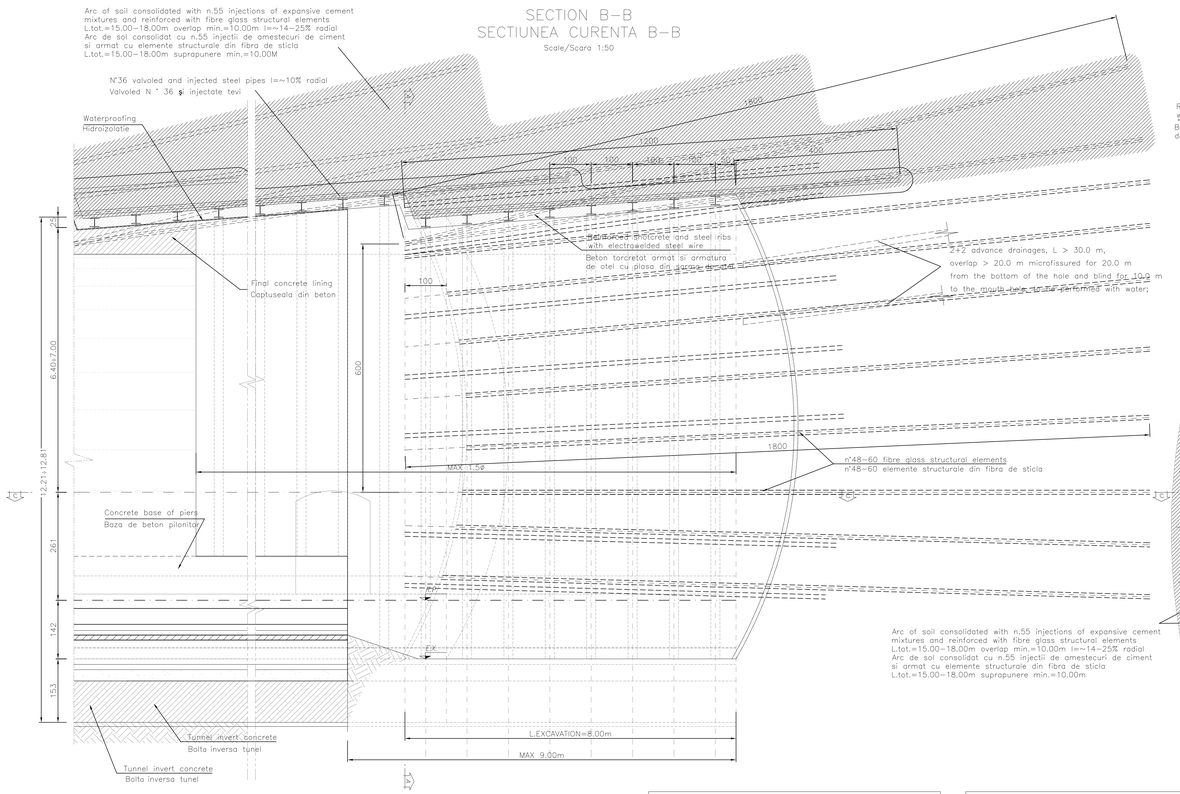
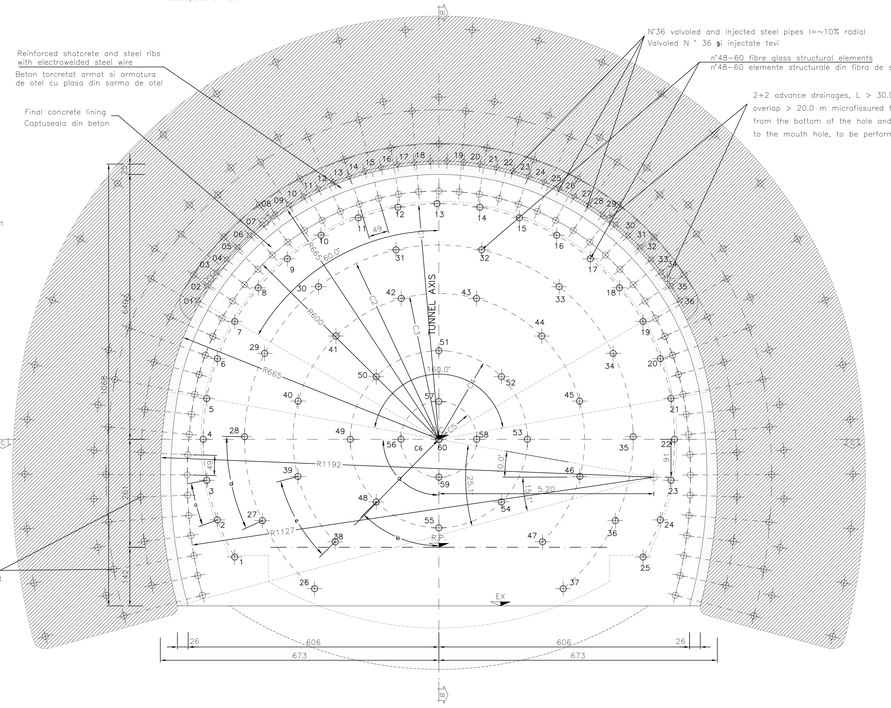
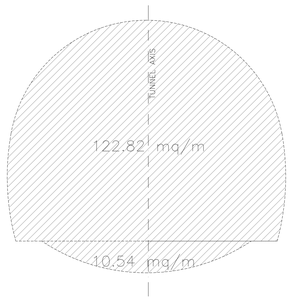
SECTION B–B
SECTIUNEA CURENTA B–B
Scale/Scara 1:50



SECTION A–A
SECTIUNEA CURENTA A–A
Scale/Scara 1:50



EXCAVATION VOLUME
total volume= 133.36 mc/m



Arc of soil consolidated with n.55 injections of expansive cement mixtures and reinforced with fibre glass structural elements
L.tot.=15.00–18.00m overlap min.=10.00m I=~14–25% radial
Arc de sol consolidat cu n.55 injectii de amestecuri de ciment si armat cu elemente structurale din fibra de sticla
L.tot.=15.00–18.00m suprapunere min.=10.00m

CONSTRUCTION PHASES

PHASE 1: implementing pre–consolidation with structural fiberglass elements to the tunnel face

PHASE 2: implementing pre–consolidation at tunnel excavation boundaries and base of steel ribs

PHASE 3: implementing long drainage in progress

PHASE 4: perform excavation

PHASE 5: laying steel ribs and shotcrete

PHASE 6: cast in place of tunnel invert, base of piers and concrete filling

PHASE 7: waterproofing

PHASE 8: cast in place of piers and tunnel crown

FAZELE DE CONSTRUCTIE

FAZA 1: implementare de pre–consolidare la fata tunelului cu elemente structurale de fibra de sticla

FAZA 2: implementare de pre–consolidare la excavarea tunelului boundaries and base of steel ribs

FAZA 3: implementare drenaj lung

Faza 4: efectuarea excavatiei

Faza 5: stabilirea nervurilor de otel si beton torcretat

FAZA 6: cast in place of tunnel invert, baza pilonilor si umplerea cu beton

FAZA 7: impermeabilitate

FAZA 8: cast in place pilonilor si coroana tunelului

LEGEND

RP = REFERENCE PLANE
EX = EXCAVATIONS PLANE
PC = CENTERS PLANE

NOTE/ NOTA

– ROUTES TO THE TYPE OF APPLICATION OF SECTIONS SEE THE PROFILE GEOMECHANICS
– TOLERANCES FOR THE CONSTRUCTION OF THE EXECUTIVE PROJECT SEE DOCUMENT "NATURAL TUNNEL – CONSTRUCTION SPECIFICATIONS AND TOLERANCES."
– ANY DIFFERENCES BETWEEN THE TOTAL AND MEASURES CUMULATIVE PARTIAL MEASURES ARE DUE TO ROUNDING OF AUTOCAD
– FOR THE SYSTEM OF DRAINAGE OF WATER VIEW SUBMISSIONS: SPECIAL SECTION TYPE OF WATERPROOFING AND DRAINAGE OF TUNNEL
– DEFORMATION AND TENSIONAL CONSOLIDATE AFTER EXCAVATION CICLES WILL SUGGEST THE CONSOLIDATION OF ACTIONS EXPECTED OF DISTANCES FROM BOW FRONT AND TUNNEL INVERT AND BASE OF PIERS COVERING THE FINAL, AS OUTLINED IN THIS DOCUMENT.

– RUTELE SPRE TIP DE APLICARE A SECTIUNILOR VEDEA GEOMECANICĂ-PROFILUL
– TOLERANTE PENTRU CONSTRUIREA DE EXECUTIVE PROIECTULUI VEZI DOCUMENTUL "TUNELUL NATURAL – SPECIFICAȚII DE CONSTRUCȚIE ȘI TOLERANȚE.
– ORICE DIFERENȚE ÎNTRE TOTAL ȘI MĂSURI DE MĂSURI TOTAL PARȚIALE SUNT, DATORITĂ ROTUNJIRII, AUTOMATE AUTOCAD
– PENTRU SISTEMUL DE DRENARE A APELOR ARGUMENTELE VEDERE: TIP SECȚIUNE SPECIALĂ A HIDROIZOLAȚII ȘI DRENAJ SAFIE UTILIZAT.
– CONTROLUL COMPORTAMENTULUI VA DIG TENSODEFORMATIVO DE DEPOZITARE ", VARIAȚII DE INTENSITATE PROPUNE". CONSOLIDAREA ACȚIUNILOR CERUTE DE DISTANȚELE DIN FAȚĂBOW ȘI A INVERSIA ȘI PLACARE A PERETILOR FINAL, CUM SA SUBLINIAT ÎN ACEST DECIZOLITATE.

FIBRE GLASS STRUCTURAL ELEMENT LAYOUT

CIRC.	RADIUS (m.)	NUMBER	LENGHT	OVERL. (m.)	RADIAL INCLIN.	ANGLE
C1	5.70	25	>=18.00	>=10.00	10.0%	α=12.00 g
C2	4.70	12	>=18.00	>=10.00	9.0%	δ=28.3 g
C3	3.52	10	>=18.00	>=10.00	8.0%	ε=33.2 g
C4	2.14	8	>=18.00	>=10.00	6.0%	β=50.0 g
C5	0.91	4	>=18.00	>=10.00	5.0%	ϑ=100.0 g
C6	0.00	1	>=18.00	>=10.00	0.00%	/
ELEMENT N° 48/60						

MATERIAL TABLE

Shotcrete
C20/25
– Average compressive strength after 48h > 1.3N/mm²;
– The shotcrete must be reinforced with electrowelded wire mesh #6 15x15cm in B450C steel or steel fibers with low carbon content.
Energy Consumption> 500 joules (From punching tests performed on fiber–reinforced concrete pilates).
The tunnel face will be armed only with fiber.

Reinforcing steel
– B450C controlled by establishment:
fynom = 450 N/mm2
ftnom = 540 N/mm2
fyk > fynom, fractile 5%
ftk > ftnom, fractile 5%
1.15 ≤ (ft/fy)k ≤ 1.35 fractile 10%
(fy/fynom)k ≤ 1.25, fractile 10%
Elongation (Agt)k > 7.5%, fractile 10%
– Weldable;
– Concrete cover: c=4cm ±20%.

Steel ribs
– Steel ribs consisting of two coupled sections HEB220 in S275 steel and stiffening brackets step 1.0m tolerance. Steel plates S275 and steel angles 60x60x10 for attaching chains.

Microfissured PVC Pipeline
– at base of waterproofing ø125mm, Th.>3mm (see DIN 1187)

Drainage PVC Pipeline
– for waste water, ø125mm, Th.>3mm (see DIN 1187)

Waterproofing
– Geotextile: polypropylene nonwoven fabric in continuos wire P>400g/mq
– PVC thermoplastic PVC waterproof membrane, Th.>2mm. Tensile strength >=15 N/mm².

Fibre Glass Structural Elements
– Consolidation with fibre glass structural elements ø60/40 and valves hardened cement mixtures (1valv./1.00m):
Density >= 19 kN/m;
Tensile strength >= 1000 MPa;
Shear strength >= 200 MPa;
Modulus of elasticity >= 40000 MPa;
Glass content >= 60%;
External diameter to fibre glass pipes ø60;
Joint (eventual): better seamless bars; if joint are present must be made for bonding with epoxy resins and screwing with steel sleeve;
Flat bars: 40 th.=6mm connected to the boudary at a 30mm PVC pipe; high adherence achieved with qarte sand

Expansive cement mixtures
– Typical composition:
Water: 1000 lt.
Cement: 42,5 Pt. 1340 kg
Bentonite: 40 kg
Sodium silicate: 10 kg
Aluminum paste: 1.5 kg
– Minimum requirements:
Free expantion ratio > 50%
Confined expantion pressure > 1.5 MPa
Semi–confined expantion pressure > 1.0 MPa
Minimum compressive strength (at 48 hours) and confined expantion > 5.0 MPa

TABELUL DE MATERIALE

Beton Torcretat
C20/25
– Rezistenta medie la compresiune dupa 48h > 1.3N/mm².
– Betonul torcretat trebuie armat sudat cu plasa de sarma ø6 15x15cm in B450C otel sau fibre de otel cu continut scazut de carbon.
Consumul de energie > 500 jouli (De la testul de perforare efectuat pe placi din beton armat).
Fata tunelului va fi armat numai cu fibre.

Cosnolidare cu otel
– Densitate > 19 KN/mc;
– Rezistenta la rupere> 950 MPa
– Rezistenta la forfecare > 140 MPa
– Modulul de elasticitate > 15000 MPa
– Continutul > 60% glass
– n°3 placi L=40mm th.>7mm conectate prin distantieri la o conturata PVC cu ø20mm pentru filtre de injectie.
– Aderenta sporita cu nisip de cuart rasina de nisip

Nervura de otel
– Nervurile de otel constau in doua sectiuni cuplate HEB220 in S275 otel si coarte de otel rigidizate cu toleranta de 1.0m±20% Placi de otel S275 unghiuri de otel 60x60x10 pentru atasarea lanturilor.

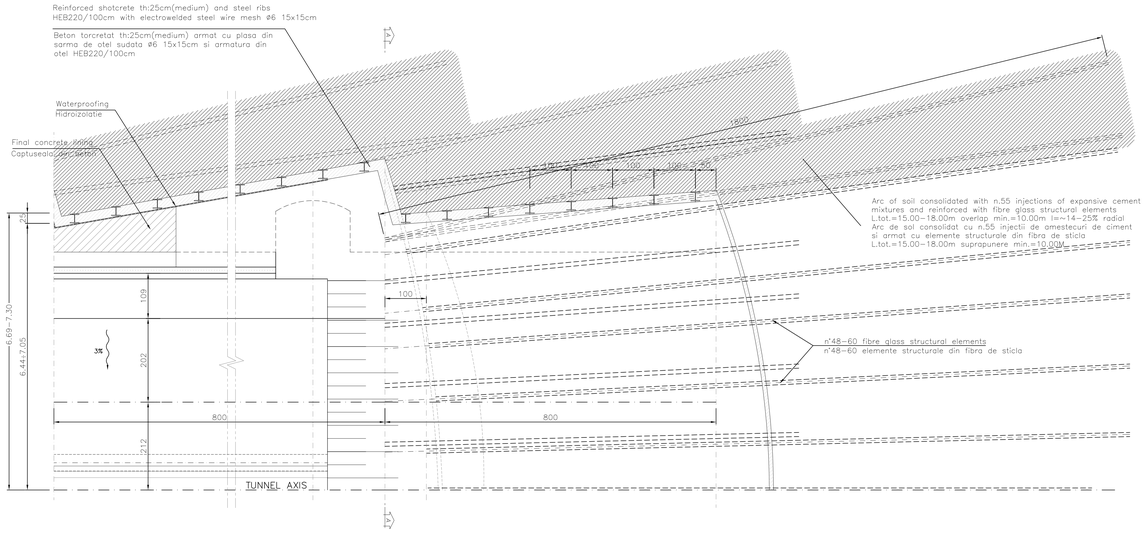
teava microcracata PVC
– la baza hidroizolatiei ø125mm, Th.>3mm (vezi DIN 1187)

Teava PVC pentru drenaj
– fpentru o apa deja folosita ø125mm, Th.>3mm (vezi DIN 1187)

Hidroizolatia
– Geotextil: polypropylena din material netesut in fir continuu P>400g/mq
– PVC: PVC termoplastic cu membrana impermeabila, Th.>2mm. Rezistenta la rupere >=15 N/mm²

Elemente structurale din fibra de sticla
Consolidarea cu elemente structurale din fibra de sticla ø60/40 si valve amestec din ciment intarit (1valv./1.00m):
– Densitate > 19 KN/mc;
– Rezistenta la rupere> 1000 MPa
– Rezistenta la forfecare > 200MPa
– Modulul de elasticitate > 40000 MPa
– Continutul > 60% sticla
diametrul exten of conductei din fibra de sticla ø60;
Imbinarea (eventual): mai bine fara sudura; daca imbinarile sunt prezente trebuiesc realizate pentru lipirea cu rasini epoxidice si racordi cu manson de otel.
Bare plate: 40 th.=6mm conenctat la limita a 20mm din conducta PVC, aderenta ridicata o obtinem cu gort din nisip
Amestecuri in ciment expansiv
– Componite tipice:
apa 1000 lt.
Ciment: 42,5 Pt. 1340 kg
Bentonite: 40 kg
Sodium silicate: 10 kg
Aluminum paste: 1.5 kg
– Cerinte minime:
raportul liber de expansiune > 50%
presiunea confirmata de expansiune > 1.5 MPa
Semi–confined expantion pressure > 1.0 MPa
rezistenta minima la rupere (at 48 hours) and confined expantion > 5.0 MPa

SECTION C–C
SECTIUNEA CURENTA C–C
Scale/Scara 1:50



Index	Data / Date	Modificare / Modification/Revision	Proiectant / Designer	Aprobat Consultant / Approved Consultant	Aprobat CFR / Approved CFR
D					
C					
B					
A					

GUVERNUL ROMANIEI / ROMANIAN GOVERNMENT
PROIECT FINANȚAT DE UNIUNEA EUROPEANĂ / EUROPEAN UNION FINANCED PROJECT

C.N.C.F. "C.F.R." - S.A.

CLIENT / CLIENT

ITALFERR (Gruppo FERROVIE DELLO STATO) Joint Venture leader
Scott Wilson
OBERMEYER PLANEN + BERATEN GmbH
TECNIC Consulting Engineers

CONSULTANT / CONSULTANT

			Data / Date	Semnătură / Signature
Aprobat / Approved	Şef proiect / Project manager	R. Liuzza		
Aprobat / Approved	Coordonator Secţiune 1 / Section 1 Coordinator	C.Gambelli		
Verificat / Checked	Tunel Expert / Tunnel Expert	C. Gambelli		
Întocmit / Elaborated	Proiectant / Designer	C.Gambelli		

SUBCONSULTANT / SUBCONSULTANT

Aprobat / Approved	Responsabil Subconsultant / Subconsultant Responsible			
Întocmit / Elaborated	Proiectant / Designer			

Reabilitarea liniei de cale ferata Braşov - Simeria, parte componentă a coridorului IV Pan European, pentru circulaţia trenurilor cu viteza maximă de 160 km/h.
Secţiune 1 Brasov - Sighisoara

Rehabilitation of the railway line Braşov - Simeria, component Part of the IV Pan-European Corridor, for the trains circulation with maximum speed of 160 km/h.
Section 1 Brasov - Sighisoara

Proiect/Project
2004/RO/16/P/PA/003

Faza / Phase: P.Th. / T.D.

Denumire desen / Drawing Title : **ARCHITA 1 TUNNEL**
NATURAL TUNNEL
Section type "C3"' with and without niches - Excavation and consolidation sections
Sectiunea tip "C3"' cu si fara nise - Sectiuni de excavatie si consolidare

Codificare / Codification System: E A 5 1 | 0 1 | C | 1 4 | B B | G N | 0 3 | 0 | 0 | 0 0 1 | 0

Scara / Scale: **variat / various**

LOT

Nr. / No: -