



BUREAU OF MATERIALS MATERIALS PROCEDURES

MP NUMBER: 9-08
EFFECTIVE DATE: 07/01/2008

APPROVAL: Eileen Sheehy

PRECAST / PRESTRESSED CONCRETE PLANT INSPECTION

PURPOSE:

To establish standard procedures for the plant inspection of precast/prestressed concrete

SUPERSEDES:

Materials Procedure Number 9 – Dated 10/01/2001

REFERENCES:

Special Provisions, Supplemental Specifications, Standard Specifications, Addenda and Attachments

Approved Shop Drawings

AASHTO - Standard Specifications for the Construction of Highway Bridges, 1989

American Concrete Institute, Manual of Concrete Practice, Volume I

Prestressed Concrete Institute, Manual for Quality Control for Plants and Production of Precast/Prestressed Concrete Products

AASHTO M-55 Specifications for Welded Steel Wire Fabric for Concrete Reinforcement

AASHTO M-203-831 Specification for Uncoated Seven Wire Stress-Relieved Strand for Prestressed Concrete

AASHTO M31M Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

Material Procedure 1-Field Inspection and Testing of Concrete

Material Procedure 2-Concrete Batching Plants

FORMS:

LB-5 - Analysis of Portland Cement
LB-9 - Analysis of Aggregates
LB-11A - Analysis of Concrete Sand
LB-14 - Miscellaneous Materials
LB-88 - Sample Envelope
LB-104 - Prestressed/Precast Report
LB-201 - Report of Slump and Air Tests
LB-296 - Notice of Non-complying Material

INSTRUCTIONS

I. Assignment Procedures

The assigned inspector shall receive from their Group Supervisor the following:

- A. Supplier, location and starting date.
- B. An approved Portland Cement Concrete mix design.
- C. Project designation with appropriate job code number to which time can be charged.
- D. A copy of the Supplementary Specifications pertaining to the work to be accomplished, approved shop drawings, forms, report and all equipment required to perform the inspection/testing task.

NOTE: The inspector must be certified as an ACI Field, Grade 1, NJDOT In-house Concrete Testing Technician, or PCI Technician, Grade 1.

II. Duties Prior to the Start of Operations

The assigned inspector shall:

- A. Confirm that the batch plant is approved.
- B. Confirm that all materials to be used in fabrication comply with specifications by either sampling and field testing, or by submitting samples to the Bureau of Materials for analysis. Obtain certifications and verify when required.
- C. Make a visual check of the plant site, beds and forms and storage of materials to insure conformance with specifications.
- D. Ensure that forms are of metal construction.

- E. Ensure that the air meter is calibrated.
- F. Ensure that the calibration of testing equipment is current.
- G. Ensure that the calibration of hydraulic jacks and gauges is current. A record of calibration shall be posted on each gauge face.

III. Duties Prior to the Casting Operation

The inspector shall:

- A. Inspect the beds and forms for cleanliness, alignment, chamfers, surface condition (holes plugged, trueness) and distance between bulkheads.
- B. Inspect the condition of stored prestressing strand. The specifications allow for the surface of the strand to be rusted but no pitting or sharp cuts are permitted. Strand must be adequately covered and stored off the ground. Heat numbers must be marked on each spool.
- C. Obtain the fabricator's elongation calculation and check for accuracy.
- D. Inspect the reinforcement for cleanliness. If the reinforcement is greasy, oily, dirty or heavily rusted, it must be cleaned or it will not be accepted for use. Ensure storage of reinforcement is off the ground.
- E. Confirm that the strand pattern is in accordance with approved shop drawings. Care must be taken to ensure that strand does not pick up dirt during the placing operation.
- F. Ensure that strand is marked after pre-loading.
- G. Ensure that each strand is loaded to 28,900 lbs. or as indicated on the fabricators' elongation chart. Control of the strand loading shall be by gauge reading.
- H. Measure the actual elongation of strand after loading. All operations inspected during the stressing of strand are potentially dangerous. Ensure that no one is located directly behind the bulkhead or the stressing jack. Measurements shall never be made while the strands are being loaded.
- I. Compare the theoretical control measurements with the actual control measurements. If a variation of more than $\pm 5\%$ occurs, stop the stressing operation pending the resolution of this problem. If this situation develops, notify Group Supervisor immediately.
- J. When strand splices are used, ensure they are in accordance with the requirements of the specifications.

- K. Inspect the strands for wire breaks, entanglements or other irregularities.
- L. Ensure that temperature correction tables are available and used when required.
- M. Record strand loading and elongation data on LB-201.

IV. Duties during the Placement of Reinforcement:

The inspector shall:

- A. Inspect epoxy coated reinforcements for proper fabrication and touch-up where appropriate.
- B. Check spacing of reinforcement and compare with the allowable tolerances of the specifications.
- C. Ensure that depth of concrete cover over all steel will be adequate when the pour is complete.
- D. Ensure that lifting devices are properly imbedded within the form.
- E. Verify correct void dimensions, locations, anchorage and spacing.
- F. No tie down straps are used to secure the voids.
- G. Measure the locations of headers and skew angle, if required.
- H. Determine that reinforcement is securely placed, so that no movement will occur during concrete pour. This is particularly critical when spiral reinforcement is used.
- I. Ensure that drainage for voids, location of dowel tubing and tie rod tube and block-outs are in the location required by the shop drawings, and that they are functional.
- J. Ensure that tie downs are placed or bent so that there will be sufficient concrete cover after the pour.
- K. Ensure that all reinforcement is secured before the pour.

V. Duties during the Concrete Pour

The inspector shall:

- A. Ensure, on a random basis, that the proportioning of concrete conforms with the requirements of MP2 by one of the following methods:
 - 1. Personal observation,
 - 2. Assignment of a subordinate,
 - 3. A delivery ticket from the batch plant listing the actual components of the concrete mix.
- B. Inspect the forms for cleanliness and presence of debris and water. If present, the form condition is unacceptable, the form must be cleaned.

- C. Inspect the form dimensions, final steel placement and clearances. Concrete placement will not commence until this inspection is completed.
- D. Ensure that the mix design has been adjusted for aggregate moisture and that aggregates are tested for gradation, as per P.C.I.
- E. Ensure that each load of concrete has a delivery ticket which indicates the following: Mix design, including aggregate moisture adjustment and daily gradation, weight of cement and aggregates, quantity of admixtures, volume of concrete, time concrete was loaded, time of discharge, and mixing water in gallons. If truck mix is used, then total revolutions of drums must also be included.
- F. Ensure that revolutions and time between cement loading and discharge are within limits of the specifications.
- G. Ensure that the delivered mix design complies with the approved mix design.
- H. Measure and record the ambient temperature or the temperature of the air in the form and of the concrete.
- I. Verify that air tests, slumps, and cylinders are made properly and that the number of tests is in accordance with the applicable specifications.
- J. Inspect dowel hole reinforcement, tie rods, and voids during vibration and placement of concrete to ensure that no movement occurs.
- K. Ensure that concrete is placed in such a way that segregation does not occur. Re-tempering of concrete shall not be permitted.
- L. Hand vibrators shall be used for ten seconds duration at locations not more than 30 inches apart. Vibrators shall not be used to move concrete.
- M. Ensure that there is little or no time between the placement of successive lifts and that concrete placement is performed in a timely manner. If cold joints occur, the member will be rejected.
- N. If weather is threatening, ensure that the fabricator has taken steps to protect the concrete if necessary.
- O. Ensure that the proper depth of concrete is placed.
- P. Ensure that the surface finish of the concrete is in accordance with the shop drawings.
- Q. Ensure that piece number and date of pour has been marked on the top of beam by fabricator.

- R. Ensure that all embedded clips and plates are in proper location and properly oriented.
- S. Ensure that the method of curing of the concrete is in accordance with the specifications.

VI. Duties during the Concrete Pour

The inspector shall:

- A. If steam curing is used, ensure that the tarpaulins are placed so that the steam does not escape. If excessive steam escapes, the tarpaulins must be repaired or replaced.
- B. Ensure that the proper delay time elapses before the start of steam curing.
- C. Ensure that bridging devices for tarpaulins are installed so steam may circulate freely within the enclosure.
- D. Temperature recording devices are required for steam curing. Ensure they are correctly located, operational and calibrated.
- E. Initial recording device graph paper, with date and time when graph paper is installed, before the start of the curing cycle.
- F. Ensure that test cylinders are placed under the tarpaulin where they will cure in the same manner as the beam.
- G. Ensure that steam does not play directly on forms, concrete or cylinders.
- H. Verify the parameters of curing. Verify temperature range, delay and time of cure to ensure that proper curing has been performed.
- I. Witness the breaking of stripping cylinders after the required curing period but before the termination of steaming. If the required strength has developed, the tarpaulins may be removed and preparations for detensioning may begin. If the required strength is not achieved, ensure that curing continues until this strength does develop.
- J. Witness the detensioning operation. Tensioned strand shall be released in accordance with a sequence described on the drawing supplied by the fabricator and while the beams are still warm and moist. Coordination of detensioning is the responsibility of the fabricator. Ensure that it is done correctly.
- K. Strands shall be released using a low oxygen flame. Play the flame over an area of strand so the metal gradually loses its temper and strength, then breaks.
- L. Ensure that both ends of a given strand are released simultaneously.

- M. Inspect each beam for surface discontinuities as it is lifted from the bed. If any prestressing strand is visible from the surface of the concrete, no repairs will be allowed and headquarters shall be notified immediately.
- N. Ensure that the drain holes to voids are opened.
- O. Ensure that surface finishing of formed surfaces is properly accomplished at this time.
- P. Inspect the member for conformance to the dimensional tolerances.
- Q. Ensure that test cylinders are marked, transported and stored properly.
- R. Measure the camber, as required by PCI, at the center of its length. Compare the camber with the requirements of the shop drawing and control tolerances.

VII. Duties Regarding the Storage of Beams:

The inspector shall:

- A. Ensure that beams are properly stored on dunnage in approximately horizontal positions.
- B. Ensure that strands are cut from ends and the areas are patched properly.
- C. Ensure that any beam areas, which have been damaged, are repaired in accordance with the contract documents.
- D. If beams are stored in more than one level, both levels shall have beams of the same length. Dunnage shall be located at the same points.
- E. Ensure that the epoxy seal coat is applied as required by the specifications.

VIII. Duties during the Loading and Shipping of Beams:

The inspector shall:

- A. Ensure that strength tests meet the specification requirements. Either 28-day cylinders or earlier testing when appropriate may establish this strength.
- B. Confirm that the beam is of proper age to allow shipping.
- C. Ensure that all required repairs have been made.
- D. Determine that the beam conforms to all specification requirements.

- E. Ensure that the beam is loaded on the truck or car in an upright position.
- F. Perform a final inspection of the beam after it is loaded.
- G. Stamp beam with DOT inspection stamp on marked end and attach a seal to reinforcing steel, bearing plate or clip. Record seal numbers on LB-104.
- H. Issue a LB-104 with all shipping information included.
- I. If seals or stamps are not used, or if the material for any reason is shipped without final inspection, or if the material is unacceptable for any reason, NOTIFY THE RESIDENT ENGINEER BY PHONE IMMEDIATELY!

IX. Authorities and Responsibilities:

- A. Be familiar with allowable tolerance of finished product and report any deviation to their Supervisor for decision on acceptance or rejection.
- B. Recognize and report immediately any malfunctions of plant equipment to plant quality control. Document the malfunction and corrective action taken, on LB-104.
- C. Recognize and report immediately to their supervisor any materials deficiency or any malfunction and corrective action taken on LB-104.
- D. Bring to the attention of their supervisor any uncertainties regarding the quality of materials, tests, equipment or methods of operations. Document any problem and action taken.
- E. The inspector in charge on any given day is responsible for immediately notifying the fabricator both verbally and in writing of any major deviation from the plans and/or specifications and/or established procedures. These incidents should be reported immediately to the team leader who will forward a copy of the communication (given to the fabricator) to the Supervisor.

X. Distribution of Forms

<u>Form</u>	<u>Distribution</u>
LB-5, LB-11A, LB-14	1. Orig. –Lab
LB-104, LB-201	1. Supervisor
	2. RE
LB-296	1. Original- Bureau Headquarters
	2. RE
	3. Regional Materials Office