IMMERSED TUNNEL
An innovation to cross a water-body

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RoyalHaskoningDHV

100 Offices | 35 Countries | 8,000 Employees

- Independent, international engineering and project management consultancy with over 130 years of experience.

- Headquartered in the Netherlands with strong roots in the United Kingdom and South Africa.


- Turnover of Euro 700 million

Royal HaskoningDHV headquarters in Amersfoort, the Netherlands
RoyalHaskoningDHV
RoyalHaskoningDHV India

15 Offices  |  350 Employees

- India Corporate office is in Noida
- Other Major offices located at Mumbai, Bangalore and Bhopal.
- Turnover of INR 50 Crore
RoyalHaskoningDHV

Our market sectors:

- Aviation
- Buildings
- Energy
- Industry
- Infrastructure
- Maritime
- Mining
- Rural Areas
- Urban Areas
- Water Technology
- Aviation
- Buildings
- Energy
- Industry
- Infrastructure
- Maritime
- Mining
- Rural Areas
- Urban Areas
- Water Technology

Infrastructure:

- Roads
- Highways
- Bridges
- Tunnels
- Railways
- Metros

Our Services (Infrastructure):

- Feasibility Studies
- Pre-bid Advisory Services
- Detailed Engineering Design
- Financial & Economic Analysis
- Tender Document Preparation
- Tender Evaluation
- Project Management
- Construction Supervision
- Quality Assurance
- Asset Management
- Road Maintenance
- Road Safety
TEC (Tunnel Engineering Consultants)

- TEC is a brand company of Royal HaskoningDHV

- **Joint venture** of two major consultancy firms RoyalHaskoningDHV (67%) and Witteveen Bos (33%)

- TEC was established in **1989**

- Tunneling experts with key expertise in **Immersed Tunneling**.
Tunnel Expertise

- Civil design and engineering related to
  - immersed tunnels
  - bored tunnels in soft soil
  - cut & cover tunnels
  - special tunnel techniques
- Electro mechanical installations
  - ventilation
  - pumps
  - lighting
  - power supply
  - traffic control
  - dynamic traffic systems
  - operation
- Safety aspects
  - (Road) Safety analysis
  - Operational procedures
  - QRA and Scenario Analysis
- Integral design in complex (urban) environment
- Road alignment design
- Risk assessment & Value Engineering
- Maintenance plans
Tunnel Services

- Policy formulation
- Master planning
- Feasibility studies
- Supervision of works
- Assistance during tendering
- Preliminary designs, detailed designs and tender documents
- Operation and maintenance
- Training
- Contract and project management
- Risk management & value engineering
Immersed Tunnel
Immersed Tunnel

What is an Immersed Tunnel?

- It is hollow concrete blocks immersed under water and joined to form tunnel.

Where it is used?

- It is used to cross a water-body as an alternative to bridge.
- It is an advantage where navigation is a must requirement.
Immersed Tunnel Technique - over 100 years

USA: Railtunnel Detroit River
1910

Europe: Maastunnel (R’dam, NL)
1937-1942
Steel Tunnels in the USA
Concrete Tunnels in Europe
Potential advantages in alignment design

- Specially River Crossings
Practically every shape

- Cost effective for wide Tunnels
Practically every waterway
Advantages over Bridge

- Does not create obstruction to the navigation channel.
- Does not block the hydrological channel.
- Avoid siltation which is a common phenomenon for a bridge support.
- Advantage for a soft soil condition when a bridge support is difficult.
- Advantage over land acquisition on the banks.
Principle of Immersed Tunnels
Principle of Immersed Tunnels
Principle of Immersed Tunnels

- Step 1: Casting of the blocks in dry docks
- Step 2: Transport of the blocks into the site
- Step 3: Preparation of bed and dredging
- Step 4: Immersing of the blocks
- Step 5: Joining of the blocks
- Step 6: Finishing and foundation
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Characteristics / Advantages

- Suitable for various and relatively poor soil conditions
- Parallel construction processes and relatively low and manageable risk profile
- Capable of dealing with (severe) seismic events
- 80-90% of all construction works can be done by local contractors (limited input from international specialist subcontractors)
Immersed Tunnel Projects

Coatzacoalcos Mexico

Coatzacoalcos Immersed Tunnel

Coatzacoalcos, Mexico

Royal HaskoningDHV
Enhancing Society Together
Immersed Tunnel Projects

Fehmarnbelt Denmark
Immersed Tunnel Projects

Amstardam Central Station (under historic building)
Thank you