**Asia’s first Sandvik DT1130i jumbo cuts tunnel through Korean mountain**

**Taeah Construction is using Sandvik DT1130i jumbo drill rig in Asia to cut 2.367 km of tunnel through a granite mountain outside of Seoul.**

A Sandvik DT1130i jumbo drilling rig equipped with Sandvik drill bits and rods is being used by South Korean contractor Taeah Construction to cut through a granite mountain for the construction of a tunnel on the Kangnam Beltway, on the southern side of Seoul.

The complete project is being carried out by Doosan Construction Ltd, and is for a 12.40 km stretch of six-lane highway from Geumcheon, a district of technology businesses, to the upmarket residential district of Seocho.

The highway needs to pass under the Gwanaksan mountain, a 632m high granite formation whose name in Korean means ‘hat-shaped peak’. Taeah, as a sub-contractor, is excavating 2.367km of the 4.99km Gwanak tunnel.

Approximately 17 % of the total tunnel length passes through hard and medium-hard granite, with Taeah’s half of the tunnel passing through the major share of this type of ground representing about 55 % of its contract.

A specialist contractor in tunnelling through rock, Taeah is the largest company of its type in the region and a key customer of Seoul-based Sandvik Suhjun Ltd.

The recently launched Sandvik DTi series comprises four different models for excavation of 16 - 203 m² cross-sections, including face drilling, bolt hole drilling, and mechanised long-hole drilling.

The DTi models are designed for automatic use, but there is also a range of practical features allowing the operator to fine tune the process on line if the rock conditions so require. This means that a single operator can easily manage the jumbo and all its drilling booms.

**Sandvik iSure**

The DTi jumbos utilise a new tunnel planning software, Sandvik iSure, which offers a totally new and efficient way of simultaneously working with blasting and drilling patterns. The iSure software ensures optimised blasting as per plan and supplies better pull-out, decreased need for scaling, increased rock loadability and smoother collaring in the following round, resulting in higher excavation quality.

The DT1130i being used on Taeah’s contract has three booms and can cover an area ranging from 20 to 183 m².

Taeah’s stretch of tunnel begins at the Gwanak Interchange, in front of the main campus of Seoul National University. Since starting on September 20 last year the contractor had, by October 2011, excavated a pit at the foot of the hill and begun the tunnel drive through some of the hardest rock that will be encountered in the mountain.

Taeah is in fact cutting two tunnels, one for each direction of the highway, but is using only one Sandvik jumbo for the work. Total length of tunnelling on Taeah’s section is 2,128.50 m, plus 238 .50 m for auxiliary works.

Project Manager Seong-su Kim says that the soil types in the tunnel have been divided into five categories, with Type 1 representing the hardest granite, Type 2 medium granite, and Types 3, 4 and 5 representing various degrees of granite and soil mixes.

Mr Kim says that tunnelling work began in July 2011, when Types 3,4 and 5 were encountered, and that in August the contractor ran into harder material. During August, Taeah cut through 50 m of Type 1 granite, 42 m of Type 2, 36 m of Type 3, 12 m of Type 4, and 15 m of Type 5.

September saw 100 m of Type 1, 78 m of Type 2, 3 m of Type 3, and none of 4 and 5.

The jumbo is used for drilling the face in one tunnel, and then removed for the blasting, during which time it drills the face in the second tunnel.

Although the rig is working 24 hours a day, only three operators are required, all of them employees of Taeah, and trained by Sandvik Suhjun.

The width of the main part of the tunnel is 20 m and the height 10 m, with a shorter stretch of 14 m wide and 9 m high.

Drilling of the face is being conducted on two bench levels, as designed by the consulting engineers for safety reasons, with the hole diameter being 45 mm, the Korean standard specification.

The face is being drilled for two specified blasting levels, once again set out by the consulting engineer. On the top bench the rig is drilling 140 or 150 holes, and on the lower bench it is drilling 70 to 80 holes.

**Sandvik Tools**

The DT1130i is using the Sandvik Alpha 330 rock tool system, a drill string rod and bit combination that has been designed specifically for high-power 45 mm drilling.

The hole depth varies according to the hardness of the rock: for Type 1, the holes are a depth of 2.5 m, for Type 2 the depth is 2 m, for Type 3 it is 1.5 m, for Type 4 it is 1.2 m, and for Type 5 it is 1 m.

Rig operator Sang-ho Kim says that with all three booms working simultaneously, drilling the required number of holes in even the hardest section of rock takes only about 1.5 hours.

He continues, “ The DT1130i is a really different jumbo, with 15 years of operating experience l have found that it produces far less overbreak than any other rig due to the accuracy of positioning the booms and its iSURE automatic control programme. It’s also very easy to operate – it is a totally new design of jumbo drill.”

Blasting is being carried out a total of six times per 24 hours during the summer months, while during the winter season it is expected to be decreased to four or five times per day.

Rock bolting is also being carried out, with three or four supports for the Types 1 and 2 rock, and up to 35 holes needed for the supporting bolts in the softer ground. The tunnel walls are being shotcreted.

In accordance with Taeah policy, each of the Sandvik bits is being sharpened four times before being replaced, a service that is provided by Sandvik Suhjun at the company’s own workshops.

Mr Kim says that to date, Taeah has been using 130 drill bits per month, each of them undergoing four sharpenings.

Taeah Construction has a tight team on the project, with only 10 engineers and 50 workers employed on the site.

The contract is being carried out for Kangnam Beltway Ltd and is due for completion on 20 May 2013.

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Sandvik Mining and Construction is a business area within the Sandvik Group and a leading global supplier of equipment, cemented-carbide tools, service and technical solutions for the excavation and sizing of rock and minerals in the mining and construction industries. Annual sales 2010 amounted to about SEK 35,200 M, with approximately 15,500 employees.