Receiving Units at the Job Site
The Engineer shall review the specifications, the Prestressed Concrete Construction Manual, and the approved shop drawings for the precast concrete before receiving the units. Units shall be inspected by the Engineer upon arrival at the construction site for compliance with all provisions of the specifications in addition to the following:

1. Inspector’s Stamp of Approval on all units.

2. Receive Report of Acceptance of Structural Concrete from the transporter and check that the units meet the description. If any of the following conditions are not met, the chance of damage during shipment are increased:
   A. The units are properly supported.
   B. The units are adequately tied to prevent movement during shipping.
   C. Plastic guards or other devices are used to protect the concrete where anchor chains would otherwise be in direct contact with the unit.

3. Any damage during shipment (cracks, spalls, etc.).

4. All dimensional tolerances in the specifications for the unit.

5. Bugholes or other visual defects of fascia units or other visible components.

Report all non-compliance to the Concrete Engineering Unit.

The Contractor shall handle and store the concrete units with extreme care to prevent damage to the units.

Rejection of Units
Units which, as determined by the Engineer, are damaged beyond repair or which do not meet dimensional tolerances shall be rejected by the Engineer and replaced with acceptable units furnished by the Contractor.

Rejection of a unit shall be done only with the concurrence of the DCES.

Erection
Erection Plan
A minimum 30 days prior to erection of the units, the Contractor shall furnish the erection procedure to the Regional Director, as required by Subsection 2.6 of the Prestressed Concrete Construction Manual, with detailed information concerning the proposed method of construction, including handling of the precast units, and the construction equipment the contractor plans to use. Any handling of the precast units at the job site shall be considered as part of the erection. Erection shall not begin until the required erection plan, including erection drawings, have been reviewed and approved by the Department. No extra payment will be made to the Contractor for any cost incurred in modifying the permanent structure due to temporary loadings induced by the Contractor’s handling and erection equipment or the erection scheme.

Three Sided Frames, Footings, Invert Slabs, Wingwalls, etc.

Manufacturer’s Representative:
The Contractor shall require the Manufacturer of the precast units to provide technical assistance and an on site representative during installation.
Lifting:
Check for the piece mark and compare it to the framing plan in the shop drawings. The pieces are often not symmetric and their orientation is important. Each piece has inserts for the purpose of lifting and may also contain inserts for framing, railing, post tensioning, and drawing the pieces together after placement. Observe the lifting and ascertain that it is done according to the erection drawings, using the correct lifting inserts.

Placing:
The pieces are placed on shims within a channel in the footing. Each piece should be placed according to the contract drawings such that the roof slabs are all in the same plane. Sometimes this is a horizontal plane, sometimes it is on a slope. Avoid placing pieces such that the roofs or legs are placed in a sawtooth fashion.

Shear Key Joints
Keyway Surface Cleaning:
The keyway surface shall be sandblast cleaned of any material which may prevent bonding (i.e. - oil, grease, water, dirt, etc.). This work may be done at the fabrication plant, or in the field. However, it shall be done prior to erection. If the sandblasting is to be done at the fabrication plant, the working drawings shall so indicate.

Preparation for Placement:
Prior to placing the grout, keyway surfaces shall be thoroughly wetted continuously with clean water during the preceding of 24 hours or as recommended by the grout material manufacturer. This wetting requirement will be waived if the keyway surfaces were coated with a penetrating sealer after the surface was blast cleaned.

After cleaning, the keyway shall be tightly sealed above the bottom of the shear key to prevent material loss. The work shall be done in such a manner that the sealing material shall be at least 5 mm above the shear key bottom. After sealing operations are completed, the Engineer shall inspect the work to ensure that the sealing material level is at least 5 mm above the shear key bottom. All sealed locations in violation of this requirement shall be corrected at no additional expense. No further work will be done to the shear key prior to the Engineer’s inspection and approval of the sealing operations. The ends of the keyway shall also be sealed to prevent material loss.

Grout Mixing-General:
The following mixing requirements shall be adhered to:

1. Mixing shall be done as close as possible to the keyway to be filled.
2. All necessary equipment for mixing and placing shall be present at the work site prior to the start of mixing. All equipment shall be in good working order as determined by the Engineer.
3. Material which, in the Engineer’s opinion is not pourable, exhibits signs of setting or hardening, prior to placement, shall not be incorporated in the work. It shall be removed from the work site.

Placement:
Placement of Cement Based Grout Material for Shear Keys.

1. The Grout manufacturer’s instructions regarding mixing and placing shall be followed, except that:
   A. No aggregate shall be added to the grout.
   B. The actual water to cement (W/C) ratio used shall comply exactly with the value given for the specific product as published in the Department’s approved list titled: Cement Based Grout Materials for Shear Keys, §701-06.
   C. Grout shall not be placed during rainfalls.
   D. Grout shall not be placed if the ambient temperature is outside the range of 7°C to 35°C.
2. Only one shear key shall be filled at a time. Filling shall begin at one end of the key and proceed continuously to the opposite end. No placement interruptions will be permitted. Grout shall be thoroughly rodded as it is placed in the keyway. Grout shall be finished flush with the top of keyway. When a differential exists between top corners of adjacent beams at the shear key joint, the grout shall be filled to the higher beam and towel finished at a 1 on 4 slope to the lower beam.

3. Curing shall be in accordance with the Grout Manufacturer's instructions unless otherwise required by the Engineer. The Contractor shall supply and place suitable curing blankets over the grout after placement. Such blankets shall be kept saturated damp, with clean water, for at least six (6) hours. Blankets shall be placed as soon as practicable after placement has been completed, but, under no circumstances, later than one (1) hour subsequent to placement.

**Loading:**
No loading of any span will be permitted until the following events have occurred, unless otherwise approved by the DCES:

1. All of the longitudinal shear keys of the span have been filled with shear key material.
2. At least 24 hours have elapsed from the time the last keyway was filled.
3. Tensioning of transverse ties is completed.

**Tensioning of Transverse Ties:**
These shall be tensioned to the force shown on the plans. Tensioning shall be done according to requirements of the specification. Tensioning shall be completed prior to performing any further work on the superstructure.

Grouting of ties shall be done according to requirements of the specification. Anchorage block-outs of fascia units shall be filled with anchorage block-out grout. Grout meeting the requirements of §701-05 or §701-06 shall be prepared and applied in accordance with the Manufacturer's instructions. Epoxy grout systems shall be prepared and applied in accordance with the Manufacturer's instructions. Epoxy grout systems shall be mixed and placed in accordance with the requirements of Subsection 502-3.15 of the Standard Specifications.

The temperature of the surface against which the grout is to be placed shall be at least 7°C. No placement of grout shall be permitted if the ambient temperature is less than 7°C. After the grout has been placed, it shall be dusted with the same brand and type of cement used in the production of the concrete units. Color to match the surrounding concrete surface.

**Miscellaneous Repairs of Precast Concrete**

**General**
Written repair procedures, together with sketches necessary to describe the deficiencies and the proposed repair, shall be prepared by the Contractor and submitted to the Engineer for approval.

**Required Information**
When written repair procedures are required for the repair of defects, repair procedure drawings shall be prepared to show the defects in the plan view, elevation and section as necessary to adequately locate and describe the defect and the proposed repair. The proposed repair procedure shall be described in detail including, where applicable, the following information, listed in a proposed sequence of operation.

1. The reason or probable reason why the defect occurred.
2. Color pictures and sketches showing plan views and sections indicating the size of the defect.
3. Removal of unsuitable material. Prior to beginning the repair, all spalled or disintegrated concrete shall be removed by chipping the unsuitable material away until sound concrete is reached. The type and size of tools and the depth at which sound concrete is reached shall be determined by the Engineer.

4. Blast Cleaning Surfaces. All surfaces to be repaired shall be thoroughly blast cleaned.

Repair

Repairs shall be made with one of the following materials: epoxy grout comprised of an epoxy resin system (721-01); epoxy polysulfide grout (721-03), mixed with fine aggregate or a (701 Series) cementitious grout. The grout shall be mixed and placed in accordance with the following:

1. Mixing:
   No mixing shall be started until all preparations have been made to use the grout. The Contractor shall be familiar with the working life limitations of the grout being used, and his operations shall be governed accordingly. Mixing shall be carried out in strict accordance with the Manufacturer’s instructions or directions contained in the Department’s Approved List manual and the following:
   a. Mixing shall be done as close as possible to the portion to be repaired.
   b. All necessary equipment for mixing and placing shall be present at the site, and in good working order, prior to the start of mixing.
   c. The epoxy grout shall be proportioned by volume in the approximate ratio of two (2) parts fine aggregate to one (1) part epoxy. The exact ratio of sand to epoxy resin system shall be determined on-site to produce a dense void-free grout.
   d. Dry, fine aggregate shall be placed in the mix container first. It shall be thoroughly agitated prior to the addition of the epoxy.
   e. The two components of the epoxy system shall be thoroughly mixed together before added to the fine aggregate.
   f. The epoxy shall be added to the fine aggregate slowly, but mixing time shall not exceed three minutes.
   g. All epoxy grout, in any individual batch, shall be used within 25 minutes after the start of mixing of the two components to create the epoxy system. All grout not used within the time limit shall be discarded.
   h. The grout shall not be retempered.
   i. No solvent, thinner or other foreign material shall be added directly to either the individual components or the epoxy mixture.

2. Placing:
   The grout shall be placed against a clean, primed receiving surface, in accordance with the following:
   a. The receiving surface shall be cleaned of all oil, grease or other material, which may prevent effective bond, immediately prior to priming the surface with neat epoxy (epoxy without aggregate) or cementitious paste.
   b. The priming of the receiving surface shall be done immediately prior to the placement of the grout.
   c. The grout shall be placed quickly and continuously. It shall not be overworked.
   d. The temperature of the receiving surface shall be above 70C at the time of grout placement.
   e. Grout placement shall not be permitted when ambient temperatures are 70C or lower, unless methods of protection, acceptable to the Inspector, are employed. Methods of protection, if permitted, shall be continued for a period of 15 hours following grout placement. The 15 hour period may be shortened, at the discretion of the Inspector, but, under no circumstances will it be less than 12 hours. Methods of protection, if permitted, are conveniences granted by the State. As such, they are not considered extra work, and, therefore, they are not entitled to extra compensation.
   f. Upon completion of grout placement, the new surface of the repaired area shall be flush with the
adjacent surfaces, unless the design of the unit specifically required otherwise.
g. On surfaces which will be exposed to view after installation, the repaired area shall be color matched to the adjacent surfaces by use of cement dust, or other means acceptable to the Inspector.

3. Post Repair Inspection and Acceptance:
The Engineer shall inspect the whole unit especially the areas that have been repaired. The unit shall comply with all requirements of the specifications before accepting the unit.