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**AWARDS 2021**



# Desarrollo Sustentable de la Cuenca Matanza- Riachuelo - Lote 3 / The Riser Concept Argentina

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Webuild

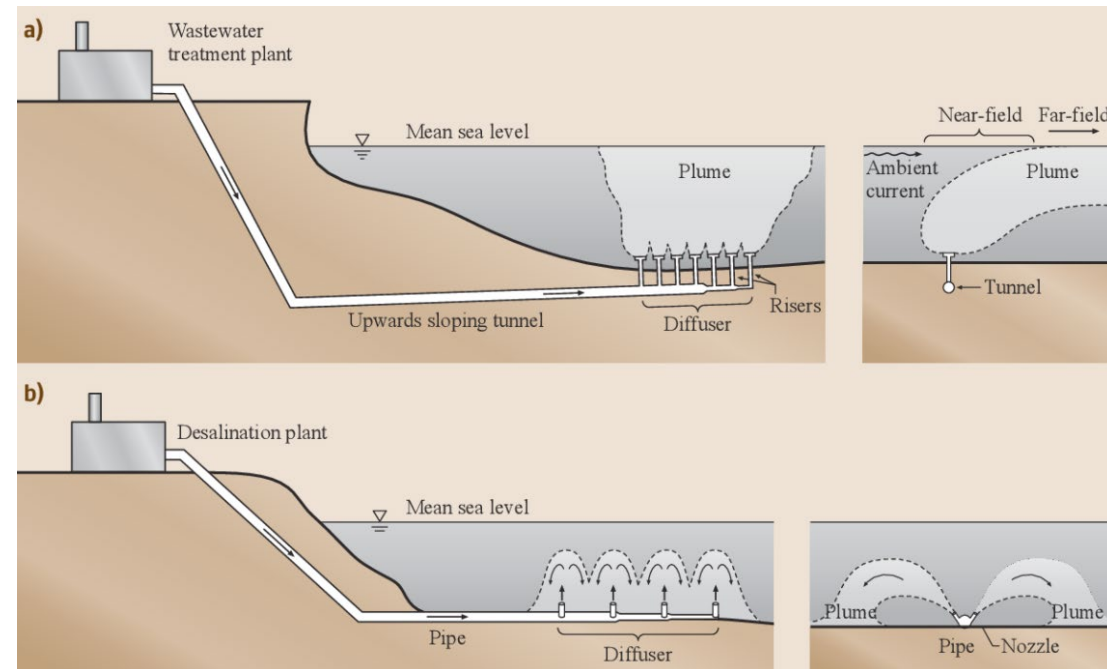


## Marine Outfall Projects

A **Marine outfall** (or ocean outfall) is a gravity discharge system that release treated wastewater, stormwater, combined sewer overflows (CSOs), or brine effluents from water treatment plants to the sea

### Marine Outfall System:

- Water Treatment Plant
- Outfall shafts
- Outfall tunnel
- Diffuser section (Risers & Diffuser Head)





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## Conventional Construction Method

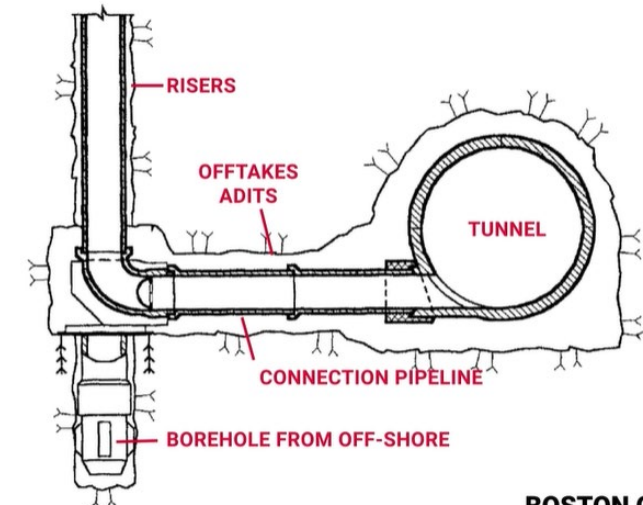
### Multistage offshore work:

- Riverbed dredging
- Jack up drilling vessel and drilling templates
- Temporary casing and drilling in phases
- Lowering and capping the riser
- Annular grouting between the drilled hole and the casing



### Underground works:

- Tunnel offtakes to connect the riser with the outfall tunnel
- Probe holes drilled from the tunnel to ascertain riser locations
- Excavation of offtake adits to expose the risers
- Construction of connection pipelines



BOSTON OFFFALL

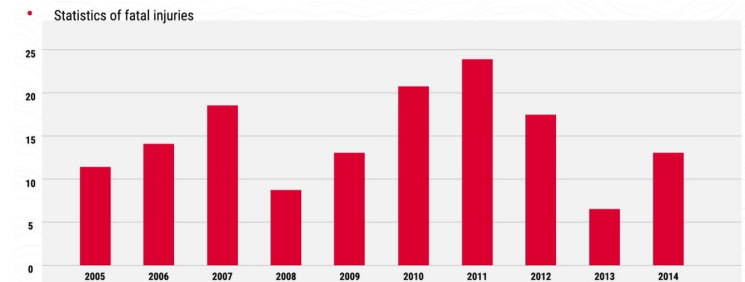
## The Riser Concept: key drivers of the Innovation

### ➤ Enhance Safety during construction

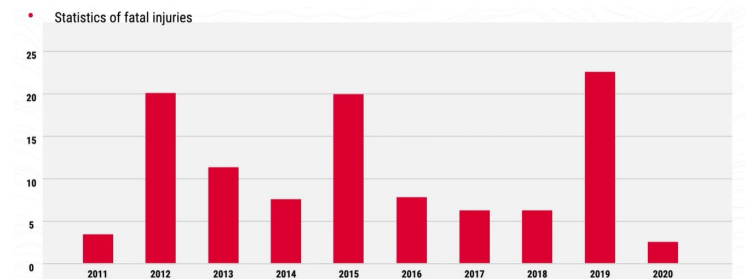
- Offshore and Underwater activities
- Extensive use of divers
- Limited accessibility for rescue activities
- Statistics of fatal injuries

### ➤ Reduce Environmental impacts

- Disturbance and suspension of contaminated sediments
- Water contamination
- Destruction of habitats
- Heavy equipment and CO2 emission



SOURCE: SURVEY AND ANALYSIS OF FATAL ACCIDENTS IN THE COMMERCIAL DIVING SECTOR, F. HERMANS (2016)



SOURCE: IMCA YEARLY REPORT OF SAFETY STATISTICS (2020)







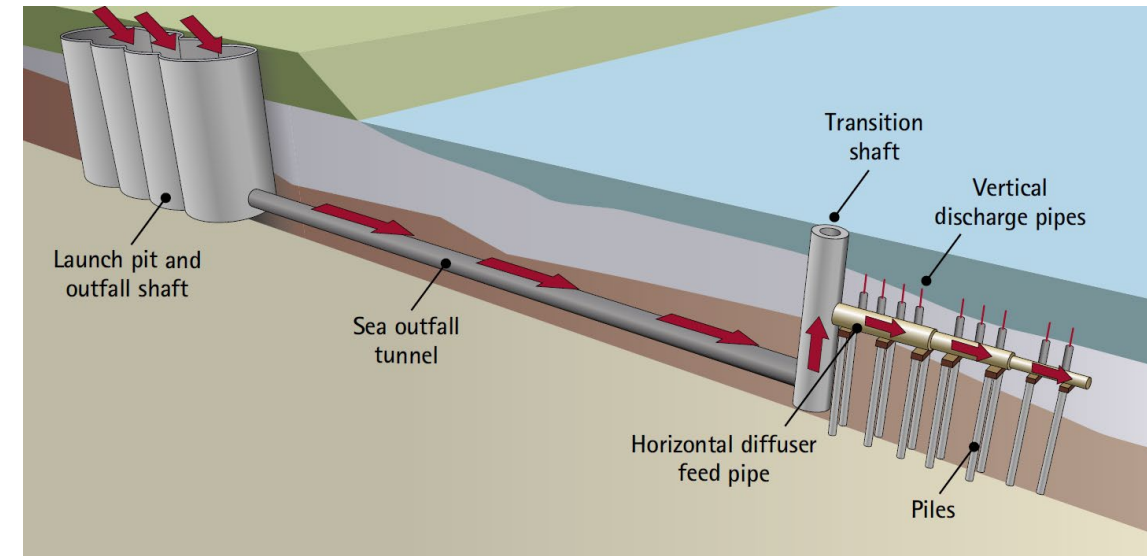
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## Riachuelo Project – Original vs Variant

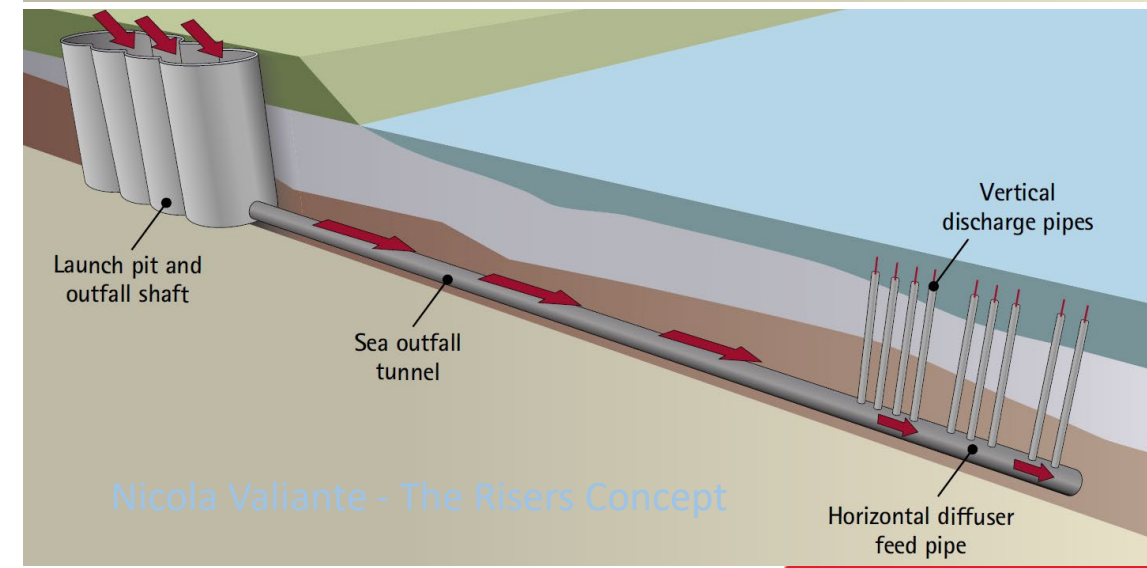
- ✓ Outfall Tunnel (10,5km)
- ✓ Offshore Transition Shaft
- ✓ Diffuser section:
  - Deep foundations (35m)
  - Pipes (3,8/2,8/1,7m)
  - Risers (≈5m each)

Sea Outfall  
Initial Solution



- ✓ Outfall Tunnel (10,5km)
- ✓ Diffuser section:
  - Diffuser Tunnel (1,5km)
  - Risers (≈35m each)

Sea Outfall  
Alternative Solution  
(Riser Concept)





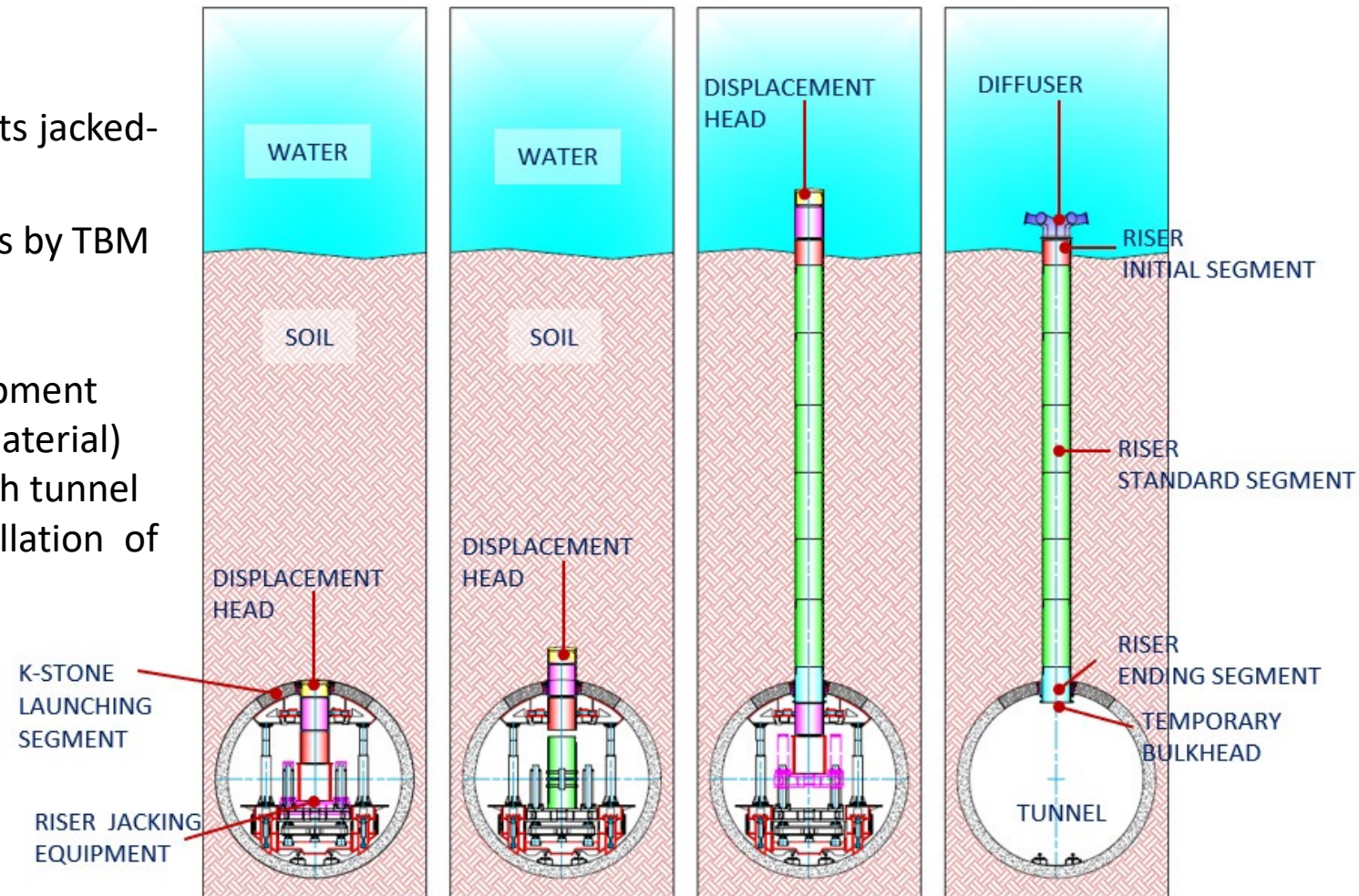
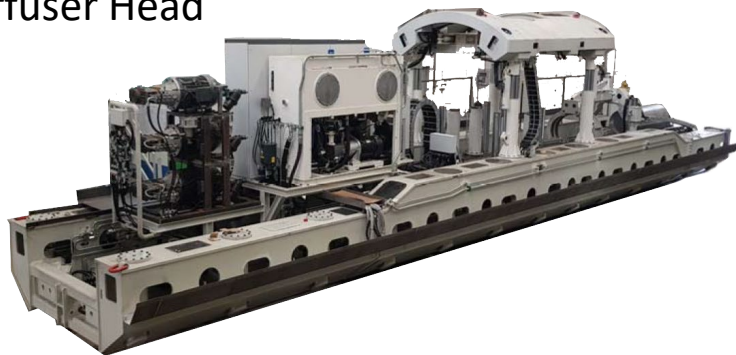
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## The Riser Concept

Bottom-up construction method. Riser segments jacked-up from the tunnel upward to the river bed.

- ✓ Installation of Tunnel Special segmental rings by TBM
  - Positioning segmental ring
  - Launching segmental ring
- ✓ Disassembling TBM / Assembling Riser Equipment
- ✓ Riser segments Jacking (and excavation of material)
- ✓ Completion of riser and final connection with tunnel
- ✓ Removal of Displacement Head and Installation of Diffuser Head





## Advantages of the Riser Concept

- ✓ Safer working conditions, less construction activities reducing the associated risks
- ✓ Limited environmental impacts by elimination of several marine works
- ✓ More reliable schedule independent from marine conditions
- ✓ Improved quality of works and the quality control process
- ✓ Lower the overall costs of the project
- ✓ Minimized interfaces with Navigations and offshore activities





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## Details of the Riser Concept – Special Rings

- ✓ Keystone Launching Segment
- ✓ Sealing System
- ✓ Displacement Head

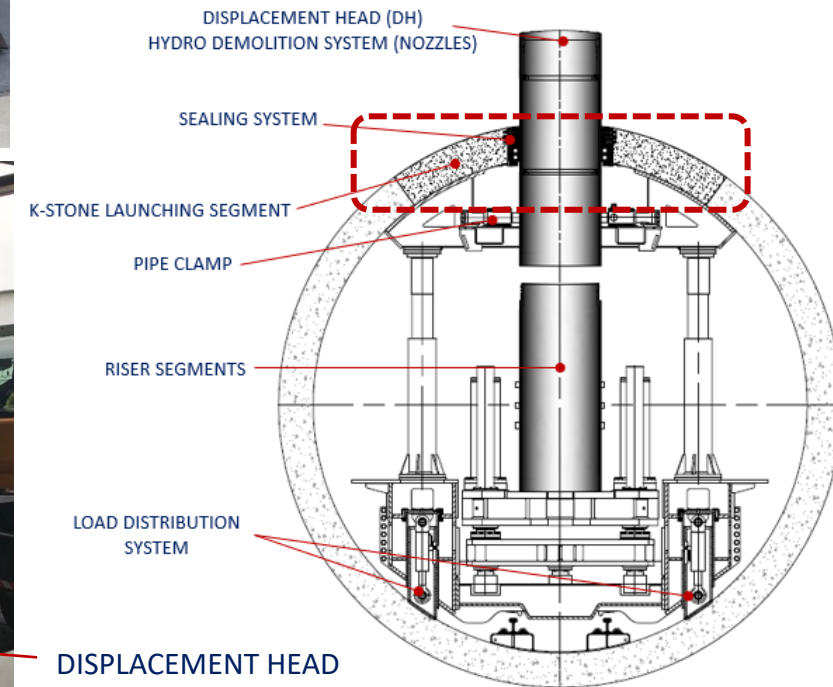
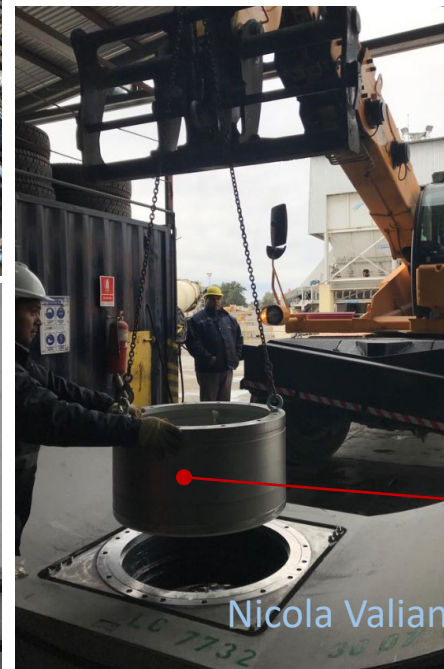
SEALING SYSTEM



DISPLACEMENT HEAD



TUNNEL LAUNCHING SEGMENT







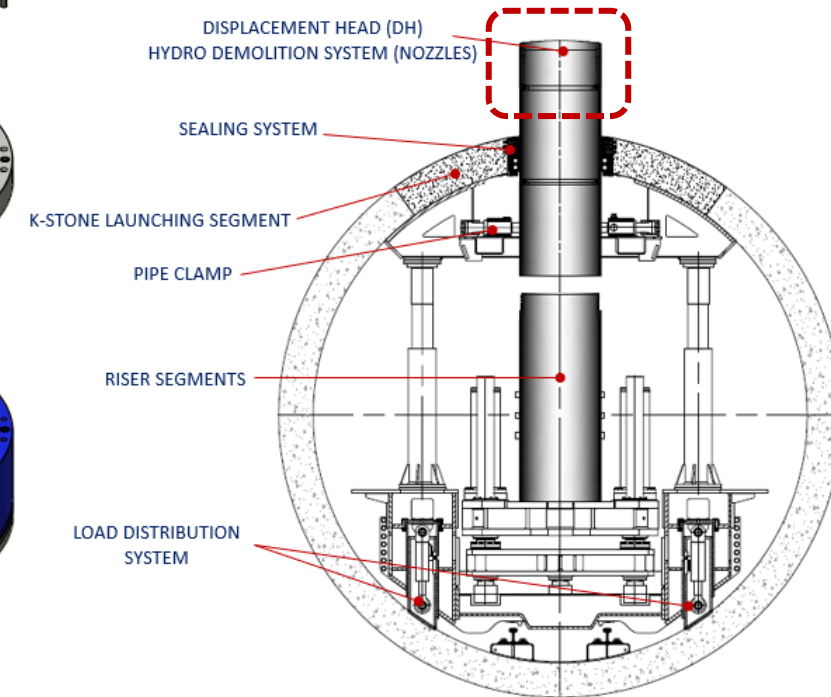
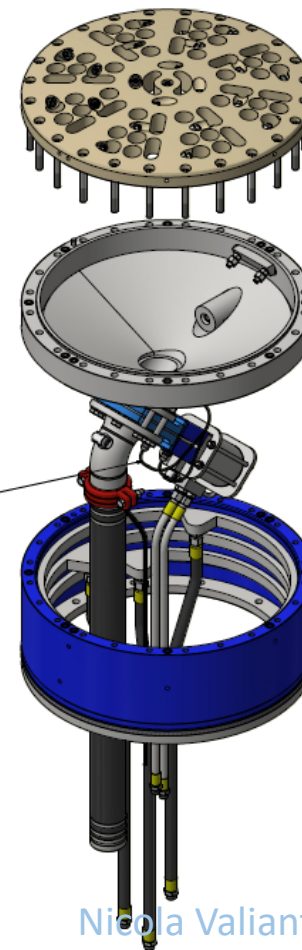
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## Details of the Riser Concept – Displacement Head

- ✓ Hydro-demolition nozzles (No. 30)
- ✓ Discharge chamber
- ✓ Soil discharge line and valve
- ✓ Dismantlable



DISPLACEMENT  
HEAD

SEALING SYSTEM



K-STONE LAUNCHING  
SEGMENT

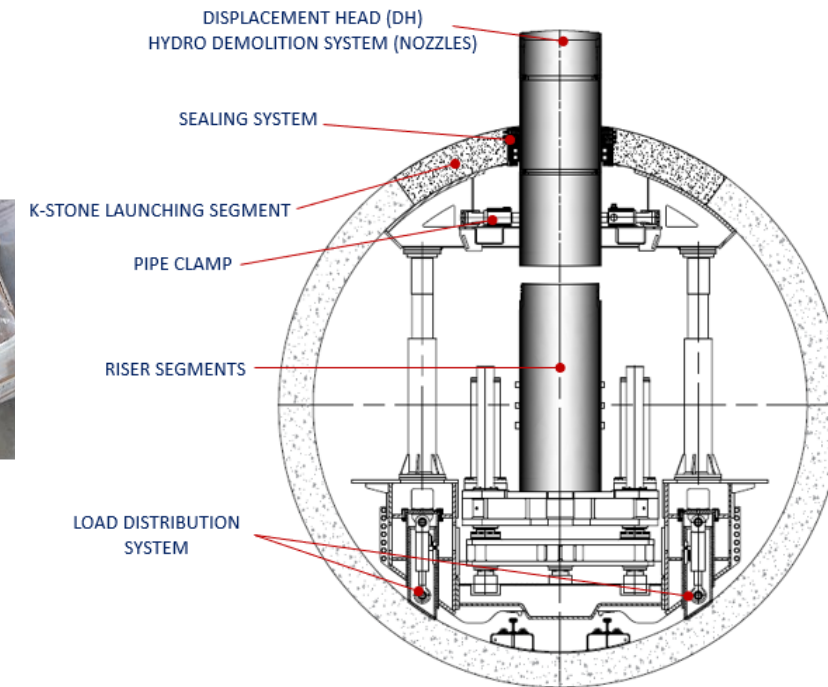
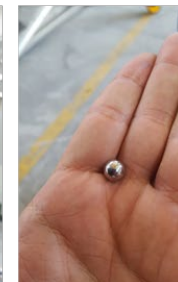
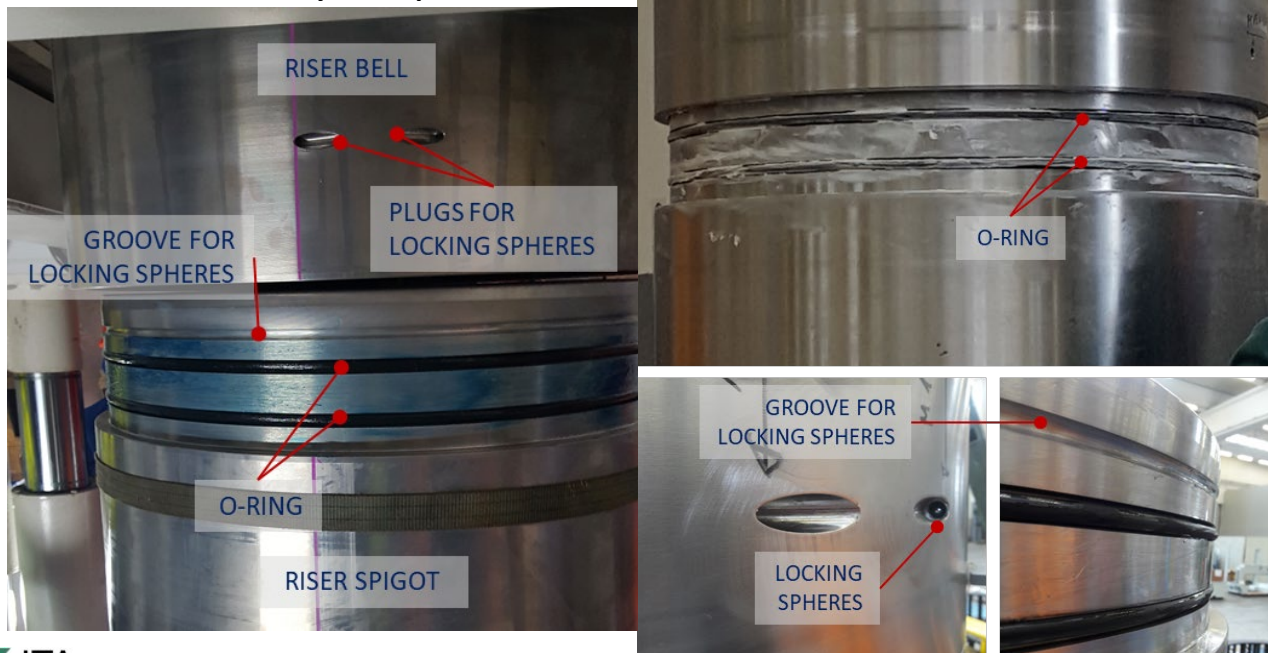


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## Details of the Riser Concept – Risers

- ✓ 1 Riser: 18 Riser Segments - OD=72 cm
- ✓ Riser Segments: Initial, Standard, Ending - capacity 400t
- ✓ Riser joint: Bell & spigot - No. 2 O-ring - locking spheres
- ✓ Durability: Duplex steel







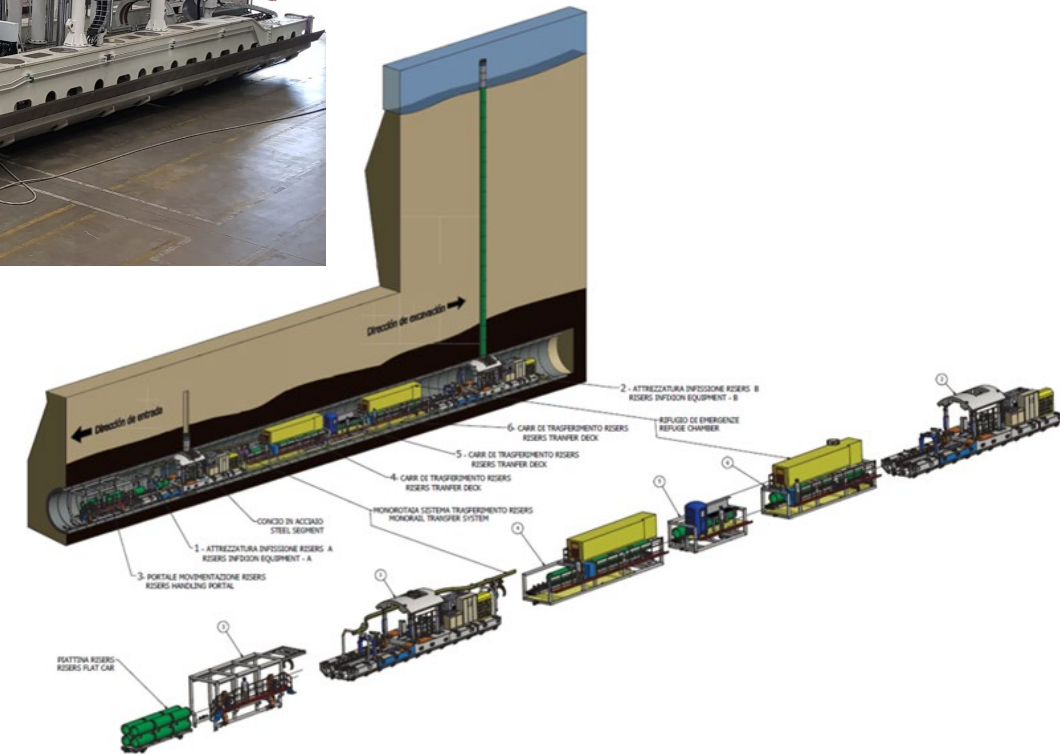
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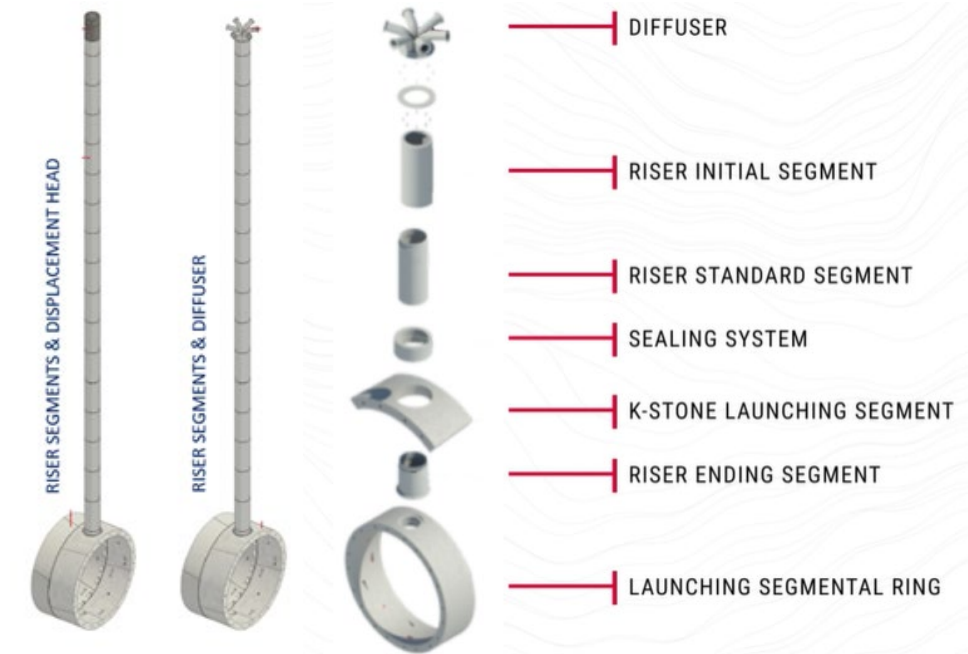
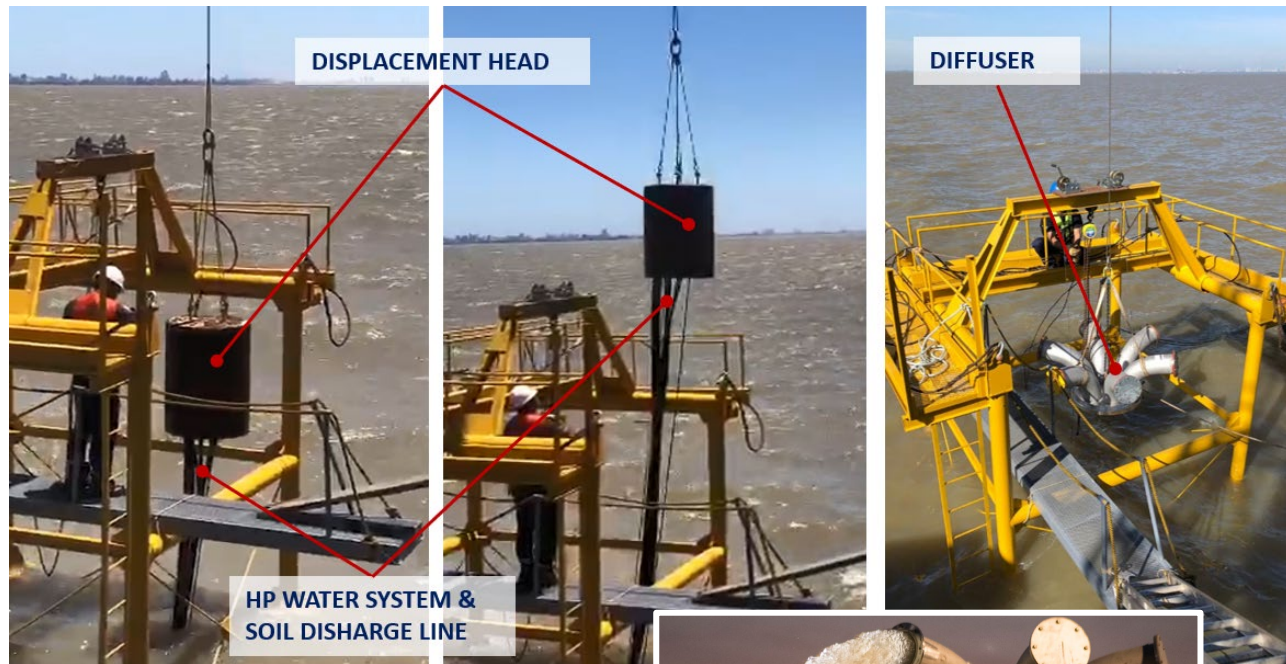
## Details of the Riser Concept – Riser Jacking Equipment

- ✓ 2 Riser Jacking Equipments
- ✓ Riser Transfer and handling
- ✓ Upper Stabilizer (Pipe Brake)
- ✓ 400 ton jacking capacity
- ✓ Load distribution system (26 jacks)
- ✓ No. 3 hydro-demolition pumps (300 bar)



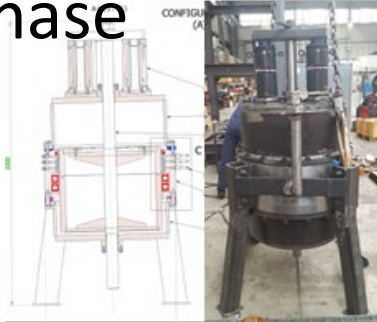


## Details of the Riser Concept – Diffusers and Offshore Activities





## Testing phase



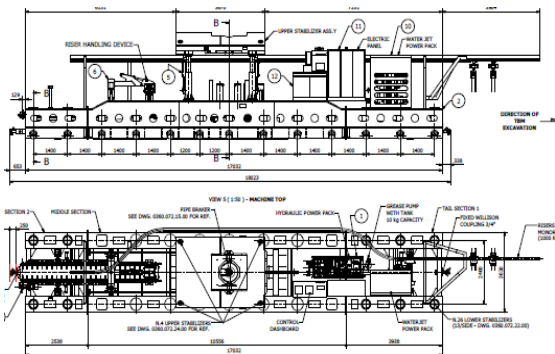
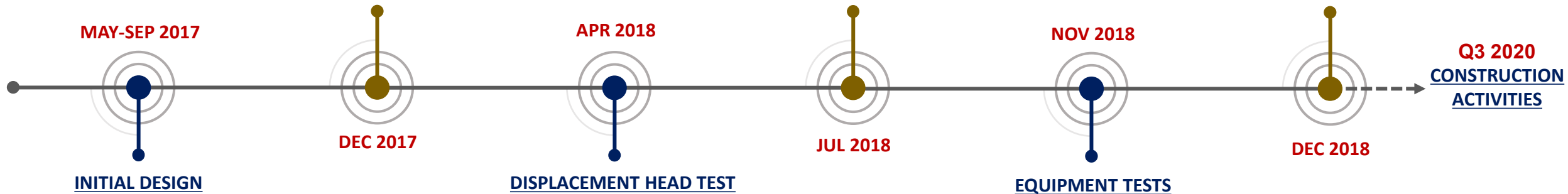
**SEALING SYSTEM TEST**



**RISER SEGMENTS TEST**



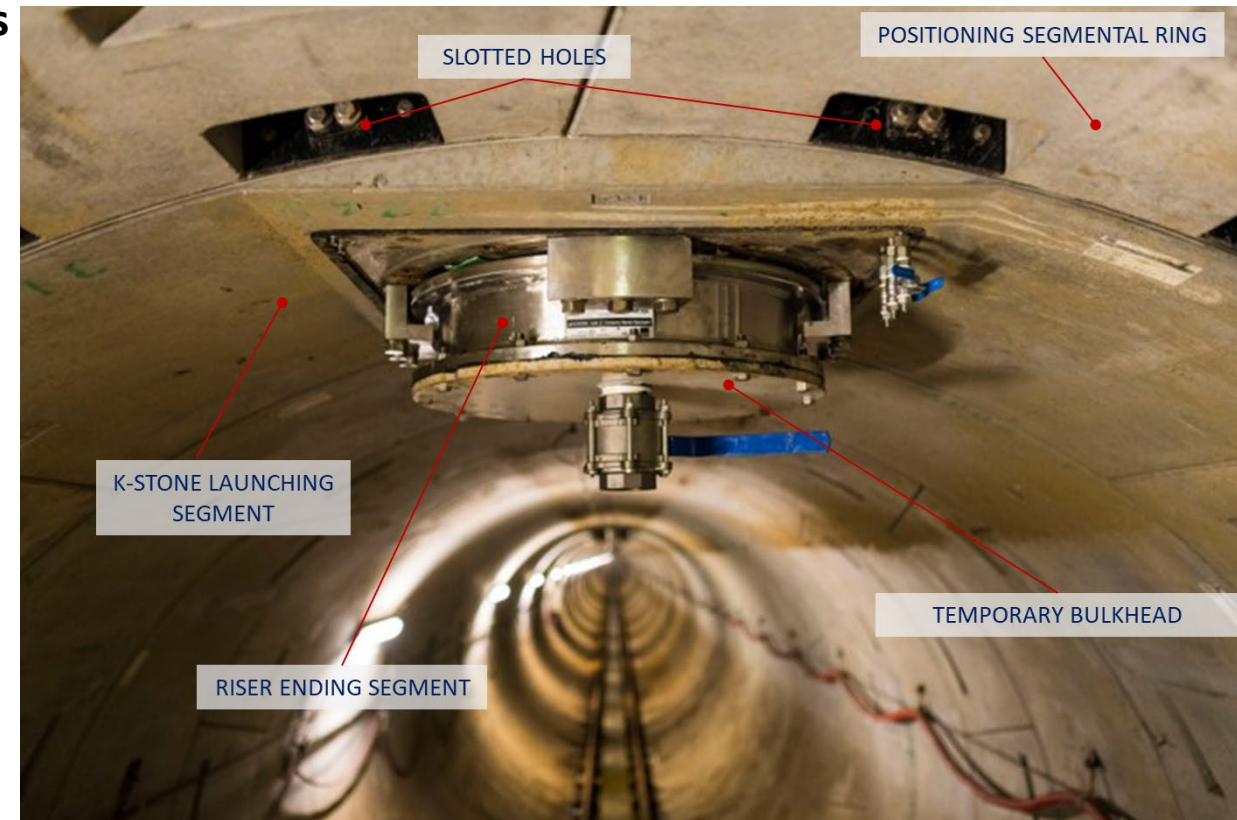
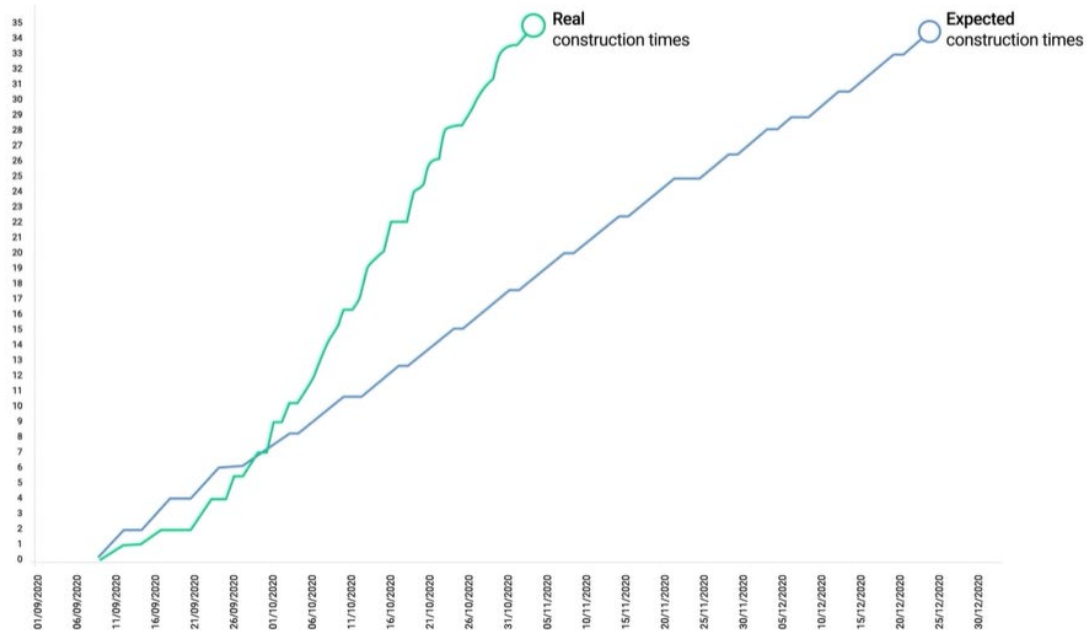
**REAL SIZE TEST**





## Execution of Riachuelo Project

- 34 risers = **1 km of riser segments installed in 50 days**
- Less than half the time that was initially estimated





## Conclusions – Future Construction of Outfall Projects

- ✓ The Riser Concept in Riachuelo Project is **practical** and **advantageous**.
- ✓ It is a **sustainable** construction technique, with an improved worker **safety** and a **reduced** environmental impact.
- ✓ The method provides **advantages** in terms of time, quality and costs.
- ✓ **Engineering innovation** that changes the way to **construct** risers and represents a **step forward** in the **future of outfall projects**



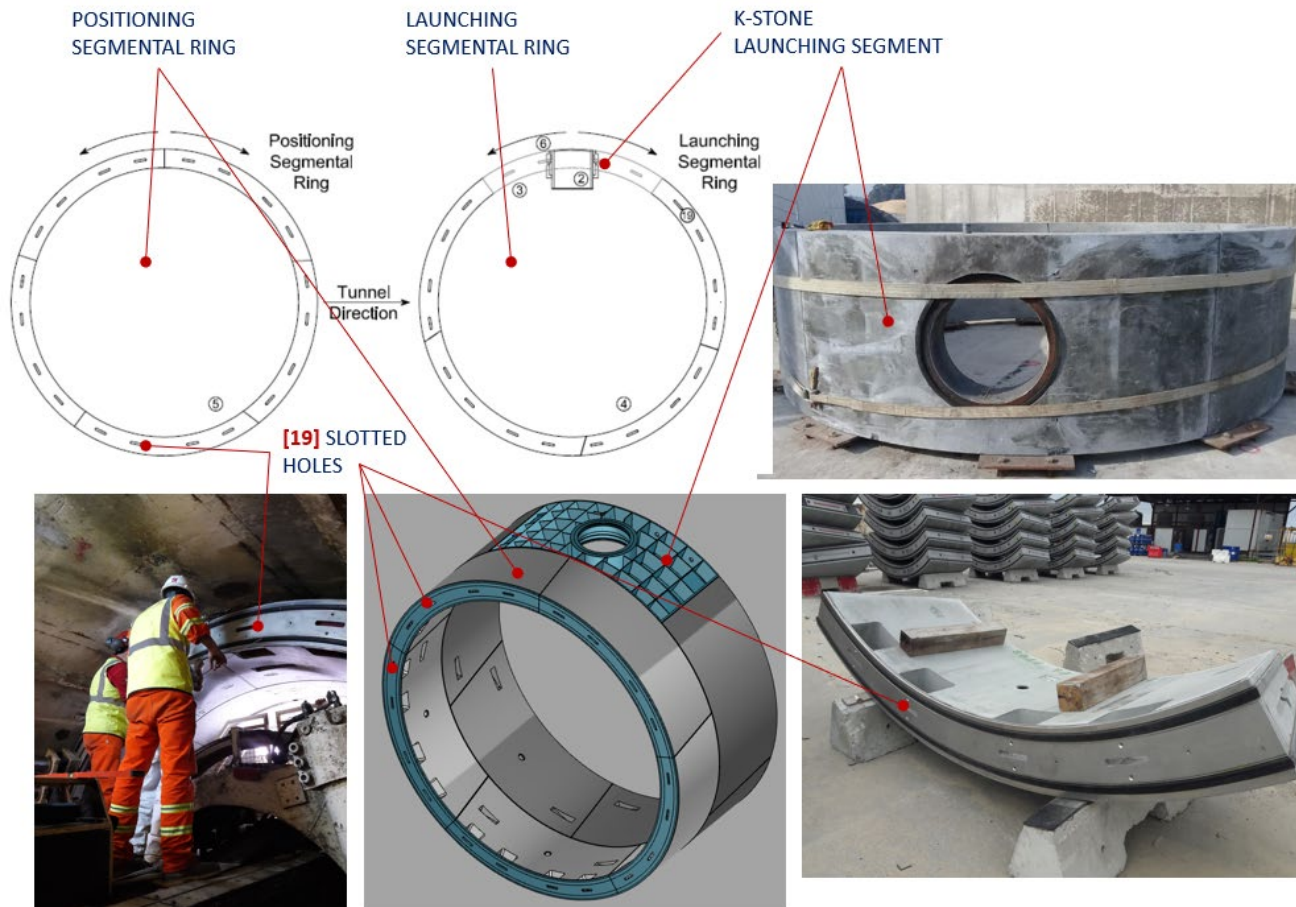


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## Q1 – Riser verticality – Special Tunnel Segments



Positioning Ring



Launching Segment



## Q3 – Innovation

### Never made before

- Construction technique and method
- Construction of Outfall Projects without using extensive marine activities/equipment
- Vertical Upward pipe jacking and excavation from inside an underwater tunnel
- Tunnel Segmental lining including an openings for pipe jacking, without need to perforate the tunnel lining
- Underwater breakthrough with underwater Displacement Head dismantling

### Innovation key elements

- Innovation in construction field
- Automation of construction steps
- Reduction of risks

*In some cases, innovation provides a tool which changes the way things are constructed.*