



**INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS**

**PORTLAND CEMENT CONCRETE PLANT INSPECTION
ITM No. 405-17**

1.0 SCOPE.

- 1.1 This procedure covers the field inspection of PCC plants. The inspection will identify the materials used in concrete production and the procedure for the storage and sampling of aggregates, cement, pozzolans, and admixtures. The inspection also covers scale and meter verification.
- 1.2 This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101 and the following:

- 2.1 National Institute of Standards and Technology (NIST). A federal technology agency that develops and applies technology, measurements, and standards.

3.0 SIGNIFICANCE AND USE. This ITM is used to ensure that PCC plants are capable of producing concrete in accordance with applicable Department Standard Specifications.

4.0 APPARATUS.

- 4.1 Certified test weights. The number of certified test weights used to check the accuracy of the scale shall be such that the cumulative weight is at least 10 percent of the scale capacity. The weights shall be a minimum NIST Class F set of weights with a calibration report indicating traceability to NIST. The weights shall be calibrated at a minimum frequency of once each 24 months.
- 4.2 Water tight container with a capacity of 50 gallons or more. Containers used to volumetrically measure the discharge from the water meter shall be calibrated and marked before used.

5.0 PROCEDURE.

- 5.1 The PCC supplier shall request a Department inspection of the PCC plant.
- 5.2 The inspection date and time shall be mutually agreed upon.

- 5.3** The PCC supplier shall ensure that the necessary apparatus are on site at the time of the calibration verification for scales and meters. Calibration verification of scales and meters shall be performed by qualified personnel of the plant owner, another highway agency, or a scale calibration company. Calibration verification of dispensers shall be performed by qualified personnel of the plant owner, admixture supplier, another highway agency, or a scale calibration company.
- 5.4** The PCC plant will be inspected in accordance with the following procedures and the results recorded on the form in Appendix A. Some of the aspects of the form are descriptive elements of the plant rather than inspections or evaluations.
- 5.4.1** Record the plant identification and material information
 - 5.4.2** Inspect the aggregate storage and conveying system
 - 5.4.3** Inspect the method to prevent over filling of the overhead aggregate bins
 - 5.4.4** Inspect the cementitious material storage and conveying system
 - 5.4.5** Review the admixture control systems
 - 5.4.5(a)** Indicate whether the admixtures are controlled by volume or weight
 - 5.4.5(b)** Indicate whether the admixtures are added manually or automatically
 - 5.4.5(c)** Determine if there is a separate dispenser for each liquid admixture. If there is not a separate dispenser, determine if the admixtures are compatible with each other and not detrimental to concrete. The dispenser may be flushed with water between admixture use or cycle.
 - 5.4.5(d)** Determine if the piping is free of leaks and properly valved to prevent backflow or siphoning
 - 5.4.5(e)** Determine if each dispenser of liquid admixture is provided with an accurately calibrated container in which the admixture may be collected when checking the accuracy
 - 5.4.6** Check all gates to confirm non-leakage by charging material into each bin and then into the weigh hopper
 - 5.4.7** Locate the cementitious weigh hopper
 - 5.4.8** Locate the aggregate weight hopper

- 5.4.9** Locate the cementitious sampling ports. If a sampling port is not provided as required by 508.02(c)2. or 702.06(d), the DTE may approve an alternate sampling location and method. The details of the alternate sampling location and method will be included in the plant inspection report.
- 5.4.10** Review the batching method
- 5.4.11** Examine the discharge boot
- 5.4.12** Determine if the scales zero prior to charging
- 5.4.13** Determine if a moisture probe is present
- 5.4.14** Determine where the admixtures are introduced
- 5.4.15** Determine the type of scales
- 5.4.16** Determine the method of addition and source of water
- 5.4.17** Verify that the supplier has checked the blades for wear.
- 5.4.18** Locate the automatic timing device
- 5.4.19** Locate the automatic discharge locking device
- 5.4.20** Review the cold weather concreting procedure, if applicable
- 5.5** The supplier shall provide documentation of the adequacy of the admixture metering and proportioning systems.
- 5.6** The scales used for weighing aggregate, cementitious materials and, if applicable, water will be checked for compliance using certified test weights. Results are to be recorded on the appropriate form in Appendix A or as otherwise approved by the DTE. The report shall include the name of the Scale Company or State Agency, if applicable. If the completed forms are not available at the time of the Department inspection, the forms shall be submitted within three work days from the date of the verification. Verification of the scales shall be completed within three months prior to, or one month after the Department inspection date.
 - 5.6.1** Record the scale identification data information
 - 5.6.2** Ensure that all weigh hoppers are clean and empty prior to calibration
 - 5.6.3** Apply the necessary calibration equipment such as chains or platforms

- 5.6.4** Tare the scales
- 5.6.5** Scale accuracy shall be verified using certified test weights to a load not less than 10 percent of the scale capacity, with substitute loads to not less than 50 percent of scale capacity, and with a combination of test weights, substitute loads or strain loads at not less than each of the upper two quarters of the scale capacity. Calibration will include at least four loads throughout the working capacity of the scales. Substitute loads and strain loads are defined in the NIST Handbook 44, 2007 edition, Section 2.20, Notes N.1.
- 5.6.6** Determine the percent of error between each scale reading and the total applied load increment.
- 5.7** The water meter will be verified for compliance using certified scale readings on a container with a capacity of 50 gallons or more. Verification shall be made up to a quantity of 200 gallons. Results are to be recorded on the appropriate form in Appendix A.
 - 5.7.1** Record the meter identification data
 - 5.7.2** The container is required to be attached to the certified scale and be tared. Instruct the plant operator to meter water into the container to the first predetermined meter reading (in pounds or gallons, depending on the meter).
 - 5.7.3** Calculate the applied load of water in the container from a meter reading in gallons. A value of 8.33 lb/gal shall be used as the unit weight for the metered water.
 - 5.7.4** Repeat 5.7.2 through 5.7.3. in a cumulative manner.
 - 5.7.5** Determine the percent of error between each Certified scale weight and the total applied load increment as calculated from the meter reading.
 - 5.7.6** Rejection of a water meter will not be based on one container check. Further accumulation of water through the meter with scale/container readings will be obtained for at least 200 gallons. The verification will include a minimum of three consecutive container measurements that substantiate compliance.

6.0 CRITICAL ELEMENTS.

- 6.1** The PCC plant will only be approved if the following critical elements of the plant operations are met.

6.2 Cementitious.

6.2.1 There is a system to prevent contamination within the silos or bins.

6.2.2 The conveying system prevents contamination.

6.3 Weigh Hopper.

6.3.1 The coarse and fine aggregate gates are tight and not leaking.

6.3.2 The cementitious gates are tight and not leaking.

6.3.3 The cementitious sampling ports meet the requirements of 508.02(c)2, 702.06(d), or an alternate requirement as approved by the DTE in accordance with 5.4.9.

6.4 Batching.

6.4.1 The scales zero prior to charging.

6.4.2 The water is potable or documentation is supplied indicating the water is in accordance with 913.01.

6.4.3 The plant may be batched remotely, but the producer shall have written quality control procedures for batching problems including equipment breakdowns and failure to meet batching tolerances. The quality control procedures shall be provided to the Department at the time of the inspection. A plant is considered to be batched remotely if the plant operator is physically located at a separate property.

6.5 Mixing.

6.5.1 The blades are in accordance with the manufacturer's recommendations.

6.5.2 The mixer is equipped with a timing device.

6.5.3 The mixer is equipped with an automatic locking device.

6.6 Certification.

6.6.1 The supplier can certify the admixture metering system.

6.6.2 The supplier can certify the accuracy of the proportioning system.

6.7 Scales and Meters.

- 6.7.1** The scale company's name and last date of test weight certification must be recorded on page four of the inspection report in 7.0.
- 6.7.2** The difference between the scale reading and the actual weight (mass) applied shall be within $\pm 0.5\%$ throughout the range unless otherwise specified. For applied loads less than 1000 lbs on the cement scale and 4000 lbs on the aggregate scale, the scales shall be accurate to $\pm 2.0\%$ or one gradation as required by 508.02 (b).
- 6.7.3** The difference between the water meter reading and the actual volume shall be within $\pm 1.0\%$, as required by 508.02(b).
- 6.7.4** The difference between the admixture meter and the actual volume shall be within $\pm 1.0\%$, as required by 508.02(b).
- 6.7.5** Admixtures shall be verified with a minimum of 100 ounces in a graduated cylinder.
- 6.7.6** Verification of scales and meters shall be completed within three months prior to, or one month after the Department inspection date. The forms provided in Appendix A shall be used for documenting verification of scales, meters and dispensers. Other forms may be used if approved by the DTE. Verification forms shall be submitted within three work days from the date of verification.

7.0 REPORT.

- 7.1** Report Appendix A

ITM 405
PORTLAND CEMENT CONCRETE PLANT INSPECTION

PLANT OWNERS NAME		PLANT CAPACITY	PLANT NO.	
OWNER'S HOME OFFICE ADDRESS		PLANT MANUFACTURER		MANUFACTURED DATE
PLANT LOCATION AND ADDRESS			TYPE OF PLANT <input type="checkbox"/> CENTRAL <input type="checkbox"/> SHRINK <input type="checkbox"/> TRANSIT	MODEL NUMBER
PLANT AREA CODE AND PHONE NUMBER				INSPECTION DATE
<u>AGGREGATES</u> CHECK SOURCES OF ALL AGGREGATES USED AT PLANT. REVIEW COPIES OF MOST RECENT WEIGH TICKETS FOR ALL AGGREGATES INTENDED FOR INDOT USE. (IDENTIFY NON-INDOT AGGREGATES AS "COMMERCIAL ONLY").				
<u>SIZE/TYPE</u>	<u>SOURCE NAME AND NUMBER</u>	<u>APPROVAL (Q#)</u>	<u>CLASS/LEDGE</u>	<u>INDOT APPROVED</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
COMMENTS: _____				
<u>CEMENTITIOUS MATERIALS</u> CHECK SOURCES OF ALL CEMENTITIOUS MATERIALS POTENTIALLY UTILIZED AT THE PLANT. THIS WILL INCLUDE CEMENT, GGBFS, FLY ASH, AND SILICA FUME. REVIEW COPIES OF MOST RECENT BILLS OF LADING. (IDENTIFY NON-INDOT MATERIALS AS "COMMERCIAL ONLY").				
<u>MATERIAL</u>	<u>TYPE/CLASS</u>	<u>SOURCE NAME AND NUMBER</u>	<u>APPROVAL #</u>	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
COMMENTS: _____				
<u>CHEMICAL ADMIXTURES</u> CHECK SOURCES OF ALL ADMIXTURES POTENTIALLY UTILIZED AT THE PLANT. REVIEW COPIES OF MOST RECENT DELIVERY TICKETS. (IDENTIFY NON-INDOT MATERIALS AS "COMMERCIAL ONLY").				
<u>NAME</u>	<u>TYPE</u>	<u>SOURCE NAME AND NUMBER</u>	<u>APPROVAL #</u>	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
COMMENTS: _____				

ITM 405
PORTLAND CEMENT CONCRETE PLANT INSPECTION

<p>AGGREGATE STORAGE YES NO <input type="checkbox"/> <input type="checkbox"/> BY STOCKPILING <input type="checkbox"/> <input type="checkbox"/> IN BINS <input type="checkbox"/> <input type="checkbox"/> ARE AGGREGATES KEPT FROM INTERMIXING</p> <p>CORRECTIVE ACTIONS: _____ _____ _____</p> <p>AGGREGATE CONVEYING SYSTEM <input type="checkbox"/> BELT <input type="checkbox"/> BUCKET ELEVATOR <input type="checkbox"/> OTHER IF OTHER, EXPLAIN: _____ _____ _____</p>	<p>BATCHING YES NO <input type="checkbox"/> <input type="checkbox"/> IS BATCHING CONDUCTED MANUALLY <input type="checkbox"/> <input type="checkbox"/> IS BATCHING CONDUCTED AUTOMATICALLY <input type="checkbox"/> <input type="checkbox"/> IS THE PLANT BATCHED REMOTELY PER 6.4.3? IF YES, ARE QUALITY CONTROL PROCEDURES ATTACHED? <input type="checkbox"/> <input type="checkbox"/> IS DISCHARGE BOOT CLEAN AND FUNCTIONING PROPERLY <input type="checkbox"/> <input type="checkbox"/> DO SCALES ZERO PRIOR TO CHARGING <input type="checkbox"/> <input type="checkbox"/> IS THERE A MOISTURE PROBE IN THE COARSE AGGREGATE <input type="checkbox"/> <input type="checkbox"/> IS THERE A MOISTURE PROBE IN THE FINE AGGREGATE</p> <p>ARE BATCH TICKETS PRINTED <input type="checkbox"/> AUTOMATICALLY <input type="checkbox"/> MANUALLY</p> <p>WHERE AND WHEN IS ADMIXTURE INTRODUCED _____ _____ _____</p> <p>SCALES <input type="checkbox"/> DIAL <input type="checkbox"/> LOAD CELL <input type="checkbox"/> OTHER</p> <p>IF OTHER, EXPLAIN: _____ _____ _____ _____ _____ _____</p>
<p>CEMENTITIOUS YES NO <input type="checkbox"/> <input type="checkbox"/> IS THERE A SYSTEM TO PREVENT CONTAMINATION WITHIN SILOS OR BINS <input type="checkbox"/> <input type="checkbox"/> DOES THE CONVEYING SYSTEM PREVENT CONTAMINATION</p> <p>CORRECTIVE ACTIONS: _____ _____ _____</p>	<p>IS WATER ADDED BY <input type="checkbox"/> VOLUME/METERED <input type="checkbox"/> WEIGHT (MASS)</p> <p>IS SOURCE OF WATER <input type="checkbox"/> WELL <input type="checkbox"/> PUBLIC UTILITY <input type="checkbox"/> OTHER</p> <p>IF OTHER, EXPLAIN: _____ _____ _____</p> <p>CORRECTIVE ACTIONS: _____ _____ _____</p>
<p>ADMIXTURES CONTROLLED BY VOLUME _____ or BY WEIGHT (MASS) _____ ADDED MANUALLY _____ or ADDED AUTOMATICALLY _____ YES NO <input type="checkbox"/> <input type="checkbox"/> SEPARATE DISPENSER FOR EACH LIQUID ADMIXTURE <input type="checkbox"/> <input type="checkbox"/> PIPING IS FREE OF LEAKS <input type="checkbox"/> <input type="checkbox"/> DISPENSER PROVIDED WITH ACCURATE CONTAINER</p> <p>CORRECTIVE ACTIONS: _____ _____ _____</p>	<p>BINS/HOPPER YES NO <input type="checkbox"/> <input type="checkbox"/> IS THERE A SYSTEM TO PREVENT OVER FILLING OF OVERHEAD AGGREGATE BINS <input type="checkbox"/> <input type="checkbox"/> ARE COARSE AND FINE AGGREGATE GATES TIGHT AND NON-LEAKING <input type="checkbox"/> <input type="checkbox"/> ARE CEMENTITIOUS GATES TIGHT AND NON-LEAKING <input type="checkbox"/> <input type="checkbox"/> ARE WEIGH HOPPER GATES TIGHT AND NON-LEAKING <input type="checkbox"/> <input type="checkbox"/> IS THE CEMENTITIOUS WEIGH HOPPER SEPARATE FROM THE AGGREGATE WEIGH HOPPER <input type="checkbox"/> <input type="checkbox"/> IS THERE A CEMENT SAMPLING PORT IN THE SILO <input type="checkbox"/> <input type="checkbox"/> IS THERE A CEMENT SAMPLING PORT IN THE WEIGH HOPPER</p> <p>CORRECTIVE ACTIONS: _____ _____ _____</p>

ITM 405
PORTLAND CEMENT CONCRETE PLANT INSPECTION

<p>MIXING YES NO</p> <p><input type="checkbox"/> <input type="checkbox"/> HAS THE SUPPLIER CHECKED THE BLADES FOR WEAR IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS</p> <p>DATE CHECKED _____</p> <p><input type="checkbox"/> <input type="checkbox"/> IS THE MIXER EQUIPPED WITH A TIMING DEVICE</p> <p><input type="checkbox"/> <input type="checkbox"/> IS THE MIXER EQUIPPED WITH AN AUTOMATIC DISCHARGE LOCKING DEVICE</p> <p>CORRECTIVE ACTIONS: _____</p> <p>_____</p> <p>_____</p>	<p>COLD WEATHER PRODUCTION YES NO</p> <p><input type="checkbox"/> <input type="checkbox"/> IS THE PLANT CAPABLE OF PRODUCING COLD WEATHER CONCRETE</p> <p><input type="checkbox"/> <input type="checkbox"/> IS THERE A SYSTEM FOR MONITORING TEMPERATURE</p> <p><input type="checkbox"/> <input type="checkbox"/> CAN THE WATER BE HEATED</p> <p><input type="checkbox"/> <input type="checkbox"/> CAN THE AGGREGATES BE HEATED <input type="checkbox"/> STEAM <input type="checkbox"/> DRY <input type="checkbox"/> OTHER</p> <p>IF OTHER, EXPLAIN: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<p>CERTIFICATION</p> <p>I CERTIFY THAT THE ADMIXTURE METERING SYSTEM IS ACCURATE AND MAINTAINED TO ±1.0%, IF BY VOLUME AND ±0.5%, IF BY WEIGHT.</p> <p>I ALSO CERTIFY THAT THE ACCURACY OF THE PROPORTIONING/BATCHING SYSTEM IS MAINTAINED IN ACCORDANCE WITH THE FOLLOWING:</p> <p style="margin-left: 40px;">ADMIXTURE.....±3 %</p> <p style="margin-left: 40px;">AGGREGATES.....± 2 %</p> <p style="margin-left: 40px;">CEMENTITIOUS MATERIALS.....± 1 %</p> <p style="margin-left: 40px;">WATER.....± 1 %</p>		
<p>_____ SUPPLIER'S SIGNATURE TITLE DATE</p>		
<p>REMARKS</p> <p>_____</p> <p>_____</p> <p>_____</p>		
<p>DEPARTMENT SIGNATURE</p>	<p>CLASSIFICATION</p>	<p>DATE SIGNED</p>
<p>DISTRICT TESTING OFFICE TELEPHONE NUMBER</p>		
<p>THIS IS TO CERTIFY THAT I HAVE ACCOMPANIED THE DEPARTMENT ON THIS INSPECTION FOR THE ABOVE NAMED CONCRETE PLANT AND HAVE GIVEN ALL INFORMATION, TRUE AND COMPLETE, TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT ONLY INDOT APPROVED MATERIALS MAY BE INCORPATED INTO CONCRETE FOR INDOT CONTRACTS AND PURCHASE ORDERS. I WILL CONTACT THE INDOT TESTING OFFICE TO UPDATE THIS MATERIAL APPROVAL LIST IF WE CHANGE ANY SOURCE, SUPPLIER, OR MATERIAL.</p>		
<p>SUPPLIER'S SIGNATURE</p>		<p>DATE SIGNED</p>
<p>DISTRIBUTION: MATERIALS MANAGEMENT DIVISION DISTRICT TESTING ENGINEER SUPPLIER</p>		

ITM 405
PORTLAND CEMENT CONCRETE PLANT INSPECTION

INSPECTION OF SCALES AND METERS FOR CONCRETE PLANT							
PRODUCER _____				PLANT LOCATION _____			
PLANT NO. _____							
Scales and meters will be checked to the maximum capacity for which they will be used. The allowable difference between the scale reading and the actual weight applied shall be $\pm 0.5\%$. Meter variation shall be $\pm 1.0\%$. Scales will be checked cumulatively throughout the working capacity plus approximately ten percent. At least three points within the working range for meters will be checked.							
SCALE COMPANY _____							
DATE OF LAST TEST WEIGHT CERTIFICATION _____							
AGGREGATE SCALE VERIFICATION ($\pm 0.5\%$)							
MAKE _____		SERIAL NO. _____		CAPACITY _____			
LOAD METHOD							
LOAD APPLIED							
SCALE READING							
ERROR, LBS (KG)							
PERCENT ERROR							
CEMENT SCALE VERIFICATION ($\pm 0.5\%$)							
MAKE _____		SERIAL NO. _____		CAPACITY _____			
LOAD METHOD							
LOAD APPLIED							
SCALE READING							
ERROR, LBS (KG)							
PERCENT ERROR							
WATER SCALE ($\pm 0.5\%$) OR METER VERIFICATION ($\pm 1.0\%$)							
MAKE _____		SERIAL NO. _____		CAPACITY _____			
METER Gal (L)							
WEIGHT (MASS) APPLIED							
SCALE READING							
ERROR, LBS (KG)							
PERCENT ERROR							
REMARKS							

