MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
UNDERDRAIN OUTLET ENDING, CAST IN PLACE

CFS:DMG 1 of 2 APPR:DBP:TEB:04-17-26
FHWA:APPR:04-20-26

a. Description. This work consists of furnishing and placing a macro synthetic fiber reinforced concrete mixture for cast in place (CIP) underdrain outlet endings. Complete this work in accordance with the standard specifications, Standard Plan R-80 Series, as shown on the plans and as detailed in this special provision.

b. Materials. Furnish Grade 3000 concrete in accordance with Table 1004-1 of the Standard Specifications for Construction and with the following modifications.

Furnish one of the following fiber reinforcement products. Alternative products may be submitted to the Engineer for review and approval providing they meet the requirements specified in Table 1.

- Adfil Strux 90/40 - Chryso North America
- Tuf-Strand SF - Euclid Chemical Company
- Forta-Ferro - Forta Corporation
- Sika Fibermesh 650 – Sika USA

Table 1: Fiber Reinforcement Properties

Fiber Type	Monofilament polypropylene or polyethylene
Length	1.5 to 2.0 inches
Tensile Strength (minimum)	70 ksi
Modulus of Elasticity (minimum)	600 ksi
Equivalent Flexural Strength *ASTM C1609/C1609M* (minimum)	130 psi
Dosage Rate (minimum)	4.0 lbs/cyd

Design the concrete mixture for the inclusion of fiber reinforcement. Ensure the final mix design with fibers included yields to 27 cubic feet per batch.

c. Construction. Complete the work to form, place, finish and cure the concrete in accordance with the standard specifications and the dimensions shown on Standard Plan R-80 Series. The outlet pipe or pipes must be located as close as possible to the center of the outlet ending.

1. Prepare Base. Excavate to the required depth and width that will allow forming. Remove unsuitable material below the required depth and replace with sound earth or other approved material. Shape the base to conform to the section shown on the Standard Plan R-80 Series and compact as directed by the Engineer.

2. Forms. Furnish wood or metal forms, straight and free of warp, full depth, and that will resist deflection during concrete placement. The Contractor may cast the footer of the outlet ending neat to the slope, as approved by the Engineer.

3. Mixing. Batch the fibers into the concrete in accordance with the manufacturer's recommendations. Mix the concrete and fiber for at least 5 minutes to create a uniform blend. Continue mixing until the fibers are fully distributed throughout the concrete.

4. Concrete Quality Assurance (QA). On a daily basis prepare a set of QA cylinders for 7-day and 28-day compressive strength testing. A set consists of two cylinders for the 7-day testing and two cylinders for the 28-day testing. Cure cylinders in accordance with the standard specifications. Test cylinders for compressive strength at the appropriate time intervals.

5. Placing and Finishing Concrete. Place the fiber reinforced concrete in accordance with the weather and temperature limitations in subsection 602.03.T of the Standard Specifications for Construction. Maintain a moist base during concrete placement. Place concrete to the required dimensions in one continuous operation.

Place concrete around the outlet pipe, trim the pipe at an angle flush with the concrete outlet ending once strength is attained.

Consolidate the concrete along the faces of the forms in a manner approved by the Engineer. Tamp the concrete surface to remove voids and strike off to the required cross section.

Finish the concrete surface with a float. Round the edges to a 1/4-inch radius with an Engineer approved finishing tool.

6. Curing and Protection. Cure the concrete by applying a white membrane curing compound in accordance with subsection 903.06.A of the Standard Specifications for Construction.

7. Backfilling. After the concrete gains the required 7-day compressive strength, remove forms and backfill with sound earth or topsoil as appropriate. Compact and level the backfill to match the grade of the concrete surface.

8. Provide slope restoration to all disturbed areas in accordance with the contract documents.

d. Acceptance. Acceptance will be based on constructing the outlet ending in accordance with the standard specifications, as modified in this specification, the Standard Plan R-80 Series and the concrete mixture achieving the minimum 28 day compressive strength of 3000 psi.

e. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Underdrain, Outlet Ending, CIP	Each