

ALDOT 453-14

PROCEDURE FOR INSPECTION AND ACCEPTANCE OF SEGMENTAL RETAINING WALL BLOCK FACILITIES, MASONRY BLOCK FACILITIES, AND OTHER SIMILAR MANUFACTURING FACILITIES

1. Scope

- 1.1. The purpose of this procedure is to establish guidelines for acceptance of segmental retaining wall blocks, masonry blocks, and other similar products, herein referred to as blocks, by the Alabama Department of Transportation (ALDOT or the Department). This procedure outlines guidelines for producers to help ensure all block products purchased by the Department, directly or through its contractors and subcontractors, meet Department specifications. Qualified producers of block products will be placed on List I-8, “*Pre-Cast Concrete Pipe and Miscellaneous Pre-Cast Concrete Products*”, in the Materials, Sources, and Devices with Special Acceptance Requirements (MSDSAR) manual.
- 1.2. The Department hereby establishes the Quality Control Program for Production, Inspection and Acceptance of Block Products. This program, also known as the Block Acceptance Program, assigns Quality Control responsibilities to the block producer and Quality Assurance responsibilities to the Department.

2. Referenced Documents

- 2.1. Requirements for the materials, processes, and documentation required for the production of block products are given in the following documents:
 - 2.1.1. ALDOT Standard Specifications for Highway Construction – (Web link: [ALDOT SPECIFICATIONS](#))

106	Control of Materials
807	Water
 - 2.1.2. Material, Sources, & Devices with Special Acceptance Requirements (MSDSAR) Manual – (Web link: [MSDSAR Manual](#))

I-1	Sources of Coarse and Fine Aggregates
I-2	Portland and Blended Cements
I-3	Mineral Admixtures for Portland Cement Concrete
I-8	Precast Concrete Pipe and Miscellaneous Precast Concrete Products
II-1	Chemical Admixtures for Portland Cement Concrete
II-22	MSE Wall Systems

- 2.1.3. ALDOT Procedures – (Web link: [ALDOT PROCEDURES](#))
 - 175 Method of Stockpiling Coarse Aggregate For All Purpose
 - 355 General Information Concerning Materials, Sources, and Devices with Special Acceptance Requirements
 - 377 Certification Program for Precast Concrete Products Technician
- 2.1.4. BMT Forms – (Web link: [BMT FORMS](#))
 - 45 Annual Certification and Guarantee for Precast Concrete Products
 - 75 Concrete Mix Design
 - 199 Precast Concrete Products Program Inspection Form
 - 210 Block Products Testing and Inspection Report Form
 - 211 Block Products Shipping Report Form
- 2.1.5. AASHTO/ASTM Standards
 - C1372 Dry-Cast Segmental Retaining Wall Units

PART 1: BLOCK CERTIFICATION

3. Producer Initial Qualification Requirements

- 3.1. Any producer of block products covered under this procedure wishing to furnish products for use in highway construction shall submit to the Materials and Tests Engineer; Attention: Aggregate Control Section, the following documentation:
 - 3.1.1. A written request to be considered for inclusion on List I-8.
 - 3.1.2. Plant Certification:
 - 3.1.2.1. Block production facilities must be certified through the ALDOT Plant Certification program as described in this procedure (Part 2: Plant Certification)
 - 3.1.3. Evidence of having a staff/contracted licensed Professional Engineer (P.E.) registered in the state where the block products are manufactured. The licensed Professional Engineer shall not be employed by ALDOT. This licensed P.E. is not required to be on-site and may be a consultant.
 - 3.1.4. A written statement by the licensed P.E. accepting overall responsibility for the company's Quality Control Program.
 - 3.1.5. Evidence of having on staff a Precast Concrete Products Technician certified by the Department per ALDOT-377. If the facility will be performing its own testing, an ACI Concrete Strength Technician must be employed.

- 3.1.6. A BMT-45 signed by a company Officer and notarized by a Notary Public.
 - 3.1.7. A list of all block products to be manufactured at the facility.
 - 3.1.8. The source and type of all materials used in the manufacturing of block products.
 - 3.1.9. Concrete mix design(s) to be used in the manufacture of blocks for ALDOT projects. One month's data or test data from an ALDOT qualified lab must be submitted before use on ALDOT projects. This information should be included in the Quality Control plan.
 - 3.1.10. Required fees as per ALDOT-355 and this procedure in Section 11.2. Submit fees to:

Alabama Department of Transportation
Attention: Aggregate Engineer
3700 Fairground Road
Montgomery, AL 36110
 - 3.1.11. A written request for a plant inspection. A plant inspection will be scheduled only after all documentation has been received, reviewed and determined to be acceptable.
- 3.2. After all requirements in Section 3.1 have been met and approved, the Aggregate Control Section will recommend approval of the source and inclusion in List I-8 to the Product Evaluation Board.

4. Producer Re-Qualification Requirements

- 4.1. Approved producers of block products shall be re-certified annually.
- 4.2. At the time of re-certification, the producer shall submit the documentation outlined in Section 3.1.

5. Responsibilities

- 5.1. The Department, in conjunction with the precast industry, will administer a viable program to train Precast Concrete Products Technicians in accordance with ALDOT-377, except that ACI Level I Field Testing and Concrete Technician is not required. However, if the producer is performing its own testing, then an ACI Concrete Strength Technician shall be required.
- 5.2. The **Producer's Precast Concrete Products Technician** shall be responsible for the following:
 - Compliance with the Quality Control Program.
 - Be present during the production and shipment of block products.
 - Test block products as required in this procedure.
 - Ensure all equipment is calibrated and maintained in accordance with this procedure.

- Visually inspect each pallet after loading, before shipment leaves the plant.
- Ensure that all block products are properly cured.
- Ensure that all manufacturing materials are from ALDOT approved sources.
- Maintain a daily production log.
- Ensure that all products are marked and stored in accordance with this procedure.
- Fill out, submit, and maintain test reports (BMT 210) and production documentation.
- Prepare and maintain documentation files of sampling, testing, and material sources.
- Complete and transmit shipping reports (BMT 211).
- Provide a completed BMT-210 and a BMT-211 with each shipment sent to the project site.
- Maintain a library of all applicable ALDOT and AASHTO/ASTM documents.

5.3. The **ALDOT Area Precast Technician** will be responsible for the following:

- Visit each precast concrete producer in the Area's jurisdiction at least once a month.
- Monitor the producer's Quality Control program.
- Review the BMT-210 and BMT-211 forms for completeness and accuracy. If acceptable, enter the information into Site Manager. If not acceptable, instruct the producer to correct the forms.
- Maintain the BMT forms at the Area office.
- Ensure tests are done in accordance with this procedure.
- Visually inspect block products that have been accepted by the producer's technician.
- Perform monthly inspections and complete form BMT-197. Submit a copy of the BMT-197 to the Aggregate Engineer.
- Ensure that a current ALDOT plant certification is displayed at the plant.

5.4. The **Aggregate Control Section** of the Bureau of Materials and Tests will be responsible for the following:

- Administer the Block Acceptance Program and monitor its effectiveness.
- Assist the block industry with classroom and hands-on training.
- Provide classroom space as required.
- Certify Precast Concrete Products Technicians.
- Perform new source initial plant inspections.
- Review and accept the producer's Quality Control plan.
- Submit new source recommendations to the Product Evaluation Board for approval.
- Maintain master files for all approved producers.
- Assist in the identification and solution of problems related to block products and/or the Block Acceptance Program.

- Maintain the approved list of precast concrete and block producers, List I-8.
- Perform annual inspections of out of state producers that are not under the jurisdiction of a Area office.
- Initiate actions to remove from the approved source list any producer that fails to adhere to the requirements given in this procedure.

6. Materials

6.1. Materials used in the production of Block Products shall meet the requirements of the appropriate Sections of the Department's Specifications and shall be purchased from approved sources listed in the Materials, Sources, and Devices with Special Acceptance Requirements manual.

- Coarse/Fine Aggregate - List I-1.
- Cement - List I-2.
- Chemical Admixtures - List II-1.
- Mineral Admixtures - List I-3
- Reinforcing steel shall be traceable to a certified mill test report and meet all requirements of the Department's Specifications, Section 106.
- Water used shall meet the requirements in Section 807 (Water for Cement Concrete).

6.2. The producer must maintain all documentation necessary to substantiate the purchase and use of all approved materials for at least three (3) years. The documentation shall be available to the Department upon request.

7. Acceptance

7.1 Acceptance of Block Products will be based on testing 10 blocks per 10,000 blocks produced or portion thereof, unless applicable AASHTO/ASTM specifications require additional testing. The blocks tested must have a compression strength of 5,000 psi and an absorption rate no greater than 5%. The testing method used shall be ASTM-C140.

8. Reporting

8.1. The completed BMT-210 and BMT-211 forms shall accompany each shipment to the project site. These forms shall be delivered to the Contractor.

- The Contractor shall review the forms, print name, sign, and date the forms, then deliver to the Project Engineer.

- The Project Engineer will review the forms, print name, sign, and date the forms, then deliver to the ALDOT Area Precast technician.
- The Area Precast Technician will review the forms for accuracy and completion. If the forms are acceptable, Area personnel will then print name, sign, and date the forms and enter into Site Manager.
- If the BMT forms are not acceptable at any step in this process, the precast producer shall submit new BMT forms that are complete and accurate.

9. Marking, Shipping, Handling and Storage

- 9.1. Prior to shipment, the producer's technician shall visually inspect each pallet of blocks before and after loading, before shipment leaves the plant, to ensure that no damage has occurred and that each pallet of blocks is properly marked.
- 9.2. Block products shall be marked as follows (can be on the pallet or the stretch wrap around the blocks, but must be clearly visible until the blocks are all used, i.e. if the stretch wrap is removed before ALDOT acceptance of the blocks, they are not acceptable):
 - ALDOT approved plant name
 - Lot number
 - Date of production
 - The letters "ALDOT"
 - The technician number
- 9.3. Block products shall be stored in a manner that will not damage the product and will allow easy access for inspecting, marking, and handling.
- 9.4. Block products shall not be shipped until 14 days after production and the minimum compressive strength and absorption requirements are met.
- 9.5. The Project Manager will accept block products at the job site provided the product is properly marked and a visual inspection reveals no damage due to shipping and handling. Any block unit found to be damaged to the extent that serviceability is impaired, will be rejected and shall not be used in the project.

10. Revocation of Source

- 10.1. A block producer will be removed from Block Acceptance Program if quality problems persist after a previous written warning has been issued, or severe quality problems hinder the structural integrity of the product. Block producers will be notified of any such action in writing.

- 10.2. Failure to maintain a current ALDOT plant certification will result in removal of the block producer from the Block Acceptance program.
- 10.3. Additional reasons for removing a block producer from the Block Acceptance Program include, but is not limited to, the following:
 - Failing to employ a Precast Concrete Products Technician certified by the Department.
 - Failing to staff/contract a Licensed Professional Engineer responsible for the plant's Quality Control Program.
 - Using materials that are not on the Department's approved source lists.
 - Failing to correct any deficiency related to any requirement in this procedure and/or the Quality Control Program within 30 days after receiving a written notice from the Department indicating the non-compliance issues.
 - Failing to comply with the requirements of the Block Acceptance Program.
 - Deviating from the requirements in the Quality Control Plan without Department's approval.
 - Producing and/or shipping products to ALDOT without the Precast Products Technician present.
 - Falsification of reports, test results, records, etc. will result in permanent disqualification by ALDOT and the producer will not be allowed to supply precast products to an ALDOT project.
- 10.4. The Department will provide guidance and assistance to producers in identifying and correcting problems which may arise.

PART 2: PLANT CERTIFICATION

11. Scope

- 11.1 This section will establish the minimum requirements and procedures producers of dry-cast manufactured block products must follow in order to obtain plant certification through the Alabama Department of Transportation. This program requires producers of dry-cast block products to perform quality control sampling, testing, auditing, and record keeping on materials they produce under this program. Participation in this program does not relieve the producer of the responsibility of complying with any other associated project requirements.
- 11.2 The fee for ALDOT Plant Certification will be \$5,000 plus the \$50 Product Evaluation Board fee for the initial application submittal. There will be an annual fee of \$5,000 for re-certification.

12. Quality Control

- 12.1. **Quality Control Manager** - Each producer must employ a Quality Control (QC) Manager who shall have defined responsibility and authority for ensuring that the management system related to quality is implemented and followed at all times. The QC Manager shall have direct access to the highest level of management at which decisions are made regarding plant policy or resources. The QC Manager must have ready access to, and be familiar with, the Quality Control Plan, facility procedures and operations, product specifications, and material standards.

The QC Manager shall be responsible for monitoring activities involving the production, inspection, testing, curing, labeling, and shipping of products. In the event the QC Manager is absent during production, the QC Manager may delegate specific duties to other qualified persons in accordance with the plant's Quality Control Plan. The QC Manager shall have the authority to stop production, if necessary.

The QC Manager, as well as anyone delegated to assume the duties of the QC Manager in his absence, shall be certified by ALDOT for all applicable technician certifications, including at a minimum, ALDOT Precast Concrete Products Technician. If the producer will be performing its own compression testing, then ACI Concrete Strength Technician certification is also required.

13 Training

- 13.1 Training must be provided by the producer to familiarize personnel with production and quality control procedures related to their specific areas of responsibility. Training events are required for new employees, when a change is made to the Quality Control Plan, when corrective or preventive action is implemented, or when otherwise deemed necessary by the QC Manager at a frequency of no less than every 12 months.

14 Quality Control Plan

- 14.1 Each producer of block products shall submit a Quality Control Plan to the Materials and Tests Engineer, attention of the Aggregate Control Section. The Quality Control Plan shall include, but is not limited to, the following;
- A statement summarizing the producer's Quality Control plan.
 - Training, Including On-the-Job Training – including information as required in Section 13.1 of this Manual.
 - List of primary personnel at the facility, including Quality Control Technician and Precast Concrete Products Technician, who MUST be present during production and shipping.

- Facility Components – including plant layout, configuration and location.
- Manufacturing Products – including specifically identifying which products are covered under this program as defined in Section 11.1 of this Manual.
- Standard Operating Procedures (Including Procedures for Corrective Actions)
- Component Materials Acceptance for:
 - Cementitious Materials – including mill certificates, color samples, and sample retention of cementitious materials for future evaluation. Frequency of once per month for each type.
 - Fine and Coarse Aggregates – The producer will be responsible for all gradations of aggregate used in products shipped to ALDOT. Stockpiles must be constructed and maintained per ALDOT-175.
 - Admixtures or Additives – including documentation of compliance testing for ASTM C959 for pigments and applicable internal QC procedures from supplier. Frequency of once per month per material
 - Water – including reports obtained from municipal suppliers or test reports conducted on well water, as applicable, at a frequency of once per year.
 - Indicate the basis of acceptance required for each material for other materials routinely or occasionally used.
- Assessing Impacts on Quality Control under Varying Conditions – including consideration of environmental changes (wet weather, snow and ice contamination of aggregate, hot and cold temperatures, and pre-wetting of aggregate for temperature or moisture control) as well as non-environment impacts (changes in personnel, equipment, or materials).
- Batch Mix Design – including provisions for: selection of correct mix design for the product being manufactured, quantities and tolerances for constituent materials, procedures for controlling and maintaining mix design, verification of mix design, and compatibility of face/blended mixes.
- Mold Inspection – including provisions for: visual inspection, cleaning, shipping, repairs, dimensional tolerances, replacement criterion, and storage.
- Machine Set Up – including a written procedure for machine and mold combination setup that is specific and applicable to the equipment used and products to be manufactured.
- Material and Batching – including: criteria for adjustments or measurement for water compensation, admix and additive dosing verification and control systems, scales verification, mix sequencing and timing, and color verification.
- Production Assessment for:
 - Wet-Side Procedures for verifying – heights and other critical dimensions, density, yield, moisture content and control, texture, color, corners and edges, deburring/surface cleaning, and pallet integrity.
 - Dry-Side Procedures for verifying – heights and other critical dimensions,

texture, color, check(s) for project-specific requirements (i.e., admixtures or additives), split dimensions and appearance, appearance (chips, cracks, etc.), and alignment and clearance of molded features.

- Curing – including a written plan that is applicable to the process and product being manufactured; including procedures that address changes in curing process to account for ambient temperature swings.
- Bundling/Cubing, Labeling, Handling and Storage of Items – including a written procedure for the product being manufactured; including specific customer requirements.
- Post Production Treatments – including written procedures for in-line and off-line post production treatments or processing.
- Shipping – including procedures for the verification of product ordered versus product shipped.
- Monitor Samples – including the implementation of a system to retain and store duplicate samples for customer submittals and/or testing. Monitor samples must be traceable to a specific project.
- Documentation – including the requirements of Sections 15.1 of this Manual.
- Internal Review/Management Meetings – including procedures to define a continuous improvement process. See also Section 16.1 of this Manual.
- Test Equipment – including procedures for verifying equipment used for in-house measurements or assessments.
- Product Identification – including requirements of Section 9.2 of this Manual.
 - Quality Control Assessment Procedures Method(s) of Correlating In-Line Assessments;
 - Procedures for Verification of In-Line Assessments; or
 - In-House Processes and Procedures, as applicable.
- Control of Non-conforming Product – A record of any samples failing required tests shall be kept on hand. Name, address, telephone number, and services of the independent testing laboratory shall be maintained, if applicable.
- List of testing equipment for "in-house" testing.
- Shipping Procedures for Department projects.
- The producer shall update the Quality Control Plan annually, and any time there is a significant change in personnel, production, materials, or Quality Control Procedures. Updates shall be submitted to the Materials and Tests Engineer, to the attention of the Aggregate Control Section for review. The Quality Control plan shall be readily available to managerial, supervisory, and quality control personnel along with the following:
 - Applicable product specifications;
 - Specifications referenced in the Quality Control Plan;
 - Methods and procedures referenced in the Quality Control Plan.
- Processes performed to assess the finished product(s) produced by a plant

- performed internally by the plant on an ongoing basis to assess product quality;
- performed periodically by a laboratory to verify in-house assessment procedures or to document the physical properties of the finished product(s).
- Procedures to monitor the quality of the finished products being manufactured on an ongoing basis that at a minimum meet the requirements of this procedure. If the governing specification requires additional testing or assessment, such tests must be performed as required.
- The Quality Control Plan must define the processes and procedures used by the facility to evaluate or measure characteristics or properties of products, and where necessary develop correlations between assessed properties and standardized properties
- Define the frequency for which property(s) are assessed or measurement(s) are taken for the internal practices adopted.

15 Quality Control Records

15.1 The following records must be maintained for a minimum of three (3) years.

- Documentation of 3 month batch plant scale checks plus one external certification annually.
- Certification and calibration records for in-house test equipment or equivalent documentation when testing is conducted externally.
- Daily production records, including mix designs for each production run, for all products shipped to ALDOT projects.
- Test results and quality control measurements as required for the product being manufactured.
- Third-party surveillance/audit reports.
- Processes and procedures warranting corrective measures and actions taken to address such requests.
- A record of training events, topics covered, and personnel in attendance.
- A record of management meetings, topics covered, and personnel in attendance.

***Note: The required length of time to maintain records is a minimum amount of time for Alabama Department of Transportation purposes. If other entities require maintaining records for a longer period of time, then you should continue to save them for that time period. These records should provide sufficient historical data to identify trends and help to avoid potential problems in the future.

16 Management Meetings

16.1 The Quality Control Manager must conduct periodic meetings with plant management and other designated personnel to review the plant's performance as it relates to production activities and the Quality Control Plan. These meetings should occur as needed, but no less than once every 6 months. A record of these meetings shall be kept which includes, but is not limited to, the following:

- Sign-in sheet of all attendees
- The results of quality control testing
- Customer feedback and complaints
- Outcome of recent internal and external audits
- Corrective and preventive actions
- Reports from managerial and supervisory personnel
- Changes in the volume and type of work
- The suitability of policies and procedures
- Recommendations for improvement
- Other relevant factors, such as quality control activities, resources, and staff training.

Not all of these topics need to be addressed at each meeting. However, the Quality Control Manager shall keep a record of each item discussed to assure that all areas are reviewed on an on-going basis. These meetings may be conducted in person, by conference call or online depending on the specific needs of the plant.

17 Safety

17.1 While the adoption and implementation of a safety program is an essential component of the manufacturing environment, this program does not address plant safety.

18 Test Failure Procedure

18.1 If the test results for a sample indicate a product does not meet the specification requirements, a check sample is to be immediately obtained by the Quality Control Manager.

If the check sample indicates the product meets the specification requirements, the Quality Control Manager is to obtain another check sample as a referee test.

If the referee sample indicates the product meets the specification requirements, the Quality Control Manager should record on the test report form what is felt to be the reason for the original failure and then allow production to resume.

If the check sample or referee sample indicates the product does not meet the specification requirements, the Quality Control Manager is to initiate an investigation to determine the cause of the failure. The investigation is to include a review of the sampling procedures, the equipment used in the production and the testing of the product, and the testing procedures of the individual performing the test. If the cause(s) can be attributed to one of the above categories, the Quality Manager is to take corrective action to bring the product, equipment, or procedure into compliance. The Quality Manager is to then record the corrective action on the test report form and take another check sample after the corrections have been made.

If this check sample indicates the product meets the specification requirements, then a confirmation sample will be obtained. If the confirmation sample meets specification requirements, the Quality Control Manager should record the results and allow production to resume.

If this check sample or confirmation sample indicates the product does not meet the specification requirements, the Quality Control Manager must stop the shipment of product or recall/replace product that has already been shipped. The Quality Control Manager is to continue the investigation into these failures. Normal production of the failing products is not to resume until the cause(s) of the failure have been identified and resolved.

19 Laboratory Testing

19.1 Labs performing testing on final products in accordance with this procedure shall be qualified by ALDOT before performing any tests for acceptance.

20 Plant Certification Final Step

20.1 Program Certification

No later than one month after the conclusion of the on-site inspection, ALDOT will submit a written report to the applicant outlining the findings during the certification visit. Once all deficiencies have been corrected and a follow-up visit by ALDOT has confirmed the corrections, the applicant will receive a notice of certification.

If the Aggregate Engineer has approved the quality control plan and all required paperwork, once the plant is certified the Aggregate Engineer will recommend to the Product Evaluation Board to add the facility to the Approved Products List I-8 certifying the plant to produce concrete block for one (1) year. The facility will receive a Transmittal Form for its records of the annual certification.