

505 Precast/Prestressed, and Drycast Concrete Structures Quality Management Plan

505.1 INTRODUCTION

The Precast/Prestressed and Drycast Concrete Structures Quality Management Plan (QMP) establishes the procedure for becoming a pre-qualified supplier of precast/prestressed and drycast concrete products (including but not limited to barrier, cattle guards, noise wall components, drainage boxes, bridge girders, precast deck panels and other structural elements, circular pipe, pipe arch culverts, and concrete box culverts). This QMP assures that precast/prestressed and drycast concrete fabrication plants are capable of constructing quality concrete products. Only pre-qualified suppliers will be allowed to deliver products to UDOT projects. Pre-qualified suppliers are responsible to ensure that their products meet all applicable specifications and are fabricated according to project drawings.

505.2 DEFINITIONS

Precast concrete - Any concrete product not cast in its final location regardless of the distance between the casting location and the point of installation or the size or complexity of the finished product.

Prefabricated elements (in conjunction with Accelerated Bridge Construction) – A single precast structural component of a bridge.

Prefabricated systems – An entire superstructure, a complete superstructure and substructure, or a total bridge that is constructed on or near the project site and typically rolled, launched, slid, lifted or otherwise transported into place. .

Prestressed concrete elements - Any concrete elements that incorporate prestressing in the form of pre-tensioned, post-tensioned strands or both.

UDOT certification - The result of a satisfactory review of the supplier's fabrication methods, personnel training and quality control systems.

UDOT pre-qualification – Pre-qualification is separate from UDOT certification. A supplier must be pre-qualified before providing products to a UDOT project. Pre-qualification requires UDOT certification and a legally binding written commitment to the quality principles and standards outlined in this document.

Drycast concrete – A manufacturing process for a zero slump concrete that requires vibration or other mechanical means to consolidate the concrete, enabling immediate removal of the side forms without detrimental effects to the concrete.

505.3 CATEGORIES OF PRECAST CONCRETE FABRICATORS

Suppliers of precast concrete products are pre-qualified in three categories.

Category UT-1 – Precast Concrete Drainage Products

Products in this class are simple drainage structures that generally stand-alone. Examples include: single cell box culverts with spans of 20 feet or less along the centerline of the roadway, and wetcast or drycast drainage boxes, manholes, and pipe. Category UT-1 suppliers are restricted to production in UDOT-certified permanent plant locations.

Fabricators of precast concrete products in Category UT-1 must maintain national industry certification as follows:

Concrete pipe and other concrete drainage products – Meet the specific requirements for the products being fabricated as outlined by the National Precast Concrete Association (NPCA) or American Concrete Pipe Association (ACPA).

Box culverts and Three-Sided Precast Structures with spans less than or equal to 20 feet and their related items (headwalls, aprons, wing walls, etc.) – maintain certification through NPCA or ACPA including special requirements for box culverts and three-sided precast structures.

Category UT-2 – Non-Prestressed Structural Products

This category includes non-prestressed structural products that are generally prefabricated elements of a structure (such as a bridge) or products other than simple drainage structures. A Category UT-2 certified plant will fabricate only non-prestressed products. Examples include: non-prestressed approach slab panels, sleeper slabs, abutments, footings, columns, bents, barrier, noise wall panels, MSE wall posts and panels, precast pavement panels, partial and full depth precast deck panels without prestressing or post-tensioning, and cattle guards. Category UT-2 suppliers must produce from UDOT certified permanent plants. Category UT-2 suppliers may also produce Category UT-1 products.

Fabricators of precast concrete products in Category UT-2 must maintain national industry certification as follows:

Safety barrier, cattle guards, precast pavement panels, other structural products (non-prestressed) – Precast/Prestressed Concrete Institute (PCI) Category B1 or NPCA Precast Certification

Noise Wall panels, retaining walls, retaining blocks, non-prestressed structural products – PCI Category B1 or NPCA

Any of the above products with architectural finish and any other precast product with architectural finish – PCI Category B1A or NPCA with architectural endorsement.

Box Culverts and Three-Sided Precast Structures with spans greater than 20 ft and their related products (headwalls, aprons, wing walls, etc.) – PCI Category B1 or NPCA Precast Certification including special requirements for box culverts and three-sided precast structures.

Category UT-3 – Prestressed (Pre-Tensioned or Post-Tensioned) Structural Products

This category includes prestressed structural products that are generally components of or prefabricated elements of a structure, such as a bridge. Prestressed products must be fabricated by a Category UT-3 certified plant. Examples include: prestressed partial-depth and full-depth precast deck panels, prestressed approach slab panels, and prestressed beams. Category UT-3 suppliers must produce from UDOT-certified permanent plants. Category UT-3 suppliers may also produce Category UT-1 and Category UT-2 products.

Fabricators of precast concrete products in Category UT-3 must maintain national industry certification as follows:

Deck Panels (Partial- and Full Depth) and other Prestressed Structural Products Excluding Beams – PCI Category B2.

Prestressed Concrete Beams – PCI Category B4.

Prestressed Structural Products with architectural finish require the additional PCI architectural certification (i.e., B2A, B4A).

Precast Plants at or Near the Project Site – Precast plants may be set up to cast **prefabricated** elements at or near the project site but will be required to obtain the applicable national certification, personnel requirements, and full UDOT pre-qualification and product inspection before placing prefabricated elements in their final location. Elements cast before UDOT pre-qualification will be at the risk of the contractor. Central Materials will not certify any product from a non-qualified fabricator. **Prefabricated systems** (excluding prefabricated elements or prestressed concrete elements which are used in the system) are not required to comply with this QMP but must follow cast-in-place inspection processes

505.4 PRE-QUALIFICATION OF PRECAST/PRESTRESSED AND DRYCAST CONCRETE SUPPLIERS

Applicants shall submit to UDOT Central Materials, a letter requesting that it be designated as a pre-qualified supplier. The letter shall include the following:

- A. Proof the fabrication plant producing precast/prestressed or drycast concrete products is currently certified by UDOT Central Materials as outlined in this document.
- B. Name and phone number of the Quality Control (QC) Manager at each production location who may be contacted for scheduling of inspections and general information.

1. UDOT Central Materials must be notified within 5 business days of any change of QC Managers or Quality Inspectors (QI). Appropriate documentation of the new personnel's certifications must be supplied to UDOT at the time of notification.
- C. The category or categories under which the supplier is seeking pre-qualification e.g. UT – 1, UT – 2, UT - 3.
- D. State a commitment to the following:
 1. Meet or exceed UDOT's Standard Specifications, including all applicable ASTM and AASHTO specifications.
 2. Make available to UDOT Central Materials all records required by this document upon request.
 3. Use a domestic source for all reinforcing steel and meet the requirements of Title 23, U.S. Code of Federal Regulations, Part 635.410, Buy America Requirements and UDOT Special Provision 01455 M for the 2008 Standard Specifications and the 2012 Standard Specification 01455.
 4. Maintain current certification through national professional associations. Provide documentation of certification.
 5. Plants manufacturing wetcast products submit to a minimum of one UDOT plant inspection per year to maintain certification.
 6. Plants manufacturing drycast products submit to a minimum of two UDOT plant inspections per year to maintain certification.
- E. A statement verifying that the signer of the letter has the legal authority to bind the company.

UDOT Central Materials will make notification of acceptance as a Pre-Qualified Precast/Prestressed, Drycast Concrete Supplier in writing.

505.5 SUPPLIER PLANT CERTIFICATION AND INSPECTION

A pre-qualified supplier will adhere to the guidelines set forth in this document as well as its stated commitments in Section 505.4. Suppliers are required to pass a UDOT inspection prior to acceptance as a pre-qualified fabrication plant. UDOT will schedule an initial plant certification inspection visit at the request of the supplier. The request should be made at least six weeks prior to the planned start of production for a UDOT project to allow for inspector scheduling. The inspector will check the plant in accordance with the requirements of this document. Upon completion the inspector will submit a written report to the fabricator outlining all deficiencies observed. The supplier is required to address all deficiencies noted

in the report before requesting another certification inspection. Upon completion of a deficiency-free inspection, UDOT Central Materials will issue a letter of certification.

Once certified, each precast/prestressed plant will be subject to a minimum of one UDOT inspection per year. Suppliers may or may not be given advance notice of an inspection. Failure in one or more of the requirements may result in suspension of certification. Suspended suppliers may not provide products to UDOT projects during suspension and must address deficiencies within 30 days or certification will be revoked. Within the 30-day period the supplier must submit a letter to UDOT Central Materials outlining the corrective action taken for each violation. If the deficiencies are not addressed within 30 days the supplier's certification is revoked and they are removed from the pre-qualified list.

Additionally, suppliers may have their certification suspended and be removed from pre-qualified status for any of the following:

- A. Loss of required professional certification
- B. Loss of required certified staff
- C. Failure to comply with UDOT's standard specifications, policies, procedures or contractual obligations
- D. Altering approved shop drawings without written approval from the Engineer
- E. Repairing wetcast precast concrete items without written approval from the Engineer
- F. Placing wetcast concrete or stripping forms for wetcast product contrary to the direction given by the UDOT materials inspector.
- G. Failure to maintain and follow a UDOT-approved Quality Control Plan.
- H. Delivery of a product to a UDOT project that does not meet UDOT's Standard Specifications or Project Drawings.

The Concrete Engineer will determine the actions to be taken against the supplier for the stated deficiencies. Any other deficiencies identified by UDOT inspectors (or its designee) according to (but not limited to) UDOT Standard Specifications or Drawings, this QMP or the facility's QC Plan will result in notice to the facility. Once notice is given to a supplier of a deficiency or deficiencies, the supplier will be required to submit a written response that includes the review of its QC records, identification of what deficiency existed in the QC process, a modification of its QC plan to address the deficiency and a statement of why the deficiency will not occur again. Action by UDOT to deficiencies may include, but are not limited to, probation for the supplier for up to a year, suspension of production of UDOT products until the deficiencies are corrected, or revocation of UDOT certification and disqualification as a UDOT supplier. Revoked certification and disqualification of a supplier may be appealed to the UDOT Director for Construction and Materials.

Suppliers suspended for a second time within a twelve-month period automatically will have their UDOT certification revoked and will be removed from pre-qualified status.

Disqualified suppliers will have their UDOT certification revoked for at least one year. The supplier may apply for certification and reinstatement as a pre-qualified supplier no sooner than ten months after the revocation. At this time the supplier will be allowed to start the

qualification process and work toward becoming a pre-qualified supplier of precast/prestressed and drycast concrete products.

505.5.1 Supplier QC Policies and Procedures

Provide adequate training to familiarize all pertinent employees with the company's QC procedures. Have a written company QC policy statement and a QC manual that includes, at a minimum, the plant certification technical criteria set forth in this document. Each pertinent employee shall receive a copy of each. Have a designated QI present on every work shift. Quality Inspectors must be properly trained and thoroughly familiar with all required QC procedures. Additionally, QI's shall have the authority to fully enforce procedures.

The QI should report to an individual with the authority and knowledge to oversee plant operations.

505.5.2 Supplier Plant Requirements

505.5.2.1 QC Procedures

Develop, periodically review, and update as necessary, a company QC policy statement and manual. UDOT Central Materials must approve the QC Manual prior to acceptance as a pre-qualified supplier.

QC plans will include forms that indicate plant personnel have verified and recorded critical data e.g. recorded actual measurements compared to required specification or applicable drawings measurements, results of visual inspection, concrete properties, etc.

Each product QC form will include a copy of the product drawing.

Designate a QI for every work shift. The QI must be UDOT Transportation Technician Qualification Program (TTQP) Concrete Testing Technician (CTT) certified and must have an- ACI SCC Testing Technician certification if the plant has a UDOT approved SCC mix design. Category UT-2 and Category UT-3 fabricators QI must be PCI Level I certified. The QI must be present during final rebar inspection, all concrete placements, and final inspection prior to shipment or placement. The QI is responsible to complete QC checklists.

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QC Manager must be UDOT TTQP CTT and Concrete Strength Testing Technician (CsTT) certified and must have an- ACI SCC Testing Technician certification if the plant has a UDOT approved SCC mix design. Category UT-2 and Category UT-3 suppliers' QC Manager must be PCI Level II certified. Category UT-3 suppliers' QC Manager must be PCI Level III certified. The QC Manager (or acting QC Manager with the same level of certifications) must be present during all stressing operations.

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Suppliers' batch plant or off-site ready-mix batch plants must be pre-qualified under UDOT's "Quality Management Plan: Ready-Mix Concrete."

Provide necessary training to the designated QI and line personnel. The QI shall have ready access to the latest company QC Manual.

Conduct meetings with the plant manager or designated representative and QC personnel a minimum of once every three months to review the plant's QC procedures, discuss possible changes and implement any procedural changes.

The plant manager or designated representative shall review and evaluate the QC techniques of all QI once every six months to assure compliance with this QMP.

Submit to a minimum of one plant inspection, each year, by a Concrete Section Inspector.

Formally consider and address in writing each deficiency noted in the Concrete Section inspection reports and conduct subsequent follow-up meetings to assure compliance.

505.5.2.2 Required QC Records:

The supplier's QC manual will include:

- Employees' current TTQP and PCI certifications (as appropriate), certification documents, and QC training records
- A written "new employee" training and/or orientation policy
- Copies of the plant's QC policy statement
- Proof of current applicable PCI, ACPA, or NPCA certification
- Copies of PCI, ACPA, or NPCA plant inspection audit reports, including documentation of the corrective action taken for each deficiency
- Minutes of meetings held to address quality control or production issues
- The QC Manager's evaluation of the QI performance of job duties
- Memoranda signed by the plant manager, detailing responses and follow-up to each specified violation documented during a UDOT inspection

The facility must provide the manual and the following QC records as requested within 24 hours:

Completed QC inspection checklists/forms, signed by the QI, for each work shift. As outlined in 505.5.2.1, checklists will include actual measurements taken, visual inspection results, etc. Linear QC charts for air, slump, unit weight and concrete temperature for all units/lots produced.

505.5.2.3 Calibration and Certification of Test Equipment.

All testing equipment or devices used for measuring material quantities shall be in good repair, calibrated and certified as specified in AASHTO, ASTM, and the UDOT Standard Specifications.

Maintain certification of beams, scales, water meters and moisture probes at the batch plant as per UDOT Standard Specifications. If the supplier chooses to use an off-site Ready-Mix concrete supplier, the supplier must maintain a copy of the Ready-Mix company's batch plant certification records for beams, scales, water meters and moisture probes.

Maintain certification of air meters, unit weight buckets, slump cones, plastic concrete cylinder, and thermometers.

Broken or malfunctioning equipment must be removed from service immediately and replaced with new or repaired/recalibrated equipment.

Use UDOT approved laboratories for concrete compressive strength tests which are used for prestressed girder release breaks or any informational concrete compressive strength tests. A list of UDOT approved laboratories can be obtained through the UDOT Materials website (<http://www.udot.utah.gov/go/materials>).

505.5.2.4 Required Test Equipment Records

Note on the inspection checklist which test equipment was used on each shift and the corresponding certification dates.

Provide proof the plant laboratory or the contract laboratory is UDOT qualified.

505.6 UDOT NOTIFICATION OF START OF PRODUCTION

For all box culverts and wetcast products, in addition to the regular communication between the UDOT Resident Engineer and the general contractor, or between the general and sub-contractor, all suppliers shall notify UDOT Central Materials 14 days prior to project startup and 24 hours prior to fabrication of any product to be used on UDOT specification controlled projects. Due to inspector travel restrictions, out of state fabricators shall notify Central Materials 30 days prior to fabrication.

Attn: Concrete Engineer
UDOT Materials Lab
4501 South 2700 West,
PO Box 145950
Salt Lake City, Utah 84114-5950

Phone: 1-801-965-3814
Fax: 1-801-965-3843

UT-3 plants fabricating girders must prepare a Precast/Prestress Girder Inspection Report (P.G.I.R.) for each girder in the structure, and note on the P.G.I.R. any unusual details to be monitored. Compile a portfolio containing all required test results, certification, and P.G.I.R.'s.

505.7 FABRICATION GENERAL INSTRUCTIONS

Give UDOT 24 hour notice of all planned major repairs of surface imperfections. Secure up-front Structures Division approval for all major repairs (i.e., honeycomb, cracking, windows, etc.).

The Fabricator is responsible for the quality of work. Verification of the quality control is the prerogative of UDOT. Verification inspection, when performed by UDOT, does not relieve the fabricator of the responsibility for quality materials and workmanship required by the contract specifications.

505.8 PRODUCT TEST REPORTS/CERTIFICATION

Acceptance of all concrete products (excluding drycast) is based on UDOT 28-day compressive strength requirements tested by UDOT (or its representative) at 28 days as specified.

Final acceptance and certification may also include an inspector's visual inspection to verify specified curing procedures, application of sealers, and assurance against damage to the product.

Fabricators may make field-cured cylinders for use in early release/shipment of the product if approved by the Resident Engineer. Early release and shipment is not acceptance. Product shipped before 28 days is at the fabricator's risk. All breaks of field-cured cylinders for early release must meet the 28-day strength requirements and be observed by a UDOT inspector/representative or be conducted by a UDOT-qualified laboratory.

Central Materials will not certify product for early release prior to three days. Central Materials will not certify product for early release before seven days without written approval from the Resident Engineer.

505.9 DRYCAST QUALIFICATION AND CERTIFICATE OF COMPLIANCE

505.9.1 Drycast audit: Drycast facilities must submit to a minimum of two random audits per year. These may be scheduled or unannounced visits. Audits will consist of documentation review, a physical tour of the plant and yard (including product storage), and an interview with the Quality Control Manager (QCM). Any deficiencies found during the audit will be reported to the QCM and must be corrected within 14 calendar days to avoid suspension of prequalification status. Drycast fabricators must meet all other personnel and

plant certification requirements of this QMP. Items not meeting the requirements of the QMP will be considered deficiencies.

505.9.2 Drycast Quality Control Records: In addition to the required records stated in section 505.5.2.2 of this document, fabricators producing drycast products will include the following items in the QC manual:

- Detailed production processes
- Inspection procedures including criteria for acceptance and rejection of product
- Testing procedures for product and concrete including minimum testing frequencies (D-load, Hydro, etc.)
- Repair procedures
- Storage and handling procedures
- Blank copies of inspection and testing forms
- Calibration records
- Concrete mix designs

505.9.3 Drycast Product Certification: It will be the drycast concrete fabricator's responsibility to issue a Manufacturer Certificate of Compliance for all product provided to a UDOT project. This document must include the following:

- A specific statement of compliance with UDOT specifications (with reference to the specific specification)
- A specific statement verifying compliance with Buy America Requirements as per Federal Code 635.410. All Buy America documentation must accompany product for each project unless the Resident Engineer has waived the requirements.
- Concrete compression cylinder test results with sample QC cylinders prepared according to ASTM C 497 section 11.

Drycast concrete products (excluding box culverts which are specific to a project and will be inspected at the prerogative of UDOT Central Materials) may be manufactured, stockpiled and inventoried without a UDOT pre-pour inspection. These products are meant to be mass produced to standards that are acceptable for multiple jurisdictions and verified by a manufacturer's Certification of Compliance.

505.10 PRE-CAST INVENTORY STOCKPILES

Pre-cast fabricators may build an initial stockpile inventory of certain UDOT standard "stock" items. The initial inspection costs for these items will be borne by the fabricator by utilizing PCI certified inspectors from companies currently under UDOT contract to conduct consultant inspections. The fabricator will make direct payment to the qualified laboratory conducting the inspection. UDOT inspectors may also provide initial inspection for pre-cast stock items if they are produced at the end of a UDOT-project daily production run. The quantities inspected in such circumstances are at the UDOT inspector's discretion. In the rare case that UDOT inventory is supplied to non UDOT projects, costs of inspections to replenish the product will be at the fabricator's cost (without the option to be inspected by UDOT at the end of a daily production run).

If a pre-cast fabricator wishes to use a stock item on a UDOT project, the item may be used and replaced to maintain the same quantity in the pre-cast stockpile. The UDOT inspector will conduct a final inspection on all pre-cast stockpile items immediately before delivery to a UDOT project. Certification will be issued at time of delivery pending the final inspection and the submittal of previous inspection, Buy America, and materials testing documentation.

Fabricators will include a plan for production of inventory in the pre-cast plant's quality control manual. The plan should identify processes for QC inspection and testing, include use of UDOT pre-approved companies for QA inspection and testing, outline plans for storing and protecting the product, and processes for product identification and documentation. The initial inspection must include pre-pour inspections of reinforcing steel and forms and concrete testing at frequencies prescribed in the Minimum Sampling and Testing Requirements (MSTR). Required QC processes must be followed and documented. Three (4 x 8) cylinders should be submitted to UDOT for testing at appropriate frequencies as part of this process.

505.10.1 Final Inspection

Product certification will be based on UDOT review of QA documentation, UDOT 28 day cylinder breaks, and a pre-shipment inspection. It will be the pre-caster's responsibility to provide UDOT with the cylinders cast by the hired QA and to maintain files with the inspection documentation to be provided to UDOT on request.

Prior to shipment of inventoried product, a final inspection (post-pour) must be conducted by UDOT. Product is subject to the same inspection criteria as regular-non inventory items. UDOT is not obligated in any way to accept stockpile product. Changes in product specifications may make stockpile materials unusable and this should be taken into consideration when planning quantities to stockpile. Product requiring concrete sealer must receive an initial application as specified and must be re-applied if it has been in inventory for more than one year before shipping. Inventory items may not be sent out for early shipment (prior to 28 days).

505.10.2 Limitations

Items eligible for inventory stockpiles are limited to products produced to UDOT Standard Drawings. Products allowed in stockpiles may consist of any combination of product types with a maximum cumulative total of 50 items. All stockpile products have a two-year shelf life. Product cast more than two years prior to a certification request will not be considered for UDOT certification.

- **APPENDIX A UDOT INSPECTOR GUIDELINES**

UDOT Inspector Check List:

1. Examine the plants QC Policy Statement and Manual.
2. Verify that the plant maintains certification for all reinforcing steel used in UDOT products in compliance with Buy America requirements according to UDOT Standard Specifications.
3. Review the distribution of QC Policy Statement and manual and its availability to employees.
4. Review QC training records.
5. Review the plant records to confirm that a QI has been assigned to each work shift and has signed the inspection checklist.
6. Interview the person(s) responsible for QC policies and procedures.
7. Verify the QI lines of authority.
8. Examine the plant's equipment certification records.
9. Review QC inspection checklist for compliance.
10. Review QC linear control charts for compliance.
11. Inspect testing equipment for damage and ensure all equipment is in good repair.
12. Verify UDOT qualification of the plant or consultant laboratory.
13. Verify current ACPA, NPCA or PCI plant certification.
14. Verify the concrete batch plant is pre-qualified under UDOT's "Quality Management Plan: Ready-Mix Concrete."