

Project Spotlight

UBC TRIUMF North Hot Cell Roof



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UBC TRIUMF turns to Lafarge for innovative solutions.

Project Details

Owner:

UBC TRIUMF

Location:

Vancouver, British Columbia

General Contractor:

UBC TRIUMF

Placers and Finishers:

F&F Construction Ltd.

Innovative Product:

UltraSeries™ Heavyweight with SCC technology

Volume of Project:

5m³

Volume of Innovative

Product: 5m³

Date of Pour:

April 2011

The Opportunity

Located in the University of British Columbia's South campus, TRIUMF is Canada's national laboratory for particle and nuclear physics. One of the specific facilities at TRIUMF is a rare isotope facility called ISAC (Isotope Separator and Accelerator). At this facility, targets are bombarded with high energy protons to produce radio isotopes. However, prior to this bombardment, the targets, typically composed of radioactive material, must first be prepped in a hot cell room.

The purpose of a hot cell room is to allow technicians to work on radioactive materials in a safe environment via mechanical arms called tele-manipulators that are suspended from the roof of the hot cell.

The ISAC facility has two hot cell rooms: North and South. Although construction for these hot cell rooms was nearly complete, several difficulties arose during the construction of the North hot cell room.

The North hot cell roof form is a complex design with many rectangular and circular holes.



The North hot cell room, constructed in the second phase of UBC TRIUMF's ISAC expansion, will allow physicists at UBC TRIUMF to further explore their research in rare isotopes.

The Challenge

While the walls and floors of a hot cell room consist of cast in place concrete, the roofs of these structures are made by pouring concrete into a form made up of welded steel I-beams and steel plating. Once the concrete has set, the roof is then lifted into position using a crane. There were three factors that contributed to the challenge of constructing the North hot cell roof: the shape of the form, the required density of the concrete, and the weight of the finished structure.



“OVERALL, THE WHOLE LAFARGE TEAM, WAS PROFESSIONAL AND ATTENTIVE TO SERVICE.”

**- GRANT MINOR
HEAD OF REMOTE HANDLING
UBC TRIUMF**



A flow test performed on UltraSeries™ Heavyweight prior to the pour demonstrates the self-consolidating nature of the concrete mix.

The Challenge Continued...

The form of the North hot cell roof is very complex with multiple rectangular and circular holes incorporated into the design to accommodate for the suspension of tele-manipulators. TRIUMF required a concrete with Agilia® SCC technology in order to fill this complex form uniformly - any voids or air bubbles would compromise the roof’s ability to shield against radiation. In addition to this, the North hot cell room was expected to hold targets at a higher radiation level than the South hot cell room. This meant that the concrete for the roof would also need to be a higher density to provide the necessary radiation shielding. This last requirement proved difficult as the total weight of the structure could not exceed 20 tons due to the weight capacity of the crane located at the ISAC facility. The targeted density for the concrete was, therefore, 3200kg per m³

The Lafarge Solution

UBC TRIUMF approached Lafarge in search of a concrete that met the density and flow requirements for the North hot cell roof. To better meet UBC TRIUMF’s needs, the Product Development staff from our Richmond Regional Product Development Lab contacted Nuclear Shielding Supplies Ltd. based in Longueuil, Quebec. After a great deal of correspondence, our Product Development staff were able to identify an aggregate mined in Kentucky that would help Lafarge meet UBC TRIUMF’s density requirements. A sample of this aggregate was flown to the Richmond Regional Product Development Lab where Product Development staff were able to combine the aggregate with our Agilia® technology to create UltraSeries™ Heavyweight, a high density concrete mix with the SCC performance of Agilia®.

Prior to the pour, an on site test was performed on a clear replica of a section of the North hot cell roof. UltraSeries™ Heavyweight performed to specification.



UltraSeries™ Heavyweight filled the steel form of the North hot cell roof uniformly and without incident.

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