Project:
Marina Coastal Expressway Contract 482

Location:
Singapore

Project completed:
2013

Owner:
Land Transport Authority

Applicator / Contractor:
Ssangyong Engineering & Construction Co., Ltd

Concrete Producer:
Island Concrete (Pte) Ltd

Products used & amount:
MasterRheobuild® 1000 – 1,500,000 litres
MasterPozzolith® R 138 – 600 000 litres

Photo courtesy by Land Transport Authority Singapore

The Background

Marina Coastal Expressway (MCE) runs a total length of approximately 5 km, connecting the Kallang-Paya Lebar Expressway (KPE) and the East Coast Parkway (ECP) in the east to the Ayer Rajah Expressway (AYE) in the west.

The Challenge

MCE C482 Project is the largest contract ever awarded by the Land Transport Authority. Under this project, the mass castings to the base slabs and top slabs of the tunnels present huge challenges, with six hours of retardation needed along with a concrete placement temperature not higher than 32 degree celcius. Singapore’s hot weather often induces loss of workability in concreting tasks.

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Improving concrete setting for the construction of Marina Coastal Expressway

The Background (Continued)

The scope of Contract 482 includes the design, construction and completion of 360m of dual carriageway depressed road structure, 640m of dual carriageway vehicular tunnel structure, slip tunnels, at-grade roads and 280m section of future transit tunnel undercrossing the MCE tunnels, trunk link sewer and associated manholes, waste water pump sump, storm water pump sump and future tunnel stub.

The Challenge (Continued)

In order to ensure sufficient compaction of fresh concrete, it is critical to extend the time for fresh concrete to remain plastic. In addition, a rapid hydration process can lead to loss in concrete strength since the resultant concrete will have a poorer structure with a higher gel/space ratio. During the hydration process, a substantial heat would be produced. If the hydration process is performed too swiftly, it will lead to a rapid increase in temperature, thereby causing considerable early thermal movement in the concrete.

The Solutions

Several trial mixtures were carried out in consultation with BASF as supplier of concrete admixtures, in line with the project’s key requirements. As the peak temperature of concrete administration must be controlled at a temperature of not higher than 75 degree celsius, MasterPozzolith® R 138, a ready-to-use, chloride free admixture designed for hot weather concreting, was adopted. Besides requiring a lower water ratio to produce concrete of a given consistency, the admixture also helps retard concrete setting, thus facilitating easier placement and finishing. Besides shorter placement time to save time and labor, MasterPozzolith® R 138 also offered the project several other benefits: better concrete durability; extended workability with no compromises in concrete strength as well as easier and quicker pumping operations that resulted in higher ultimate strength with better surface finish.

MasterRheobuild® 1000, a super-plasticising admixture containing a sulphonated polymer with chloride-free properties to impart rheoplastic attributes to concrete, was also adopted. The benefits it brought to the project were substantial. These included very high workability, high water reduction, superior cohesion, high early strength as well as low shrinkage and creep.

The Customer Benefits

• Slowing down of hydration process to maintain concrete strength, slower temperature increase and extend workability in hot-weather concreting
• Economical mix design featuring the right admixture was achieved

Project facts at a glance

- Concrete volume of over 400,000m³ required.
- Consist of castings from 1,000m³ to 6,000m³ volumes per casting.
- Construction of this mega project involved more than 1,100 workers at its peak.

More information

For more information, contact our office in Singapore:
33 Tuas Ave 11, Singapore 639090
Tel: +65-6861-6766
Fax: +65-6861-3186
infotmc-ap@basf.com