

# *Case study: Refurbishment of a tunnel.*

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***3rd European Forum of Road Tunnel Safety Officers***

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**WHEN YOU NEED TO BE SURE**



# SGS OVERVIEW

- Introduction
- Tasks of a Tunnel Safety Officer
- Refurbishment of a tunnel
- Case study: Tunnel Bruc
- Conclusions

# SGS TASKS OF A TSO

- The EU directive
- Spanish transposition:
  - Design
  - Construction
  - Operation

**TSOs shall:**

- a) Ensure coordination with emergency services and take part in the preparation of operational schemes
- (b) Take part in the planning, implementation and evaluation of emergency operations
- (c) Take part in the definition of safety schemes and the specification of the structure, equipment and operation in respect of both new tunnels and modifications to existing tunnels
- (d) Verify that operational staff and emergency services are trained, and he/she shall take part in the organisation of exercises held at regular intervals
- (e) Give advice on the commissioning of the structure, equipment and operation of tunnels
- (f) Verify that the tunnel structure and equipment are maintained and repaired
- (g) Take part in the evaluation of any significant incident or accident as referred to in Article 5(3) and (4)

## TASKS OF A TSO. THE EU DIRECTIVE

### TSOs shall:

- a) Ensure coordination with emergency services and take part in the preparation of operational schemes
- (b) Take part in the planning, implementation and evaluation of emergency operations
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### **Annex I. 3. Measures concerning operations: Works in tunnels**

***Complete or partial closure of lanes due to construction or maintenance<sup>o</sup> works planned in advance shall always begin outside the tunnel. Variable message signs, traffic signals and mechanical barriers may be used for this purpose.***

## Annex II.

### Approval of the design

...

**1.2. Before any construction work begins.. The TM shall consult the TSO... The TM shall submit the safety documentation to the AA and attach the opinion of the Safety Officer...**

### Safety documentation

**2.1. The Tunnel Manager shall compile safety documentation for each tunnel and keep it permanently up-to-date. He shall provide a copy of the safety documentation to the TSO.**

## Annex II. Approval of the design, safety documentation, commissioning of a tunnel, modifications and periodic exercises

...

**3.2. This procedure also applies to the opening of a tunnel to public traffic after any major change in construction or operation or any substantial modification work on the tunnel which might significantly alter any of the constituent components of the safety Documentation.**

...

**The TM shall transmit the safety documentation ...to the TSO who shall give his opinion...**



## Annex II.

....

**For any substantial modification in the structure, equipment or operation, which might significantly alter any of the constituent components of the safety documentation, the Tunnel Manager shall ask for a new authorisation of operation following the procedure described under point 3).**

...

**Annex II. 4**

***The Tunnel Manager shall inform the Safety Officer of any other change in construction and operation. Furthermore, prior to any modification work on the tunnel, the Tunnel Manager shall provide the Safety Officer with documentation detailing the proposals.***

***The SO shall examine the consequences of the modification and in any event give his opinion to the TM, who will send copy to the AA and tho the emergency services***

# TASKS OF A TSO. SPANISH REGULATION RD635/2006

## TSOs shall:

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- (b) Take part in the planning, implementation and evaluation of emergency operations
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## TASKS OF A TSO. SPANISH REGULATION RD635/2006

### Design

Take part in the design of all aspects in respect of tunnel safety.  
Report to the Tunnel Manager and the A. Authority on the tunnel safety documentation, prior to the design's approval

### Construction

Be a partner of the project manager and the health and safety coordinator  
**Verify that the tunnel safety equipment and its assembly are suitable**  
Report to the A. Authority and the Tunnel Manager on possible modifications of the equipment in respect of the design, for its approval and that of tunnel safety documentation

Assess, prior to authorisation of operation, on the structure, equipment and safety documentation.

### Based on EU Directive:

- C) Take part in the definition of safety schemes and the specification of the structure, equipment and operation in respect of both new tunnels and modifications to existing tunnels
- (e) Give advice on the commissioning of the structure, equipment and operation of tunnels

## DIRECTIVE

- Report to the AA in all phases (different TSOs?)
- Specific procedures (commissioning)
- Coordination

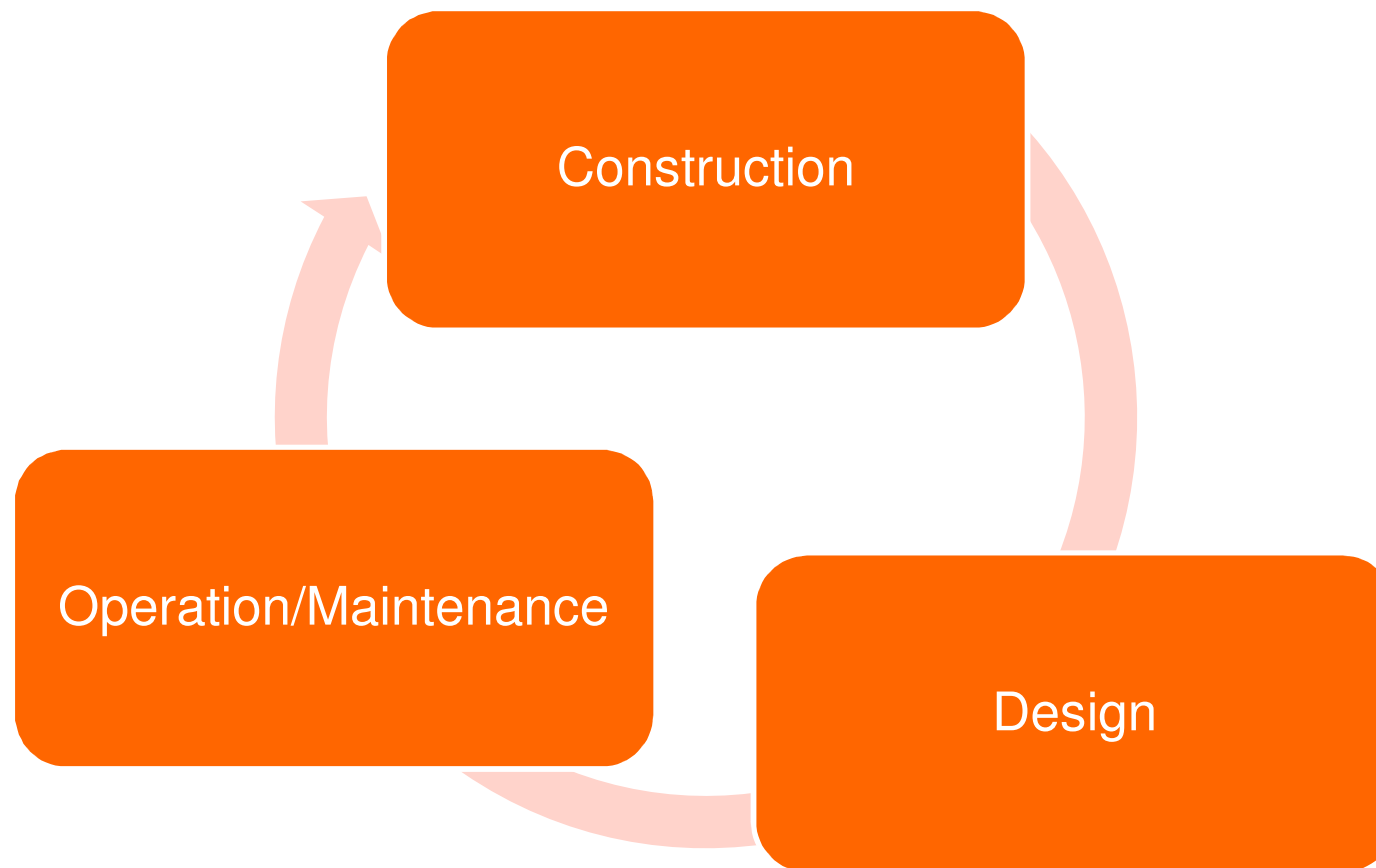
## SPAIN

- Construction supervision (≠ controlling construction)
- Be a partner, participate

## Minimal Equipment / Safety documentation

- Tasks
- Tunnel currently in operation (maintained and repaired, not easy to close)
- Many stakeholders
- Changes in procedures
- M.O.C.? Temporary equipment?
- Safety documentation & commissioning

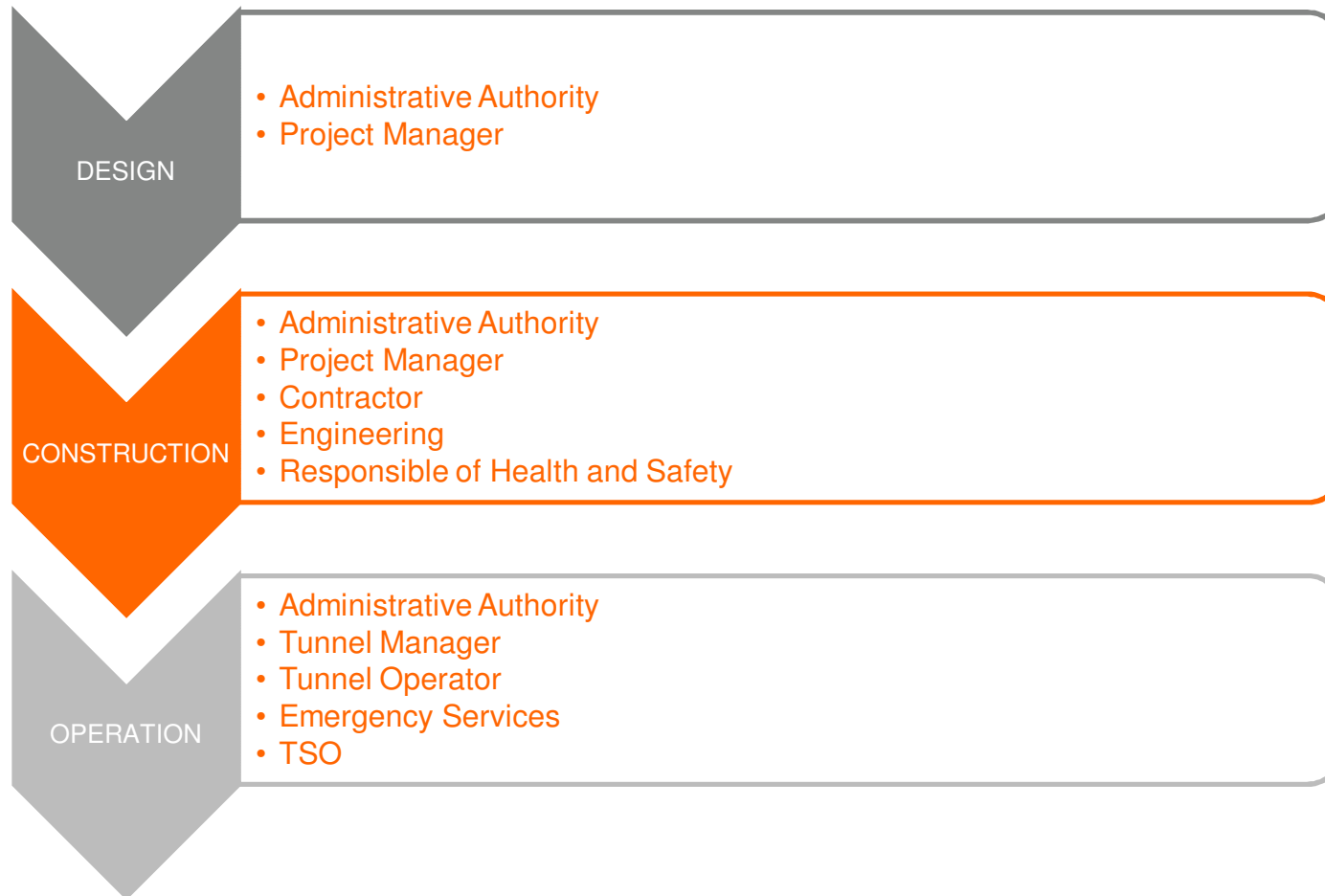
## REFURBISHMENT OF A TUNNEL.





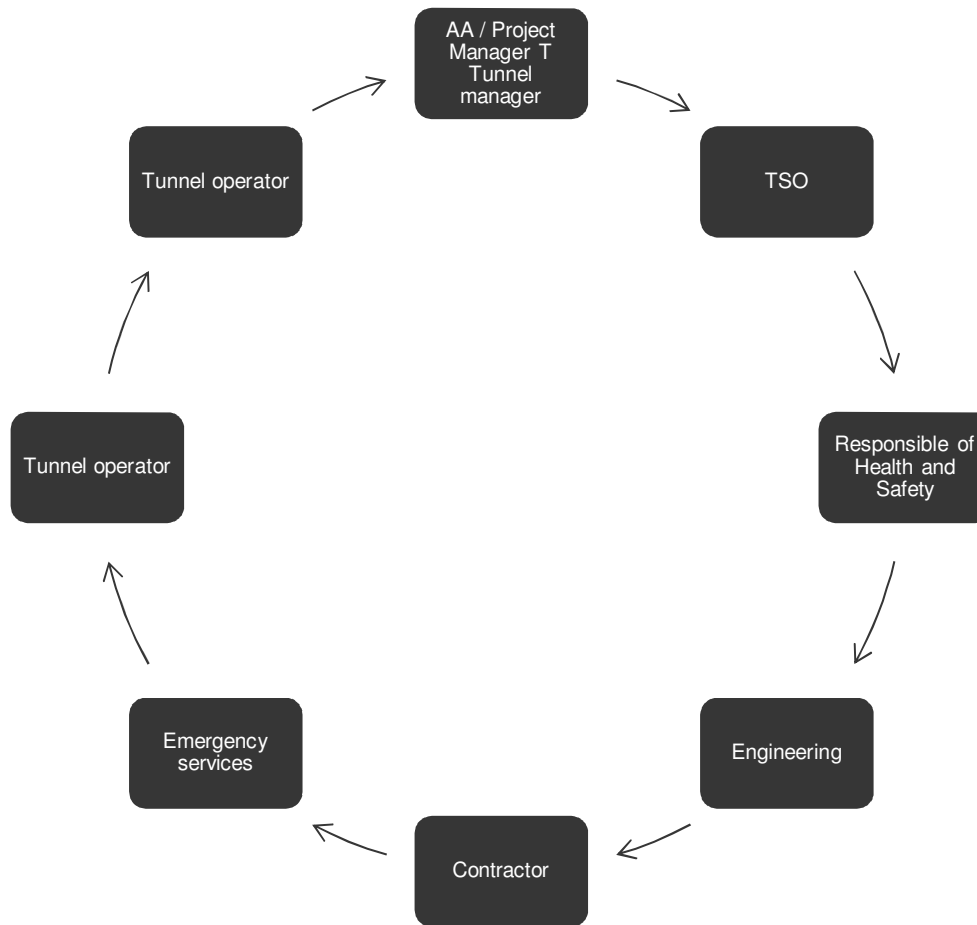


# REFURBISHMENT OF A TUNNEL. STAKEHOLDERS

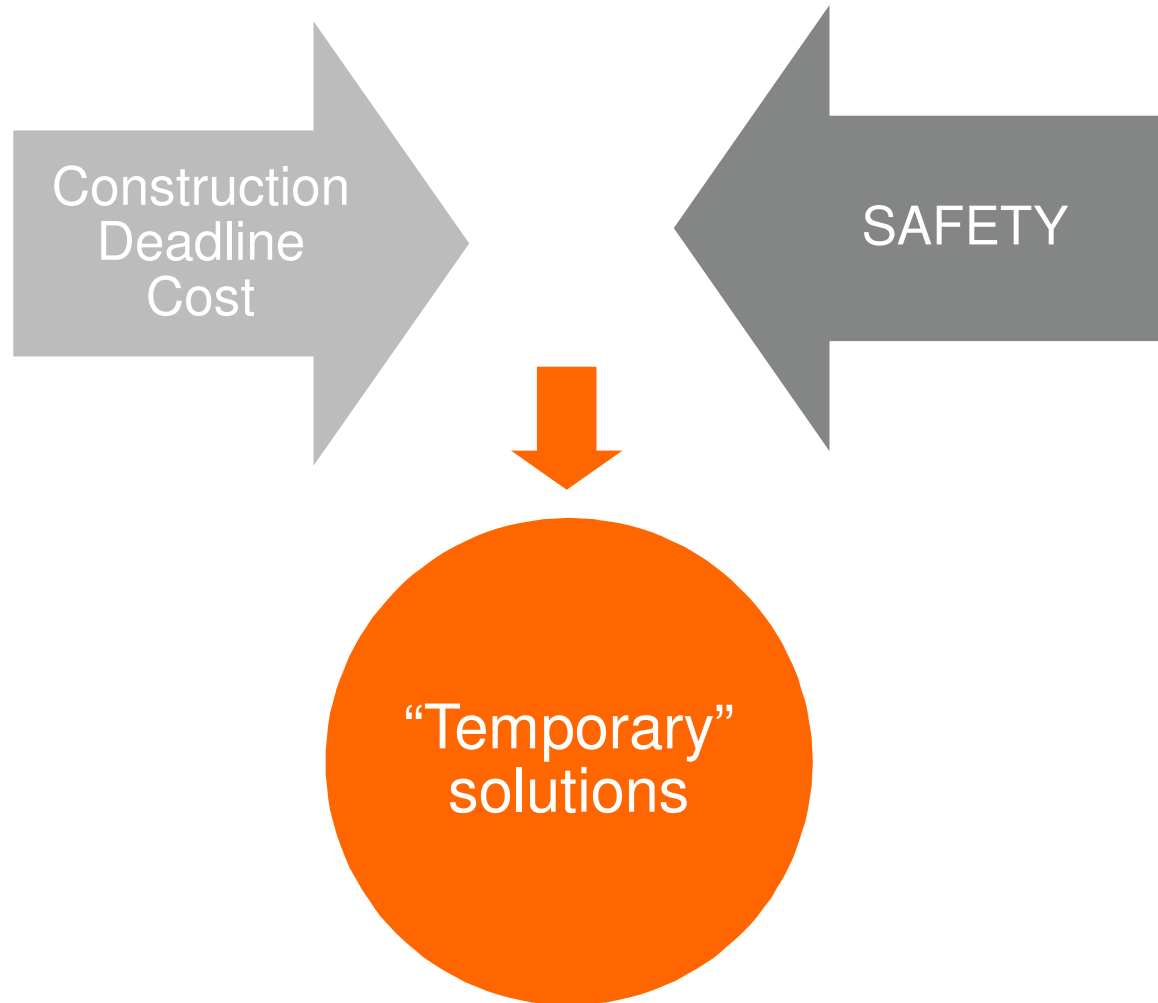


## REFURBISHMENT OF A TUNNEL. PROCEDURES

**A lot of  
meetings  
and time**



## REFURBISHMENT OF A TUNNEL. MINIMAL OPERATING CONDITIONS



## REFURBISHMENT OF A TUNNEL. MINIMAL OPERATING CONDITIONS

- Difficult to define for every case: simplifying actions
- Tunnel/lane closure?-> clear in structural works
- Equipment works?
- Continuous training
- Coordination with maintenance works

## REFURBISHMENT OF A TUNNEL. SAFETY DOCUMENTATION

### Annex II

- a description of the organisation, human and material resources and instructions specified by the Tunnel Manager to ensure operation and maintenance of the tunnel,
- an emergency response plan drawn up jointly with the emergency services which also takes into account people with reduced mobility and disabled people,
- a description of the system of permanent feedback of experience through which significant incidents and accidents can be recorded and analysed.

Required for authorisation of operation!



## CASE STUDY EL BRUC TUNNEL

- 2 contractors, AA, Project Manager,...
- Tunnel in operation, discussion about limits

- 2-lane (830m) and 3-lane (1100) tubes
- Section: narrow sidewalks and lanes
- ventilation longitudinal /semi-transverse
- false ceiling
- 2 emergency exits
- traffic jams not often
- No DG
- Alternative road (winter exception)



# EL BRUC TUNNEL

## CONTRACTOR 1

- Emergency phones
- Lighting
- Power supply
- Variable signs
- Water supply
- Loudspeakers
- Traffic signals
- Pavement
- Emergency exits
- Communication system





# EL BRUC TUNNEL

## CONTRACTOR 2

- false ceiling demolition
- structural reinforcement
- new ventilation (semitransverse-> longitudinal)
- cable detection, lighting
  
- power supply

- The tunnel is in operation, but often traffic affectation
- After some months, lane closure becomes “normal” condition
- Workers usually in the tunnel
- Temporary equipment
- Tunnel operator very much involved in the refurbishment
- Unexpected errors must be foreseen
- Equipment starts, failure may occur (part of the existing equipment remains...)



## EL BRUC TUNNEL

- Coordination with Emergency services
- Training: CC Operator, Facilities Manager:
- Participation in the specification
- End of the process: integration and final tests
- Procedures? Reopening and assessment
- Safety documentation



# TUNNEL REFURBISHMENT PARTICIPATION IN ESPECIFICATION



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## TUNNEL REFURBISHMENT TEMPORARY EQUIPMENT







# TUNNEL REFURBISHMENT TRAFFIC RESTRICTION



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## TUNNEL REFURBISHMENT FINAL TESTS



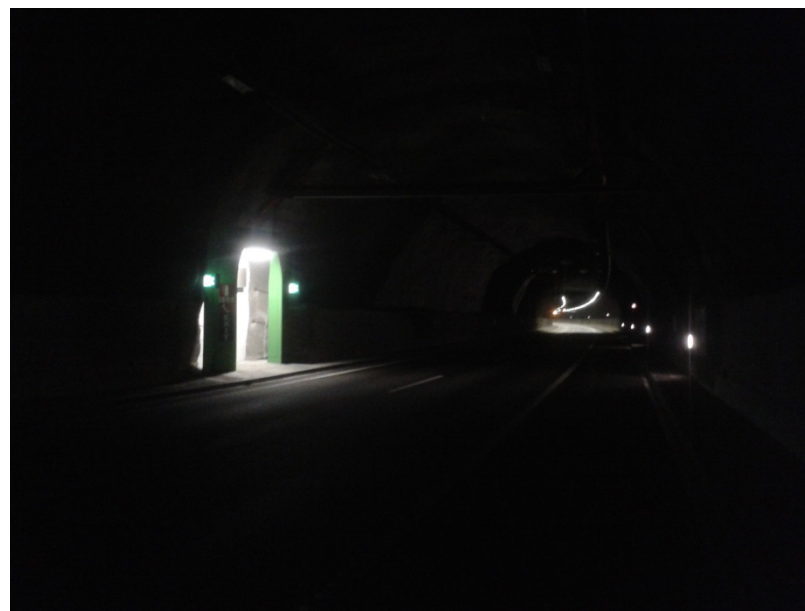
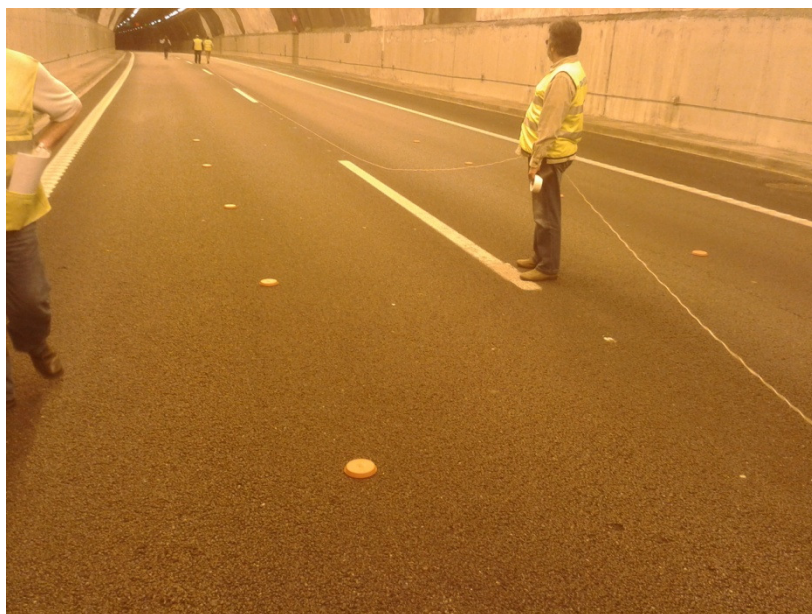
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## TUNNEL REFURBISHMENT TUNNEL IS IN OPERATION



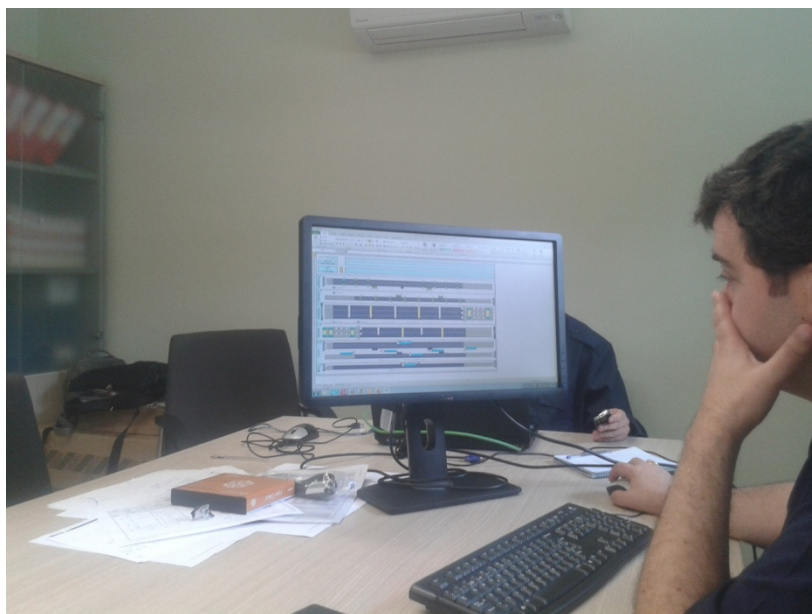
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## TUNNEL REFURBISHMENT CONTINUOUS TRAINING



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# TUNNEL REFURBISHMENT COORDINATION



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# TUNNEL REFURBISHMENT CONCLUSIONS

- Challenge for both TO & TSO
- More stakeholders coordination is essential
- Partial refurbishment, the unexpected might happen
- Continuous training of the TO
- TO and contractors working together
- Normal operation is traffic restriction and workers inside the tunnel



# TUNNEL REFURBISHMENT CONCLUSIONS

- Procedures
- Safety documentation up-to-date
- Many more refurbishments in the future



SGS

THANK  
YOU!



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