

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

INSPECTION AND ACCEPTANCE PROCEDURES
FOR PRECAST CONCRETE PRODUCTS

1. PURPOSE

- 1.1 To set forth procedures for the inspection and acceptance of precast concrete products, including inlets, manholes, box culverts, 3-sided bridge units, retaining wall panels, headwalls, wingwalls, lagging, junction boxes, and any other precast products, and the approval of the plants at which they are fabricated.
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2. SCOPE

- 2.1 This procedure will apply to all precast concrete products supplied for use on West Virginia Division of Highways projects and to all precast concrete product fabricators that supply material for use on West Virginia Division of Highways projects.
- 2.2 For prestressed concrete members refer to MP 603.10.40 "Inspection and Acceptance Procedure for Prestressed Concrete Bridge Beams."
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3. FABRICATOR APPROVAL

- 3.1 All precast concrete product fabricators (hereafter referred to as the Fabricator) shall be approved by Materials Control Soils and Testing MCS&T Division prior to the start of any work for the WVDOH. If not listed on the WVDOH Approved List of Precast Concrete Fabricators, a Fabricator shall contact MCS&T Division a minimum of six weeks prior to the planned date on which fabrication is to begin to initiate the approval process.
- 3.2 In order for a Fabricator to be approved and listed on the WVDOH Approved List of Precast Concrete Fabricators, they must be NPCA (National Precast Concrete Association) certified or have an equivalent type of certification.

- 3.3 The process for approving a Fabricator shall include, but not be limited to, an on-site visit to the fabrication plant by a WVDOH representative from MCS&T Division. During this visit, the WVDOH Quality Assurance (QA) personnel shall inspect the fabrication facility and Quality Control (QC) lab, meet with QC and other key personnel from the Fabricator, and sample component materials which will be used in the fabrication of precast items.
- 3.3.1 Sampling and testing of component materials shall be done in accordance with MP 603.02.10. Copies of recent component delivery tickets should be presented on the day of sampling. All component materials must be approved prior to the start of fabrication.
- 3.3.1.1 Any Fabricator which does not produce for the WVDOH for a period of 2 years shall be removed from the Approved Fabricator list. After removal from the approved list, before a Fabricator can again produce for the WVDOH, they must repeat the approval process. Sampling of component materials will not continue when the plant is not listed on the Approved Fabricator list.
- 3.3.2 Personnel from the Fabricator required to be present during the initial on-site visit and meeting between WVDOH and Fabricator shall include representatives from Production and Quality Control. Any questions and concerns regarding WVDOH requirements, including applicable Specifications, Materials Procedure (MP's), Standard Details, and QC/QA Inspections shall be addressed at this meeting.
- 3.3.3 The Fabricator must submit the Quality Control Manual/Plan for review at this meeting.
- 3.4 All Concrete Mix Designs which will be used on products fabricated for the WVDOH must be submitted for review & approval, prior to the start of fabrication.
- 3.5 The Fabrication Plant QC Personnel, as a minimum, shall be a certified ACI Grade I Concrete Field Testing Technician and/or a WVDOH PCC Inspector.

4. FABRICATION & INSPECTION OF PRODUCTS

- 4.1 Prior to beginning fabrication of any precast concrete products, the Fabricator shall provide written or email notification to MCS&T Division at least one calendar week in advance of the date on which fabrication is to begin.

- 4.1.1 Depending upon the precast items being fabricated, MCS&T Division may choose to monitor fabrication. Fabrication of structurally significant products such as box culverts and 3-sided bridge units shall be monitored. Other items may be monitored at the discretion of MCS&T.
- 4.1.2 After fabrication has begun, the Fabricator shall keep MCS&T Division and the Inspector (whether a WVDOH employee or a contract employee representing the WVDOH) informed in advance of the days on which fabrication will take place.
- 4.2 Shop Drawings must be approved by the West Virginia Division of Highways prior to the start of any work by the Fabricator. The Inspector must have a copy of these approved shop drawings prior to start of any work by the Fabricator.
- 4.3 Concrete cylinders shall be made for compressive strength testing with 6-inch by 12-inch (150 mm by 300 mm) or 4-inch by 8-inch (100 mm by 200 mm) molds. The cylinders are to be cured in the same area as the products for which they represent (Field Cured as outlined in AASHTO T23) until tested to create a curing environment similar to the product that they represent. A compressive strength test shall consist of the average result of a set of cylinders, which is at least two cylinders. Form removal isn't to be allowed until concrete has reached 50% of the design strength, unless otherwise specified. If forms are stripped from box culverts at 50% of the design strength, another curing method from section 601.12, or AASHTO M259, or M273 (whichever is applicable) must be used until 70% of the design strength is obtained.
- 4.3.1 For both conventional concrete and SCC mixes, a minimum of one set of compressive strength cylinders shall be fabricated from every 7 yards of concrete, or fraction thereof, with a minimum of one set per day per mix design. Both the form removal strength and the 28-day strength must be confirmed by a set of cylinders. Cylinders shall be the same size as those used in the initial approved mix design. For conventional concrete, slump, temperature, and air content tests shall be conducted on the first batch of concrete each day and every time that cylinders are fabricated. For SCC mixes, spread, temperature, and air content tests shall be conducted on every batch. For all types of concrete, unit weight and yield tests shall be conducted on the first batch of concrete each day and thereafter as deemed necessary by Quality Control and Quality Assurance Personnel.
- 4.4 When required, absorption tests are to be conducted in accordance with ASTM C642-13, and tests should be conducted on a weekly basis for each mix design used, at a minimum, unless otherwise specified.

- 4.5 Unless otherwise specified, plastic concrete shall have an air content measured at $7 \pm 2\%$.
- 4.5.1 Prior to the use of Self-Consolidating Concrete in precast items all mix designs must be submitted to MCS&T for approval and meet the requirements of the following table. Test results from trial batches produced by the laboratory which designed it shall be included in the submittal. The compressive strength of the design mix shall be at least 15% above the specified design strength.

Table 4.5.1 - SCC Mix Design Acceptance

Fresh Property	Mix Design Batch Acceptance Criteria
Air Content	$7 \pm 1.5\%$
Spread (ASTM C1611)	Target ± 1.5 inches (38 mm) $2 \text{ seconds} \leq T_{50} \leq 7 \text{ seconds}$ Visual Stability Index ≤ 1.0
Passing Ability (ASTM C1621)	J-Ring Value ≤ 1 inch (25 mm)
Segregation Resistance (ASTM C1610)	Segregation $\leq 12\%$
Unit Weight and Yield	$\pm 2\%$ of Theoretical

- 4.5.2 The following table lists the criteria for SCC production.

Table 4.5.2 - SCC Production Acceptance

Fresh Property	Production Acceptance Criteria
Air Content	$7 \pm 2\%$
Spread (ASTM C1611)	Target ± 2 inches (50 mm) $2 \text{ seconds} \leq T_{50} \leq 7 \text{ seconds}$ Visual Stability Index ≤ 1.0
Concrete Temperature	$< 90^\circ\text{F}$ (32°C)
Unit Weight and Yield	$\pm 2\%$ of Theoretical

- 4.5.3 SCC should only be given minimal vibration; and shall not be dropped from a distance greater than 4 feet relative to the top of the form.

5. FINAL INSPECTION

- 5.1 After fabrication is completed and prior to shipment, the precast items will be stored on dunnage. The Fabricator shall provide MCS&T Division with a written or email request for final inspection a minimum of one calendar week prior to the desired date of inspection. Effective communication from the Fabricator to MCS&T Division and Consultant Inspection Agency is the key to avoiding any scheduling conflicts regarding final inspection.
- 5.2 At the final inspection, the fabricator shall provide the inspector with documentation of required data pertinent to the product(s) being produced. Attached to this document is a sample inspection sheet to be used as a guide for presenting this information. This documentation is also available on the [MCS&T Division Website \(link\)](#)¹.
- 5.2.1 For the final inspection, the Inspector may witness compressive strength tests if required, inspect repairs as needed, and conduct a thorough visual examination of each member. A copy of the Inspector's daily reports, a copy of the final inspection report, and all other pertinent information provided to the Inspector by the Fabricator shall be kept on file by MCS&T Division.
- 5.2.2 For box culverts, trial fitting of adjacent pieces, prior to shipping, will be required as part of the final inspection process. Each adjacent box culvert will be stacked in pairs vertically; the gaps between each pair will be measured, and dunnage will be placed below the bottom culvert to prevent damage. The maximum gap between the adjacent pieces shall not exceed ½ inch (13 mm), unless otherwise stated in the construction plans.

6. ACCEPTANCE & REJECTION

- 6.1 Upon completion of final inspection, if a precast product meets all specification requirements and does not contain any defects, the Inspector will stamp the precast product as accepted by MCS&T Division and provide a 7-digit Laboratory Reference Number for shipment.

¹ <https://transportation.wv.gov/highways/mcst/Material%20Procedures/2018%20MPs/MP%20604.02.40%20-%20Attachment.pdf>

- 6.2 If, however, the precast product does not meet all specification requirements due to damage, defect, or dimensional tolerance, the product must be further evaluated before potential acceptance by the MCS&T Division or the District for which the product was produced, as discussed further in the next sections.
- 6.2.1 Minor damage and/or defects may be repaired in accordance with the pre-approved repair procedures which should be incorporated within the Fabricator QC Plan. For cracks 4 mils (.1 mm) or less a silane treatment may be used. Cracks between 4 mils (0.1 mm) and 16 mils (0.4 mm) shall be repaired by epoxy injection in accordance with Section 603.10.2. Products with cracks exceeding 16 mils (4 mm) shall be rejected by MCS&T. If repairs appear satisfactory and all other specifications are met, the Inspector shall stamp the product as approved for shipment. MCS&T Division will issue a 7-digit Laboratory Reference Number for acceptance.
- 6.2.2 Major damage and/or defects shall be evaluated on a case-by-case basis. If a product is approved for repair and if repairs appear satisfactory, the Inspector shall stamp the product as approved for shipment.
- 6.2.3 If a product does not meet specification requirements due to dimensional measurements not within tolerance, the product must be evaluated by the contractor and or District as to its potential acceptance. If the decision is made to accept the product, acceptance shall be provided by the District through a DMIR. If, however, the product will not be accepted, the Inspector will reject the product, and MSC&T Division will apply a Laboratory Reference Number documenting the rejected product.



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RLS:Mge
ATTACHMENT

**PRECAST CONCRETE PRODUCTS
WVDOT DIVISION OF HIGHWAYS MCS&T DIVISION**

SAMPLE FABRICATION CHECKLIST

Preliminary Verifications

NPCA (National Precast Concrete Association) Certification _____

CONCRETE COMPONENTS

Mix Design Lab # (if applicable): _____

Cement Source: _____

Fly Ash Source: _____

Coarse Aggregate Source 1: _____

Coarse Aggregate Source 2: _____

Cement Type: _____

Approved/Tested: _____

Fly Ash Type: _____

Approved/Tested: _____

Coarse Aggregate 1: _____

Approved/Tested: _____

Coarse Aggregate 2: _____

Approved/Tested: _____

Fine Aggregate 1: _____

Approved/Tested: _____

Fine Aggregate 2: _____

Approved/Tested: _____

Batch Water Source: _____

Approved/Tested: _____

Admixtures: _____

STEEL COMPONENTS

Reinforcement: Supplier(s): _____

Description: _____ Lab Number: _____

Description: _____ Lab Number: _____

Description: _____ Lab Number: _____

Inserts: Supplier(s): _____

Description: _____ Lab Number: _____

SHIPLOOSE MATERIAL

Grates: Fabricator: _____

Mill Certs.: _____ Galvanize Cert.: _____ Lab Number: _____

Mastic: Fabricator: _____

Inspected at: _____ Lab Number: _____

SHOP DRAWING REVIEW

Approval Date: _____ Approved By: _____

Sample Form Inspection (Pre-Placement of Concrete)

Product Type (s)				
Criteria	Design Dimension	Tolerance (±)	Actual Measurement	Within Tolerance
Fill in Form Information (if applicable)				
Height of Product (ft-inch)				
Depth of form (ft-inch)				
Inside Width of form (inch)				
Outside Width of form (inch)				
Inside Length of form (inch)				
Outside Length of form (inch)				
Wall Thickness (inch)				
Forms Square and Level (√)				
Skew dimensions [if applicable (ft-inch)]				
Locations of inserts, sleeves, block outs, etc. (√)				

Product Type(s)		Form Properly sealed at joints & edges (√)	
Framework Constructed of metal on concrete foundation (√)		Form Clean & Free of debris (√)	
Form dimensionally correct (√)		Release Agent applied (√)	
Other Information:			

Reinforcing Steel	
Reinforcing Steel (Condition)	
Fill in steel information (if applicable)	
Size & Grade	
Location & Lapping Length (√)	
Spacing and Clearances (√)	
Chairs, Spacers properly used	

Sample Concrete Placement & Curing

Quality Control Concrete Testing			
Concrete Truck Arrival Time		Concrete Truck Departure Time	
Concrete Temp		Ambient Temp, Weather Conditions	
Slump/Spread (inch)		Air Content (%)	
QC Tests performed per Specifications & Passing		Number & diameter (inch) of Cylinders	
Comments:			

Placement of Concrete			
Lift	Start Time	Completion Time	Vibrated (External/Internal/Both)
1 st			
2 nd			
3 rd			
4 th			
Placement of Concrete Completion Time			
Comments:			

Curing/Finishing of Concrete	
Top Surface Finished Per Specification	
Lifting loops/inserts accessible	
Product Curing Location (Inside/Outside)	
Product Covered & Heat Applied (Time Start & Time Finished)	
Heat Sensors Installed (√)	
Compressive Strength Cylinders Stored with Product under Curing/Normal Environment (√)	
Compressive Strength Test Conducted when curing was discontinued (√)	
Comments:	

Sample Concrete Post Pour Product Inspection

Product	
Visual Inspection for Damage (√)	
Notes (Size & Location of cracks, spalls, honeycomb, etc.)	
Products in Need of Repair (√)	
Repair Method Approved (√)	
Comments: 	

Product Type (s)	Design Dimension	Tolerance (±)	Actual Measurement	Within Tolerance
Fill in Form Information (if applicable)				
Height of Product (ft-inch)				
Inside Width of product (inch)				
Outside Width of product (inch)				
Inside Length of product (inch)				
Outside Length of product (inch)				
Wall Thickness (inch)				
Product Square and Level (√)				
Skew dimensions [if applicable (ft-inch)]				
Locations of inserts, sleeves, block outs, etc. (√)				

Product	
Dimensional Tolerances Met? (yes or no)	
Heights (yes or no)	
Widths (yes or no)	
Depths (yes or no)	
Wall Thickness(es) (yes or no)	
Inserts, sleeves, lifting points, etc. (yes or no)	
All Concrete Finishes per specification (yes or no)	
Product properly transported (yes or no)	
Product stored on proper dunnage (yes or no)	
Design Shipping Strength met (yes or no)	
Repairs Satisfactory (yes or no)	
Product Stamped for Final Inspection (yes or no)	
Comments:	

