min - 75 mm Max.</td>
<td>60 mm Min - 75 mm Max.</td>
</tr>
<tr>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
<td><strong>Top Mat of Bar Reinforcement Exposure Conditions</strong></td>
</tr>
<tr>
<td>All Conditions (This method is acceptable whenever re-bar is exposed)</td>
<td>Less Than 5% and No Individual Area &gt; 2.5 m² and No Individual Dimension &gt; 2.0 m</td>
<td>100% Exposure</td>
</tr>
<tr>
<td><strong>Construction Sequence</strong></td>
<td><strong>Construction Sequence</strong></td>
<td><strong>Construction Sequence</strong></td>
</tr>
<tr>
<td>1 Selective or total removal of old concrete top layer</td>
<td>Selective or no removal of old concrete top layer</td>
<td>Total removal of old concrete top layer</td>
</tr>
<tr>
<td>2 Blast Cleaning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Preplacement Wetting (12 hrs. Min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Bonding Grout Placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Placement of Class D or DP Slab Reconstruction Concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 <strong>FINISHING AND TEXTURING</strong></td>
<td></td>
<td><strong>Go To STEP 11</strong></td>
</tr>
<tr>
<td>7 3 DAY WET CURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 BLAST CLEANING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 PREPLACEMENT WETTING (12 hrs. Min.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 <strong>BONDING GROUT PLACEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 <strong>PLACEMENT OF MICROSilica OVERLAY CONCRETE</strong></td>
<td><strong>PLACEMENT OF CLASS DP OVERLAY CONCRETE</strong></td>
<td></td>
</tr>
<tr>
<td>12 <strong>FINISHING AND TEXTURING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 4 DAY WET CURE</td>
<td>7 DAY WET CURE</td>
<td></td>
</tr>
<tr>
<td>14 SAW CUT GROOVING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 <strong>PENETRATING SEALER APPLICATION</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I. Construction Operations

1. Removal of Old Concrete:
   All deteriorated and unsound concrete (based on half-cell potentials, sounding, and/or chloride contents) should be removed to 25 mm around the top mat of bar reinforcement. Removal should be done using maximum 20 kg chipping hammers equipped with minimum 50 mm wide chisel tips. No pick tips should be used. Bush hammers should not be used due to the micro cracking caused by this type of equipment. For large areas of removal, hydro demolition has been found to be very cost effective.

2. Blast Cleaning
   One of the most important factors affecting the performance of reconstruction and overlay concrete is the bond strength between new and existing concrete. After damaged, or unsound concrete has been removed, a fine layer of powder exists on the concrete substrate. This must be removed along with any residual dirt or grease. High pressure air will not always remove the entire layer of dust. Sand blasting, shot blasting, or high pressure water blasting will do a sufficient job. The substrate can be considered clean when 50% of the coarse aggregate can be seen. If the dust and dirt are not removed, the slab reconstruction concrete will not bond to the deck, which leads to delaminations.

   A. Blast Cleaning Checklist
      1. Make sure the surface is clean after blast cleaning.
      2. The surface must be free of grease, dirt, loose concrete, mortar and loose or injurious rust on the reinforcement.
      3. Additional blast cleaning may be required if more than 48 hours pass before bonding grout placement or if the prepared surface is contaminated.

   B. Position of the Top Mat of Bar Reinforcement
      After all deteriorated concrete has been removed, care has to be taken to ensure that the top mat of bar reinforcement is in the correct position. If the reinforcement is out of position from being walked on, the new concrete will not encapsulate it and voids will form. These voids will reduce the bond strength and eventually lead to deterioration of the deck. To ensure that the steel mat is stationary, chairs and tie downs may be necessary.

3. Structural Slab Wetting
   Care must be taken to make sure that overlay concrete will properly bond to the structural deck. If an inferior bond is formed, the deck will soon delaminate and require repairs. The slab must be thoroughly wet to a saturated-surface dry (SSD) condition. A minimum wetting period of 12 hours, immediately prior to placement of all concrete overlays is necessary. The soaking of the deck allows the bonding grout to better adhere to the structural concrete. If this step is not performed, the existing concrete will absorb water from the bonding grout and overlay concrete, causing the materials to dry out prematurely, creating a weak bond between the structural deck and the overlay concrete. There is also an increased potential for cracking in the overlay.

4. Bonding Grout
   A. Material - §705-22
      Bonding grout is simply a 50/50 mix of cement and sand with enough water to form a slurry with the consistency of thick cream. The sand and cement should be thoroughly mixed for one minute before the water is added to the mortar mixer.

   B. Purpose
      The grout acts as a glue between the new concrete and existing concrete. To assure a good bond, the
SECTION 584 - SPECIALIZED CONCRETE OVERLAYS FOR STRUCTURAL SLABS

surface must be well blast cleaned, free from dirt, dust, and chemicals, and in a SSD condition.

C. Application
There should be no standing water on the deck at the time of grout placement. Apply the grout in an even coat 3 mm ± 1.5 mm thick. Brushing on the grout with stiff brooms is an effective application procedure. If there is too much grout or not enough, the bond strength will be weaker.

D. Application Rate
In most cases the grout can be applied faster than the new concrete can be placed. Never allow the grout to be placed so far ahead of the new concrete that the grout dries out before the new concrete is placed over it. In most cases the grout placement should progress approximately 1 m - 1.5 m in front of the concrete placement. If the grout dries before placement of the new concrete, the new concrete will not bond to the deck. When this occurs the grout must be removed by blast cleaning and re-applied. **Under no circumstances should re-tempering the grout be allowed.**

5. Placement of Slab Reconstruction Concrete
A. Environmental conditions during placement.
It is essential that the new concrete properly bond to the existing concrete and reinforcement. If an adequate bond is not developed, cracking and delaminations will occur. Several simple things can be done to ensure that the concrete is being placed in the best possible environment.

1. Temperature and Evaporation
While the temperature is not something that can be controlled, it is important not to ignore it. The contractor must supply an adequate recording thermometer to keep track of the substrate surface temperature. Differences between the substrate temperature and the temperature of the new concrete overlay should be kept to a minimum. Excessive temperature variation can cause cracking and debonding.

The ambient temperature has a great effect on the properties of concrete as well. Ambient temperature affects the speed at which concrete "sets up" and cures. If the ambient temperature is high, the concrete will set up quickly. If the ambient temperature is low, the concrete may not set up fast enough and cold weather placement procedures may be necessary. Either of these conditions will have adverse effects on the quality of the hardened concrete.

Using the temperature readings in conjunction with the relative humidity and the wind speed, the EIC or Inspector should calculate the hourly evaporation rates using Table 555-3 from the Standard Specifications book. If the evaporation rate is high, even when the temperature is not, no concrete should be placed. High evaporation rates will greatly increase cracking of the deck by drawing water out of the plastic concrete, causing shrinkage cracks. Conditions of low humidity (below 50%), high temperatures (30°C and above), and excessive wind velocity (20 kph and up), can cause the evaporation rate to exceed the bleeding rate. This will cause a crust to form on the surface of the plastic concrete, even when retarders are used, and may result in screeding and finishing problems. When the above unfavorable conditions are unavoidable, the use of a fog spray may be used but with caution or a wind screen is recommended. Water from fog sprays cannot be worked into the concrete surface during finishing wind screen is recommended. Also, if high temperatures are expected during the day, it may be necessary to place concrete at night.

2. Traffic
Another factor that is believed to contribute to the cracking of concrete, particularly with respect to decks, is traffic. The vibrations caused by traffic on bridges during the concrete's initial set can cause cracking. To reduce the cracking associated with this, traffic should be provided a smooth riding surface through the construction zone. A smooth transition from pavement to approach slab to deck should be provided to reduce bouncing of vehicles. Acceleration or deceleration of vehicles on the
SECTION 584 - SPECIALIZED CONCRETE OVERLAYS FOR STRUCTURAL SLABS

structure should be reduced as much as possible. The flow of traffic should be maintained at a constant rate. The operating speed of traffic should be reduced as much as possible; a speed limit below 55 kph is recommended for the first 24 hours. This will help to reduce vibrations during the most critical period.

B. Placement

In all cases, the Contractor has the option of placing slab reconstruction concrete separately from the specialized overlay as long as the procedures for separate placements are followed. This includes the additional surface preparation and cure times.

Method 1 - Separate Placements
Whenever possible, it is desirable to have a uniform overlay thickness. Variations in the concrete overlay thickness should be kept to a minimum. Overlay concrete is more difficult to consolidate and finish, especially in thicker placements. Variations in thickness increase the chance for cracking as well. In situations where the placement thickness varies to a high extent (over 25 mm) throughout the placement area, it is advisable to place a separate layer of slab reconstruction concrete first. In most cases this material will be either Class D or Class DP concrete. It is essential that the slab reconstruction concrete is properly vibrated to insure consolidation and encapsulation of the reinforcement.

Method 2 and 3 - Single Placements - See 11. Overlay Concrete Placement.

6. Finishing and Texturing of Slab Reconstruction Concrete
For areas of exposed reinforcement less than 2.5 m², hand finishing is allowed but excessive hand finishing should be avoided. For areas greater than 2.5 m², use either the same machine which will finish the overlay or a manually driven vibrator equipped power screed from the Department’s Approved List. Make sure that the equipment is in good working condition and properly set up.

The slab reconstruction concrete should be screeded to the level of the surrounding concrete or in cases where there is 100% exposure, to 10 mm minimum over the top mat of bar reinforcement.

This is essential in order to maintain the proper cover over the reinforcement. The surface should then be roughened with a tinning rake, broom or similar device to provide a good bonding surface for the overlay concrete.

7. Curing of Slab Reconstruction Concrete
The curing covers must be applied as soon as possible after texturing. The slab reconstruction concrete has to be continuously wet cured for a minimum period of 3 days. The wet burlap and curing cover option is not allowed.

8. Blast Cleaning of Concrete Slab
The bonding of the overlay to the concrete slab is essential for the overlay to reach its full life expectancy. Laitance, dirt and other contaminants will be present on the new slab reconstruction concrete and any pre-existing concrete surface. Follow the recommendations noted in 2. Blast Cleaning.

9. Prewetting for Overlay Placement
The deck must be prewet for at least 12 hours immediately before the application of the bonding grout. At the time of bonding grout application, the deck should be in a saturated surface dry condition (SSD) but there should not be any standing water (puddling) present. Sprinklers can be shut off just prior to the start of placement, however, excessive water will negatively affect the bond between the overlay, bonding grout and deck. Standing water can be removed with a broom or by air blasts.
10. Bonding Grout for Overlay Placement
Again proper placement of the bonding grout is essential to achieve good bond. The grout must not be applied too far ahead of the overlay placement. Follow the recommendations of 4. Bonding Grout of this section.

11. Overlay Concrete Placement
A pre-placement meeting must be held well in advance of the overlay placement in order to work out any details with the Contractor. Follow the recommendations of section 5. Placement of Slab Reconstruction Concrete, of this manual, in addition to the following.

Careful attention should be given to the water content of the overlay concrete mix. All water must be added at the plant, no additions of water are allowed at the job site or on-route. The performance of the specialized overlay concrete relies heavily on impermeability. High water contents compromise the impermeability of the concrete and will reduce service life. If there are problems achieving a workable consistency, up to 2 additions of the water reducing admixture may be added at the job site as long as the maximum dosage rate is not exceeded. High range water reducer is used with microsilica concrete and normal range water reducer is used with class DP. The additions must be of the same admixture used in the initial batching procedure.

Specialized concrete overlays need particular attention paid to the weather requirements. The necessary equipment and materials should be on hand to control placement and curing of the concrete, i.e. vibrators, wet burlap, turf drag, etc. The finishing operation should be reviewed and a dry run performed prior to the concrete placement. Placement of concrete must be performed in accordance with the specifications. Concrete should be placed as near to its final position as possible. The concrete placement should be performed so that there is an excess of concrete in front of the finishing machine across its entire width. The Contractor must place enough concrete at the parapets to prevent excessive shoveling of additional concrete and trowel finishing after the finishing machine has passed. Internal vibration must be used to achieve the proper consolidation. Vibrators should not be used to move concrete. Finishing of concrete should be performed in a timely manner. The concrete should not be overworked as this can cause tearing of the surface and increase the potential for scaling. When finishing concrete, adding water to the surface or "blessing" is not permitted. This process adds additional water to the concrete surface and greatly reduces its freeze/thaw resistance, resulting in scaling.

In situations where the overlay is used as the slab reconstruction concrete, and placed at the same time, it is very difficult to maintain a consistent consolidation. When the placement is of nonuniform depth, it is difficult to achieve maximum consolidation. Therefore, it is important to internally vibrate all slab reconstruction concrete. If this concrete is not properly vibrated, it will not encapsulate the reinforcement entirely, leaving voids.

A. Microsilica Concrete
Workers are often worried about over vibration of microsilica concrete. Because of the manner in which microsilica fills the voids in the concrete mix, over-consolidation is much more difficult than with other concrete mixes. In fact, under consolidation is more of a problem. The overlay should be well consolidated with internal vibrators throughout the entire placement and not just at construction joints or along bulkheads. The internal vibration will create a 1.5 mm to 3.0 mm layer of "cream" on top of the overlay. This layer also aids in the surface texturing of the overlay.

B. Class DP Concrete
This class of concrete handles the same way and is similar to another class of concrete you may be familiar with, Class HP. Due to the flyash in the mix, Class DP is easier to handle and finish than microsilica concrete, however, it does tend to have a slower set time and strength gain. It is very
important when placing DP concrete in a single placement that sufficient consolidation is achieved through vibration. Class DP concrete should not be excessively hand finished because it will have a tendency to scale.

C. Placement Position and Timing

1. Alignment of Deck Profile

Along with all other concerns, deck rehabilitations require additional care. There should be no change in the depth of total concrete placement. That is, the placement thickness should be uniform. Since the overlay is the final riding surface of the bridge, surface irregularities should be kept to an absolute minimum. No irregularities can be greater than 3.0 mm. This should be checked often during finishing with the contractor supplied 3.0 meter straight edge. One common problem occurs when the rail cups, used to support the finishing machine, are placed more than 300 mm apart. This causes the rail to sag as the finishing machine passes.

2. Time Requirements

The placement must proceed in a timely manner. When a delay in the placement is unavoidable, precautionary measures should be taken to ensure the best possible quality overlay. If a placement is delayed for 30 minutes or less, wet burlap or plastic should be placed on all unfinished plastic concrete, both ahead and behind the finishing machine, to protect it from drying. Placement can then continue for delays between 30 and 60 minutes, the same procedure may be used only if initial set has not occurred.

If a delay is for more than 60 minutes or if the concrete reaches initial set, all further placement must be discontinued for at least 48 hours, and the concrete bulkheaded. Further material may be placed provided a gap, of at least 3.0 meters, is left between the initially set and freshly placed concrete. This gap is to allow sufficient clearance for the finishing machine. If proper procedures are not followed, the joint between the initially set and fresh concrete will never bond correctly, resulting in early distress to the deck. When concrete is to be placed in the bulkheaded area, all preparation and placement procedures should be followed.

12. Finishing and Texturing of Overlay Concrete

A. Basic Guidance for Operation of Finishing Machine.

This is a check list of how to operate a finishing machine for best results. A dry run must be performed prior to the placement to ensure that nothing has been overlooked. An experienced machine operator should run the finishing machine. No one should attempt to finish overlay concrete on a bridge deck unless they have previous experience through other projects. Section 557 of the “Construction Inspection Manual” should be thoroughly reviewed prior to the start of the project.

FINISHING MACHINE OPERATION CHECKLIST

1. Is 100 mm of material being maintained in front of augers?
2. Is there a golf ball size (50-75 mm diam.) roll maintained in front of the smooth wheel roller?
3. Is the vibrator set between 3000 and 5000 VPM? Check this with a reed tachometer.
4. Is the carriage travel speed between 14 meters and 18 meters per minute?
5. Is the drag pan adjusted for best results?
6. Is the automatic machine advance set to a minimum of 50 mm?
7. On super-elevated decks, have the following been checked:
   a. Finishing rollers rotate uphill only.
   b. Finish will be done moving uphill.
   c. Do not reverse direction of rotation of finishing rollers.
   d. The machine will automatically advance on both sides.

Texturing
SECTION 584 - SPECIALIZED CONCRETE OVERLAYS FOR STRUCTURAL SLABS

As soon as the finishing machine has formed a uniformly smooth, dense surface, the overlay must be textured with an approved turf drag in one pass only. Application of the texturing should not be done forcefully such that aggregate is pulled up by the drag. Make sure that the concrete is not overworked in the areas being trowel finished.

Note: It is not necessary that the concrete surface prior to texturing have all bug holes filled, or that the surface is smooth since texturing will be immediately applied and saw cut grooving will be done later. Irregularities (holes) < 6 mm do not need to be filled.

13. Curing of Overlay Concrete
When the entire job has gone well to this point, and all of the material was well consolidated, and properly textured, the bridge will still not last its expected life if the overlay is not properly cured. All requirements for normal concrete curing apply here, and the specifications should be stringently applied. Only wet burlap with continuous wetting is allowed on overlays. Along with the normal concrete procedures, specialized overlays require some extra effort. Review curing procedures in accordance with Section 557 of the "Construction Inspection Manual".

A. Burlap
The overlay must be covered with clean wet burlap within 10 minutes of being placed. Make sure that the burlap is wet before it is placed on the deck. If the burlap is dry when first put down, it will draw (wick) water from the concrete, resulting in shrinkage cracking. Make sure that all specifications concerning time and overlap of the burlap are strictly adhered to. Do not worry about the burlap pattern appearing on the concrete surface. Timely application of curing is more important than the texture and aesthetics of the overlay.

B. Slab wetting system
   1. Microsilica Concretes
      These overlays must be kept continually wet for a minimum of 96 hours (4 days). Make sure before placement that the wetting system will be operational when needed.
   2. Class DP Concrete
      DP concrete must be kept continuously wet cured for a minimum of 168 hours (7 days).

C. Ensuring Proper Curing Period
Curing temperatures are to be maintained per specifications during the curing period. Extremely high or low temperatures are detrimental to freshly placed concrete. Differentials in temperatures, such as change between day and night temperatures, are also detrimental to fresh concrete.

14. Saw Cut Grooving
The saw cut grooving should be performed as soon as possible after the required curing period, 4 days for Microsilica Overlay Concrete or 7 days for Class DP Overlay Concrete. Grooving should be done before allowing traffic on the overlay. The grooving must be cut according to all specifications and approved by the Engineer in Charge. Grooving is important for maintaining surface friction during wet weather. Engineers should ensure that the debris or slurry from the saw cuts is being controlled and disposed of in an environmentally safe manner. Follow the recommendations in Section 558 of the “Construction Inspection Manual”.

15. Penetrating Sealer Application
The sealer used must be from the Department’s Approved List. Only a non-water based penetrating sealer may be used due to friction problems encountered with water based sealers.

II. Cold Weather Concrete Operations
All subjects covered in Sections 555 and 557 of the "Construction Inspection Manual" concerning cold
weather concreting, apply for specialized concrete overlays placed in cold weather. In addition to those requirements, specific requirements for specialized concrete overlays are as follows:

1. **Minimum Temperature for Placement**
   Specialized concrete overlays for structural slabs may be placed if the ambient air temperature is 7°C or greater, the temperature of the deck after prewet is no less than 7°C, and rising air temperatures are predicted. Further, the prediction must be for ambient air temperatures of over 7°C for the 8 hours immediately after placement.

   The temperature of the substrate must be as close as possible to the drop temperature of the overlay concrete in order to minimize thermal stresses between them. Excessive temperature variations can cause debonding and cracking.

2. **Aggregation of Curing Hours**
   The curing period for specialized concrete overlays is accumulated in curing hours. A curing hour is defined as any hour, after covering with wet burlap, during which the curing temperature remains at or above 7°C, as measured by a recording thermometer. The Contractor shall supply a continuous recording thermometer.

3. **Requirements for Enclosures and External Heat**
   **A. Low Curing Temperature**
   Should the 7°C minimum for placement be met, and subsequently the curing temperature drops below 7°C at any time during the curing period, the structure must be enclosed and external heat provided in accordance with §555 of the NYS Standard Specifications. There is no provision under Specification Section 584 to extend the curing period when the curing temperature falls below 7°C; once the curing temperature falls below 7°C, the application of external heat is required. **If the curing temperature drops below 0°C at any time during the curing period, the concrete will be rejected.**

   **B. Low Placement Temperature**
   Prior to concrete placement, if the temperature is less than the 7°C minimum, concrete placement may not begin unless the structure is enclosed on 6-sides and external heat is provided for the entire curing period. In accordance with §555 of the NYS Standard Specifications, the existing deck slab cannot be considered to be the bottom of the enclosure.

   The substrate should be uniformly heated.

   **C. Removal of Enclosures and External Heaters**
   Once external heat provisions are required, they shall remain on the structure until the curing is complete, regardless of the ambient temperature. The temperature of the structure must be reduced at a slow rate after the cure period so as not to shock the concrete. This will allow internal free moisture to expand and escape slowly (prevent rapid freeze).

   **4. Chart**
   The Placement and Curing Flow Chart (Exhibit 584-A) should be helpful when making placement decisions and determining which provisions apply for the placement and curing of specialized concrete overlays during cold conditions.
Specialized Concrete Overlays for Structural Slabs
Placement & Curing Flow Chart
Section 584

CHECK AMB. TEMP

AMB. TEMP ≥7EC

CHECK PREDICTED AMB. TEMP FOR 8 HRS. AFTER PLACEMENT

PREDICTED 8 HR. AMB. TEMP ≥7EC

NORMAL PLACEMENT

CURING TEMP ≥7EC

COMPLETE CURE

CURING TEMP <7EC AT ANY TIME

DO NOT PLACE

PLACE UNDER §557

NOTE: IF CURING TEMP FALLS BELOW 0ºC AT ANY TIME, CONCRETE WILL BE REJECTED.

AMB. TEMP = AMBIENT TEMPERATURE