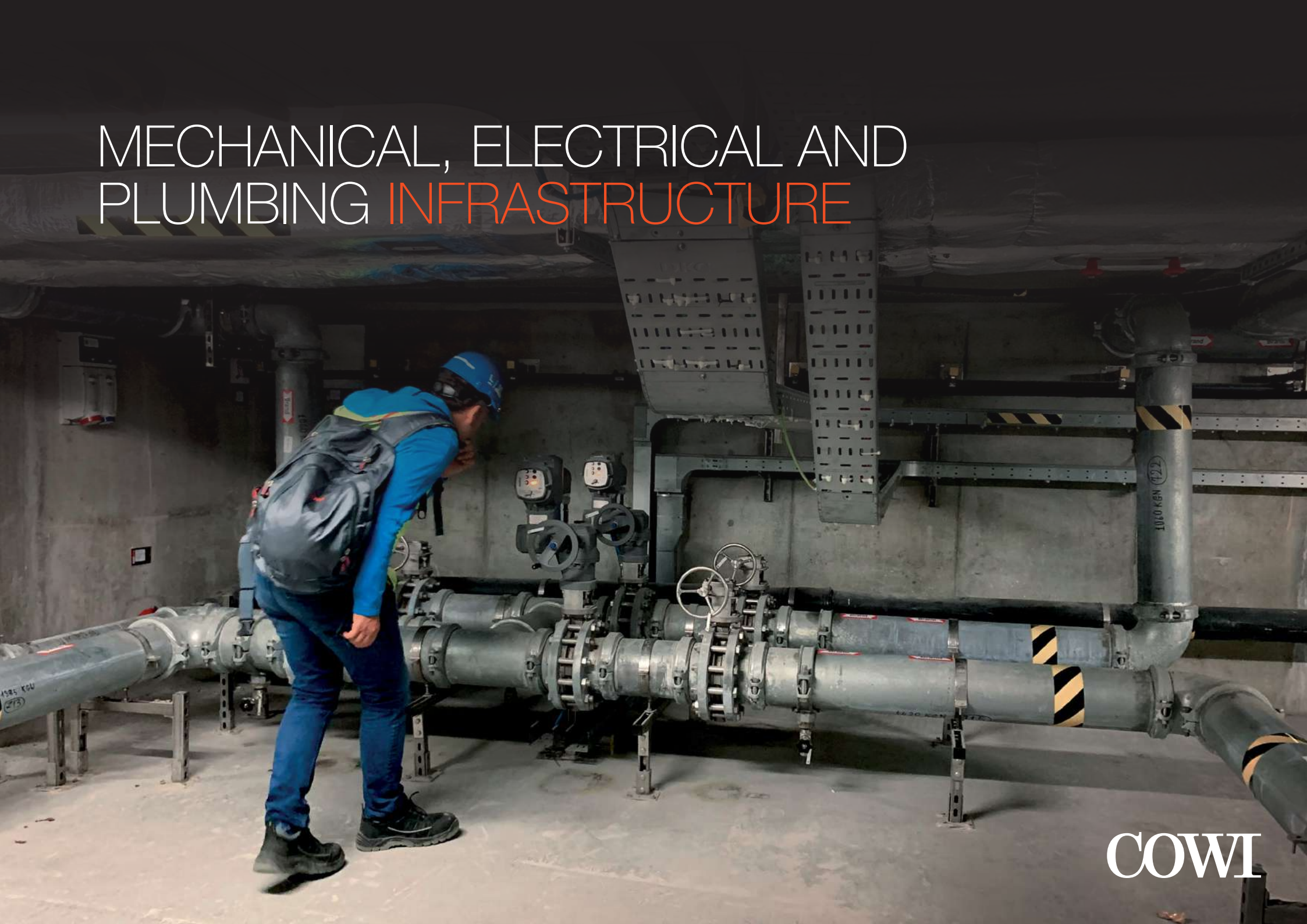
MECHANICAL, ELECTRICAL AND PLUMBING INFRASTRUCTURE



COWI

A MULTIDISCIPLINARY GROUP

Urbanisation and the demands of modern society pose significant challenges for infrastructure in cities across the globe.

55% of the world's 7.6 billion people live in urban areas. By 2050, it is estimated this number will rise to 68%, adding another 2.5 billion people to cities all over the world. This puts an enormous pressure on transport systems, building stock, natural resources and the environment. At COWI, we are dedicated to delivering answers to these pressing needs. Working in teams across disciplines, geographies, gender and culture, our 7300 employees provide solutions within infrastructure, buildings, environment, water, energy, industry and planning. Combining our world-class expertise and experience globally and locally, we help societies move forward.

One of the challenges associated with the increasing complexity of these infrastructure projects is the integration of the mechanical and electrical design and installation.

The COWI Mechanical, Electrical and Plubming (MEP) group is a global leader of mechanical and electrical engineering for infrastructure projects such as tunnels, underground structures, bridges, highways, airports, water and energy projects. We combine our global presence with local knowledge to take on projects anywhere in the world.

We have extensive experience in project management, design, site supervision and testing and commissioning on large and complex infrastructure projects involving multiple stakeholders and disciplines.

COWI. Your experienced partner for MEP Design and Installation.

MEP SERVICES A HOLISTIC APPROACH

COWI is a one-stop-shop partner delivering services throughout the entire project life cycle.

COWI provides comprehensive consulting on mechanical and electrical design and installation for infrastructure projects around the world. We utilise and offer a holistic design approach throughout the entire design process:

- FEASIBILITY
- CONCEPT
- PROCUREMENT
- DESIGN
- CONSTRUCTION
- TEST AND COMMISSIONING
- OPERATION AND MAINTENANCE

COMPLETE MEP DESIGN PACKAGE

FIRE LIFE SAFETY
- Fire Engineering for rapidly evolving technology
- Analyze fire risk and behavior of fires & explosion
- Evacuation strategy & analysis
- Tunnel Safety case
- Design Fire Assessments
- Qualitative, semi-quantitative and quantitative Fire Risk Assessment
- HAZMAT / HAZOP / HAZID

NUMERICAL ANALYSIS
- Evacuation modelling
- 1D Simulations – Aero/ Thermodynamic Simulations
  - Air velocity – Volume flow
  - Air temperature
  - CO concentration
  - NOx concentration
- 3D Simulations – CFD
  - Fire Simulation
  - Smoke Spread
  - Pollution Dispersion
  - Toxic gas

MECHANICAL, ELECTRICAL, COMMUNICATION AND ITS SYSTEMS DESIGN
- Firefighting Systems
- Drainage
- Tunnel ventilation
- Cooling – HVAC
- Lifts, escalators & travellators
- Emergency fire doors – Flood gates – Platform Screen Doors – Access hoists
- Power supply and distribution – Lighting
- Fire detection & Alarm
- Transformers – UPS
- SCADA / PLC
- Intelligent traffic systems (ITS)
- Data Network
- RAMS / SIL analysis

TEST AND COMMISSIONING
- Firefighting testing and commissioning
- Instrumentation
- FAT /SAT test
- Airfow monitoring
- Noise and vibration
- Field Experiments and Model Tests
- Meteorological Measurements
- Wind Tunnel Tests

OPERATIONS AND APPROVALS
- Tunnel Operation
- Tunnel Management
- Tunnel Safety Officer
- Principal Inspection
- Tunnel Audits

DESIGN PROCESS

COPENHAGEN METRO – THE CIRCLE LINE AND SOUTH EXTENSION, DENMARK

CONNECTING COPENHAGEN

Cityringen is Copenhagen's circle line with fully automatic, driverless trains running through 17 underground stations and 15,5 km long twin bored tunnels.

Sydhavnen extension is a part of the new metro line consisting of a 4.5 km tunnel and additional five stations, connecting the town center and Cityringen to the southern part of Copenhagen.

For more than 25 years COWI has been a trusted partner to the project owner, Metroselskabet, as design lead by performing tender design, design review, design follow up and providing assistance and site supervision during construction, testing and commissioning.

A large component of this scope of work has been to undertake the MEP design delivered through the tender, design and construction.

FACTS

LOCATION: Copenhagen, Denmark
PERIOD: 2007–2024
CLIENT: Metroselskabet A/S

COWI SERVICES

- Fire & life safety and risk analyses
- Heating, ventilation and air conditioning
- Tunnel ventilation and 1D and CFD analyses
- Station smoke management and CFD analyses
- Electrical system
- Lighting of back of house areas
- Drainage and sanitary and water supply systems
- Fire detection & suppression
- SCADA system
- Flood protection gates
- Earthing & bonding
- Corrosion monitoring system
- RAMS analysis & system assurance plan

DOHA METRO RED LINE, QATAR

REALISING A NEW TRANSPORTATION INFRASTRUCTURE IN DOHA

The Red Line North Underground is part of the Doha Metro, a rapid transit system under construction in the capital of Qatar and surrounding municipalities. The project is part of a wide-ranging plan to realize a new transportation structure in Doha, which represents urban life and comfort in a hostile climate for the many residents and visitors in the capital.

The line extends over approximately 13 km that includes of 11.6 km twin-bored tunnels and seven underground stations.
COWI undertook the planning ,detailed design and construction of the MEP, architectural and civil works for the project by the successful design and build joint venture.

Using 3D drawings and Building Information Modelling the MEP engineers came up with solutions to incorporate all MEP features in an architectural construction with vertical routing and limited space.

FACTS

LOCATION: Doha, Qatar
PERIOD: 2013–2019
CLIENT: ISG JV Impregilo, SK, Galfar

COWI SERVICES

Using 3D drawings and Building Information Modelling our engineers developed solutions to:

- Fire & life safety
- Heating, ventilation and air conditioning
- Tunnel ventilation and 1D and CFD analyses
- Station smoke management and CFD analyses
- Electrical system
- Vertical transportation systems
- Lighting of back of house areas
- Drainage and sanitary and water supply systems
- Fire detection & suppression
- SCADA system
- Storm water management system
- Earthing & bonding
- District cooling system

FORNEBU METRO EXTENSION, NORWAY

GREEN MOBILITY SOLUTION LINKING FORNEBU AND OSLO

The 8.5 km long extension of the Oslo Metro is the largest transportation project in Oslo in more than 20 years and will connect Fornebu peninsula with the Norwegian capital.

The project is an important urban development initiative and will be a catalyst for greener mobility solutions.

As a part of a Design Joint Venture, COWI was awarded the contract to develop the concept design, and detailed design including cost estimation and project wide procurement support for the Fornebu Metro Extension.

The scope includes signalling infrastructure, seven new stations and new maintenance facilities at Fornebu. COWI developed all the MEP systems and delivered the space planning and optimised solutions for the tunnels, caverns and six very deep underground stations.

FACTS

LOCATION: Fornebu and Oslo, Norway
PERIOD: Ongoing
CLIENT: Oslo municipality, Fornebubanen

COWI SERVICES

- Fire and life safety and risk assesment
- Heating, ventilation and air conditioning
- Tunnel ventilation and numerical analyses
- Station smoke management system
- Electrical system
- Lighting of back of house areas
- Drainage and sanitary and water supply systems
- Fire detection & suppression
- SCADA
- Earthing & bonding
- RAMS analysis

LOWER THAMES CROSSING, UNITED KINGDOM

EASING CONGESTION ON THE DARTFORD CROSSING

The Lower Thames Crossing will be a bored tunnel under the River Thames east of Gravesend and Tilbury.

The new crossing will ease congestion on the Dartford Crossing which handles around 55 million journeys every year – six million more than it was designed for – and suffers frequent closures.

COWI is the technical partner to Highways England to develop the scheme for authority approval and to assist in the procurement of design and build and maintenance contractors. COWI is responsible for the development of the preliminary design and reference design for the bored tunnel delivering optimum solutions for tunnel safety, availability and customer experience.

COWI's MEP engineers have utilised their design and construction background to promote a positive outcome from the beginning , with a focus on helping Highways England understand construction cost, time and risk and total life cost. The design has been focused on space planning to optimise the space usage, allowing for future installations as technology progresses.

FACTS

LOCATION: London, UK
PERIOD: 2016 – Ongoing
CLIENT: Highways England

COWI SERVICES

- Fire & life safety
- Operational risk assessment
- Tunnel ventilation, 1D and CFD analyses
- Portal buildings space planning
- Cooling
- Tunnel and ramp drainage
- Fixed fire fighting systems
- Power services, electrical distribution
- Lighting
- RAMS analyses

Photo: DLSY

1915 CANAKKALE BRIDGE, TURKEY

IMPROVING THE TRAFFIC NETWORK OVER THE ÇANAKKALE STRAIT

Rapid economic growth has resulted in a new norm of chronic traffic congestions in the area affecting tourism, agriculture and transit activities. The aim of the Malkara-Çanakkale Motorway project and the 1915 Çanakkale Bridge is to change this norm.

The 2023 m suspension bridge and related approach bridges will connect the European and Asian side across the Çanakkale Strait in Turkey. This will improve the traffic network and promote socio-economic growth and tourism without traffic congestions.

FACTS

LOCATION: Çanakkale Strait, Turkey
PERIOD: 2017–2023
CLIENT: Daelim, Limak. SK E&C. Yapi Merkezi

COWI SERVICES

- Detailed design and technical follow up during construction
- Dehumidification system to reduce corrosion
- Firefighting system designed for redundancy
- Mechanical access facilities
- Bridge drainage system

THE KING ABDUL AZIZ ROAD, KINGDOM OF SAUDI ARABIA

KAAR PROJECT, URBAN DEVELOPMENT PROJECT LOCATED IN MECCA

This signature urban development project in the holy city of Mecca stretches over 1.2 million m² and when completed will provide more efficient multimodal transportation to a central pedestrian boulevard accommodating more than a 100,000 people travelling to and from the Al-Haram Mosque.

Above ground, the project includes a large ring road and bus rapid transit station. The new city development will have 100,000 residential units, hotels and apartments and 28,000 hotel rooms, alongside commercial and recreational areas as well as a new mosque.

COWI is designing all the infrastructure elements of this development including the roads and road tunnels, pedestrian tunnels, four underground car parks, two metro stations with the C&C tunnel, two flyover bridges, and numerous above ground structures for the regional bus station and bus rapid transit station.

For the metro stations COWI undertook the assessment of the MEP space planning. The service aimed to verify the space for the MEP installations and provide a complete coordinated solution considering constructability, functionality and operation & maintenance. COWI designed all the MEP systems for the infrastructure above and underground.

FACTS

LOCATION: Kingdom of Saudi Arabia
PERIOD: 2015–2020 (est.)
CLIENT: Nesma & Partners, Umm Al Qura
STAGE OF THE PROJECT: Planning, Design and Construction

COWI SERVICES

- MEP space planning for the metro tunnel and mosque and Haramain stations
- MEP detail design for roads and road tunnels
- MEP detail design for pedestrian underpasses
- MEP detail design for the regional bus station and bus rapid transit station
- MEP detail design for four car parks
- Dry and wet utilities and the utility tunnel for the whole development
- MEP and utilities for the pedestrian boulevard

DESIGNED BY COWI

SOUTH HARBOUR EXTENSION, CPH METRO

LOCATION: Copenhagen, Denmark

PERIOD: 2015–2017

CLIENT: Metroselskabet A/S

SERVICES:
- Development of Design & Build tender material. Coordination of design with architects, structural team
- HVAC
- Flood gates
- Firefighting
- Mechanical access facilities
- Drainage
- Power supply and distribution systems
- Lighting protection and Lighting systems
- Control, monitoring and SCADA
- Fire detection
- Communication and security
- Traffic management systems
- Escalators and Lifts

NY KASTRUP AIRPORT STATION

LOCATION: Denmark

PERIOD: 2020–2024

CLIENT: Sund & Belt / A/S Øresund

SERVICES:
- Development of Concept and Preliminary design for tendering
- Fire & life safety
- Heating, ventilation and air conditioning
- Tunnel ventilation systems
- Electrical systems
- SCADA system
- Communication systems
- Lighting
- Drainage systems
- Fire fighting system
- Earthing & bonding

MARIEHOLM TUNNEL

LOCATION: Sweden

PERIOD: 2016

CLIENT: The Swedish Road Administration

SERVICES:
- Development of conceptual designs and preparation of Tender Documents
- Tunnel ventilation
- Drainage of tunnel and ramps including pump stations and buffer storage
- Fire hydrant systems in the tunnel
- Lighting and signage
- Fire detection and alarm system
- Closed Circuit Television (CCTV)
- Power supply including transformers and UPS
- Earthing and bonding
- SCADA
- Traffic management system

SILKEBORG TUNNEL

LOCATION: Silkeborg, Denmark

PERIOD: 2009–2016

CLIENT: Danish Road Directorate

SERVICES
- Development of conceptual designs and Preparation of Tender Documents for tunnel ventilation, drainage, lighting, power, fire hydrants and ventilation cooling and fire protection of technical compartment
- Risk analysis and Safety Concept
- CFD simulations of tunnel ventilation
- Cost Estimates
- Assisting the Road Directorate during the tendering process
- Construction Supervision

SILVERTOWN TUNNEL LONDON

LOCATION: London, UK

PERIOD: 2019–2025

CLIENT: RiverLinx consortium

SERVICES:
- Development of Preliminary, Developed and Detailed design for Contractor
- Fire & life safety
- Operational risk sssesment
- Heating, ventilation and air conditioning
- Tunnel ventilation systems and 1D and CFD analyses
- Electrical systems
- SCADA system
- Communication systems
- Tunnel lighting
- Drainage systems
- Fire fighting system
- Earthing & bonding
- RAMS analysis

MALTA TO GOZO SUBSEA TUNNEL

LOCATION: Malta

PERIOD: 2018–2019

CLIENT: SINTEF / Infrastucture Malta

SERVICES:
- Initial technical feasibility study for a 14 km, single bore subsea highway tunnel, followed by preparation of a concept design
- Fire life and safety concept
- Spaceproofing and design of MEP systems for tunnel, technical compartments, evacuation gallery and refuge areas

DESIGNED BY COWI

CHITTAGONG TBM TUNNEL

LOCATION: Bangladesh

PERIOD: 2016–Ongoing

CLIENT: Bangladesh Bridge Authority

SERVICES:
- A 3.4 km dual two lane TBM tunnel below the Karnaphuli River including ramps and approach roads
- Review of contractors fire life safety strategy
- Review of contractors design of MEP installations

DUBAI STORM WATER

LOCATION: United Arab Emirates

PERIOD: Ongoing

CLIENT: Stantec – Dubai Municipality

SERVICES:
- (5x5)m Penstock at 35m deep
- Instrumentation: Flow meter, water analyzer, radar level measurement
- Normal and emergency power
- Ventilation and cooling of technical rooms of kiosks
- Control & SCADA design with RTU /GSM connection to the main SCADA center

PUENTE NIGALE

LOCATION: Maracaibo Lake, Venezuela

PERIOD: 2006–2015

CLIENT: Construtora Noberto Odebrecht

SERVICES:
- Conceptual design studies
- Design basis, safety concept and risk analyses
- Basic design of MEP
- Detailed specifcations (functional requirements) of electrical installations related to structures

ØRESUND BRIDGE

LOCATION: Peberholm and Malmo

PERIOD: 2000

CLIENT: Sundlink Contractors

SERVICES:
- Design of the installations
- Ellaboration of tender documents for subcontracting the systems
- Coordination of the mechanical and electrical installations with construction works
- Maintenance of the internal and external interfaces for all design groups working with the detailed design of the bridge

IZMIT BAY BRIDGE

LOCATION: Izmit, Turkey

PERIOD: 2010–

CLIENT: IHI Infrastructure Systems Co

SERVICES:
- Water pipes for firefighting
- Hydraulic buffers
- Gantries
- Assistance to subcontractors
- Drainages
- Dehumidification system to reduce corrosion

HORNSREV AND KRIEGERS FLAK A AND B

LOCATION: Baltic Sea, Denmark

PERIOD: 2013–2014

CLIENT: Energinet dk

SERVICES:
Detailed design of
- Firefighting systems
- Fire Life Safety Strategy
- Staff Rescue Systems
- HVAC system
- SCADA
- Communication
- Cranes for equipment and life rescue boat
- Helipad Protection
- Drainage
- LV installations

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POWERING YOUR 360° SOLUTIONS

COWI is a leading consulting group that creates value for customers, people and society through our 360° approach. We tackle challenges from many vantage points to create coherent solutions for our customers.