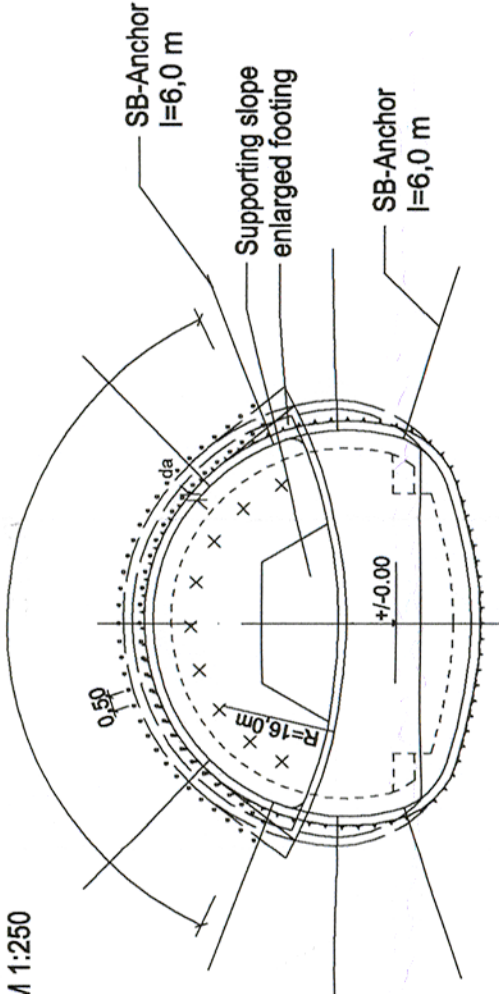
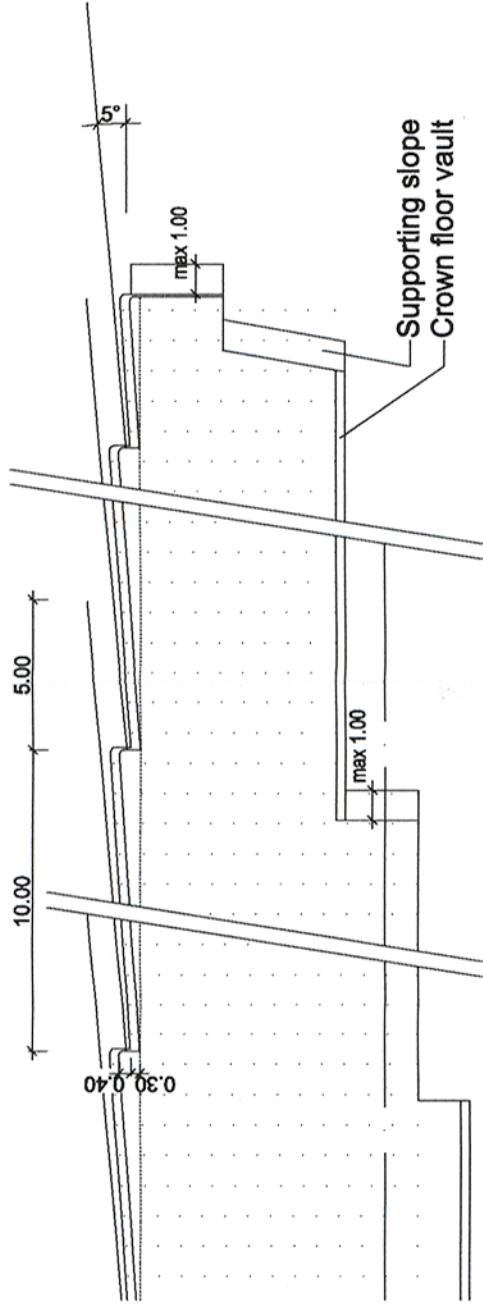
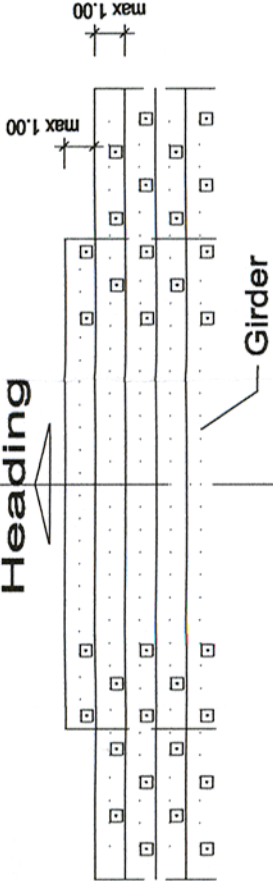


Advance support with pipe umbrella



Heading



1. Crown

- Advance support protection with pipe umbrella 10.0 m

Excavation:

- Sections, at the choice of the Contractor, length of round max. 1,0 m
- with supporting slope and enlarged footing - invert arch

Reinforcement:

- temporary crown face with shotcrete after each round
- Shotcrete after each round
- Tunnel face anchors with a length of 8.0 m as required
- Steel fabric mats, steel sets, girder, shotcrete after each round
- Systematic anchoring at second round behind heading after each round
- Trailing distance crown up to 6.0 m from the front of face
- Crown excavation - opening length up to 2.0 m in full width
- Arch of shotcrete in invert of crown after each excavation section

2. Bench:

- Trailing bench according to measurement results

Excavation:

- Length of round max. 1.0 m
- in full width with excavation section of shotcrete arch in invert of crown

Reinforcement:

- Steel fabric mats, steel sets, girder, shotcrete after each round
- Systematic anchoring at second round behind heading after each round
- Trailing distance between the invert excavation to the face of the bench max. 8.0 m

3. Invert:

- Trailing distance between the invert excavation to the face of the bench max. 8.0 m

Excavation:

- Unsupported round length max. 2 m

Reinforcement:

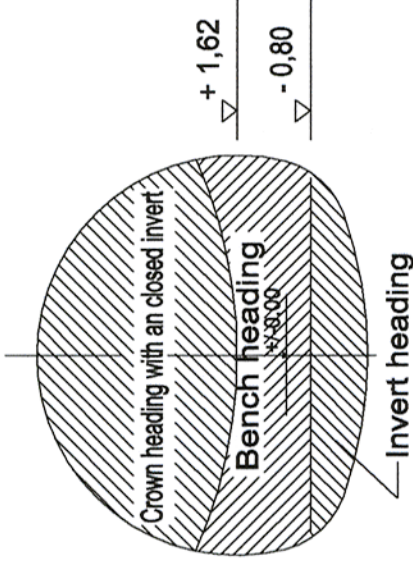
- Steel fabric mats, shotcrete after each round

| ORT    | Term                                        | UNIT | QUANTITY PER LFM TUNNEL I.M. |
|--------|---------------------------------------------|------|------------------------------|
| Crown  | Excavation section                          | m³   | 67,91                        |
|        | Steel fabric mats Q 335, 2 Layers, A        | m²   | 36,68                        |
|        | Steel sets, girder Typ 2, e=1,0 m, FS       | m    | 18,34                        |
|        | Shotcrete da=30 cm                          | m³   | 18,34                        |
|        | Anchor l=6,0 m, SB, 200 kN                  | St   | 3,00                         |
|        | Reinforced shotcrete face 10 cm             | m²   | 42,50                        |
|        | Tunnel face anchor l=12 m, e=8,0 m          | St   | 1,125                        |
|        | Steel pipe casings l=15 m, e=10,0 m         | St   | 3,00                         |
|        | Excavation section                          | m³   | 0,50                         |
|        | Shotcrete d=15 cm                           | m³   | 0,50                         |
| Kf     | Steel (fabric mats, horizontal bars)        | kg   | 35,00                        |
|        | Shotcrete da=30 cm                          | m³   | 13,60                        |
| Crown  | Steel fabric mats Q 257, 2 Layer            | m²   | 27,20                        |
|        | Excavation section                          | m³   | 39,55                        |
| Bench  | Steel fabric mats Q 257, 2 Layer            | m²   | 15,76                        |
|        | Steel sets, lattice girder, Type 2, e=1,0 m | m    | 7,88                         |
|        | Shotcrete da=30 cm                          | m²   | 10,35                        |
|        | Anchor l=6,0 m, SB, 200 kN                  | St   | 4,00                         |
|        | Excavation section                          | m³   | 18,42                        |
| Invert | Steel fabric mats Q 257, 2 Layer            | m²   | 27,18                        |
|        | Shotcrete da=30 cm                          | m²   | 13,59                        |

The quantity data are for cross section CS1 with inner shell thickness of 60 cm. In case of inner shell thickness of 40 cm (cross section CS2), the values to adjust.

Legend :

- Kf ... Enlarged footing
- I ... Length
- a ... Distance in transverse direction
- e ... Distance in longitudinal direction
- A ... Connection of the reinforcement between the crown and bench
- SN ... Rock anchor
- SB ... Injection bore anchors
- ... Length of anchor 4 m
- ... Length of anchor 6 m
- × ... Tunnel face anchors with a length 12 m
- Typ 1 ... Girder GI 100
- Typ 2 ... Girder GI 120
- FS ... Girder at the foot of the crown



MINISTERUL  
TRANSPORTURILOR



COMPANIA NAȚIONALĂ DE CĂI FERATE "CFR" SA

PROIECTANT / DESIGNER:



Semnatura  
Signature

Data  
Date

Aprobat  
Approved

Verificat  
Checked

Aprobat  
Approved

Proiectat  
Designed

Sef de echipa  
Team leader

Expert Cheie  
Key Expert

Adjunct Sef de echipa  
Deputy Team leader

Inginer  
Engineer

C. Teodorescu

M. Diegmann

J. Werfling

D. Ciotarnel

06/2013

06/2013

06/2013

06/2013

"Reabilitarea liniei c.f. Frontieră - Curtici - Simeria, parte componentă a coridorului IV Pan - European pentru circulația trenurilor cu viteză maximă de 160 km/h"  
Tronsonul 2: km 614-Gurasada  
"Rehabilitation of the Railway Line Border - Curtici - Simeria, component Part of the IV Pan - European Corridor for the Trains Circulation with maximum speed of 160 km/h"  
Section 2 :km 614-Gurasada

Project 9i  
35311.1

Denumire desen / Drawing name:  
EXCAVATION CLASS 6.3

Scara / Scale

1:250

Cod desen / Drawing Code

EC 9

Nr / No

EC 9