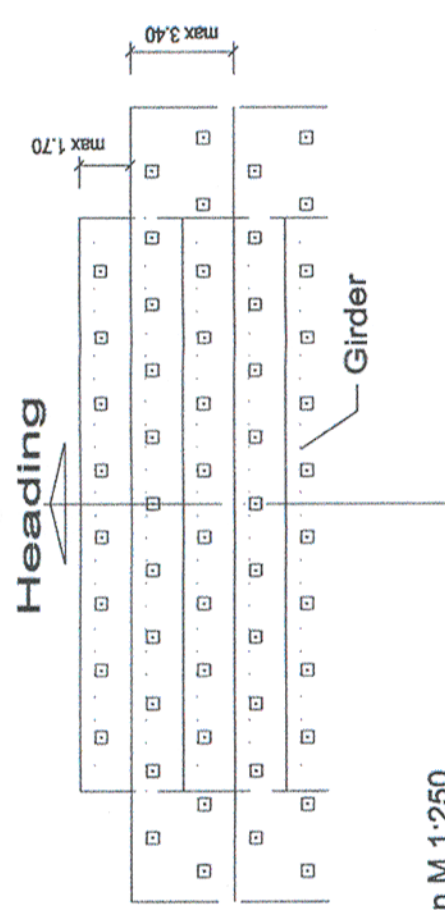
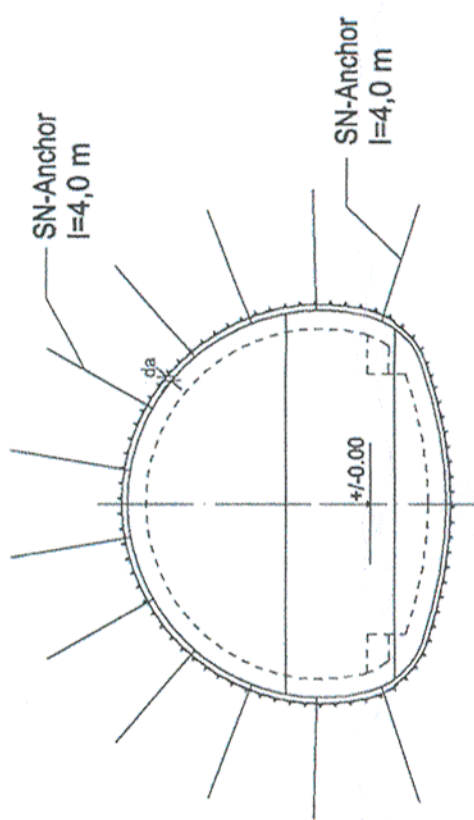
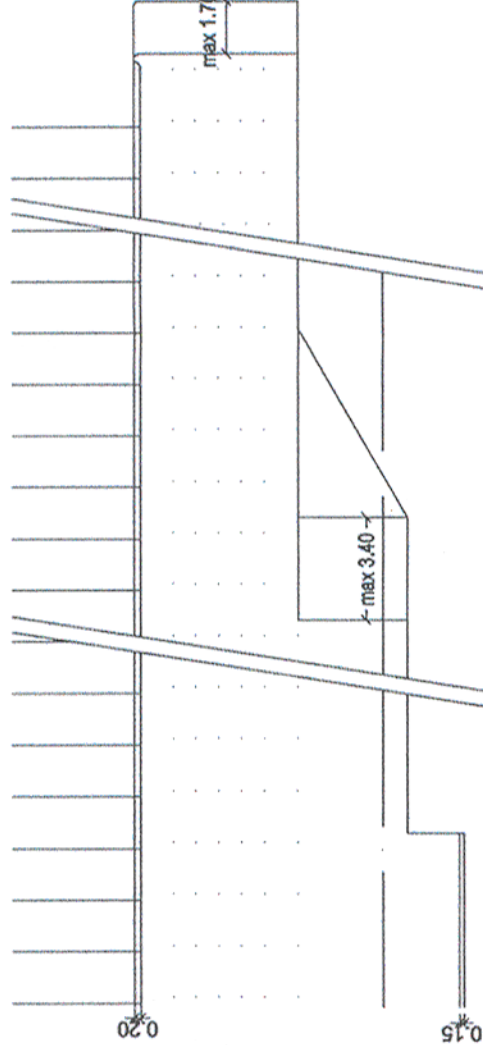


Excavation Class 4.1  
Cross Section M 1:250



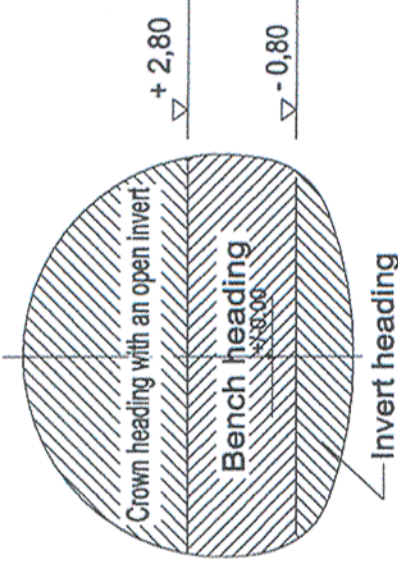
Execution M 1:250



Longitudinal section M 1:250

1. Crown  
Excavation:  
- Length of round max. 1,7 m  
Reinforcement:  
- Shotcrete after each round  
- Steel fabric mats, steel sets, girder, shotcrete after each round  
- Systematic anchoring at second round behind heading after each round
2. Bench:  
- Trailing max. 200 m behind Crown  
Excavation:  
- Length of round max. 3,4 m  
- half side or middle hawser  
Reinforcement:  
- Systematic anchoring and steel fabric mats after each round  
- Shotcrete after every second deduction
3. Invert:  
- Trailing distance not limited  
Excavation:  
- Unsupported round length max. 10 m  
Reinforcement:  
- Steel fabric mats, shotcrete

ORT	Term	UNIT	QUANTITY PER LPM TUNNEL
Crown	Excavation section	m <sup>3</sup>	52,94
	Steel fabric mats Q188, 1 Layers, A	m <sup>2</sup>	18,25
	Steel sets, girder Typ 1, e=1,70 m	m	10,62
	Shotcrete da=20 cm	m <sup>2</sup>	17,74
	Anchor l=4,0 m, SN, 150 kN	St	5,00
Spiles with injection drill bolt l=3,5m			as required
Bench	Excavation section	m <sup>3</sup>	46,66
	Steel fabric mats Q 188, 1 Layer	m <sup>2</sup>	7,42
	Shotcrete da=20 cm	m <sup>2</sup>	7,44
Invert	Anchor l=4,0 m, SN, 150 kN	St	1,76
	Excavation section	m <sup>3</sup>	16,44
	Steel fabric mats Q 188, 1 Layer	m <sup>2</sup>	12,84
	Shotcrete da=15 cm	m <sup>2</sup>	12,44



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

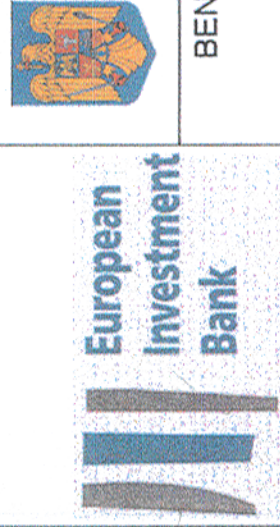


Verificator / Expert  
Checker / Expert

Cerinta  
Requirement

Semnatura  
Signature

Referat / Expertiza  
Report / Expertise



MINISTERUL  
TRANSPORTURILOR

BENEFICIAR / BENEFICIARY :

COMPANIA NAȚIONALĂ DE CĂI FERATE "CFR" SA



PROIECTANT / DESIGNER:

Aprobat Approved	Verificat Checked	Aprobat Approved	Proiectat Designed	Data Date	Semnatura Signature
Sef de echipa Team leader	Expert Cheie Key Expert	Adjunct Sef de echipa Deputy Team leader	Inginer Engineer	06/2013	C. Teodorescu
				06/2013	M. Diegmann
				06/2013	J. Werfling
				06/2013	D. Ciotarnei

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

"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 4.1

Scara / Scale  
1:250

Cod desen / Drawing Code  
EC 1

Nr / No  
EC 1