

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 850**

**CEMENT TREATED FREE
DRAINING BASE**

APRIL 18, 2008

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850.01 Description. This work consists of constructing a cement treated free draining base (CTFDB) on a prepared base course.

850.02 Materials. Use CTFDB which is a mixture of aggregate, portland cement, and water. Use portland cement conforming to 701.01 or 701.04. Do not substitute pozzolans for portland cement. Furnish aggregate conforming to the following:

Furnish aggregate consisting of CCS, crushed gravel, or ACBFS according to the following:

- A. Use aggregate for cement treated free draining base with the gradation of No. 57 or 67 conforming to Table 703.01-1.
- B. Provide aggregate with physical properties of

	Maximum
Percent of wear, Los Angeles test, (stone or gravel)	40
Loss, sodium sulfate soundness test, percent	15
Shale and shaly material, percent	5
Chert that disintegrates in 5 cycles of the soundness test, percent	5
Liquid limit ^[1]	25
Plastic index ^[1]	6
Fractured pieces ^[2] , percent	90
[1] The portion of the material passing the No. 40 (425 µm) sieve.	
[2] If gravel is used, ensure that the aggregate retained on the No. 8 (2.37 mm) sieve has at least two mechanically fractured faces. Ensure that the gravel is crushed from material retained on the 1/2 inch (12.5 mm) sieve.	

Furnish ACBFS according to Supplement 1027.

850.03 Proportioning, Mixing, and Transporting. Proportion, mix, and transport CTFDB according to Item 499, except prepare a mix design conforming to the following requirements:

- A. Ensure that the minimum cement content by weight is 250 pounds per cubic yard (148 kg/m³) when using No. 57 gradation and 220 pounds per cubic yard (130 kg/m³) when using No. 67 gradation.
- B. Ensure that the water-cement ratio is approximately 0.36. This ratio is the amount of water, exclusive of that absorbed by the aggregates, to the amount of cement, by weight. The Contractor may change this water-cement ratio depending on the workability of the mixture.
- C. The Contractor may use water-reducing admixtures according to 705.12.
- D. Prewet, as necessary, the mixer fins and chute to allow discharge of the CTFDB.

850.04 Verification of Design. A minimum of 30 days before the production of CTFDB, submit a computed blend of aggregates, cement content, admixture, and water content for the necessary testing to determine the mix design acceptance. Have an independent private laboratory perform the required tests to check the yield of the mix design.

The Department will take random samples of the material at the discharge of the mixer and following the spreading operation to ensure conformance to the mix design. The Department will check the yield using a bulk density test for aggregate (ASTM C 29) to determine the unit weight of the mix.

850.05 Equipment. Provide all equipment necessary to mix, transport, place, compact, and finish CTFDB. Receive approval for this equipment before work can start.

850.06 Placing and Spreading. When the Contract Documents do not require the base to be primed, sprinkle it with water so it is thoroughly moistened when CTFDB is placed.

Do not allow workers to walk in freshly mixed CTFDB with boots or shoes coated with earth or other foreign material.

Before compaction, spread the mixed CTFDB to produce a smooth uniform layer.

If the width of the CTFDB being placed in one operation is more than 12 feet (3.5 m) or the total area of any given width on the project exceeds 5000 square yards (4000 m²), use a spreader.

The Department will test for in place gradation after spreading, but before compaction testing, according to Supplement 1090.

850.07 Limitations on Placing Operations. Spread CTFDB only when the atmospheric temperature is above 35 °F (2 °C). Do not spread on frozen material.

Do not place the CTFDB when rain is imminent. If rain occurs during placement of the CTFDB, cease all operations. Do not place the CTFDB when rain has softened the underlying base course or subgrade.

Do not place the CTFDB during any weather conditions that would cause its degradation, segregation, or contamination.

850.08 Compaction and Shaping. Compact and shape CTFDB to produce uniform density and cross-section. Use approved methods of compaction and shaping.

Compact the CTFDB using steel wheel rollers, modified slip-form pavers (using vibratory plates), or high-density screed pavers. Firmly seat the CTFDB into place by using the above equipment or combination thereof. Compact the CTFDB without crushing the aggregate or segregating the materials.

Perform the final compaction using steel wheel rollers weighing from 6 to 10 tons (5 to 9 metric tons). The Contractor may use vibratory rollers meeting the above requirements provided the vibration is turned off. Make at least two passes over any given point on the surface with the rollers. More passes may be required to ensure compaction.

Begin compaction within 1/2 hour of the spreading operation. Provide sufficient spreading and compaction equipment to complete compaction within 1-1/2 hours after water is added to the aggregate and cement.

Make construction joints by cutting a straight transverse joint in the completed work to form a vertical face at the end of each day's work or when work is suspended for more than 3 hours. Cut the CTFDB using a diamond blade saw. The Contractor may use a bulkhead instead of this procedure.

850.09 Curing. Place 6-mil (150 µm) white opaque polyethylene sheeting conforming to 705.06 over the completed CTFDB course immediately after compaction, and keep the sheeting in place for 3 days. Do not use concrete curing membranes.

If the next layer of pavement is placed without loading the CTFDB with construction or compaction equipment, the Engineer may allow a 2-day curing period. In this case, do not allow more than 4 hours to elapse between the removal of the curing and the placement of the pavement.

When the next layer of pavement is asphalt or a pavement layer that requires compaction equipment, cure the CTFDB for 3 days.

A cure day is defined as 24 consecutive hours. Maintain the temperature of the CTFDB above 40 °F (5 °C) during the curing period. For every day that the temperature of the CTFDB falls below 40 °F (5 °C) for any length of time, add an additional cure day.

850.10 Protection of the Underdrains. Do not allow equipment to crush any part of the underdrain system as a result of the placement or compaction of CTFDB. Repair or replace damaged underdrain pipe at no expense to the Department.

Ensure a positive connection between the underdrain backfill and the CTFDB at all times.

850.11 Protection of the Cement Treated Free Draining Base. The Department has not designed CTFDB for use as a haul road. Provided there is no significant displacement, breakup, or contamination, the Contractor may operate hauling units and other construction vehicles on the CTFDB.

If significant displacement, breakup, or contamination of the CTFDB is occurring, cease operating the hauling units and construction vehicles on the CTFDB. The Department will not allow hauling units and construction vehicles to travel on the CTFDB until the Contractor has satisfactorily demonstrated that displacement, breakup, or contamination is not expected to recur.

The use of the CTFDB by hauling vehicles or construction equipment is at the risk of the Contractor. Repair or replace all damage to the CTFDB, base, subgrade, or underdrains caused by the hauling units and construction vehicles at no expense to the Department.

Protect the CTFDB from fine material contamination at all times.

Provide adequate surface and subsurface drainage for the CTFDB, base, and subgrade at all times.

If constructing asphalt concrete pavement on the CTFDB, place the first course using a paver mounted on tracks. Allow the first course to cure overnight before placing the succeeding pavement courses.

850.12 Thickness Tolerances. Ensure that the compacted depth of CTFDB is $4 \pm 1/2$ inch (100 ± 13 mm). Ensure that the compacted depth conforms to the plans.

Verify the specified depth by randomly checking the CTFDB's depth during construction for at least every 2000 square yards (1650 m^2). If the depth is less than the specified depth by more than $1/2$ inch (13 mm), remove and replace it with CTFDB within tolerance at no expense to the Department.

850.13 Surface Tolerance. Use templates, slope boards, or other devices to verify the surface tolerance.

Ensure that the finished surface is uniform and does not vary more than $1/2$ inch (13 mm) from a 10-foot (3 m) straightedge applied to the surface parallel to the centerline of the pavement. If an area is out of tolerance, remove the areas and replace it with CTFDB within the specified tolerance at no expense to the Department.

850.14 Exposure to the Elements. Place the next layer of pavement within 40 days of the end of the CTFDB's curing period.

The Contractor may construct the CTFDB at any time that complies with the temperature restrictions specified in 850.07. However, completely cover the CTFDB with the next layer of pavement, and place the underdrain system and have it functioning before the atmospheric temperature falls below 35°F (2°C) or by the end of the construction season in any given calendar year.

Remove and replace CTFDB, base, subgrade, and underdrain system damaged by exposure to temperatures below 35 °F (2 °C) at no expense to the Department.

850.15 Method of Measurement. The Department will measure the 4-inch (100 mm) Cement Treated Free Draining Base by the number of square yards (square meters) computed from the profile grade and typical sections accepted in place.

850.16 Basis of Payment. The Department will pay for accepted quantities at the contract price as follows:

Item	Unit	Description
850	Square Yard (Square Meter)	4 inch (100 mm) Cement Treated Free Draining Base

Designer Note: Only use this supplemental specification after receiving approval by the Office of Pavement Engineering. ODOT's current pavement drainage design which incorporates 304 and 605 items has historically shown acceptable performance with the use of open graded aggregate bases, whether, asphalt, cement or untreated.

Contact the Office of Pavement Engineering (614) 995-5990 for further information and use.