Gold mine cover structure improves environmental protection while increasing worker safety

Located in northern Ontario, near the Town of Cochrane, Detour Lake has more than 15 million ounces of gold in reserves and an expected annual production of over 650,000 ounces. Detour Gold Corporation, a Canadian gold exploration and development company, is the developer. With production scheduled to commence in early 2013, this project is on track to becoming Canada's largest operating gold mine.

Constructing a cover structure for their operation that also enabled them to house a conveyor needed to be done in a safe, environmentally responsible and cost-effective manner. Detour Gold's requests were threefold: ensure worker safety by minimizing the amount of dust created by the stockpile; minimize the release of dust into the environment; manage the amount of material awaiting transport to the mine's ore processing facility.

In total, 3,363 beams were constructed into aluminum gussets to form the structure. Photo courtesy Detour Corporation and Graeme Oxby.

Selection process

In early 2011, Greatario Engineered Storage Systems responded to a bid request by Detour Gold for their stockpile containment solution. BBA's structural engineers, the Detour Gold engineering team, AMEC, Greatario and CST Covers met to discuss specifications of the bid.

Partnering with their parent company, CST Covers, allowed Greatario to offer a customized 'turnkey' containment solution for the mine. Following review of the proposal and site visits to other CST bulk storage domes, the contract was awarded to Greatario in December, 2011. Greatario assumed the role of general contractor and installer of the dome. CST Covers provided engineering services, and manufactured and supplied the dome.

Key factors leading to Detour Gold's decision to employ Greatario's dome solution for the site included:

• Capability to customize the build to meet project specifications. Covers are designed around a bulk storage facility's specific clearance requirement, stockpile configuration and bulk handling equipment.

• Structural design of the CST domes including aluminum joints requiring no onsite welding.

• Aluminum is corrosion resistant, offers larger clear span cover capabilities and design flexibility, resulting in less installation time, labour and equipment.

• Greatario's aluminum construction helps to eliminate fugitive particulate emissions, comply with clean air regulations, manage dust and protect stored material from degradation by the elements.

• Low capital cost.

• The dome can be removed and redeployed once the mine is decommissioned.

Construction

A typical design/build would be 'tower build technology', which means the dome is built from the inside-out. The inner frames and poles are constructed and raised by a pole crane. However, as the existing conveyor at Detour Gold eliminated the opportunity to use this technology, an outside-in cover construction method was used.

Outside frames and panels were constructed on the walls of the structure. The frames and panels were then constructed inward until the dome was complete. Man lifts and cranes were used as the dome rings were completed. The construction team built one complete ring at a time and then moved up to the next ring. A total of 25 rings was assembled.

In total, 3,363 beams were constructed into aluminum gussets to form the structure. Greatario's team built the dome as deliveries from CST Covers arrived on site. As the prefabricated beams slide easily into aluminum gussets and hold securely, the assembly process requires no welding of the dome itself, which was a huge advantage. This precise assembly process allowed the construction team to assemble the dome under various weather conditions. The finished frame was then clad with over 2,240 aluminum sheets.

The finished stockpile dome is 97.5m in diameter and 52m high, which is the largest dome that Greatario has built and the largest aluminum geodesic dome in Canada. It is designed to withstand snow loads and wind speeds typical for the area. Material is transported from the dome to the mine's ore processing plant via an existing underground tunnel.

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