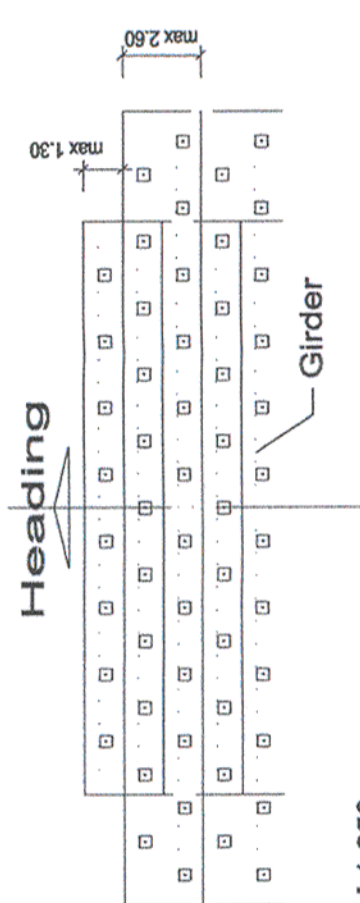
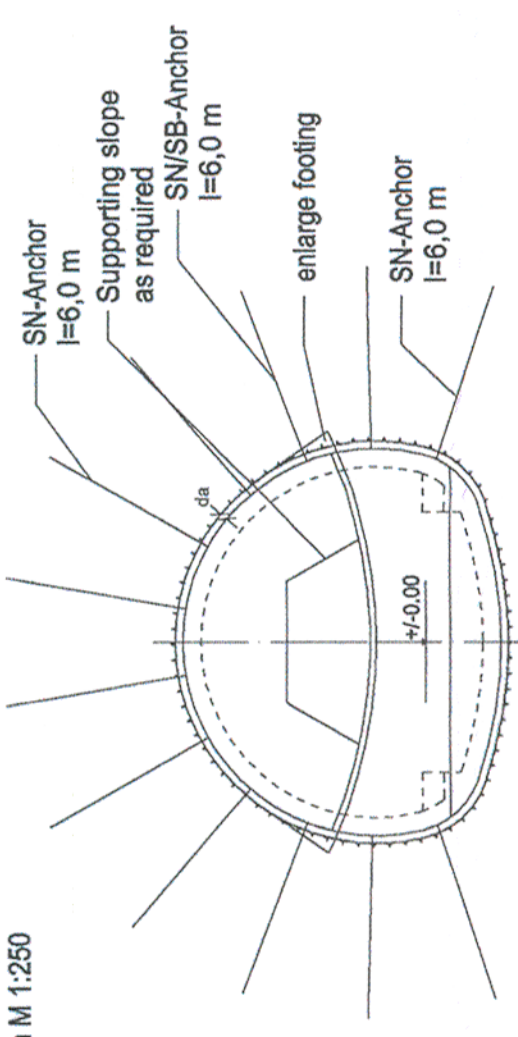
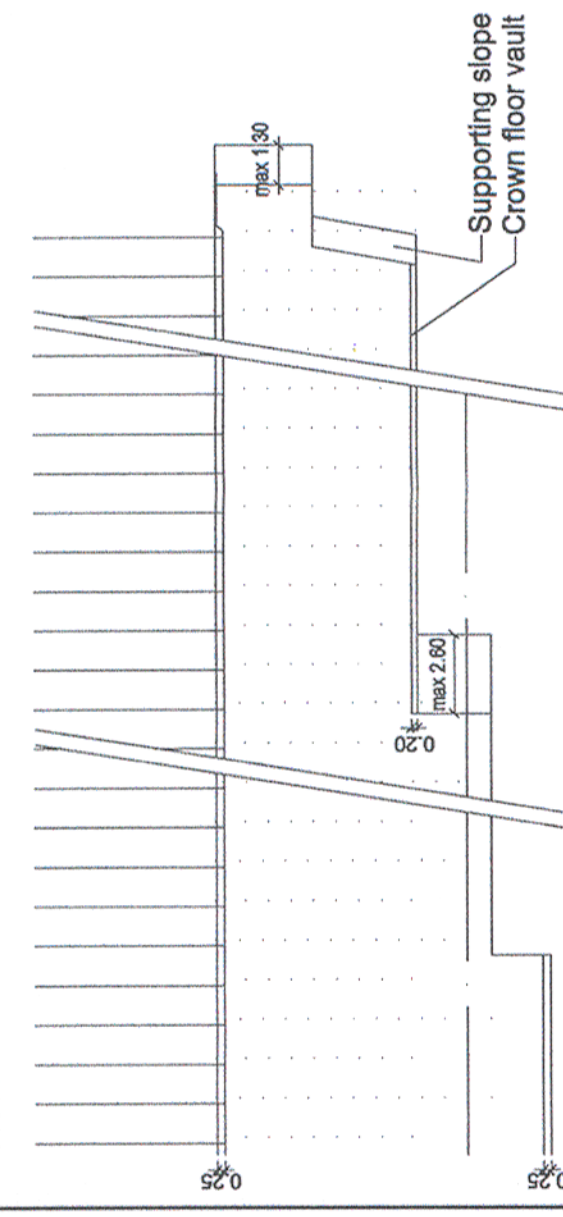


Excavation Class 4.4  
Cross Section M 1:250



Execution M 1:250



Longitudinal section M 1:250

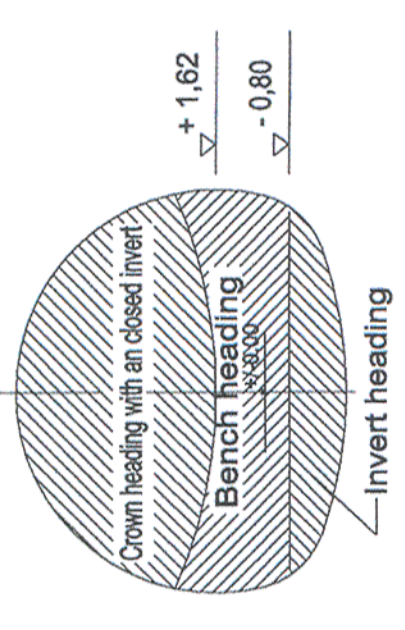
- Crown**  
Excavation:  
- Length of round max. 1,3 m  
Reinforcement:  
- Shotcrete sealing of the tunnel face after every tee  
- Shotcrete after each round  
- Steel fabric, mats, steel sets, girder, shotcrete after each round  
- Systematic anchoring at second round behind heading after each round  
- Arch of shotcrete in invert of crown after each excavation section
- Bench:**  
- Trailing max. 60 m behind Crown  
Excavation:  
- Length of round max. 1,3 m  
- In full width with excavation section of shotcrete arch in invert of crown  
Reinforcement:  
- Steel fabric, mats, shotcrete after each round  
- Every second steel set, girder is extended  
- Systematic anchoring at second round behind heading after each round
- Invert:**  
- Trailing distance up to 100 m from the face of the bench or according to measurement results  
Excavation:  
- Unsupported round length max. 10 m  
Reinforcement:  
- Steel fabric mats, shotcrete after each round

ORT	Term	UNIT	QUANTITY PER LFM TUNNEL
Crown	Excavation section	m <sup>3</sup>	63,30
	Steel fabric mats Q 257, 2 Layers, A	m <sup>2</sup>	35,64
	Steel sets, girder Typ 1, e=1,3 m	m	13,71
	Shotcrete da=25 cm	m <sup>2</sup>	17,82
	Anchor l=6,0 m, SN/SB, 200 kN	St	6,54
Kf	Sealing shotcrete face 6 cm	m <sup>2</sup>	30,00
	Splices with injection drill bolt l=3,5 m	St	0,50
	Excavation section	m <sup>3</sup>	0,50
	Shotcrete da=15 cm	m <sup>3</sup>	0,50
	Steel (fabric mats, horizontal bars)	kg	35,00
Crown-SG	Shotcrete da=20 cm	m <sup>2</sup>	13,40
	Steel fabric mats Q 188, 2 Layer	m <sup>2</sup>	26,80
Bench	Excavation section	m <sup>3</sup>	37,58
	Steel fabric mats Q 257, 2 Layer	m <sup>2</sup>	15,44
	Steel sets, girder Type 1, e=2,6 m	m	2,97
	Shotcrete da=25 cm	m <sup>2</sup>	7,72
	Anchor l=6,0 m, SN/SB, 200 kN	St	2,31
Invert	Excavation section	m <sup>3</sup>	17,75
	Steel fabric mats Q 257, 2 Layer	m <sup>2</sup>	25,70
	Shotcrete da=25 cm	m <sup>2</sup>	12,85

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
- l ... 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
- x ... 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



BENEFICIAR / BENEFICIARY :  
COMANIA NAȚIONALĂ DE CĂI FERATE "CFR" SA



PROIECTANT / DESIGNER:

Approbat Approved	Sef de echipa Team leader	C. Teodorescu	06/2013	[Signature]	Semnatura Signature
Verificat Checked	Expert Cheie Key Expert	M. Diegmann	06/2013	[Signature]	Semnatura Signature
Approbat Approved	Adjunct Sef de echipa Deputy Team leader	J. Werfling	06/2013	[Signature]	Semnatura Signature
Proiectat Designed	Inginer Engineer	D. Ciotarnel	06/2013	[Signature]	Semnatura Signature

"Reabilitarea liniei c.f. Frontieră - Curtici - Simeria, parte componentă a coridorului IV Pan - European pentru circulația trenurilor cu viteză maximă de 160 km/h"  
Tronsoanel 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

Denumire desen / Drawing name:  
EXCAVATION CLASS 4.3

Scara / Scale	Cod desen / Drawing Code	Nr / No
1:250	EC 4	EC 4