

Special Specification 4065

Precast Post-Tensioned Concrete Pavement



1. DESCRIPTION

Fabricate and construct a precast post-tensioned concrete pavement panels. This Item covers fabrication of the precast panels, transportation to the jobsite, installation, post-tensioning, and underslab grouting operations, and diamond grinding the pavement surface.

2. MATERIALS

Provide new materials that comply with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following Items:

- Item 360, "Concrete Pavement,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 424, "Precast Concrete Structures (Fabrication),"
- Item 425, "Precast Prestressed Concrete Structural Members,"
- Item 426, "Post-Tensioning,"
- Item 440, "Reinforcement for Concrete,"
- DMS-4655, "Concrete Repair Materials," and
- DMS-6100, "Epoxyes and Adhesives."

3. EQUIPMENT

Provide the necessary equipment for all work including but not limited to fabrication and handling of the precast panels at the fabrication plant; transportation of the precast panels to the jobsite; handling of the panels at the jobsite; removal of the existing pavement; placement of the hot-mix asphalt leveling course; underslab grouting; and diamond grinding of the pavement surface.

4. CONSTRUCTION

4.1. **Panel Fabrication.** Fabricate and store precast panels in accordance with Item 424, "Precast Concrete Structures (Fabrication)," Item 425, "Precast Prestressed Concrete Structural Members," and the requirements given below:

4.1.1. **Tolerances.** Ensure precast panels, regardless of type, meet the tolerances given below in Table 1.

**Table1
Tolerances for Precast Panels**

Dimension	Tolerance
Length (parallel to long axis of panel)	± 1/4"
Width (normal to long axis of panel)	± 1/4"
Nominal Thickness	± 1/4"
Squareness (difference in measurement from corner to corner across top surface, measured diagonally)	± 1/8"
Horizontal Alignment (upon release of stress)– Deviation from straightness of mating edge of panels	± 1/8"
Vertical Alignment–Camber (upon release of stress)	± 1/8"
Deviation of ends (horizontal skew)	± 1/8"
Deviation of ends (vertical batter)	± 1/8"
Position of Strands, and post-tensioning ducts	± 1/4" Vertical ¹ ± 1/4" Horizontal
Position of lifting anchors	± 3"
Position of non-prestressed reinforcement	± 1/4"
Dimensions of blockouts/pockets	± 1/4"

1. Measured from bottom of panel.

- 4.1.2. **Finishing.** Unless otherwise shown on the plans, apply a carpet drag texture finish to the top surface of the panels (driving surface), as per Item 360, "Concrete Pavement." Apply the texture in a timely manner after final screeding so the desired texture depth is achieved without disturbing the underlying concrete or turning over aggregate. Apply the surface texture either parallel or normal to the long axis of the panel, as directed.
- 4.1.3. **Curing.** Cure the precast panels in accordance to Item 424, "Precast Concrete Structures (Fabrication)." Begin curing immediately following surface finish texturing.
- Membrane curing, in accordance with Item 360, "Concrete Pavement" is permitted at the discretion of the Engineer. If membrane curing is used, apply a minimum 2 applications of the curing membrane immediately after surface texture finishing.
- Maintain curing for a minimum of 72 hours from the beginning of curing operations on the sides and top surface of the panels. While in the forms, the forms will be considered to provide adequate curing for the edges (vertical faces) of the panels. If any part of the form is removed, apply curing to the exposed surface as described above. Ensure curing for any given panel is not interrupted for more than 4 hours during removal of panels from the forms to the storage area.
- 4.1.4. **Removal from Forms and Storage.** Ensure no damage occurs to the panels when removed from the forms. Handle and store panels in accordance with Item 425, "Precast Prestressed Concrete Structural Members." Ensure damage does not occur to either the panels or blockouts when removing materials forming blockouts from the panel.
- Store panels so adequate support is provided to prevent cracking or creep-induced deformation (sagging). Stack panels no higher than 5 panels per stack, with adequate support between panels. Store panels so individual panels or stacks of panels are not touching one another. For panels stored for long periods of time (longer than one month), check the panels for creep-induced deformation at least once per month.
- 4.1.5. **Lifting and Handling.** Handle panels so the panels are not damaged during lifting or moving. Use the lifting anchors cast into the panels lifting and moving the panels at the fabrication plant. Ensure that the angle between the top surface of the panel and the lifting line is not be less than 60°, when measured from the top surface of the panel to the lifting line.
- 4.1.6. **Dowel Pockets.** Sandblast all faces of the dowel pockets to remove the form finish and roughen the dowel pocket faces. After sandblasting, remove all debris with clean, oil-free compressed air.

- 4.1.7. **Transportation.** Transport panels in such a manner as to not damage the panel during transportation. Properly support panels during transportation such that cracking or deformation (sagging) does not occur. If more than one panel is transported, provide proper support and separation between the individual panels. Panels will be lying horizontally during transportation, unless otherwise approved.
- 4.1.8. **Repairs.** Repairs of damage caused to the panels during fabrication, lifting and handling, or transportation will be addressed on a case-by-case basis, and in accordance with Item 424, "Precast Concrete Structures (Fabrication)." Repetitive damage to panels will be cause for stoppage of fabrication operations until the cause of the damage is remedied.
- 4.1.9. **Demonstration of Panel Fit.** Initially fabricate only 4 panels and assemble these panels at the fabrication plant to demonstrate the fit of the panels. Assemble the panels over a level surface that will not cause damage to the panels during or after assembly.
- Correct any imperfections that cause problems with fitting the panels prior to proceeding with panel fabrication. Commence panel fabrication following the trial assembly only upon approval.
- 4.2. **Base Preparation.** Place the precast panels over a prepared surface as shown on the plans Ensure the surface is free from debris and other materials that may prevent the panels from fully resting on the base.
- 4.2.1. **Base Material.** Install the precast panels over either the existing base material or a new asphaltic or cementitious material as shown on the plans.
- 4.2.2. **Grade Control for Placement.** Establish grade control for placement of the base material to ensure long-wavelength roughness is not built into the base. Establish grade control using stringlines, laser guidance, or other comparable methods. Grade control methods must be approved prior commencement of base preparation.
- 4.3. **Smoothness.** Ensure the finished surface of the prepared base will provide full support beneath the panels. Check the smoothness of the finished surface of the base in accordance with Item 585, "Ride Quality for Pavement Surfaces" using Test Type A. Use a 20 ft. straightedge instead of a 10 ft. straightedge, and ensure that the variation of the surface will be such that a 6 in. diameter circular plate, 0.125-in. thick cannot be passed beneath the straightedge. Correct areas of the base surface not conforming to this smoothness requirement at the Contractor's expense to the satisfaction of the Engineer. **Panel Installation on Site.**
- 4.3.1. **Equipment.** Provide all necessary equipment required for panel installation, post-tensioning, and grouting on site prior to commencement of panel installation. Ensure that lifting and transporting equipment does not damage the prepared base prior to or during panel installation. Repair damage to the prepared base at the Contractor's expense to the satisfaction of the Engineer.
- 4.3.2. **Placement Technique.** Install panels one at a time, and in such a manner that the base material is not damaged during installation. Ensure that the angle between the top surface of the panel and the lifting line attached to each lifting anchor is not less than 60°, when measured from the horizontal surface of the panel to the lifting line.
- Aligned in the longitudinal direction (parallel to the roadway centerline) using the centerline of the panels, mark the centerline of each panel on the top surface of the panel at the adjoining edges.
- Align the centerline of the panels to a line laid out by a surveyor (provided by the Contractor) on the surface of the base prior to placement of the panels. If necessary, use shims in the joints between panels to correct horizontal misalignment of the centerline of the panels. Ensure that the total thickness of shims used in any joint will be no more than 1/8-inch. Repair damage caused to the panels by shims at the Contractor's expense to the satisfaction of the Engineer.
- 4.3.3. **Placement Tolerances.** Unless otherwise indicated on the plans, place the centerline of all precast panels to within 1/4-in. of the pre-surveyed centerline marked on the surface of the base, and the centerline of adjoining panels to within 1/8-in. of each other at the adjoining edge.

For vertical alignment, ensure that the top surface of an individual panel is no more than 3/16-in. higher or lower than the top surface of an adjoining panel at any point along the joint between the panels. Ensure that the width of the gap between adjoining panels at the top surface of the joint is no more than 1/4-in.

- 4.3.4. **Post-Tensioning.** Post-tension slab units prior to opening section to traffic. Grout post-tensioning tendons within 3 day after post-tensioning is performed. Temporary post tensioning may be used to bring the panel together.
- 4.3.5. **Repairs and Patching.** Repair damage caused to the precast panels during any part of the panel installation process at the Contractor's expense to the satisfaction of the Engineer. Repairs of damaged areas will be addressed on a case-by-case basis by the Engineer. Repair damage within acceptable limits caused to the top surface (driving surface) of the panels using an approved repair method. Repetitive damage to panels will be cause for stoppage of installation operations until the cause of the damage can be remedied. Patch lifting anchor recesses, and all other recesses using approved patching materials and methods.
- 4.3.6. **Slab Anchors.** Slab anchors will be provided as shown on the plans to tie the precast pavement slab to the existing subbase.
- 4.4. **Tendon Grouting.** Grouting of the post-tensioning tendons will be performed in accordance with Item 426, "Post-Tensioning."
- 4.5. **Dowel Bar Installation.** Drill and epoxy grout dowel bars when shown on the plans.
- Use a concrete repair material meeting the requirements of DMS 4655, "Concrete Repair Materials," Type A category to fill the dowel pockets. Mix, place, and cure according to manufacturer's recommendations. Joint details are as shown on the plans.
- 4.6. **Underslab Grouting.** Perform underslab grouting to fill voids beneath the precast panels that may be present after placing the panels over the prepared base. Utilize the grout channels and ports shown in the plans for underslab grouting.
- 4.6.1. **Grouting Materials.** Furnish materials for a grout mixture consisting of Type I, II or III Portland cement, a fluidifier, fly ash and water. Pre-package grouts may be used as approved by the Engineer.
- 4.6.2. Provide a fluidifier as a cement dispersing agent possessing such characteristics that will inhibit early stiffening of the pumpable mortar, tend to hold the solid constituents of the fluid mortar in suspension and prevent completely all setting shrinkage of the grout. Water will conform to Item 421, "Hydraulic Cement Concrete".
- Use Class C fly ash, meeting the requirements of DMS-4610. Select the fly ash to be used from a list of approved sources maintained by the Materials and Pavement Section, Construction Division.
- 4.6.3. **Grouting Equipment.** Provide grouting equipment similar to that used for tendon grouting. The equipment will consist of at least the following:
- Equipment for accurately measuring and proportioning by volume or weight the various materials composing the grout,
 - A colloidal mixer, capable of operating in a range from 800 rpm to 2,000 rpm and thoroughly mixing the various components of the grout in an approved manner,
 - A positive action pump capable of forcing grout through grout holes in the slab and into voids and cavities beneath the pavement slab. The injection pump will be capable of continuous pumping at rates as low as 1-1/2 gal. per minute,
 - A discharge line equipped with a positive cut-off valve at the nozzle end, and a bypass return line for recirculating the grout back into a holding tank or mixer unless otherwise approved, and
 - A stop watch and flow cone conforming to the dimensions and other requirements of Test Method Tex-437-A, "Method of Test for Flow of Grout Mixtures (Flow-Cone Method)."

- 4.6.4. **Proportioning Grout Mixture.** Provide a grout mixture, herein referred to as "Grout Slurry," consisting of proportions of Portland cement, fly ash, fluidifier and water. Furnish the Engineer the proposed mix design meeting the following requirements:
- The grout slurry will remain fluid and not exhibit a resistance to flow for a minimum of one hour,
 - The time of efflux from the flow cone will be between 10 and 20 seconds. The flow test will be performed in accordance with Test Method Tex-437-A, "Method of Test for Flow of Grout Mixtures (Flow-Cone Method),"
 - The grout slurry will achieve initial set in less than 4 hours. The grout slurry will not be allowed to carry traffic until which time it has set to the satisfaction of the Engineer; or until which set time, as determined with Test Method Tex-302- D, "Time of Setting of Hydraulic Cement by Gillmore Needles," has been reached, and
 - The 7 day compressive strength of the grout slurry will not be less than 200 psi. The compressive strength will be determined in accordance with Test Method Tex-307-D, "Compressive Strength of Hydraulic Cement Mortars."
- 4.6.5. **Procedures.** Conduct underslab grouting not more than 7 days after placement of the precast panels. The Engineer may require grouting to be completed prior to opening the pavement to traffic if voids observed during panel placement are deemed to be detrimental to pavement performance under traffic loading.
- Backfill or seal slab edges to prevent grout leakage from beneath the slab during underslab grouting.
- Use minimal pressure to force the grout beneath the pavement slab. Under no circumstances should underslab grouting cause the pavement slab to lift. Pump grout into the port at the lowest end of each grout channel in each panel. Pump grout until it flows out of the nearest grout port along the same grout channel, or until the line pressure on the grout pump reaches 5 psi. Grouting pressure of 5 psi may be exceeded if the Contractor can demonstrate that slab lift is not occurring at higher pressures. If grout does not flow from the nearest intermediate port after the maximum grouting pressure has been reached, pump grout into the nearest port until grouting is completed to the satisfaction of the Engineer.
- Check the fluidity of the grout at the beginning of each grouting operation and after each time the grout pump is flushed. Measure grout fluidity in accordance with test method Tex-437-A, "Test for Flow of Grout Mixtures (Flow Cone Method)." Adjust fluidity to achieve the necessary flow requirements to achieve full undersealing. If excessive bleeding of the grout is observed, the Engineer may require the Contractor to adjust the grout mixture.
- 4.6.6. **Cleanup.** Upon completion of grouting, fill recesses in the surface of the panels at the grout ports with an approved mortar and finish to the satisfaction of the Engineer. Immediately flush grout that flows onto the finished surface of the pavement during the grouting operation. Remove residual grout which hardens on the pavement surface using an approved technique to the satisfaction of the Engineer at the expense of the Contractor.
- 4.7. **Diamond Grinding.** When directed, diamond grind the entire area of the pavement surface after pavement construction is completed. Perform grinding with abrasive grinding equipment, designed specifically for grinding pavement surfaces to close tolerances, utilizing diamond cutting blades with a minimum cutting width of 36 in. Ensure grinding equipment will accurately establish slope elevations and profile grade controls.
- Ensure ground surfaces are not smooth or polished. Pick up residue from grinding operation by means of a vacuum attachment to the grinding machine that will prevent it from flowing across the pavement and from being left on the surface of the pavement. Submit a plan for removal of the grinding residue for approval prior to the beginning of grinding operations.
- 4.8. **Ride Quality.** Ensure a finished ride quality after diamond grinding that meets the smoothness requirements given in Special Specification 3004, "Diamond Grinding and Grooving Pavement." The surface ride quality measurement will be conducted by the Contractor.

5. MEASUREMENT

This Item will be measured by the square yard of surface area of completed pavement. Completed pavement is pavement in place, under slab grouted, and diamond ground to the requirements given in this Special Specification.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Precast Post-Tensioned Concrete Pavement." This price will be full compensation for furnishing equipment, labor, materials, tools, and incidentals. Diamond grinding concrete pavement will be paid by the pertinent bid item.