

MasterFiber[®] Products

Precast Septic Tanks



Beginning 2012, the Washington Department of Health (WDOH) will require all precast septic tanks to meet new loading requirements. The White Block Company, a precast manufacturer in Washington State, was faced with two difficult challenges due to this change: an increase in the reinforcement required and the rising cost of steel reinforcement. In order to overcome these challenges, the White Block Company utilized the services of Inland Northwest Engineering Incorporated to review and update the designs of their septic tanks for the current loading as well as the required loading. In order to maintain or increase performance without driving up costs, White Block Company decided to use fiber reinforced concrete as an alternative and contacted Master Builders Solutions for help. Master Builders Solutions was able to review the designs provided by the engineer and provide a synthetic fiber solution that met the specifications of the WDOH and the White Block Company.

Project:

Precast septic tanks with MasterFiber products

Location:

Spokane, WA

Owner/s:

White Block Company

Design Engineer:

Inland Northwest
Engineering Incorporated

Requirements:

Vacuum of 10 inches of mercury

Products Used:

MasterFiber MAC Matrix
macrosynthetic fiber
MasterGlenium[®] 7700
high-range water-reducing admixture
MasterAir[®] AE 90
air-entraining admixture
MasterMatrix[®] VMA 450
viscosity-modifying admixture

Market Sector:

Precast concrete

Project Profile

Padgett-Thomas Barracks, Cadet Housing



The Fiber Solution

Master Builders Solutions recommended the use of MasterFiber MAC Matrix, a macrosynthetic fiber, for this project. MasterFiber MAC Matrix fiber is capable of replacing most of the welded wire reinforcement and No. 3 and No. 4 reinforcing bars used as temperature and shrinkage reinforcement, depending on the application. In addition, MasterFiber MAC Matrix fiber is designed specifically to be used at high dosage rates not only to meet the demands of the projects but also to provide superior finishability. Based on the calculations provided by the design engineer, Master Builders Solutions arrived at a fiber dosage of 6.5 lb/yd³ (3.9 kg/m³) to meet the required loading criteria.

A test tank of 1,000-gallon capacity, with the recommended dosage of MasterFiber MAC Matrix fibers, was cast using self-consolidating concrete (SCC). The tank was cured in a covered structure with temperatures ranging from 30 °F to 60 °F (-1 °C to 16 °C). After 28 days of curing, the tank was subjected to the vacuum test to determine its structural capacity.

Mixture Proportions

Water – cement ratio	0.42
Cement content	– 630 lb/yd ³ (374 kg/m ³)
Fiber dosage	6.5 lb/yd ³ (3.9 kg/m ³)

Properties of Concrete

- Air content: 5%
- Concrete temperature: 70 °F (21 °C)
- Slump flow: 28 in. (710 mm)
- 28-day compressive strength: 6,610 psi (45.5 MPa)

Testing the Structural Capacity of the Tank

The vacuum test specified in ASTM C 1227 “Standard Specification for Precast Concrete Septic Tanks” is the standard test method used to determine the structural capacity of septic tanks against external pressure. In addition, the vacuum test measures watertightness and the data is reported in terms of “inches of mercury.” The WDOH specifications requires a vacuum (negative air pressure) of 10 inches (250 mm) of mercury. The pictures show the tank being subjected to the vacuum test. Test conducted on the fiber-reinforced concrete septic tank containing MasterFiber MAC Matrix macrosynthetic fiber resulted in a vacuum of 12 inches (305 millimeters) of mercury. Thus, the measured vacuum exceeded the specified value for the tank tested.

Master Builders Solutions

Master Builders Solutions is a leading global manufacturer of concrete admixtures, as well as other sustainable solutions for the construction industry, focussed on delivering its vision: Inspiring people to build better. Master Builders Solutions provides value-added technology and market-leading R&D capabilities to improve the performance

of construction materials and to enable the reduction of CO₂ emissions in the production of concrete. Founded in 1909, Master Builders Solutions has ca. 1600 employees operating 35 production sites globally, supporting their customers in mastering their building challenges of today – for a decarbonised future.

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