MaxFlow

CELLULAR CONCRETE

for GEOTECHNICAL APPLICATIONS

MAXFLOW Environmental Corporation

PROJECT ANALYSIS: Meeting Specs at a Lower Cast Density Thereby Using Less Cement

Project: Gest Street Bridge Modification.
Date: Winter, January 1999
Location: Downtown Cincinnati, Ohio.
Owner / Engineer: City of Cincinnati.
Description: A traffic bridge built to cross existing railroad tracks all of which are located within the Ohio River flood plain.

Gest Street Fill Cavity. (Foreground) A progression image showing a 10 ft thick section of cast cellular concrete fill. (Top) Precast concrete retaining wall. (Right) North bridge abutment.

Project Scope: Due to a poor soil condition at the location of one of the approaches and further considering that an 18 foot thick section of fill would be required to carry the roadway to the elevation of the bridge deck, the project engineer decided to backfill using low-density cellular concrete. The selection of cellular concrete was made to substantially reduce the dead-load burdens that backfilling would imposed upon the in-situ strata.

Project Specification: Lifts of Range Class II cellular concrete fill shall be placed in the cavity to an elevation of two feet below the final surface. Thereafter, Range Class IV cellular concrete fill shall be placed to complete the cavity fill to an elevation within 1" of the proposed grade. Table (1) lists the properties, as specified, for the two Range Classes. The specified compressive strength values shown represent the minimum values determined as necessary for the fill to serve as an adequate support base for the proposed concrete roadway slab.

Table 1. Specified Range Class Properties

Range Class[1]	Cast Density (lbs/ft³)	Minimum Compressive Strength[2]
II	30	40
IV	42	120

1. A typical industry categorization for the shown cast density and compressive strength values.
2. Values are shown in psi (lbs/in²) @ 28 days of age.

Corresponding Mix Designs: In accordance with the cast densities specified and shown in Table (1), corresponding mix designs are tabulated and shown in Table (2).

Table 2. Specified Mix Designs

Mixture Component	By Weight (lbs/yd³)		By Volume (ft³/yd³)	
Class	II	IV	II	IV
Cement[1]	515	745	2.6	3.8
Water[2]	232	335	3.7	5.4
Preformed Foam[3]	62	53	20.7	17.8

1. Type I portland cement
2. Calculated water to cement ratio = .45
3. Generated density = 3.00 lbs/ft³

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(Cont.)

Lower Density: As dead-load reduction was a primary objective in this application, latitude was given to the contractor to further reduce the placement density of the cellular concrete fill providing that the minimum compressive strength values were met. The fill contractor was able to meet the minimum specified compressive strength requirements at lower cast densities by using **MaxFlow Cellular Concrete** fill. For the Range Classes II and IV materials, cast densities of 24 and 30 pcf respectively were used. Table (3) lists a summary of the resulting physical properties.

Table 3. Installed MaxFlow Fill Properties

Cast Density (lbs/ft^3)		Average Dry Density (lbs/ft^3)	Average Compressive Strength[1] (psi)	Compressive Strength Range[2] (psi)
Class II	24	16	71	55 - 86
Class IV	30	22	147	130 - 164

1. Values are shown @ 28 days of age.
2. Values are shown @ 28 days of age and represent the maximum and minimum compressive strengths for the density group.

The **MaxFlow Cellular Concrete** fill, as installed, met the specified minimum compressive strength requirements while further reducing in-service dead-loading by 20 - 30 percent.

Cost Benefit: More than just reduced dead-loading was accomplished by meeting the specified compressive strengths at lower cast densities. Substantial cost savings were realized as a result of reduced cement consumption.

Table (4) is assembled to compare the cement factors of the mix designs as specified to those actually used. The values shown in the reduction column represent the cement savings on a per cubic yard basis. The cement factors of the specified mixtures are those as shown earlier in Table (2).

Table 4. Cement Factor Savings

Range Class	Cement Factor as Specified[1]	Cement Factor as Submitted[1]	Reduction in Cement Factor[1]
II	515	402	113
IV	745	515	230

1. Values are stated in lbs/yd^3.

The information collected herein has been assembled to exhibit the performance and cost savings potential offered by use of **MaxFlow Cellular Concrete** fill. It is presented for use by design professionals considering the use of the MaxFlow fill material in various engineered applications. Additional information may be obtained by contacting a MaxFlow representative.

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