MASTER® BUILDERS SOLUTIONS

Project:
Human Agricultural Biosciences Building, Virginia Tech

Location:
Blacksburg, VA

Owner/s:
Virginia Tech

Concrete Contractor:
United Forming

Concrete Producer:
Chandler Concrete

Requirements:
50% fly ash mixes

Products Used*:
Green Sense Concrete Mixture Optimization Service

MasterGlenium® 7500 high-range water-reducing admixture

MasterSure® Z 60 workability-retaining admixture

Market Sector:
Ready-mixed concrete

Project Profile

Environmentally Preferable Concrete

Virginia Tech Human Agricultural Biosciences Building

The Background

The Human and Agricultural Biosciences Building 1 (HABB1) at Virginia Tech in Blacksburg, VA is being built to hold nearly 100,000 square feet (9,300 m^2) of research space for important work in the areas of nanotechnology, bioenergy, environmental quality analysis, and other scientific disciplines. When it is completed in late 2013, HABB1 will house several laboratories where students and faculty can work to solve the challenges of today and in the future.

BASF
We create chemistry

Virginia Tech Human Agricultural Biosciences Building

In designing the building, the University pursued a sustainable construction strategy to align with the forward-thinking research that will be done there. They chose to quantify the sustainability of the structure by pursuing LEED certification from the US Green Building Council.

The Challenge

To develop a sustainable concrete mixture that would support the customer requirement for LEED certification, ready-mixed concrete producer Chandler Concrete of Christiansburg, VA needed to maintain an overall fly ash usage of at least 25% in the cast-in-place concrete. They also needed to adhere to an aggressive project timeline, making it necessary to achieve high-early strengths on particular elements. The challenge was to meet the target early-age strengths while staying on the tight schedule, because high fly ash concrete mixtures typically result in lower compressive strength at 3 and 7 days.

The Solution

Despite limited available options due to the schedule and budget constraints, concrete contractor United Forming and the concrete producer were able to provide a forward-thinking, innovative solution to this problem. They drastically increased fly ash contents on the less time-sensitive concrete mixtures to approximately 50% to allow for decreased fly ash contents on the more time-sensitive mixtures, resulting in an overall average fly ash usage of 25% for the project.

To achieve the very high 50% fly ash replacement requirement, Chandler Concrete partnered with its admixture supplier, BASF Construction Chemicals, to develop advanced concrete mixtures using BASF's proprietary Green Sense Concrete Mixture Proportioning Optimization Service. Through the use of dynamic polymers, including high-range water-reducing admixtures and workability-retaining admixtures, Chandler Concrete was able to provide the contractor with concrete mixtures that utilized the requested fly ash replacement levels, while still providing all of the necessary performance requirements. In addition to meeting the specific fly ash replacement needs, the concrete mixtures provided superior workability and finishing quality.

Project Facts & Benefits

An Eco-Efficiency Analysis, using methodology validated by NSF International, was conducted to quantify the environmental impact of sustainable concrete for the project (Chart 1). Below are some of the practical equivalents for the resulting savings:

- Greenhouse gas reduction equivalent to 49,597 gallons (187,725 L) of gasoline
- Reduction in the generation of solid waste by 49.3 tons (50.1 tonnes)
- Water savings equal to 75,800 ½-liter bottles

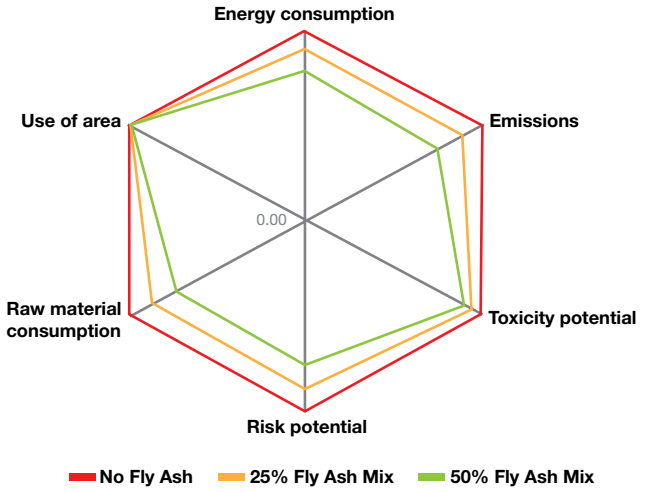
The environmental fingerprint shown in Figure 1 at right shows that the concrete mixture with 50% fly ash provided the lowest environmental impact of the three mixes in the six categories, based on BASF's third party validated Eco-Efficiency Analysis methodology.

Chart 1. Environmental impact of sustainable concrete for Virginia Tech Human Agricultural Biosciences Building #1*

Environmental Impact Cateory	Environmental Benefits
Energy	645,922 kWh (2,325,319 MJ) savings
Fossil Fuel Consumption	50,197 lb (22,769 kg) savings
Greenhouse Gas (CO_2 eq)	975,069 lb CO_2 (442,284 kg) reduction
Acidification Potential (acid rain) (SO_2 eq)	6,092 lb SO_2 (2,763 kg) reduction
Water Usage	10,013 gal (37,903 L) savings
Solid Waste	19,725 lb (8,947 kg) savings

* Based on 5,000 yd^3 (3,820 m^3) of concreteProject Facts

Fig. 1 Environmental Fingerprint



More Information

The Master Builders Solutions brand brings all of BASF's expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

The know-how and experience of a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions.

*Effective January 1, 2014, the names of BASF's Master Builders Solutions brand products have changed:
Glenium 7500 became MasterGlenium 7500
RheoTEC Z-60 became MasterSure Z 60

Contact

United States
23700 Chagrin Boulevard
Cleveland, Ohio 44122-5544
Tel: 800 628-9990 ■ Fax: 216 839-8821

Canada
1800 Clark Boulevard
Brampton, Ontario L6T 4M7
Tel: 800 387-5862 ■ Fax: 905 792-0651

www.master-builders-solutions.basf.us