

Sustainable construction materials

MACCAFERRI

Responsible design and construction



“Meeting the needs of the present without compromising the ability of future generations to meet their own needs” UNESCO





A Comprehensive Guide to Fiber-Reinforced Concrete (FRC)

Date

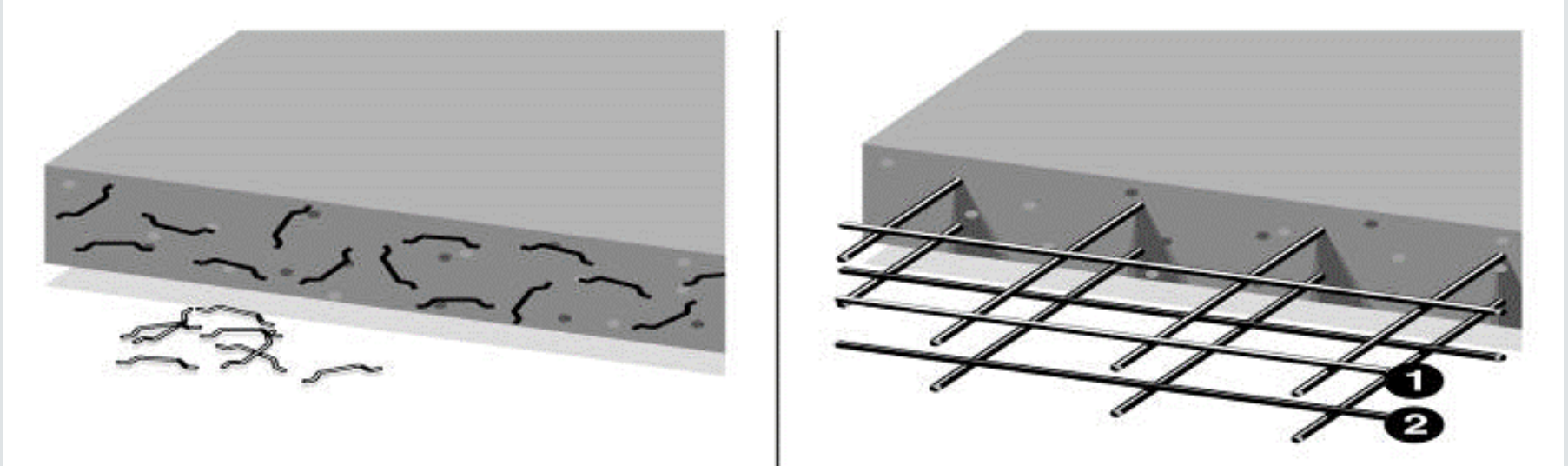
08 March 2024

Author

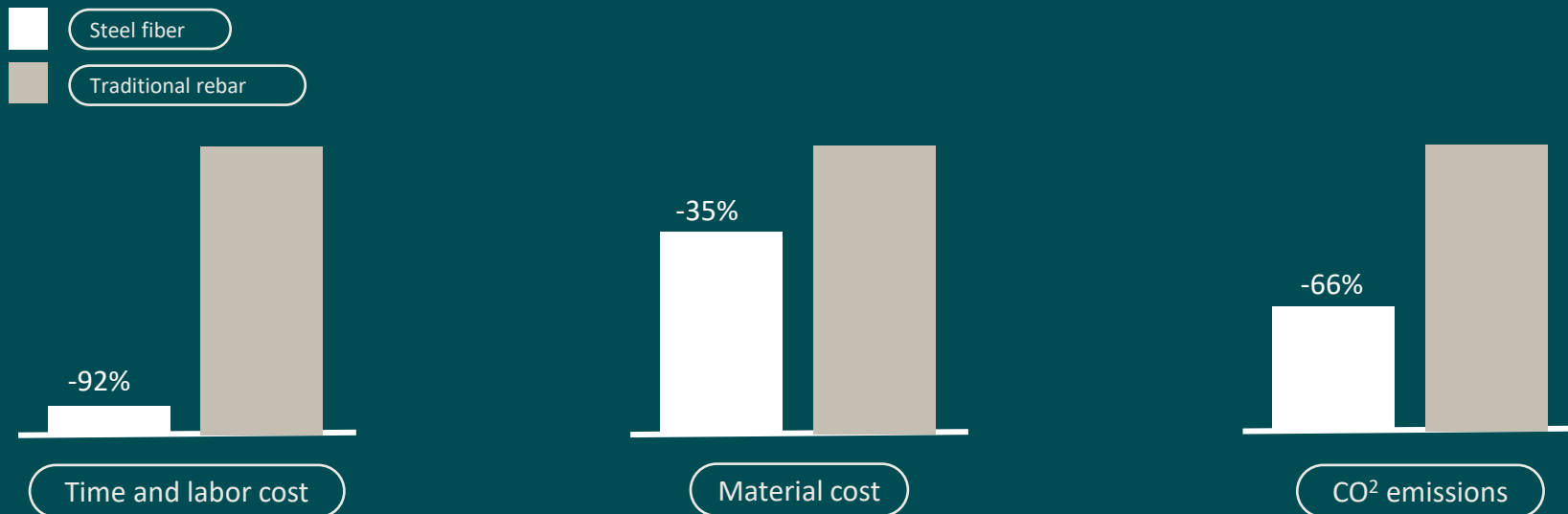
Shervin Penero
Sr. Technical Business Development Engineer

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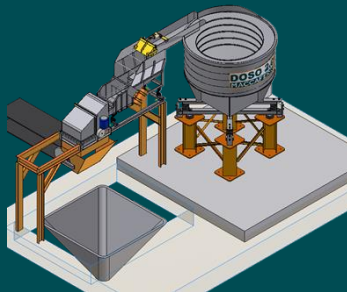
REDUCE | We prioritize the optimization of our solutions in order to save time and resources. Our aim is to lower their environmental impact while maintaining their excellent performances.



Steel fiber vs. traditional solution: A comprehensive comparison



Steel fiber vs. traditional solution



1 Fiber dosing



1 Rebar cutting



2 Rebar transfer



2 Fiber concrete pouring



3 Rebar installation



4 Concrete pouring

SFRC Solution



- Reduction in steel weight and waste
- Reduction in concrete requirement
- Requires less labor and maintenance

Applications Across Industries

M Flooring Applications

- M** Residential
- M** Commercial
- M** Industrial
- M** Raft slab
- M** Liquid tight floors
- M** Bonded overlay
- M** Pile supported slab
- M** Heavy duty pavement

M Composite Deck

- M** Foundations
- M** Precast
- M** Shotcrete
- M** Infrastructure
 - M** Tunneling
 - M** Railway

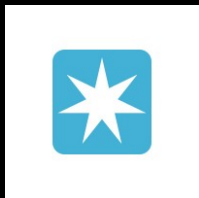
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Solid LF Warehouse Project Maersk South Luzon Mega DC

Owner: Precos, Inc / Solid Group

Location: Calamba, Laguna

Contractor: Sta. Clara International Corp.



Year of Construction:	2022-2023
Floor Area:	50,000 m ²
Slab Thickness:	250mm
Steel Fibers:	275 MT
Floor Type:	Jointless (24 x 24)
Joints:	Terajoints (Armor Joints)
Ground Improvement:	Macgrid EG 30s









ILO Land Warehouse Project

Owner: ILO Construction, Inc.

Location: LIMA Park, Malvar, Batangas

Contractor: ILO Construction, Inc.

Year of Construction:	2022-2023
Floor Area:	15,000 m ²
Slab Thickness:	170mm
Steel Fibers:	60 MT
Floor Type:	Jointless (24 x 24)
Joints:	Terajoints (Armor Joints)









NCB El Colono Project

Owner: New Century Building System, Inc.
Location: LIMA Park, Malvar, Batangas
Contractor: Aboitiz Construction, Inc.

Year of Construction: 2023
Floor Area: 3,000 m²
Slab Thickness: 150mm
Steel Fibers: 9,000 kg
Floor Type: Saw cut solution









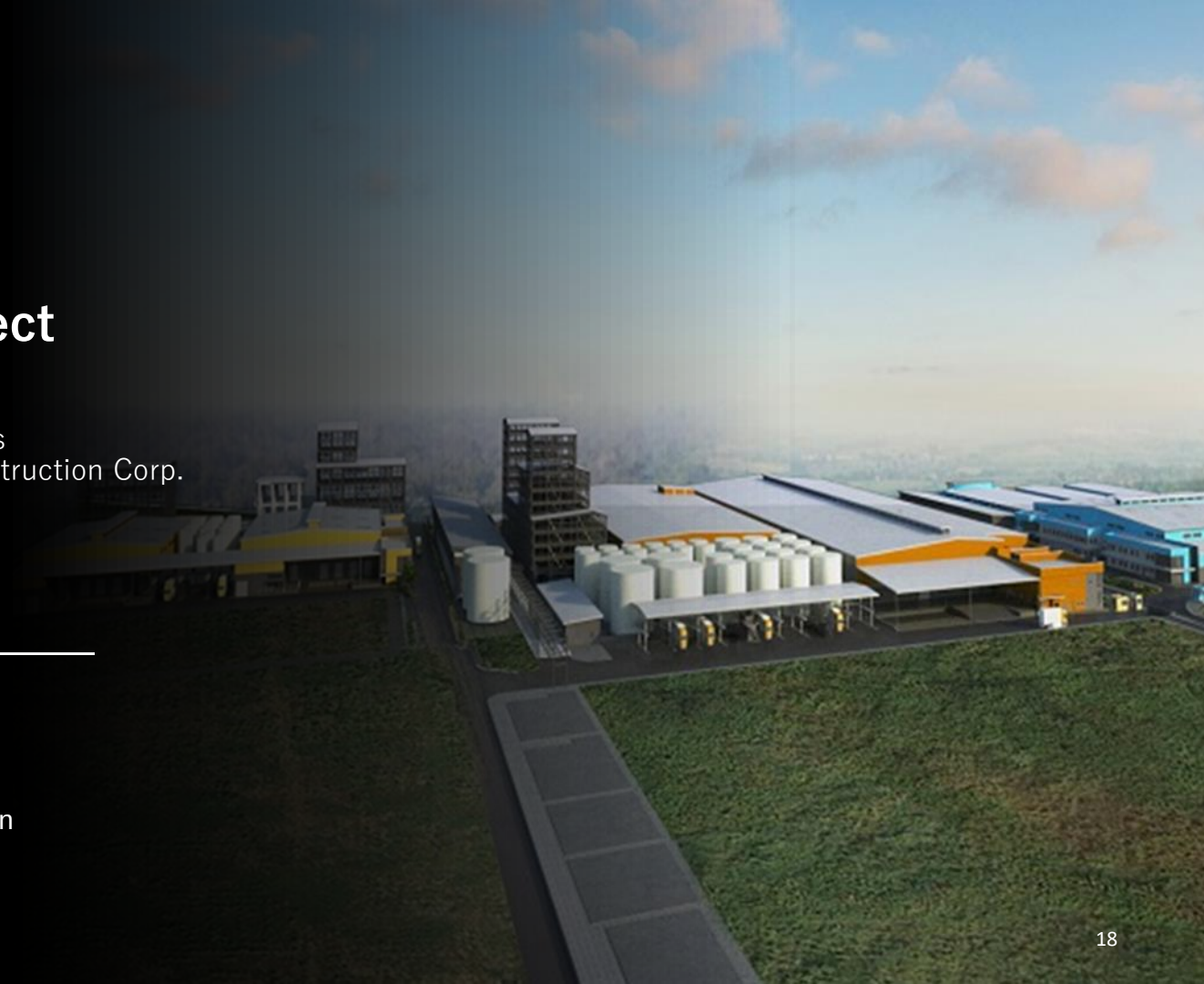
Southern Star Project

Owner: D&L Industries, Inc.

Location: FIT – Tanauan, Batangas

Contractor: Sumitomo Mitsui Construction Corp.

Year of Construction:	2020
Floor Area:	45,820 m ²
Slab Thickness:	200mm
Steel Fibers:	183,280 kg
Floor Type:	Jointless solution









Aeropack Project

Owner: D&L Industries, Inc.

Location: FIT – Tanauan, Batangas

Contractor: Sumitomo Mitsui Construction Corp.

Year of Construction:	2021-2022
Floor Area:	25,676 m ²
Slab Thickness:	150-180mm
Steel Fibers:	90 MT
Floor Type:	Jointless solution (24x24m)









Nestle North Distribution Center

Owner: Osborne+Co/Nestle Philippines

Location: San Manuel, Tarlac

Contractor: Ilo Construction, Inc.

Year of Construction:	2018
Floor Area:	33,000 m ²
Slab Thickness:	200mm
Steel Fibers:	105 MT
Floor Type:	Jointless (24 x 24)
Joints:	Terajoints (Armor Joints)









Knauf Gypsum Facility (External Pavement)

Owner: Knauf Gypsum Facility (External Pavement)

Location: Calaca, Batangas

Contractor: Betonbau Phil, Inc.

Year of Construction:	2017
Floor Area:	3,000 m ²
Slab Thickness:	200mm
Steel Fibers:	12,000 kg
Floor Type:	Saw cut solution









ABS-CBN Sound Stage Project

Owner: ABS-CBN Corporation

Location: San Jose Del Monte, Bulacan

Contractor: First Balfour, Inc.

Year of Construction:	2017
Floor Area:	3,000 m ²
Slab Thickness:	200mm
Steel Fibers:	12,000 kg
Floor Type:	Saw cut solution








ABB-CUN
EL3 STAGE
STUDIO & LIVE RECORDING SPACE



JAPAN TOBACCO INTERNATIONAL

JTI Flex Facility Project

Owner: JTI Philippines, Inc.

Location: Malvar, Batangas

Contractor: Sta. Clara International Corp.



Year of Construction:	2018
Floor Area:	48,000 m ²
Slab Thickness:	200mm
Steel Fibers:	192 MT
Floor Type:	Jointless (20 x 20)
Joints:	Terajoints (Armor Joints)







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Port of Paranaguá

- Container Terminal
- Brazil
- 2002
- 2,690,977 ft²
(250,000 m²)
- 3D 80/60BG

Concrete pavement

Port of Barcelona

- Container Terminal
- Spain
- 2002
- 10,763,910 ft²
(1,000,000 m²)
- 3D 65/60BG

Concrete pavement





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Port of Algeciras

- Maersk Container Terminal (construction in sea)
- Spain
- 1995-2011
- 3,767,368 ft² (350,000 m²)
- 3D 80/60BG

Concrete pavement



Port d'Astakos

- Port
- Greece
- 2003-2007
- 2,690,977 ft²
(250,000 m²)
- 3D 80/60BG

Concrete pavement



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Kapikule Border Gate

- Turkey
- 2008
- 2,583,338 ft²
(240,000 m²)
- 3D 65/60BG

Concrete pavement



Highway E17

- Belgium
- 2011
- 796,529 ft²
(74,000 m²)
- 3D 80/60BG

Concrete pavement

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Westrac facility

- Multistory building
- Perth
- 2012
- Dramix 3D





Colmore Plaza

- Multistory building
- UK
- 2006
- RC-65/60-BN



Student Accommodation Bournemouth

- Multistory building
- UK
- 2008
- RC-65/60-BN

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Mercure
HOTELS

- Hotel
- Belgium
- 2012
- 28,524 ft²
(2,650 m²)
- Dramix 3D 65/60BG

Foundation
Raft/matt
Multi-storey building



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ZEISS

- Industrial
- Germany
- 2001
- 129,166 ft²
(12,000 m²)
- Dramix 3D 65/60BG

Foundation
Raft/Matt Industrial



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■ BASF

We create chemistry

- Silo
- Germany
- 2014
- 32,291 ft²
(3,000 m²)
- Dramix 5D 65/60BG

Foundation
Raft/matt Industrial

Potsdamer Platz

- Multi-storey building
- Germany
- 1997
- 753,473 ft²
(70,000 m²)
- Dramix 3D 80/50BG

Foundation

Underwater concrete

- Water pressure:
up to 4177 lbf/ft²
(200 kN/m²)
- Slab thickness:
393.70 (120 cm)
- Pile distance:
10.5 ft x 10.5 ft
(3.2 m x 3.2 m)





Liefkenshoek tunnel

Rail tunnel under the river Scheldt (-55.77 ft/-17 m)

- Belgium
- 2014
- Dramix 3D 80/50BG (606.27t/550 tonnes)
- Slab thickness: 6.56 ft (2 m)

Foundation
Underwater concrete



Parking Lammermarkt

- Parking
- Netherlands
- 2016
- 52,204.97 ft²
(4,850 m²)
- Dramix 3D 65/60BG

Foundation
Underwater Concrete

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Stonetree Boundary Walls

- Abu Dhabi
- Precast panels of
14.76 x 7.87 ft
(4.5 x 2.4 m)
- 1.25 lbs fibers/ft²
(20 kg fibers/m²)
with L/D = 80

Walls



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CHANGER L'ÉNERGIE ENSEMBLE

- France
- 3D 80/60GG

Electrical cabins



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- Thailand
- 4D 65/60 BG

Precast sewer pipe



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SHOTCRETE TUNNELING APPLICATIONS – Dramix Steel Fibres

- San Roque Hydroelectric Power Plant
- Bakun Hydroelectric Power Plant
- Ambuklao & Binga Hydro Powerplants Rehabilitation
- Upper Wawa Pumping Station Diversion Tunnels and Slope Protection (PrimeBMD | PARAMINA)





Upper Wawa Pumping Station Diversion Tunnel and Slope Protection | DRAMIX 3D 65/35 BG |
PrimeBMD Corporation



Upper Wawa Pumping Station Diversion Tunnel and Slope Protection | DRAMIX 3D 65/35 BG |
PrimeBMD Corporation



Local Trial Mining Site | DRAMIX 3D 65/35 BG | Oceania Gold Philippines

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M Mining

M Precast

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Suzhou Metro Line 5





Cross River Rail Twin tunnels, Brisbane (Australia)

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Entities involved

Owner :	Queensland Government
Designer:	Aecom Jacobs
Contractor(s):	CPB Ghella BAM JV
Precast plant:	Wagners

Tunnel parameters

Year of construction:	2020-2021
Designed lifetime (years):	100
Dimensions (m)	
Internal diameter	6.64m
External diameter	6.91 m
Total length (excavated tunnels)	7.6km (Twin)
Length of DRAMIX® reinforced section	7km permanent

Segmental lining parameters

Number of segments (incl. key):	24948
Size of segments (L x W x T):	1.7 m long x 0.27 m thick.
Concrete quality:	50-60MPa
Fiber type:	DRAMIX® 4D 80/60 BG
Fiber dosage:	35 kg/m ³



Forrestfield Airport Link, Perth (Australia)

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Entities involved

Owner :	Public Transport Authority WA
Designer:	GHD
Contractor(s):	Salini Impreglio-NRW JV
Precast concrete supply:	Boral

Tunnel parameters

Year of construction:	2017-2019
Designed lifetime (years):	100
Dimensions (m)	
Internal diameter	6.22m
External diameter	6.77 m
Total length (excavated)	15 km
Length of DRAMIX® reinforced section	14.2 km

Segmental lining parameters

Number of segments (incl. key):	54000
Size of segments (L x W x T):	1.6 m long x 0.275 m thick
Concrete quality:	S60
Fiber type:	DRAMIX® 4D 80/60 BG
Fiber dosage:	32 kg/m ³



Sydney Metro Chatswood to Sydneyham, Sydney (Australia)

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Owner : Transport NSW
Designer: Aurecon
Contractor(s): John Holland CPB Ghella
Precast plant: Boral

Tunnel parameters

Year of construction: 2019-2020
Designed lifetime (years): 100
Dimensions (m)
 Internal diameter
 External diameter 6.69 m
 Total length (excavated) 15.5 km
 Length of **DRAMIX®** reinforced section 15.5 km

Segmental lining parameters

Number of segments (incl. key): 99746
Size of segments (L x W x T): 3.5 m x 1.7 m x 0.26 m
Concrete quality: 80MPa
Fiber type: DRAMIX® 4D 80/60 BG
Fiber dosage: 36 kg/m³



Sydney Metro North West twin tunnel, Sydney (Australia)

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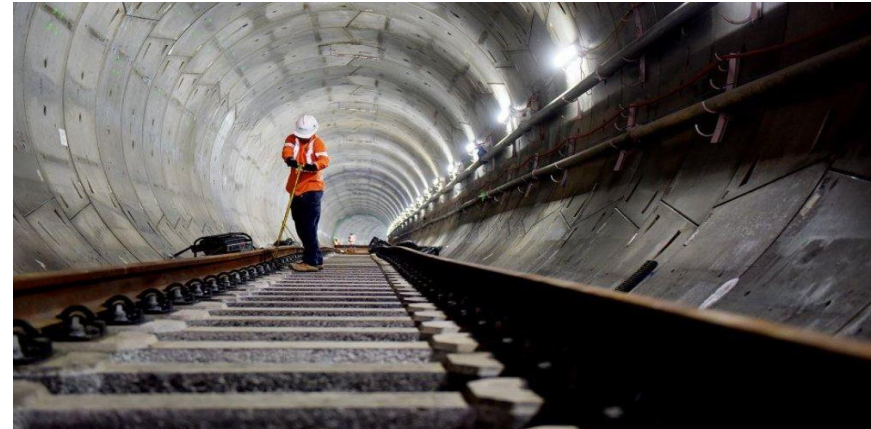
Owner : Transport NSW
Designer: PSM Hyder
Contractor(s): Thiess John Dragador
Precast plant: Holcim

Tunnel parameters

Year of construction: 2014-2019
Designed lifetime (years): 100
Dimensions (m)
 Internal diameter 6.00m
 External diameter 6.69 m
 Total length (excavated) 15.5 km
 Length of **DRAMIX®** reinforced section 15.5 km

Segmental lining parameters

Number of segments (incl. key): 98184
Size of segments (L x W x T): 1.7m x 0.26 m
Concrete quality: 80MPa
Fiber type: DRAMIX® 4D 80/60 BG
Fiber dosage: 36 kg/m³



THANK YOU!

Shervin Penero

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