



SIKA AT WORK

DOHA METRO, QATAR

SIKA'S CONCRETE TECHNOLOGIES

BUILDING TRUST



DOHA METRO: SIKA'S CONCRETE TECHNOLOGIES



PROJECT DESCRIPTION

The Doha Metro, Qatar, part of the \$35 billion Qatar Integrated Rail Project (QIRP), will be one of the most advanced rail transit systems in the world when Phase 1 becomes operational by the end of 2019. It will have four lines with an approximate overall length of 300 km and 100 stations and will be an integral component of the larger Qatar Rail network, which will include a long-distance rail for passengers and freight linking Qatar to the GCC, and Lusail's city local light rail transit (LRT).

The Doha Metro will eventually consist of four lines opening in phases beginning in 2019, with an eventual completion date of 2026. The Red, Green and Gold Lines will radiate out from a central interchange at Msheireb in Downtown Doha, with the Blue Line providing a semi-orbital service.¹

¹ The QIRP budget is projected to be QAR 130 billion.

DOHA METRO - KEY FACTS:

- Total length of lines: 358 km
- Underground: 119 km
- Elevated: 3 km
- At grade: 166 km
- Number of stations: 100



PRODUCTS USED

Product	Use
Sika® ViscoCrete® TS-100	Concrete Admixture for Precast Tunnel Segments and Steel Fiber Reinforced Concrete (SFRC)
SikaFiber® 12-34	Special monofilament polypropylene fibre for concrete, for the prevention of concrete spalling in the event of fire
SikaGard® 65WN	Water dispersed, two parts epoxy protective curing compound and coating
Sikaplan® WT 2200/32HL	Waterproofing membrane based on flexible polyolefin (FPO)
Rugasol® 2	Surface retarder for exposed aggregate finish
SikaSwell®	Hydrophilic joint sealing profile
Separol® FP-15	Oil based anti-corrosive shutter release agent
Separol® W-320	Water based mold release agent
Sika® MonoTop® 620	Cementitious, silicafume containing, polymer modified, one-component pore sealer and finishing coat
SikaGrout®-114	One component cementitious, free flowing, nonshrink precision grout with high ultimate strength
SikaTop® Armatec®	Cement-based, epoxy-modified, three component, anti-corrosive coating and bonding agent
SikaCare® Extra	Avoid deposits of concrete and mortar on construction equipment and machinery at construction site, ready-mix- and precast plants
SikaClean® Ultra	Highly active concrete and lime remover
Antisol®-WB	Curing, priming/sealing and surface hardener compound for freshly laid concrete
Antisol®-E15	Concrete curing compound based on emulsified paraffin
Aliva® 257	Concrete spraying machine for wet and dry application
Aliva® 403	Dosing pump for shotcrete accelerator
Sikadur® 31 SBA	Solvent-free, thixotropic, structural epoxy adhesive especially formulated for segmental bridge construction
SikaRep®	Shrinkage controlled, structural grade, load bearing cementitious repair mortar
SikaCrete®	Free flowing microconcrete for grouting and repair
Sika® Foam TBM 101FB	Foaming Agent for TBM - EPBM tunnelling
SikaMelt®-9209 HT	Multipurpose PSA Hot Melt for floor lamination
SikaMelt®-9285 HT/FR	Multipurpose PSA Hot Melt for floor lamination

DOHA METRO UNDERGROUND LINES

RED LINE SOUTH UNDERGROUND

PROJECT DETAILS

The scope of Red Line South contract comprises the design and construction of the underground works below central Doha, including five underground stations between the Msheireb Underground Station and the New Doha International Airport and incorporates the main depot and maintenance facilities, in addition to two switchboxes. This package will approximately comprise 13.8 km twin bored tunnel.

MAIN CHALLENGES

The main challenge was to produce a steel fiber reinforced concrete with very low w/b (0.32); with a good workability but for a short time; for a triple blend (OPC, microsilica and GGBS) mix; with high fines content and addition of polypropylene fibers for fire protection. Although a high content of slag (over 60%), high early strengths were required to speed up production. Sika® ViscoCrete® TS-100 was specially formulated for these harsh conditions. Another requirement of the project was to have a fire rated concrete to resist fire within 170 min (EUREKA fire curve), without spalling. Concrete with SikaFiber® 12-34 was tested and approved under these conditions.

SIKA PRODUCTS/TECHNOLOGIES

Concrete:

- sika® ViscoCrete® TS-100 for tunnel segments
- SikaFiber® 12-34 for tunnel segments (fire protection)

Ancillary products:

- aliva equipments - dosing unit Aliva 403
- SikaGard® 65WN

Waterproofing - cross passages and shafts:

- Sikaplan® WT 2200/32HL



RED LINE NORTH UNDERGROUND

PROJECT DETAILS

The Red Line North Underground extends in a northerly direction from the station of Mushaireb, for a length of approximately 13 km through seven new underground stations. The project involves the excavation of two parallel tunnels, approximately 11.6 km long.

MAIN CHALLENGES

The main challenge was to produce a steel fiber reinforced concrete with very low w/b (0.32), with a good workability but for a short time, for a triple blend (OPC, microsilica and GGBS) mix, with high fines content and addition of polypropylene fibers for fire protection. Although a high content of slag (over 60%), high early strengths were required to speed up production. For those harsh conditions, was specially formulated Sika® ViscoCrete® TS-100.

SIKA PRODUCTS/TECHNOLOGIES

Concrete:

- Sika® ViscoCrete® TS-100 for tunnel segments

Ancillary products:

- Aliva equipment and spare parts
- Rugasol 2
- SikaSwell®
- Separol® FP-15
- Separol® W-320
- Sika® MonoTop® 620
- SikaGrout®-114
- SikaTop® Armatex®





GOLD LINE UNDERGROUND

PROJECT DETAILS

The route of the Gold Line traverses Doha from East to West, linking New Doha International Airport and Industrial Area. It will involve a total of 32km of bored tunnelling. The tunnel will be lined with approximately 128,000 segments. The line will have 13 underground stations.

MAIN CHALLENGES

A perfect finishing of the concrete, with a low consumption of mold release agent, lead to the use of Separol® W-320, water-based specially formulated product for high temperatures, heated formwork and concrete submitted to steam curing process.

Foaming agents are widely used for soil conditioning in TBM excavation. Different types of soils and a diversified condition of water table leads to the use of very stable foams, with lubricant action to minimize wear of the equipment, reducing head torque, allowing a smooth operation. Sika Foam® TBM 101FB was chosen for part of the Gold Line because of its superior features.

SIKA PRODUCTS/TECHNOLOGIES

Concrete:

- Separol® FP-15
- Separol® W-320
- Sika Foam TBM 101FB

Ancillary products:

- Antisol®-WB
- Aliva 257 shotcrete machine and Aliva 403 accelerator dosing pump

GREEN LINE UNDERGROUND

PROJECT DETAILS

The Green Line will run from the industrial areas in the south through the center of Doha and to the Education City. This project consists of 16.6 km of twin bored tunnels, 8 underground stations. This project spans from Msheireb (Central Station) through to Education City and on to Al Rayyan.

MAIN CHALLENGES

A perfect finishing of the concrete, with a low consumption of mold release agent, lead to the use of Separol® W-320, water-based specially formulated product for high temperatures, heated formwork and concrete submitted to steam curing process.

SIKA PRODUCTS/TECHNOLOGIES

- Separol® FP 15
- Separol® W-320

Ancillary products:

- SikaCare® Extra
- SikaClean® Ultra

Waterproofing – cross passages and shafts:

- Sikaplan® WT 2200/32HL

DOHA METRO ELEVATED SECTIONS

MAIN CHALLENGES

High demanding and precise bonding of heavy structural concrete elements lead to the choice of Sikadur®-31 SBA, segmental bridge adhesive, for the elevated sections of Doha Metro Red Line South, Red Line North and Green Line.

RED LINE SOUTH ELEVATED

PROJECT DETAILS

The Project covers the design and construction of 7.2 km metro line including 3 elevated metro stations linking Doha Old Airport (end of Red Line South Underground) to Al Wakrah and further to Mesaieed. Elevated viaducts will be constructed using mainly state of the art construction method “precast segmental erection, span by span method”.

SIKA PRODUCTS/TECHNOLOGIES

Segmental bridge adhesive:

- Sikadur® 31 SBA

Ancillary products:

- Antisol®-E15
- Antisol®-WB
- Separol® FP-15
- SikaRep®
- SikaCrete®



RED LINE NORTH ELEVATED

PROJECT DETAILS

6.7 km long section of the Red Line, that runs from Lusail Center (where passengers can transfer to a separate lightrail line – LRT) to the Doha Golf Club (where the metro starts to run underground).

SIKA PRODUCTS/TECHNOLOGIES

Segmental bridge adhesive:

- Sikadur®-31 SBA

Ancillary products:

- Antisol®-WB



GREEN LINE ELEVATED

PROJECT DETAILS

The new section has a total length of 3.2km, of which 2.7 km will be realised as a bridge from prefabricated components. The prefab parts will be produced in a factory in Doha owned by the joint venture and assembled on site.

SIKA PRODUCTS/TECHNOLOGIES

Segmental bridge adhesive:

- Sikadur®-31 SBA



RAIL TRACK

PROJECT DETAILS

Developed by PORR together with the Austrian Federal Railways, this Slab Track Austria technology is a ballastfree slab trailblazing track system which meets the most stringent demands of railway construction, with international reputation as a top class product.

The system has proven to be practically maintenance-free. The system has a planned life of at least 60 years.

MAIN CHALLENGES

A rubber sheet acts as a separation layer between the track slab and main concrete. For the lamination of recycled rubber sheet with precast concrete track slab, the customer has been using a solvent based adhesive for over 25 years. It would need heavy investments in exhaust system and storage for a solvent based system.

In addition to this, the project had a tight deadline to produce 400,000 m² of slabs over a period of 14 months. With higher drying time for solvent based adhesive, productivity would have posed a challenge. SikaMelt- 9209HT and SikaMelt- 9285HT/FR were proposed and approved to replace the old technology.

SIKA PRODUCTS/TECHNOLOGIES

- SikaMelt®-9209 HT
- SikaMelt®-9285 HT/FR



DOHA METRO, QATAR



Owner: Qrail

Joint ventures:

RLS JV: QDVC (France/Qatar) / GS E&C (Korea) / Al Darwish (Qatar)

ISG JV: Salini-Impregilo (Italy) / SK E&C (Korea) / Galfar Al Misnad (Qatar)

PSH JV: Porr (Austria) / Saudi Binladen (KSA) / HBK (Qatar)

ALYSJ JV: Aktor (Greece) / Lars&Toubro (India) / Yapi Merkezi (Turkey) / STFA (Turkey) / Al Jaber (Qatar)

FYAP JV: FCC (Spain) / Yuksel (Turkey) / Archirodon (Netherlands) / Petroserv (Qatar)

RLR JV: Rizzani de Eccher (Italy) / Lotte Engineering (Korea) / Redco (Qatar)

PSH JV: Porr (Austria) / Saudi Binladen (KSA) / HBK (Qatar)

PORR Bau GmbH (Subcontractor of Mitsubishi Heavy Industries)

Sika Company: Sika Qatar LLC

WE ARE SIKA

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing and protecting in the building sector and the motor vehicle industry. Sika's product lines feature concrete admixtures, mortars, sealants and adhesives, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.

Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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