

A Himalayan Tunneling Success, Z-Morh Tunnel

Jammu & Kashmir, India.

Z-Morh tunnel is a road tunnel project and is a step towards ensuring all-weather connectivity between Srinagar and Kargil in the Ladakh region of India. The tunnel gets its name from its "Z" formation between Sonamarg. The tunnel would avoid regions of snowfall and avalanches. Along with Zoji-la Tunnel, the Zmorh Tunnel would ensure year-long road connectivity between Srinagar and Kargil which currently remains closed for about seven months due to snow.



Project owner
**National highways and
infrastructure
Development
Corporation, India.**

Product
Durus® EasyShot

Function
**Reinforcing the tunnel
linings at 4kgs/m³ of
Durus® EasyShot and
replacing 30kgs/m³ steel
fibre in the shotcrete mix
design.**

Leading Contractor
APCO Infra Pvt. Ltd.

Volume of macro fibres
450, 000 kgs

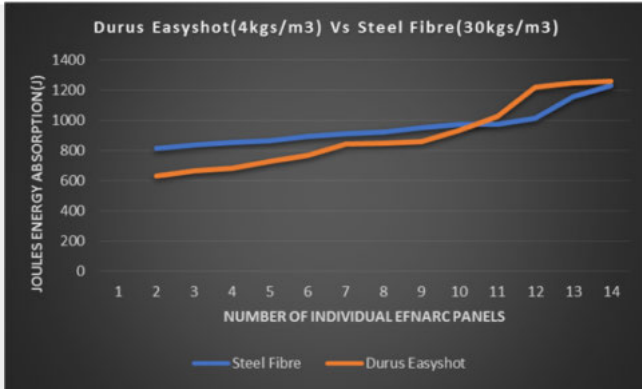
Challenge

This is a two lane bi-directional tunnel. The tunnel is 6.5 Km long with a parallel 6.5 Km long escape tunnel. Located at an elevation of 8652 feet above sea level, the tunnel has two portals - West and East with a ventilation tunnel (Adit) in between. The tunnelling was proposed through NATM in the view of challenging fragile Himalayan Geology. Portal face was full of clay mixed soil embedded with cobble and gravel. Colluvium, shale and lime stone were encountered. Good rock was found 600 meter of tunnel excavation. The peak temperature in the winters reaches as close as -45

degrees. The temperature at site during the season ranging from -10 degrees to -16 degrees. With all these conditions a minimum of 750 to 950 Joules was specified and required on the project.

Solution

A lot of advanced panel tests were performed on the project to determine a technically conforming fibre reinforced lining solution to be employed in these tunnels. The product Durus Easyshot was selected on account of better performance in the mix, special "pucks" for parallel mixing enclosed in an automatic dosing bag for manual/automatic batching plant which resulted in saving up to 20%



Performance: Steel Fibre Vs Durus Easyshot for 14 EFNARC samples.



Working on a difficult geography to ensure winter supplies



One of the tunnel portals



Shotcrete Machines ready to spray Durus Easyshot



EFNARC sample preparation for testing

wastage of fibres on site during batching, handling and transportation.

Benefits of the solution

- Low per cubic meter cost to reinforce shotcrete.
- Flexible bag sizes to facilitate automatic dosing based on the shotcrete mix requirements. All batching Wastage eliminated
- Space requirements at site minimised.
- No use of wire mesh, speedy progress of contract.
- No corrosion risks at storage.
- Uniform spraying of the shotcrete (with wire mesh chances of pocket formation are high).
- Consistency in EFNARC test results as well ground deformations control on an optimum dosage (4kg)
- No choking found in the ME5 shotcrete machine.

Result

Durus EasyShot has a low cost per Joule. With 4kg/m³ values of more than 850 Joules was achieved on the project. The project specifications required an E700 class Joules energy absorption. As Durus EasyShot is a flexible shotcrete fibre, there are zero blockages in the nozzles which make sure that the shotcrete machines runs hassle free, a great machine output and no downtime. All these factors together allowed Durus EasyShot to outperform steel fibre (30kg/m³) on this project. It is noteworthy to mention that an additional cost saving was achieved by eliminating machine maintenance, downtime, reduced output and nozzle replacements which are very frequent with steel fibre.

Products used



Durus® EasyShot: Easy to Spray

Macro Synthetic fibres are machine friendly.



Durus® EasyShot: Easy to Mix

Macro Synthetic fibres disperse homogenously.



Durus® EasyShot: Easy to store

Macro Synthetic fibres are the easiest to store at difficult site locations.