

**Project:**  
Sainj Hydroelectric Power Plant

**Location:**  
Kullu District, Himachal Pradesh India

**Project completed:**  
March 2015

**Applicator/Contractor:**  
HCC

**Market sector:**  
Hydropower

**Products used & amounts:**  
MasterGlenium SKY 8787

## Sainj Hydroelectric Power Plant World record for long distance concrete pumping to 2.432 Km



Head Race tunnel of 100 MW Sainj Hydroelectric Power Plant

### The background

Sainj Hydroelectric Project is a run of the river project on Sainj River in Kullu District of Himachal Pradesh, India. The project comprised of a diversion barrage, intake arrangement for drawing 35.88 cumecs of water, two underground de-silting chambers, a 6,300 m long, 3.85 m diameter modified horse-shoe shaped Head Race Tunnel (HRT), an underground restricted orifice-type 9 m diameter and 87 m high surge shaft, a 2.75 m diameter 550 m long steel lined pressure shaft, two Pelton vertical axis turbines, each generating 50 MW power located in an underground power house.

We have been commissioned by HCC to supply concrete admixtures for the construction of the HRT.

The finished diameter of HRT is only 3.85 m and in such smaller diameter tunnel, vehicle movement and crossing are restricted and carrying out multi activities poses severe challenge due to congested working space. The movement of concrete conveying transit mixers is often restricted to one way traffic only.

Temperature (ranging from 5°C to 35°C) and humidity inside the tunnel required adequate ventilation system which also create challenging working conditions as tunnel length increases. To overcome these problems, long distance concrete pumping is used for the concrete lining work of HRT.

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# Sainj Hydroelectric Power Plant

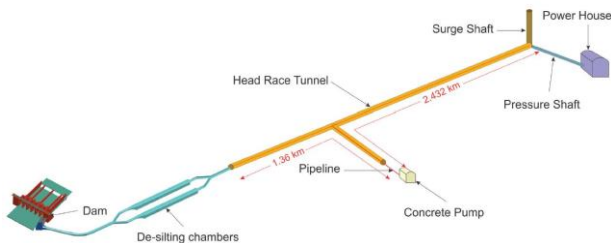
## World record for long distance concrete pumping to 2.432 Km



Flow of concrete at 2,400m from the pumping point



Concrete pump is the heart of the operation. It can be operated on 2 sides - piston side (for Long distance) and rod side (for short distance)



Layout of long distance concrete pumping - 1.36 km upstream and 2.432 km downstream

### The challenge

While attempting long distance concrete pumping, selection of concrete pump, layout of concrete conveying pipeline, selection and quality control of concrete materials, dealing with diverse climatic conditions and safe execution of all construction operations are crucial.

- Selection of concrete pump – continuous inspections and maintenance to avoid breakdown and ensure the continuity of the long distance pumping.
- Pipeline installation and maintenance – the right pipe diameter (150mm dia.) and thickness must be designed to withstand high pumping pressure. Design for the pipeline layout had to be efficient to keep the required flow rates and at the same time stable during operations. Cleaning of the pipeline must be thorough as even a small chunk of concrete remaining inside the pipeline has the potential for disrupting the pumping operation.
- Concrete materials – controlling the variations in concrete materials is key to control the quality and consistency of concrete. Concrete mix must be able to meet the concreting requirements associated to pumping distance, temperatures and relative humidity inside and outside the tunnel.
- Climatic condition – located in the Himalayan region with diverse temperatures ranging from 5°C to 35°C.
- Safety – pumping concrete in long distance involved working with high sustained pressure compared to conventional concreting. Safe working conditions like adequate ventilation and lighting are crucial.

### Our solution

With specially formulated concrete admixture **MasterGlenium SKY 8787**, the Smart Dynamic Concrete (SDC) technology improved the concrete mix characteristics by providing varying retention periods (4-12 hours) while maintaining workability. Most importantly, **MasterGlenium SKY 8787** increased the flowability of the concrete mix, allowing concrete to be pumped up to 1,360 m upstream and 2,432 m downstream for the concrete lining works in the HRT.

Periodical lab and full scale field trials were performed to continuously aid the concreting process in adverse climatic conditions. With **MasterGlenium SKY 8787**, the optimum concrete mix is easily achieved with QA / QC in monitoring the standards consistency of other raw materials, providing high performance concrete for the tunnel lining.

### The customer's benefit

- Eliminated the dangers of working in congested space - lesser 'near-miss' compared to traditional approach.
- Improved the quality of the lining and overall QA / QC, with zero or negligible repairing cost.
- Saves construction time of up to 50% - faster project delivery which lead to early revenue generation allowing other components of the project to be completed in tandem.
- Overall enhanced the quality of construction
- Marked the history of long distance concrete pumping, with potential for even longer pumping up to 3 km in future.

### Projects facts at a glance (max. 800 characters)

- 1st project in the world to pump concrete to the longest distance
- Concrete pumped to 2,432 m downstream and 1,360 m upstream
- Robust concrete mix with 4-12 hours retention period
- Setting time between 8-22 hours for concrete workability

### Master Builders Solutions by MBCC Group

The Master Builders Solutions brand expresses MBCC's expertise in providing customized chemical solutions for new construction, maintenance, repair and restoration of structures.

Master Builders Solutions is built on the experience gained from more than a century in the construction industry. At the core of the Master Builders Solutions brand is the combined know-how and experience of a global community of MBCC construction experts, who connect with you to solve all of your construction challenges.

Further information is available at:  
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