1. EXISTING SITUATION

Brasov Station

Object 02. Platforms

There are five platforms in the station having the following dimensions:

- Platform at track 1 with a length L = 439,50m variable width l = 2,95 ÷ 5,70m and the elevation with respect to the existing SUL ranging between +0,00m and +0,50m
- Intermediary platform between tracks 2-III with a length L = 485,85m, variable width l = 6,86m ÷ 8,63m and the elevation with respect to the existing SUL ranging between +0,14m and 0,39m
- Intermediary platform between tracks IV-5 with a length L = 370,80m, variable width l = 2,23m ÷ 8,60m and the elevation with respect to the existing SUL ranging between +0,06m and +0,38m
- Intermediary platform between tracks 6-7 with a length L = 374,00m, variable width l = 4,15m ÷ 8,48m and the elevation with respect to the existing SUL ranging between +0,00m and +0,26m
- Intermediary platform between tracks 7-8 with a length L = 258,70m, variable width l = 4,00m ÷ 4,85m and the elevation with respect to the existing SUL ranging between +0,12m and +0,27m

The platforms are built in simple concrete foundation system and prefabricated border stones towards the railway track, and for the rest, compacted filling, cast-in-place concrete slab and hard-wearing asphalt layer.

Object 03. Canopies

There are three canopies with the following dimensions:

- Canopy at the intermediary platform between tracks 2-III with a length L = 132,00m and variable width l = 8,10m ÷ 8,20m
- Canopy at the intermediary platform between tracks IV-5 with a length L = 70,00m and variable width l = 8,15m ÷ 8,50m
- Canopy at the intermediary platform between tracks 7-8 with a length L = 70,00m and variable width l = 8,10m ÷ 8,50m

The canopies are made of column-type reinforced concrete and thin sheets.
Infiltration areas caused by rainwater are noted at the existing canopies, due to both the degradation of the cover and the drainage columns for draining rainwater from the cover of the canopies, which are partially broken, rusty and clogged. The consequence of this degradation is a partial deterioration of the reinforced concrete elements of the canopy: columns, slabs.

The readjustment of the the railway tracks axis from the BRASOV Station allows the maintaining of the existing canopies, with compliance to the gauge in conditions of proper retracing of the platforms. But the rehabilitation of these canopies is imposed.

Object 04. Pedestian tunnel

The existing pedestrian tunnel ensures access for passengers from the platform corresponding to the passenger building to the platforms between the tracks 2-III, IV-5 and 7-8 by means of two access staircases and it stretches underneath all the tracks from the station, having an exitway covered with two staircases.

The flooring of the tunnel is made of floor tiles, the walls are laid with travertine and the ceiling is painted with washable paint; the stairs are laid with granite tiles.

- The length of the tunnel serving the platforms is L = 85,00m and the width is l = 5,85m.
- The length of the tunnel from the intermediary platfowm between tracks 7-8 and the station exit is L = 63,00m and the width is l = 2,95m.
- The height of the pedestrian tunnel is 2,50m, and in the staircase zone is of 3,75m and 4,20m.

Object 08. Protection fence between tracks

The existing protection fences are constructed between:
- tracks 1-2 with a length L = 468,50m
- tracks III-IV with a length L = 346,00m
- tracks 5-6 with a length L = 302,00m

These are made of panels built with metallic profiles and they are in a fairly advanced state of decay.

Brasov- Stupini Interval

Stupini Station

Object 01. Passenger station

Work characteristics:	Development and consolidation of the building respecting the norms in force;
Structure:	Structure made of unconfined bearing masonry, reinforced concrete slab over the ground floor, slab over the 1st floor and reinforced concrete staircase;

Importance category: According to H.G. 766-oct 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);

Importance class: According to Code P100 (seismic proof design), the importance class is III

Fire resistance degree: According to Code P118, the building belongs to fire resistance degree V,

Fire risk category: According to Code P118-99, the fire risk from operational point of view is low.

According to OMT 290/2000 Risk class 2B

The passenger building has a structure consisting of unconfined bearing masonry, reinforced concrete slab over the ground floor, slab over first floor and reinforced concrete staircase. According to the geotechnical probing no. 12.2/845/12.2002, concrete foundation in good condition, width of foundation 0.60m, foundation elevation -2.12m with respect to SUL, bearing layer made of dusty sands with small, dry, thicksetted gravel which allow a conventional design pressure, as the base value P_{conv}=350kPa.

Object 02. Platforms

Platforms are built at elevations ranging between +0,10 and +0,25m with respect to the existing SUL and they are built in simple concrete foundation system and prefabricated border stones towards the railway track, compacted filling, cast-in-place concrete slab and hard-wearing asphalt layer. The dimensions of these platforms are:

- the intermediary platform between tracks 1-2 has a length L = 15,30m and width l = 1,75m
- the intermediary platform between tracks 3-4 has alength L = 15,10m and width l = 1,95m

These platforms are not satisfactory from service point of view, being in an advanced state of decay.

Stupini – Bod Interval

Bod Station

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, the one between tracks 3-4 made of precast concrete elements and the one between the tracks 1-2 finished with asphalt.
The platform is finished with asphalt in front of the passenger building.
The dimensions of these platforms are:

- The platform at track 1 has a length L =205,00m and a variable width l = 3,00 ÷ 8,50m
- The intermediary platform between tracks 1-2 has a length L = 197,00m and a variable width l = 1,50 ÷ 1,80m

- The intermediary platform between tracks 3-4 has a length L = 126,00m and width l = 1,75m

These platforms are inappropriate from service point of view, being in an advanced state of decay.
The platforms will be dismatled.

Bod – Feldioara Interval

Feldioara Station

Object 01. Passenger building

- No. of storeys : Partial basement + Ground floor + Floor
- Built surface : 350,00m^2
- Gross built area : 870,00m^2

Work characteristic: Development and consolidation of the building respecting the norms in force;
Structure: Structure made of unconfined bearing masonry, reinforced concrete slab over the ground floor, slab over the 1st floor and wooden stairway;
Importance category: According to H.G. 766-oct 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
Importance class: According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree: According to Code P118, the building belongs to fire resistance degree V
Fire risk category: According to Code P118-99, the fire risk from operational point of view is low
According to OMT 290/2000Risk class 2B

The passenger building is laid on the ground floor and first floor, with partial basement.
From functional point of view, the building comprises passenger spaces on the ground floor(waiting room, booking office), CED technological spaces (IDM office, CED relay room, batteries, TTR relay room, CED workshop, Dsitrict L room) and a dwelling having two rooms.
The first floor is entirely for railway staff housing, including two apartments with two and three rooms and a studio apartment.
The partial basement comprises technical spaces. The roof of the building is roof framing type, with ceramic tile covering, which requires replacement.
From the verifications performed on the building made on-situ and according to project no35-496-1978, the following have resulted:

The passenger building has been built in 1868, ground floor and first floor, on dressed stone masonry continuous foundations, bearing walls made of 56 and 18cm thick bricks, wooden floors and roof framing with covering made of fired clay tiles.
Since its execution up to the present day, a building has undergone a series of current repairs and a series of interior space development works necessary after the station's electrodynamic centralization, development works which did not aggravate the strength of the building.
Due to the earthquake from 4th of March 1977, the building has suffered a series of deteriorations at the walls and slab over the floor levels. Following these defects induced by the earthquake, the building was repaired, consisting of the following procedures: restoration of the collapsed wall and the restoration of of the slab as a temporary solution, remaining for additional measures to strengthen the building to be carried out.

Object 02. Platforms

There are three intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, two of them made of precast concrete elements and one finished with asphalt.
The platform is finished with asphalt in front of the passenger building.
The platforms have the following dimensions:

- The platform at track 1 has a length L =95,55m and a width l = 1,55m
- The intermediary platform between tracks 1-2 has a length L = 144,80m and a width l = 1,55m
- The intermediary platform between tracks 2-3 has a length L = 155,80m and a width l = 1,75m
- The intermediary platform between tracks 4-5 has a length L = 153,25m and a width l = 1,75m

These platforms are not satisfactory from service point of view, being in an advanced state of decay.

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramps
The warehouse existing in the building is fitted with a loading/unloading ramp constructed in a stone bearing wall-type system towards the railway track and compacted filling in the field.
The length of the ramp is L = 60,00m and the width l = 10,20m
The ramp will be dismantled.

Feldioara – Apata Interval

ROTBAV FLAG STATION

Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The platform at track 1 has a length L = 115,00m and a width l = 1,45m
- The platform at track 2 has a length L = 116,00m and a width l = 1,55m

VADU ROŞU FLAG STATION

MĂIERUŞ FLAG STATION – is disabled and it is moved to another site, on a new route

Maierus traction Substation

The traction substation in the Maierus Station provides the power supply for the contact line. The perimeter of the substation is restricted by a precast elements enclosure with a height of 2m and a total area of about 1822m^2.

The Rupea traction substation includes the following exterior constructions:

- 11m and 8m precast reinforced concrete frames for supporting the cables
- brackets and foundations for the electric fittings
- foundations and runways for I.U.P. switches
- foundations and runways for power transformers
- connection manhole for the returning feeder
- boxes for clamps
- manholes for the connection with the earth plate's belt
- cable raceways

Control room

Work characteristic:	Arrangement of the building for automatization respecting the norms in force
Structure:	The structure is made of non-confined bearing masonry, reinforced concrete floor for the accumulators and prefabricated strip-shaped elements on the rest of the surface
Importance category:	According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C)
Importance class:	According to Code P100 (seismic proof design), the importance class is III

Fire resistance degree: According to Code P118, the building belongs to fire resistance degree V
Fire risk category: According to Code P118-99, the fire risk from operational point of view is low
According to OMT 290/2000 Risk class 1A

Constructive system

The building (structure) is on the ground floor, being made of load-bearing masonry, hollow bricks (290x140x63mm format) for exterior walls and solid bricks (240x115x63mm format) for interior walls, a bituminous non-walk terrace roof, reinforced concrete floor slabs for the accumulators and prefabricated strip-shaped elements on the rest of the surface.

The foundations are continuous simple concrete foundations. The building is placed on a platform made of new filling (wastes and crushed rocks) having a 3m thickness. Reinforced concrete tie beam have been provided. The foundations are embedded in this filling and have been dimensioned so that a 1daN/cm^2 pressure at their base will not be exceeded.

Apata Station

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The intermediary platform between tracks 1-2 has a length L = 131,00m and a width l = 1,80m
- The intermediary platform between tracks 3-4 has a length L = 118,25m and a width l = 1,80m

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramp
A loading/unloading ramp is placed in the station towards the „x" end, made of a concrete retaining wall and compacted filling in the field, with a square building stone blanket.

- The length of the ramp is L = 70,00m and the width is l =10,00m

The ramp will be rehabilitated.

Apata – Racos Interval

ORMENIS FLAG STATION

AUGUSTIN FLAG STATION

Racos Station

Object 01. Passenger building

- No. of storeys	: Ground floor
- Built area	: 307,00+53,00= 360,00m^2
- Gross building area	: 360,00m^2
- Importance category acc. to HGR 766 / 1997(annex 3)	: cat. C (normal importance)
- Fire resistance degree acc. to P118/1999	: III
- Fire risk category acc. to P118/1999	: low

Functional description

Both the initial building and the extension are developed on the ground floor.

From functionality point of view, the building is formed from passenger spaces (waiting room, booking office, clinic), spaces for the railway staff (station manager's office, archives, offices, dormitory) and technological spaces (TTR room, SCB room, warehouses). The roof of the initial building is roof framing type, with roof tile covering, while the extension is covered with a platform roof.

Due to the systematization works undergone by the railway station, the building will be dismantled.

Racos – Cata Interval

MATEIAS FLAG STATION

Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.

These platforms have the following dimensions:

- The platform from track 1 has a length L = 49,00m and width l = 1,65m
- The platform from track 2 has a length L = 60,00m and width l = 1,75m

The platforms will be dismantled.

Rupea traction substation

The traction substation in the Rupea Station provides the power supply for the contact line. The perimeter of the substation is restricted by a precast elements enclosure with a height of 2m and a total area of about 1822m^2.

The Rupea traction substation includes the following exterior constructions:

- 11m and 8m precast reinforced concrete frames for supporting the cables
- brackets and foundations for the electric fittings
- foundations and runways for I.U.P. switches
- foundations and runways for power transformers
- connection manhole for the returning feeder
- boxes for clamps
- manholes for the connection with the earth plate's belt
- cable raceways

Control room

Structure:

The structure is made of non-confined bearing masonry, reinforced concrete floor for the accumulators and prefabricated strip-shaped elements on the rest of the surface

Importance category:	According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C)
Importance class:	According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree:	According to Code P118, the building belongs to fire resistance degree V
Fire risk category:	According to Code P118-99, the fire risk from operational point of view is low
Acc. to OMT 290/2000	Risk class 1A

Constructive system

The building (structure) is on the ground floor, being made of load-bearing masonry for exterior walls, hollow bricks (290x140x63mm format), solid bricks (240x115x63mm format) for interior walls, a bituminous non-walk platform roof, reinforced concrete floor slabs for the accumulators and prefabricated strip-shaped elements on the rest of the surface.

The foundations are continuous simple concrete foundations. Reinforced concrete tie beam have been provided for the upper part. The foundations have been dimensioned so that a 1daN/cm^2 pressure at their base will not be exceeded.

Cata Station

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The intermediary platform between tracks 1-2 has a length L = 30,30m and width l = 2,00m
- The intermediary platform between tracks 2-3 has a length L = 105,00m and width l = 2,00m

Due to the station being moved to another site and the excavation works carried out in this area, these platforms will be dismantled.

Cata – Archita Interval

PALOS ARDEAL FLAG STATION

Platforms
There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- Length L = 63,00m and width l = 1,65m

The platforms will be dismantled.

BEIA FLAG STATION

Platforms
There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The platform from track 1 has a length L = 150,00m and width l = 2,15m
- The platform from track 2 has a length L = 116,00m and width l = 2,15m

The platforms will be dismantled.

Archita Station

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The platform in front of the building has a length L = 26,00m and width = 5,00m
- The intermediary platform between tracks 1-2 has a length L = 140,00m and width l = 1,80m
- The platform at track 3 has a length L = 118,00m and width l = 2,00m

Due to the station being moved to another site and the track and excavation works carried out in this area, these platforms will be dismantled.

Archita – Vanatori Interval

FELEAG FLAG STATION

MURENI FLAG STATION

Platforms

There are two intermediary platforms in the flag station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The intermediary platform between tracks 1-2 has a length L = 121,00m and width l = 2,00m
- The intermediary platform between tracks 1-2 has a length L = 101,00m and width l = 1,80m

The platforms will be dismantled.

MURENI TRACTION SUBSTATION

The traction substation in the MURENI Station provides the power supply for the contact line. The perimeter of the substation is restricted by a precast elements enclosure with a height of 2m and a total area of about 2350m^2.

The Rupea traction substation includes the following exterior constructions:

- 11m and 8m precast reinforced concrete frames for supporting the cables
- brackets and foundations for the electric fittings
- foundations and runways for I.U.P. switches
- foundations and runways for power transformers
- connection manhole for the returning feeder
- boxes for clamps
- manholes for the connection with the earth plate's belt
- cable raceways

Control room

Structure:	Structure made of reinforced concrete frames and masonry enclosures, reinforced concrete floors for the accumulators and prefabricated strip-shaped elements on the rest of the surface

Importance category:	According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C)
Importance class:	According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree:	According to Code P118, the building belongs to fire resistance degree V
Fire risk category:	According to Code P118-99, the fire risk from operational point of view is low

According to OMT 290/2000Risk class 1A.

Constructive system

The building (structure) is on the ground floor, being made of reinforced concrete frames with masonry enclosures for the exterior walls, with hollow bricks (290x140x63mm format), solid bricks (240x115x63mm format) for interior walls, a bituminous non-walk terrace roof, reinforced concrete floor slabs for the accumulators and prefabricated strip-shaped elements on the rest of the surface.

Vanatori Station

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, made of precast concrete elements.
These platforms have the following dimensions:

- The intermediary platform between tracks 1-2 has a length L = 167,30m and width l = 1,70m
- The intermediary platform between tracks 3-4 has a length L = 178,00m and width l = 3,60m

Due to the station being moved to another site and the excavation works carried out in this area, these platforms will be dismantled.

Vanatori – Albesti-Tarnava Interval

Albesti-Tarnava Station

Object 01. Passenger building

- No. of storeys : Partial basement + Ground floor + Partial attic
- Built area : 200,00m^2
- Gross building area : 430,00m^2

- Importance category
  acc. to HGR 766 / 1997(annex 3) : cat. C (normal importance)
- Fire resistance degree acc. to P118/1999 : III
- Fire risk category acc. to P118/1999 : low

The passenger building is set up on the ground floor and the attic with partial basement.
From functionality point of view, the building comprises at the ground floor the following spaces: passenger spaces (waiting room, booking office), technological spaces for CED (IDM office, CED relay room, electromechanic room, TTR room) and station manager office.
A two room apartment for railway staff is located on the first floor.
The partial basement comprises storage spaces. The roof of the building is roof framing-type, with deteriorated roof ceramic tiles, which requires replacement.
The passenger building from Albesti-Tarnava has a structure made of non-confined bearing masonry, reinforced concrete slab over the ground floor and first floor and reinforced concrete staircase. Most of the building was constructed having a basement, being orientated towards Brasov.
From the data and measurements obtained from boring no. 12.2/825/november 2002 the deduction of the following was possible:
- The foundation was made from concrete and it is in good condition;
- Width of foundation 0.70m;
- Foundation elevation -3.00m from SUL;
- The bearing layer consists of dusty sand with scarce gravel, consistent plastic;
- Water was not encountered during the boring;
- The bearing layer consisting of dusty sand with scarce gravel, consistent plastic, admits a design conventional pressure, as a base value, P_{conv}=250Kpa, according to STAS 3300/2-85.

The exisiting passenger building will be rehabilitated.

Object 02. Platforms

There are two intermediary platforms in the station at +0,00m elevation with respect to the existing SUL elevation, one of the made of precast concrete elements and one finished with asphalt. The platform is finished with asphalt in front of the building.
These platforms have the following dimensions:

- The platform from track 1 has a length L =153,00m and width l = 3,80m
- The intermediary platform between tracks 1-2 has a length L = 165,00m and width l = 3,00m
- The intermediary platform between tracks 3-4 has a length L = 149,00m şi lăţime l = 1,35m

These platforms are not satisfactory from service point of view, being in an advanced state of decay.
The platforms will be dismantled.

Object 04. Pedestrian tunnel

The existing underground pedestrian tunnel is constructed towards the end xxxxxxxx at the 293+825,14 km. It crosses the railway tracks from the station, connecting the residential zones located on both sides of the railway tracks, without having contact with the platforms.
The reinforced concrete tunnel has unfinished flooring, walls and staircases; the access stairs are covered with metal sheets on a metallic structure suffering from advanced decay.

- The length of the pedestrian tunnel is L = 47,45m and the width is l = 2,00m.
- The height of the pedestrian tunnel is 2, 40 m.

The undergroung pedestrian tunnel will be rehabilitated.

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramps
A loading/unloading ramp is fitted in at track 5 in the station constructed in a stone bearing wall-type system towards the railway track and compacted filling in the field.

- The length of the ramp is L = 211,00m and the width l = 3,00m

The ramp will be dismantled.

Albesti-Tarnava - Sighisoara Interval

Sighisoara Station

Object 02. Platforms

There are four platforms in the station, having the following dimensions:

- Platform at track 1: in front of the station with a length L = 78,00m, variable width l =3,90m ÷ 4,30m and elevation with respect to the exisiting SUL ranging between +0,46m and +0,57m and towards the ”y” end with a length L = 185,00m, variable width l =1,30m ÷ 2,45m and elevation with respect to the existing SUL ranging between +0,00m and +0,17m
- Intermediary platform between tracks II-III with a length L = 385,00m, variable width l = 4,60m ÷ 6,45m and elevation with respect to the existing SUL ranging between +0,00m si +0,39m
- Technological platform between tracks III-4 with a length L = 300,00m, variable width l = 1,40m ÷ 1,80m and elevation with respect to the existing SUL ranging between +0,00m si +0,17m
- Technological platform between tracks 4-5 with a length L = 290,00m, variable width l = 1,40m ÷ 1,50m at elevation +0,00m with respect to the existing SUL

- Technological platform between tracks 5-6 with a length L = 83,00m, width l = 1,25m at elevation +0,00m with respect to the existing SUL

The platform in front of the station is built in simple concrete foundation system and prefabricated border stones towards the railway track, and for the rest, compacted filling, cast-in-place concrete slab and putty.
The platform at track 1 towars „y" end is made from precast concrete elements.
The intermediary platform between tracks II-III is built in simple concrete foundation system and wide, prefabricated border stones towards the railway track, and for the rest, compacted filling, cast-in-place concrete slab and hard-wearing asphalt layer
The technological platforms between tracks III-4 and 4-5 si 5-6 are made from precast concrete elements.
These platforms are not satisfactory from service point of view, being in an advanced state of decay.
The platforms at track 1 and tracks II-III will be rehabilitated.
The technological platforms between tracks III-4 and 4-5 and 5-6 will be dismatled.

Object 03. Canopies

There is a canopy in the station at the intermediary platform between tracks II-III with the following dimensions: length L = 149,30m and width l = 6,00m.
The canopy is made from reinforced concrete and metallic columns, with heat-sealable waterproofing membrane covering; drainage of rainwater is done through sheet-metal gutters and downspouts connected to the sewerage system.
It shows infiltrations, being in an advanced state of decay.
The canopy will be rehabilitated.

Object 04. Pedestrian tunnel

The existing pedestrian tunnel ensures access for passengers between the platform at the passenger building and the platform between tracks II-III by means of two access staircases and it continues underneath all tracks with an exitway covered with an exit staircase.
The flooring of the tunnel is made of mosaic tiles, the walls are tiled with glazed ceramic tiles and the ceiling is coated with regular paint; the stairs are made from mosaic.
The length of the tunnel is L = 76,90m and the width l = 2,95m.
The height of the pedestrian tunnel is 2,50 m.
The pedestrian tunnel presents water seepage and highly decayed finishings.
It shall be rehabilitated.

Object 08. Protection fence between tracks

The protection fence is built between tracks 1-II and has a length L = 300,00m
It is made from wire mess panels and it is in an advanced state of decay.
The protection fence between tracks will be dismantled.

2. DESIGNED SITUATION

Brasov Station

Climatic conditions: the characteristic snow load at soil level according to CR 1-1-3-2005 is s0,k = 2,0 kN/m2; the reference wind pressure according to NP-082-2004 is 0,4 kPa , and the velocity between 31 ÷ 35 m/s.
Seismic conditions: Control period (corner) Tc=0,7s and ag=0,20g ; according to the P100-1/2006 Norm.

Object 01. Passenger building

There are no designed works for the passenger building.

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- the platform at track 1: 451m long, 2,90 – 5,70m variable width, with the height at the superior level of the track 1 track rail h=0,55m.
- the intermediary platform between tracks 2 and 3: 451m long, 5 – 8,60m variable width, with the height with respect to the superior level of the track 2 track rail h=0,55m.
- the intermediary platform between tracks IV and 5, with the length L=352m, variable width 3,00-8,65 m and the height from the superior level of the track IV track rail h=0,55m;
- the intermediary platform between tracks VI and 7, with the length L=339m, variable width 5,86-8,55 m and the height from the superior level of the track VI track rail h=0,55m;
- the intermediary platform between tracks 7 and 8, with the length L=265m, variable width 4,60-6,55 m and the height from the superior level of the track VI h=0,38m;

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.
Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms..

The platforms from tracks 1, 7 and 8 will be executed using the following technology:
- The existing prefabricated border stones will be dismantled, the excavations will be carried out in longitudinal ditches using propping, according to the indicated cross-sections, respecting the railway gauge;
- The position of vertical elements is traced with respect to the railway axis;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed;
- after that the ballast layer will be compacted, on top of which the polyethylene foil is laid; after this phase the C16/20 reinforced concrete is poured followed by the laying of the asphalt.

The access ramps will be built at the ends of the platforms, according to the overall plan. Please be noted that in the case of the construction of all platform elements, the reference markers are SUL and the railway tracks axis.
All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

The platforms from tracks 2-3; IV-5; VI-7 will be executed using the following technology:

The following technology will be carried out:
- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two

pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	
	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** the actual dimensions and site are maintained;

R E H A B I L I T A T I O N O F C A N O P I E S

Rehabilitation works have been provided for the three canopies in the BRASOV railway Station

1. Will be fully rebuilt: the waterproofing system of the canopy and the draining system (gutters, downspots and collecting vents) for rainwater.
2. the structural frame of the canopies will be fully reviewed, considering the following:
   - checking of columns and of the reinforced concrete slab
   - restoration of the plastering and of the metal edges on the reinforced concrete columns
   - restoration of the decayed areas: exfoliated concrete, stained with rust, visible reinforcement etc.
3. Phasing and types of repair works for the decayed reinforced concrete of the canopies (acc. to the Specifications Book 4.7):
   a. Preparation of the r.c. support layer
   b. Crack repairing (injecting, filling the joints and sealing the cracks)
   c. Operations for protecting the corroded reinforcement bars

d. Restoration of decayed concrete surfaces with special mortars/concretes

e. additional consolidation measures (welding of reinforcement, concrete casting, fiber glass fabric)

4. The stated intervention measures will be adapted, as applicable, after the observation (by appropriate stripping) of the state of each canopy (and of each of its elements), and with the designers appraisal.

5. The following have been provided for the updating to modern standards:

- aluminium false ceilings and frontons
- decorative plastering for the columns of the canopies

Be noted that:

The rehabilitation works (capital repairs) may differ from case to case, and hidden works may appear (after appropriate stripping) - situation which can only be analyzed after exposing the waterproofing, exfoliation of plasterings and decayed concretes, stripping of platforms.

In order not to endanger the stability of canopies (foundations, columns, slabs, beams), during the works (to them and their corresponding platforms) it is recommended the development of appropriate timbering and solid metal propping of the canopy structure.

The clamping of the support elements (the support spacer) of the false aluminum ceilings on to the existing r.c. structure of the canopies will be done with dowels having a recommended dimension of ø8 - 60 mm ***(in order not to penetrate and damage the r.c. slab of the canopy).*** The spacing between dowels is established by the provider of the false aluminium band ceiling.

The maintenance of the railway gauge on the entire length of the canopies is important; the thickness of the package formed by the support spacer and the aluminium bands composing the false ceiling is of max. 8cm. This spacing will be respected on the entire length of the canopies, at the margin incident with the railway gauge.

No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground..
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 1317.6 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.

- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate.
The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 09. OCC Building

The new building will have Gf+1 storeys with plan dimensions of 30x24,7 and a 8.45m total height. The foundation is of reinforced concrete beams network type, with walls made from efficient bricks. For technological considerations, the concrete slab at ±0,00 elevation drops in some areas underneath this level, the continuity of the floor being done by means of a technological floor, and for reaching the finite elevation of the slab over the ground floor, another technological floor is used.

Brasov- Stupini Interval

Stupini Station

Climatic conditions: the characteristic snow load at soil level according to CR 1-1-3-2005 is $s_{0,k}$ = 2,0 kN/m^2; the reference wind pressure according to NP-082-2004 is 0,4 kPa , and the velocity between 31 ÷ 35 m/s.

Seismic conditions: Control period (corner) Tc=0,7s and ag=0,20g ; according to the P100-1/2006 Norm.
Geotechnical conditions:
According to: Geotechnical boring FTE 5 – STUPINI Station (theme data : ASTALROM / ITALFER)
Geotechnical boring FTE 5 has the following stratification:
- a vegetal soil layer was encountered at the surface (0.10 m)
- next, up to the depth of 3.20 m, there is a layer of brown, sandy
- further, up to the investigation depth (10.00 m), a loose horizon was intercepted consisting of grey, dusty sand with gravel, with medium puddling…..

Underground water depth level : - 1.50 m
The intercepted soils are described as:

High plasticity
Plastic consistent consistency state
A practically saturated moisture content
High compressibility

If, when carrying out works, it is noted that the borings in the project have not been performed precisely in the objective site, studies will be performed / supplimentary verification borings on the site of the structure, in order to determine if the data from the project borings are correct. If there are differences, the designed works will be adapted to the results of these test geotechnical studies (which can lead to additional costs).

Object 01. Passenger building

According to P100-3-2008 Code for seismic design "Regulations for the seismic evaluation of existing buildings", by applying the qualitative evaluation methods and checkings by rapid procedures of structural calculus, the following have resulted:
In the actual state, the building has a insufficient degree of seismic ensurance, $R<0,5=R_{min}$ and a high seismic risk, RsII, due to a composition not complying with the actual norms, din cauza unei alcatuiri neconforme cu normele actuale, as well as the materials from which it was built. After consolidation, the building will have R>0,5=Rmin and RsIII.

- Intervention solutions and rehabilitation works have been provided in order to restore and increase its horizontal load bearing capability by introducing some 25x25cm reinforced concrete tie columns, in all the corners of the exterior walls of the building, continued with 15cm reinforced concrete cladding for the foundation and 10cm for the entire length of the soldiers (ground floor and first storey);
- Checking and repairing the degradations observed in structural elements.

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal

	importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- Platform at track 1 : length of 100m, with a 3m width with the height from the superior level of the track rail h= 0,38 m

A 4,8m x 12,95m platform has been provided for an easy access to the station platform.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the whole surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** A new canopy with metal structure is provided at:

track 1: Length =8m; Width = 4m; in alignment

S T R U C T U R E D E S C R I P T I O N :

- Block foundations and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out (all along the platform and canopy) on which the foundation will be built .
- The completely metallic superstructure is made of: metallic poles with composite section (2U 26), cross beams with variable caisson section, longitudinal purlins made of rectangular-shaped pipe and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=8 m), the system of fastening to the cross beams was provided with oval-shaped holes. The canopy covering is made of corrugated steel sheet protected on both sides. A longitudinal gutter was provided all along the canopy and also discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project; the beam will be connected to the pole by welding on site (positioned with mounting screws), then the deteriorated protection layers will be remade in certain points.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis (track 1), the canopy axis and the ±0.00= designed SUL (track 1):

a. the longitudinal axis of the foundation for canopy poles is at 4,725m from the axis of track 1

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the canopy axis as a reference mark; the tracing will be done 3m left and 3m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for track 1

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platform, follow the longitudinal profile of the designed tracks.

3. The implementation of the railway gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Concrete platform for supporting the fire fighting water storage tanks

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness,

on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station

The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank

The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Valves and metering cabin

The valves and metering cabin is made of C12/15 cast-in-place reinforced concrete and has the plan dimensions of 2,00x2,00m and h= 2,25m. The walls and the inferior slab have 25cm thickness, and the superior slab has a thickness of 10cm. The covering slab will be placed at 0,20m above the set-up terrain and it will have an embedded frame with a cast iron manhole cover. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The valves and metering cabin will be laid on a well compacted ballast bed of 15 cm thickness over which a 10cm thick concrete levelling underlay was previously poured.
The cabin will be placed on top of the borehole, making insulation with a 2cm bituminous mastic around the shaft necessary.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Typical I.S. shelter buildings

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 50cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system will be finalized when purchasing the containers.

Stupini – Bod Interval

Bod Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,20g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 2,0 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil
The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain.

Site conditions : The maximum freezing depth is of 110cm, according to STAS 6054-77.

Geotechnical conditions:
According to: **Geotechnical borehole FTE 9, FBO 1 and FBO 2** – BOD Station (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :
- la a vegetal soil layer was encountered at the surface (0.10 m)
- next, up to the depth of 2.50 – 4.50m, a cohesive horizon consisting of brown, dusty clay and clayey dust, ranging from soft plastic to consistent plastic. In boreholes FBO 2 and FTE 9 a filling layer has been intercepted up to the depth of 1.00 – 1.30m.
- further, up to the investigation depth (10.00m), a non-cohesive horizont consisting of brown, dusty sand, dusty sand with gravel and sand with gravel, with medium puddling, was encountered.

Underground water depth level : FTE 9 : - 2.20 m ; FBO 1 : - 1.30 m; FBO 2 : - 1.50 m

For the cohesive horizon – brown, dusty clay (dc)- situated above the underground water level, the intercepted soils can be characterized as follows:

With high plasticity
With the plastic consistent consistency state
A practically saturated moisture content
High compressibility

For the cohesive horizon – brown, dusty clay (dc) and clayey dust (cd) – situated underneath the underground water level, the intercepted soils can be characterized as follows:

With high plasticity
With plastic soft consistency state……..plastic consistent
A practically saturated moisture content
With high copressbility…… very high

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

The station building is a ground floor structure of rectangular shape, having dimensions of 13,40m x 41,00m , and the free interior height is 4,00m.
The structural frame is made of confined bearing masonry. Cast-in-place reinforced concrete tie columns, bounded to the masonry by means of horizontal reinforcement fitted in the joints, are provided at corners and wall intersections.
The floor consists of a cast-in-place reinforced concrete slab casted over the masonry by means of the general tie beam and a number of beams which compensates the local lack of retaining walls.
The wooden framework of the roof is rested on the walls or beams. A cantilever reinforced concrete canopy is fitted above the exit towards the “square”, being extended from the floor slab. The side facing the tracks, where the platform is located, is covered with a canopy with independent metallic structure.
An additional link of the walls by means of lintels (level elevations +2,10 or +3,00m) is provided, mainly on longitudinal direction of the building.
From technological requirements, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.
The foundations of the building consist of a network of crossed reinforced concrete bases in the form of tie beams embedded at the upper and lower part of the foundations.
The entire structure transmits loads to the ground by means of a compacted ballast bed extended on the whole contour, completely under the platform, as well as an the other three sides from the “square”.

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design) The importance class is III
Risk class:	1A according to OMT 290/2000

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- the platform at track 1: 150m long, 3m width which increases up to 6.05m in front of the building, with the height at the superior level of the track 1 track rail h=0,55m.
- the new intermediary platform, between tracks 1 and II, length L=250m, with width l= 6,05 m and the height at the superior level of the track 3 track rail h=0,55m.
- the new intermediary platform, between tracks III and IV, length L=250m, with width l= 6,05 m and the height at the superior level of the track IV track rail h=0,38m.

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL. The ramps will have the following characteristics:
- 10m length, 2,40m width and 5,5% and 3,8% slope

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform
The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall.

Intermediary platform track I-II
The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall.

Intermediary platform track III - IV
The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;

- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall.

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);

- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** A new canopy with metal structure is provided at:

track 1: Length =75m; Width = 5,90m; in alignment
track 1-II: Length =159m; Width = 5,90m; in alignment
track III-4: Length =159m; Width = 5,90m; in alignment

The direct foundation of the CANOPIES will be done in the brown, dusty clay and clayey dust, ranging from plastic soft to plastic consistent, on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical enginner is absolutely necessary, after performing the excavations/fillings (as the case may be).

S T R U C T U R E D E S C R I P T I O N :

- Block foundations and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out (all along the platform and canopy) on which the foundation will be built .
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), cross beams with variable caisson section, longitudinal purlins made of rectangular-shaped pipe and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves.
- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL;

a. the longitudinal axes of the foundation for canopy poles are midway from the distance between the axes of the designed railway tracks 1-II and III-4

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for track 1

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platform, follow the longitudinal profile of the designed tracks.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important; so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete

Importance category: according to H.G. 766/1997 – **C** (normal importance).

Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:

- at track 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.

The site water has an aggressive carbonic character.

Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.

The simple levelling concrete is C6/7,5.

The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.

Pumps are used for lowering the ground water level below the level of the excavation.

During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).

The excavation shall be done partly manually and partly mechanical. The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.

The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Mud separator (desilter) - earthworks
The mud separator will be mounted buried, at 5,00m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.
To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Bod – Feldioara Interval

Feldioara Station

Seismic conditions : the design seismic zone is characterized by the parameters:
a_g = 0,20g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter:
$s_{0,k}$ = 2,0 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil

The wind load zone is characterized by the perameter:

q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain.

Site conditions : The maximum freezing depth is of 110cm, according to STAS 6054-77.

Geotechnical conditions:

According to: **Geotechnical borehole FTE 18 – Feldioara Station** (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :

- la a vegetal soil layer was encountered at the surface (0.20 m)
- next, up to the depth of – 3.00m, a cohesive horizon consisting of brown, sandy clayey dust, rich plastic and dark dusty clay up to the -3.80 depth
- further, up to the investigation depth (10.00m), a grey, packed sand layer was encountered

Underground water depth level : FTE 18 : - 3.00 m

For the cohesive horizon – sandy clayey dust (scd) - situated above the underground water level, the intercepted soils can be characterized as follows:

With medium plasticity
With the plastic rich consistency state
A moist moisture content
High compressibility

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs

For the design railway run, general filling works with variable thicknesses (~1÷4m) are performed on the entire area of the station.

Object 01. Passenger building

According to P100-3-2008 Code for seismic design "Regulations for the seismic evaluation of existing buildings", by applying the qualitative evaluation methods and checkings by rapid procedures of structural calculus, the following have resulted:
In the actual state, the building has a insufficient degree of seismic ensurance, R<0,5=R_{min} and a high seismic risk, RsII, due to a composition not complying with the actual norms, din cauza unei alcatuiri neconforme cu normele actuale, as well as the materials from which it was built. After consolidation, the building will have R>0,5=Rmin and RsIII.
Intervention solutions and rehabilitation works have been provided in order to restore and increase its horizontal load bearing capability by:

The slab over the basement will be consolidated using masonry arches supported by rail-type profiles (gunite mortar reinforced plastering will be applied with small aggregates over the intrados of the slab and around the rail profiles the slab will be consolidated with INP30 profiles embedded in the masonry);
The existing foundation of the two building frontons (down to the inferior elevation) will be consolidated, by 20cm thick reinforced concrete coverings;
The consolidation (of the two frontons) of the walls will be continued by 12cm thick reinforced concrete covering on the entire height of the upright(ground and first floor);
Both facades will be consolidated by 6cm reinforced concrete covering of the embrasure located between the window openings;
For the load-bearing partition walls from the first storey supported directly on the slab, IPN30 metallic profiles for sustaining these walls shall be introduced.
If hidden structural works appear during the consolidation works, the designer will be consulted.

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000..

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- the platform at track 1: 100m long, 3m width which increases up to 6.05m in front of the building, with the height from the superior level of the track 1 track rail h=0,38m.
- the new intermediary platform, between tracks 2 and III, length L=250m, with width l= 6,00 m and the height from the superior level of the track II track rail h=0,55m.
- the new intermediary platform, between tracks IV and 5, length L=250m, with width l= 5,95 m and the height at the superior level of the track 4 track rail h=0,38m

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL. The ramps will have the following characteristics:
- 10m length, 2,40m width
- 7m length, 2,40m width

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,30m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall

Intermediary platform track 2-III

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,30m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;

- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

Intermediary platform track IV – 5 :

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,8m from the newly designed railway axis towards track III and at 1,75m towards track 4, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards track III track at a distance of 2,35m and at a distance of 2,30m towards track 4;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98%

compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done partially in the general filling (the railway earth platform – see railway infrastructure works), and partially (in the areas of tracks III, IV,5) in the cohesive horizon consisting of brown, dusty clay and clayey sandy dust, rich plastic, on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical enginner is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** A new canopy with metal structure is provided at:

  track 1: Length =75m; Width = 5,90m; in curve
  track 2-III: Length =159m; Width = 5,90m; in curve
  track IV-5: Length =159m; Width = 5,20m; in curve

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal with caisson cross-section(2u) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the

bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves. GTC-type transversal beams adapted to the width of the canopies are used for the canopies placed on curves (see general layout plan for station canopies)

- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are placed according to the plan (which takes anto account the speed and the gauges on curve)

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete

Importance category: according to H.G. 766/1997 – **C** (normal importance).

Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:

- at line 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
On the side towards track 4 ,the excavation, done vertically, is propped with metal sheet piles anchored at the upper side to the tracks of the railway. Otherwise, the excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramp – serves as an intermediary point for handling goods where the railway transport is switched to road transport and vice versa. For ensuring the link between the two means of transportation, the elevation mark of the embankment is +1,12m with respect to the upper level of the railway track. A 1% draining slope shall be ensured towards the "square". The collecting this water may be achieved by connecting to a local water drainage system. The ramp is connected to the road access area by an inclined plane havin a maximum 9% slope.
The composition of the structural frame is the following:

– on the entire contour of the ramp, including the sides of the connection to road access zone, a retaining wall made of precast reinforced concrete elements will be built, function on the 1,725m compulsory distance from the railway axis. The founding elevation for foundations is -1,31 m with respect to S.U.L., the retaining wall being built on a simple concrete leveling layer, cast on to a ballast bed;

– inside the enclosure thus created, from the level of the developed ramp or of the existing filling, a completion earth filling having min. 98% compaction is built as a support layer for the ramp covering and for the inclined connection plane;

– the covering is executed using a 23cm thick reinforced road concrete layer, laid over a 20cm well compacted filter bed;
– a pedestrian staircase is provided at the end opposite to the road access connection;
– a protection railing is provided on the entire contour, except for the road access and the unloading side from the railway.

Concrete platform for supporting the fire fighting water storage tanks – 2 pieces

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station

The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.

The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank
The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Mud separator (desilter) - earthworks
The mud separator will be mounted buried, at 4,80m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.
To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.
Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Typical I.S. shelter buildings

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 50cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system will be finalized when purchasing the containers.

Feldioara – Apata Interval

ROTBAV Flag Station

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track I : length of 150m, with a 3m width with the height from the superior level of the track I track rail, h= 0,38 m
- platform at track II : length of 150m, with a 3m width with the height from the superior level of the track II track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,30m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;

- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 04. Pedestrian tunnel

Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 and 2 by a staircase with a width of 1.90m, orientated parallel to the platforms, and covered with the metallic canopy.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, closed, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

VADU ROŞU FLAG STATION

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track I : length of 150m, with a 3m width with the height from the superior level of the track I track rail, h= 0,38 m
- platform at track II : length of 150m, with a 3m width with the height from the superior level of the track II track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 04. Pedestrian tunnel

Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 and 2 by a staircase with a width of 1.90m, orientated parallel to the platforms, and covered with the metallic canopy.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

MĂIERUŞ FLAG STATION

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

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In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
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Foundations for lamp posts

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Platform railings

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	In slope
	For stairways
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Object 04. Pedestrian tunnel

Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

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- at line 1 and 2 by a staircase with a width of 1.90m, orientated parallel to the platforms, and covered with the metallic canopy.
The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
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Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.

The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Maierus traction Substation

Control room

According to Code P100-3-2008 for seismic proof design - „Provisions for seismic assessment of existing buildings", by applying the quality evaluation methods and rapid calculation methods for structural design, the following have resulted:
In the actual form, the building has a seismic safety degree R>0,5=Rmin and a high seismic risk RsIII, due to its structure not complying with the existing norms, as well as the materials from which it was built.
Cheking and repairing solutions for noted degradations of the structural elements are provided.
A part of the existing cable channels will be dismantled and demolished without affecting the existing foundation and new simple concrete cable channels with striated caps will be built.
The existing reinforced concrete tie beam of the foundation will not be affected during the demolition and construction of the new cable channels.

Exterior constructions

By modernizing electric power supply network of the contact line, the inside chamber of the traction substation is proposed to be fitted in regard to the construction works. Thus, all the exterior constructions (concrete brackets for the electric fittings, supports for the bar frame, foundations for boxes for clamps) will be dismantled.
New exterior constructions are provided for installing the new brackets supporting the electrical equipment, manhole chimney, new foundations for electrical transformers, boxes for clamps, encase for the returning feeder, 110kV switch, pumping station, oil separator (expeller) and also for the various cable raceways.

Foundations for supports

The foundations of the cast-in-place supports are made of C12/15 class reinforced concrete.
To avoid the high frequency of maintainance works, the use of SCA-type centrifugated reinforced concrete supports was chosen, remaining for the required depth to be achieved by the depth of the pole hole.
In terms of plan dimensions, the foundation is block-type with dimensions of 1,20x1,20 x 1,20m.

Foundations for equipments

The foundations for equipments are made of C12/15 cast-in-place reinforced concrete with different dimensions depending on the requirements of the equipments associated with them.
They are placed on a 20cm thick well compacted ballast bed.

Foundations for transformers
The foundations for transformers are made of C20/25 cast-in-place reinforced concrete having a box shape, with drain holes to direct the oil leaked from the transformers towards the oil and hydrocarbon expeller.

Cable raceways
Two types of cable raceways were provided for this project in terms of plan dimensions: 0,80x1,20m and 1,20x1,20m with a 15cm thickness of the walls and will be made precast, from C25/30 class reinforced concrete. The raceways will be covered with reinforced concrete slabs made of 8cm thick precast elements modulated by plan dimensions of 1,04x0,245m and 1,29x0,245m.

Site enclosure
The enclosure made of precast reinforced concrete elements shall be done on the entire length of the site.

Other elements
The runways of the transformers will be replaced according to the afferent drawn plans.
The clamping elements of the reinforced concrete frames will be replaced according to the presented details.

Category and class of importance
According to the seismic proof design Code P100/1-2006, part I, the importance class is III and according to the Government Resolution 766/97 (H.G. 766/97) for approving some regulations for quality in constructions, the importance category is C – normal.

Apata Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,20g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil;
The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain;

Site conditions : The maximum freezing depth is of 110cm, according to STAS 6054-77

Geotechnical conditions:

According to: **Geotechnical borehole FTE 28, FTE 29, FAP 1 and FAP 2 – Apata Station** (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :

- la a vegetal soil layer was encountered at the surface (0.30 m) in boreholes FAP 1, FAP 2 and a filling layer was found in boreholes FTE 28 and FTE 29 (0.90 - 1.20 m)
- next is, up to the depth of 2.30 – 5.30m, a cohesive complex consisting of brown, dusty clay and clayey sandy dust
- after which, a non-cohesive sand with gravel horizon with gravel was encountered, with medium puddling……puddled, up to 5.80 – 8.00m
- further, up to the investigation depth (10.00m), a grey marley clay horizon was intercepted

Underground water depth level : between 1.20 – 2.60 m

For the cohesive horizon – brown, dusty clays (dc) - situated above the underground water level, the intercepted soils can be characterized as follows:

With medium plasticity……high
With the consistent consistency state
A practically saturated moisture content
High compressibility

For the cohesive horizon – brown, dusty clays (dc) - situated under the underground water level, the intercepted soils can be characterized as follows:

With medium plasticity……high

For the designed railway lay-out, general filling works with variable thickness (~1÷4m) shall be carried out on the entire area of the station.

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

The station building is a ground floor structure of rectangular shape, having dimensions of 13,40m x 41,00m , and the free interior height is 4,00m.
The structural frame is made of confined bearing masonry. Cast-in-place reinforced concrete tie columns, bounded to the masonry by means of horizontal reinforcement fitted in the joints, are provided at corners and wall intersections.
The floor consists of a cast-in-place reinforced concrete slab cast over the masonry by means of the general tie beam and a number of beams which compensates the local lack of retaining walls.

The wooden framework of the roof is rested on the walls or beams. A cantilever reinforced concrete canopy is fitted above the exit towards the "square", being extended from the floor slab. The side facing the tracks, where the platform is located, is covered with a canopy with independent metallic structure.
An additional link of the walls by means of lintels (level elevations +2,10 or +3,00m) is provided, mainly on longitudinal direction of the building.
From technological requirements, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.
The foundations of the building consist of a network of crossed reinforced concrete bases in the form of tie beams embedded at the upper and lower part of the foundations.
The entire structure transmits loads to the ground by means of a compacted ballast bed extended on the whole contour, completely under the platform, as well as an the other three sides from the "square".

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- platform at track 1 : length of 150m, with a 3m width which increases front of the station and the tunnel to 6.05m, with the height from the superior level of the track 1 track rail, h= 0,55 m
- the new intermediary platform, between tracks 1 and II : length L=250m, with a variable width ranging between l=5,95 – 6,29m, with the height with respect to the superior level of the track 1 track rail, h= 0,55 m
- the new intermediary platform, between tracks III and 4 : length L=250m, with a variable width ranging between l=5,95 – 6,53m, with the height with respect to the superior level of the track 4 track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.

The ramps at the three platforms will have the following characteristics:
- 10m long, 2,40m wide;
- 7m long, 2,40m wide;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,30m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform track 1 – II :

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted at a distance of 2,30m towards the track;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

Intermediary platform track III – IV :

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,80m from the newly designed railway axis towards track III and at 1,75m towards track 4, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted at a distance of 2,30m towards track III and 2,35m towards track 4;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.

The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	
	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done in the general filling (the railway earth platform – see railway infrastructure works) on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical designer is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure are provided at:

track 1: Length =75m; Width = 5,90m; in curve
track 1-II: Length =159m; Width = variable 6,10 ÷ 5,50 m; in curve
track III-4: Length =159m; Width =variable 5,50 ÷ 6,10 m; in curve

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;

- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves. The variable width of the canopy (5,50÷6,10) was imposed by the distance between tracks; GTC-type transversal beams adapted to the width of the canopies are used (see general layout plan for station canopies);
- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are placed according to the plan (which takes anto account the speed and the gauges on curve)

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete
Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.

The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate.
The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.
- height of gate 1 500 mm

- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramp – serves as an intermediary point for handling goods where the railway transport is switched to road transport and vice versa. For ensuring the link between the two means of transportation, the elevation mark of the embankment is +1,12m with respect to the upper level of the railway track. A 1% draining slope shall be ensured towards the "square". The collecting this water may be achieved by connecting to a local water drainage system. The ramp is connected to the road access area by an inclined plane havin a maximum 9% slope.
The construction of the mentioned object is done on the site of an older ramp which no longer corresponds, both as plan dimensions and height, and as distance towards the newly designed railway route. Only the sections of the old ramp which prevent the building of the new structure are to be dismantled, preserving a large part of the necessary earth filling.
The composition of the structural frame is the following:

– on the entire contour of the ramp, including the sides of the connection to road access zone, a retaining wall made of precast reinforced concrete elements will be built, function on the 1,725m compulsory distance from the railway axis. The founding elevation for foundations is -1,31 m with respect to S.U.L., the retaining wall being built on a simple concrete leveling layer, cast on to a ballast bed;

– inside the enclosure thus created, from the level of the developed ramp or of the existing filling, a completion earth filling having min. 98% compaction is built as a support layer for the ramp covering and for the inclined connection plane;

– the covering is executed using a 23cm thick reinforced road concrete layer, laid over a 20cm well compacted filter bed;
– a pedestrian staircase is provided at the end opposite to the road access connection;
– a protection railing is provided on the entire contour, except for the road access and the unloading side from the railway.

Concrete platform for supporting the fire fighting water storage tanks

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in

metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station

The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.

The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.

The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.

In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank

The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.

Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Apata – Racos Interval

ORMENIS Flag Station

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), the importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track I : length of 150m, with a 3m width with the height from the superior level of the track I track rail, h= 0,38 m
- platform at track II : length of 150m, with a 3m width with the height from the superior level of the track II track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,75m towards track I and 1,8m towards track II from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,30m, respectively 2,35m towards track II; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing In slope For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

ORMENIS Tunnel
GSMR Shelter building

Work characteristic:	Construction of the technological foundation necessary for the shelter building
Structure:	Continous concrete foundation under the 6 shelter buildings
Importance cathegory:	According to H.G. 766-oct 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance cathegory (C).
Importance class:	According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree:	According to Code P118, the building belongs to fire resistance degree V

Fire risk category: According to Code P118-99, the fire risk from operational point of view is low

According to OMT 290/2000Risk class 2B

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 50cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system will be finalized when purchasing the containers.

The containers will be protected by an enclosure consisting of a fence composed of self-bearing zinc-coated wire mesh panels (2510x2035) and metal zinc-coated pipe poles. The poles will be introduced in C8/10 class simple concrete foundations, laid on a well compacted ballast layer.

Racos Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,16g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil;

The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain; the velocity is between 31 ÷ 35 m/s

Geotechnical conditions: According to: **geotechnical boreholes FTE 36, FTE 37, FTE 38, FPR 1, FPR 2, FPR 3, FPR 4, FPR 5, FPR 6, FR1, FR2 – RACOS station** (theme data : ASTALROM / ITALFER)

Geotechnical borings have the following stratification:
- in all boreholes a filling layer was encountered (0.30 - 4.50 m), except for boreholes FPR 4 si FPR 2 where a vegetal soil layer was encountered (0.30 m)
- next is a complex formed from a alternation of cohesive and weak-cohesive soils(brown, soft plastic……strongly plastic dusty clay, sandy clay, clayey dust, clayey sandy dust, clayey sand) with non-cohesive soils (brown, yellowish-brown, yellowish clayey, medium thickseted……..thickseted) up to depths ranging between 2.50 – 6.80m. This is valid except for boreholes FR1, FTE 37, FPR 3 and FPR 5, in which this complex is found up to the base of the boreholes (10.00m)

- further, up to the investigation depth which ranges between 2.60 – 7.00m, the basic complex was intercepted (hard, greenish marl-limestone and marley limestone)
- underground water depth level : between 1.50 – 4.80 m

For the cohesive horizon – brown and yellowish-brown dusty clays (dc) and clayey sandy dusts (csd) – situated above the level of the underground water level, the intercepted soils are described as:

Medium plasticity
Soft plastic…thickseted plastic consistency state
A practically saturated moisture content
High compressibility

For the weakly-cohesive horizon – brownish-yellow, brown and yellowish-brown clays (c) and dusty clays (dc) – situated underneath the underground water level, the intercepted soils are described as:

Low...medium plasticity
Soft plastic…consistent plastic consistency state
A practically saturated moisture content
High…very high compressibility

For the cohesive horizon – clays (c) and dusty clays (dc), yellowish-brown, brown and brownish-yellow – situated underneath the underground water level, the intercepted soils are described as:

Medium…very high plasticity
Consitent plastic…thickseted plastic consistency state
Very moist…practically saturated moisture content
High…very high compressibility

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

A Station building having dimensions in plan of 36,40 x 13,00m and GF+1S number of storeys was provided for the RACOS Station. The building is built on a 1m thick well compacted ballast bed. The foundation solution consists of a beam network-type foundation, and the structural frame is composed of reinforced concrete beams and columns, with partition walls made from efficient bricks.

From technoilogical considerations, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track 1 : length of 150m, with a 3m width which increases in front of the station and the tunnel to 6.05m, with the height from the superior level of the track 1 track rail, h= 0,55 m
- the new intermediary platform, between tracks 1 and II, length L=250m, with width l= 6,05 m and the height from the superior level of the track 3 track rail h=0,55m
- the new intermediary platform, between tracks III and IV, length L=250m, with width l= 6,05 m and the height from the superior level of the track IV track rail h=0,38m

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.

The ramps at the three platforms will have the following characteristics:

- 10m long, 2,40m wide;
- 7m long, 2,40m wide;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm thick compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform track II – III :

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm thick compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted at a distance of 2,275m towards the track;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

Intermediary platform track IV – V :

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a 30cm thick compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles will be executed;

- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted at a distance of 2,275m towards the track;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space remaining between them is completed with cast-in-place C16/20 reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall;

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from

C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	
	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done (as the case may be); in the filling layer or in the complex formed by an alternance of cohesive and weak cohesive soils (dusty clay, sandy clay, clayey sand with gravel…) with non-cohesive soils (clayey sand with gravel, dusty sand with gravel…), on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical enginner is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure are provided at:

track 1: Length =75m; Width = 5,90m; in alignment
track 2-III: Length =159m; Width = 5,90 m; in alignment
track IV-5: Length =159m; Width = 5,90 m; in alignment

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves;
- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are placed midway between the railway axes of the 2-III respectively IV-5 designed tracks

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete
Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at track 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from track I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.

Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
On the side towards track 4 ,the excavation, done vertically, is propped with metal sheet piles anchored at the upper side to the tracks of the railway. Otherwise, the excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)
Concrete platform for supporting the fire fighting water storage tanks – 2 pieces

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station
The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast

iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank
The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Mud separator (desilter) - earthworks
The mud separator will be mounted buried, at 5,00m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.
To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Racos – Cata Interval

HOMOROD Tunnel
GSMR Shelter building

Work characteristic:	Construction of the technological foundation necessary for the shelter building
Structure:	Continous concrete foundation under the 6 shelter buildings
Importance cathegory:	According to H.G. 766-oct 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance cathegory (C).

Importance class:	According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree:	According to Code P118, the building belongs to fire resistance degree V
Fire risk category:	According to Code P118-99, the fire risk from operational point of view is low

According to OMT 290/2000Risk class 2B

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 50cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system will be finalized when purchasing the containers.

The containers will be protected by an enclosure consisting of a fence composed of self-bearing zinc-coated wire mesh panels (2510x2035) and metal zinc-coated pipe poles. The poles will be introduced in C8/10 class simple concrete foundations, laid on a well compacted ballast layer.

MATEIAS Flag Station

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), the importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track I : length of 150m, with a 3m respectively 6m width, with the height from the superior level of the track II track rail, h= 0,38 m
- intermediary platform, between tracks II - 3, length L=150m, with width l= 6,05 m and the height from the superior level of the track II track rail h=0,38 m
- platform at track 4 : length of 150m, with a 3m respectively 6m width, with the height from the superior level of the track I track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and 4 platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks 1-II

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;

- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;

- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm

- railing types:	In landing In slope For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 04. Pedestrian tunnel

Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from track I.
- at the intermediary platforms, by a staircase located on the axis of the platform, each having a 1,90m width.
The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, closed, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.
Three canopies shall be built for the newly designed pedestrian tunnel from the Mateias Station. The structure is made entirely of ironworks and it consists of two transversally fixed lattice girders with horizontal uprights in front of the joints from the upper part of the beam. The metal structure is made from rectangular pipes. the metal structure of the canopies will be clamped to the newly designed base which has a 30cm thickness, by means of structural steel cleats embedded in the concrete.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

PLATFORM PLAN FOR SEDIMENT SEPARATOR

(for the Pedestrian Tunnel – Mateias Flag Station)

The pedestrian tunnel of Flag station Mateias was equipped with a sediment separator (buried at +457.65), which will be placed on top of a concrete (C6/7.5) platform reinforced with Φ8 net at 20 cm.
The dimensions of the platform are 2.30 m x 2.50 m size and thickness 15 cm. Between the natural terrain and the platform there will be a layer of well compacted ballast with a thickness of 10cm.

Rupea traction Substation

Control room

According to Code P100-3-2008 for seismic proof design - „Provisions for seismic assessment of existing buildings", by applying the quality evaluation methods and rapid calculation methods for structural design, the following have resulted:

In the actual form, the building has a seismic safety degree R>0,5=Rmin and a high seismic risk RsIII, due to its structure not complying with the existing norms, as well as the materials from which it was built.
Cheking and repairing solutions for noted degradations of the structural elements are provided.
The existing perimetral foundation from the exterior of the building will be consolidated by widening the continous base with 25cm of reinforced concrete.
The existing exterior bearing walls will be consolidated by applying gunite mortar (the guniting shall be done in at least two layers, the thickness of the layers being 3cm; the second layer is applied before the end of the setting process of the previous layer).
A part of the existing cable channels will be dismantled and demolished without affecting the existing foundation and new simple concrete cable channels with striated caps will be built.
The existing reinforced concrete tie beam of the foundation will not be affected during the demolition and construction of the new cable channels.

By modernizing the power supply system of the contact line, the inside chamber of the traction substation is proposed to be fitted in regard to the construction works. Thus, all the exterior constructions (concrete brackets for the electric fittings, supports for the bar frame, foundations for boxes for clamps) will be dismantled.

New exterior constructions are provided for installing the new brackets supporting the electrical equipment, manhole chimney, new foundations for electrical transformers, boxes for clamps, encase for the returning feeder, 110kV switch, pumping station, oil separator (expeller) and also for the various cable raceways.

Foundations for supports
The foundations of the cast-in-place supports are made of C12/15 class reinforced concrete.
To avoid the high frequency of maintainance works, the use of SCA-type centrifugated reinforced concrete supports was chosen, remaining for the required depth to be achieved by the depth of the pole hole.
In terms of plan dimensions, the foundation is block-type with dimensions of 1,20x1,20 x 1,20m.

Foundations for equipments
The foundations for equipments are made of C12/15 cast-in-place reinforced concrete with different dimensions depending on the requirements of the equipments associated with them.
They are placed on a 20cm thick well compacted ballast bed.

Foundations for transformers
The foundations for transformers are made of C20/25 cast-in-place reinforced concrete having a box shape, with drain holes to direct the oil leaked from the transformers towards the oil and hydrocarbon expeller.

Cable raceways
Two types of cable raceways were provided for this project in terms of plan dimensions: 0,80x1,20m and 1,20x1,20m with a 15cm thickness of the walls and will be made precast, from C25/30 class reinforced concrete. The raceways will be covered with reinforced concrete slabs made of 8cm thick precast elements modulated by plan dimensions of 1,04x0,245m and 1,29x0,245m.

Site enclosure
The enclosure made of precast reinforced concrete elements shall be done on the entire length of the site.

Other elements
The runways of the transformers will be replaced according to the afferent drawn plans.
The clamping elements of the reinforced concrete frames will be replaced according to the presented details.

Category and class of importance
According to the seismic proof design Code P100/1-2006, part I, the importance class is III and according to the Government Resolution 766/97 (H.G. 766/97) for approving some regulations for quality in constructions, the importance category is C – normal.

Cata Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,16g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil;
The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain;

Site conditions : The maximum freezing depth is of 100cm, according to STAS 6054-77

Geotechnical conditions:

According to: **Geotechnical boreholes FTE 43, FC 1, FC 2 – Cata Station** (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :

- a vegetal soil layer was encountered at the surface (0.20 - 0.30 m) in boreholes FTE 43 and FC 2 and a filling layer was found in borehole FC 1 (0.50 m)
- next is, up to the depth of 4.40 – 4.60m, a cohesive complex consisting of brown and dark, stiff plastic rich clay and dusty clay
- after which, a non-cohesive sand with gravel, gravel with clayey sand and gravel with dusty sand horizon with gravel was encountered, with medium puddling……puddled, up to 6.15 – 6.80m
- up to the base of the boreholes (15.00 m) a grey cohesive complex made of hard rich clay, marley clay, rich marley clay, dusty marley clay, clayey marley dust, sandy clayey marley dustfurther, up to the investigation depth (10.00m), a grey marley clay horizon was intercepted

Underground water depth level : FTE 43 : - 3.20 m ; FC 1 : -1.30m ; FC 2 : -1.20m

For the cohesive horizon – dark, rich clays (rc) - situated above the underground water level, the intercepted soils can be characterized as follows:

With very high plasticity
With strong plastic consistency state
A very moist…practically saturated moisture content
Medium compressibility

For the cohesive horizon – brown and grey, clays (c), rich clays (rc), dusty clays (dc) - situated under the underground water level, the intercepted soils can be characterized as follows:

With very high plasticity
With consistent plastic … strong plastic consistency state
A practically saturated moisture content
High compressibility

For the marley cohesive horizon – grey marley clay (mc), marley rich clay (mrc), marley dusty clay (mdc) and marley clayey dust (mcd) - situated under the underground water level, the intercepted soils can be characterized as follows:

With high … very high plasticity
With strong plastic consistency state
A practically saturated moisture content

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

The station building is a ground floor structure of rectangular shape, having dimensions of 13,40m x 41,00m , and the free interior height is 4,00m.

The structural frame is made of confined bearing masonry. Cast-in-place reinforced concrete tie columns, bounded to the masonry by means of horizontal reinforcement fitted in the joints, are provided at corners and wall intersections.
The floor consists of a cast-in-place reinforced concrete slab casted over the masonry by means of the general tie beam and a number of beams which compensates the local lack of retaining walls.
The wooden framework of the roof is rested on the walls or beams. A cantilever reinforced concrete canopy is fitted above the exit towards the "square", being extended from the floor slab. The side facing the tracks, where the platform is located, is covered with a canopy with independent metallic structure.
An additional link of the walls by means of lintels (level elevations +2,10 or +3,00m) is provided, mainly on longitudinal direction of the building.
From technological requirements, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.
The foundations of the building consist of a network of crossed reinforced concrete bases in the form of tie beams embedded at the upper and lower part of the foundations.
The entire structure transmits loads to the ground by means of a compacted ballast bed extended on the whole contour, completely under the platform, as well as an the other three sides from the "square".

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track 1 : length of 150m, with a 3m width which increases in front of the station and the tunnel to 6.05m, with the height from the superior level of the track 1 track rail, h= 0,55 m
- the new intermediary platform, between tracks 1 and II, length L=250m, with width l= 6,05 m and the height from the superior level of the track II track rail h=0,55m
- the new intermediary platform, between tracks III and 4, length L=250m, with width l= 6,05 m and the height from the superior level of the track III track rail h=0,38m

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.

The ramps at the three platforms will have the following characteristics:

- 10m long, 2,40m wide;
- 7m long, 2,40m wide;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks 1-II

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;

- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks III-4

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two

pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done in the general filling (the railway earth platform – see railway infrastructure works) on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical designer is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure are provided at:

track 1: Length =75m; Width = 5,90m; in alignment
track 1-II: Length =159m; Width = 5,90 m; in alignment
track III-4: Length =159m; Width = 5,90 m; in alignment

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm

space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves.

- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are midway from the distance between the axes of the designed railway tracks 1-II and III-4

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete

Importance category: according to H.G. 766/1997 – **C** (normal importance).

Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at track 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
On the side towards track 4 ,the excavation, done vertically, is propped with metal sheet piles anchored at the upper side to the tracks of the railway. Otherwise, the excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Concrete platform for supporting the fire fighting water storage tanks

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station

The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank

The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Mud separator (desilter) - earthworks

The mud separator will be mounted buried, at 5,00m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.

To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.

Valves and metering cabin
The valves and metering cabin is made of C12/15 cast-in-place reinforced concrete and has the plan dimensions of 2,00x2,00m and h= 2,25m. The walls and the inferior slab have 25cm thickness, and the superior slab has a thickness of 10cm. The covering slab will be placed at 0,20m above the set-up terrain and it will have an embedded frame with a cast iron manhole cover. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The valves and metering cabin will be laid on a well compacted ballast bed of 15 cm thickness over which a 10cm thick concrete levelling underlay was previously poured.
The cabin will be placed on top of the borehole, making insulation with a 2cm bituminous mastic around the shaft necessary.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Cata – Archita Interval

PALOS ARDEAL Flag Station

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- platform at track I : length of 150m, with a 3m widthand the height from the superior level of the track I track rail, h= 0,38 m
- platform at track II : length of 150m, with a 3m widthand the height from the superior level of the track II track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway flag station, ramps for people with disabilities will be installed

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,8m towards track I and 1,75m towards track II from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,35m, respectively 2,30m towards track II; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.

The distance between the vertical beams varies from one railing to another, because aestethics was aimed.

The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing In slope For stairways
- length	variable, function of its position on the platform
- gate opening	2 510mm

BEIA Flag Station

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to the normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), the importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- platform at track I : length of 150m, with a 3m width and the height from the superior level of the track I track rail, h= 0,38 m
- platform at track II : length of 150m, with a 3m width and the height from the superior level of the track II track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway flag station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1, 75m towards track I and 1,8m towards track II from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,305m, respectively 2,35m towards track II; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.

To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing In slope For stairways
- length	variable, function of its position on the platform
- gate opening	2 510mm

Km 247+150
GSMR Shelter building

Work characteristic:	Construction of the technological foundation necessary for the shelter building
Structure:	Continous concrete foundation under the 6 shelter buildings
Importance cathegory:	According to H.G. 766-oct 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance cathegory (C).
Importance class:	According to Code P100 (seismic proof design), the importance class is III
Fire resistance degree:	According to Code P118, the building belongs to fire resistance degree V
Fire risk category:	According to Code P118-99, the fire risk from operational point of view is low

According to OMT 290/2000Risk class 2B

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 50cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system

will be finalized when purchasing the containers. The containers will be protected by an enclosure consisting of a fence composed of self-bearing zinc-coated wire mesh panels (2510x2035) and metal zinc-coated pipe poles. The poles will be introduced in C8/10 class simple concrete foundations, laid on a well compacted ballast layer.

Archita Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,16g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil

The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain.

Site conditions : The maximum freezing depth is of 100cm, according to STAS 6054-77

Geotechnical conditions**:**

According to: **Geotechnical borings FAR 1, FAR 2 – Archita Station** (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification:

- a filling layer was encountered at the surface (0.30 – 0.50 m)
- next is a cohesive complex composed of brown, grey and dark clay, dusty clay and clayey sandy dust, soft plastic… strong plastic which develop up to the base of the boreholes (9.00 - 10.00 m)

Underground water depth level : FAR 1 : -0.50 m ; FAR 2 : -0.25 m

For the cohesive horizon – brown and grey, clays (c), dusty clays (dc), sandy clayey dusts (scd) - situated under the underground water level, the intercepted soils can be characterized as follows:

With medium … very high plasticity
With soft plastic … strong plastic consistency state
A practically saturated moisture content
High ... very high compressibility

Protection and regulation works of the river bed and partially general filling works with variable thickness (~1 ÷ 4m) are executed on the entire area of the station for the designed railway route.

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

The station building is a ground floor structure of rectangular shape, having dimensions of 13,40m x 41,00m , and the free interior height is 4,00m.
The structural frame is made of confined bearing masonry. Cast-in-place reinforced concrete tie columns, bounded to the masonry by means of horizontal reinforcement fitted in the joints, are provided at corners and wall intersections.
The floor consists of a cast-in-place reinforced concrete slab casted over the masonry by means of the general tie beam and a number of beams which compensates the local lack of retaining walls.
The wooden framework of the roof is rested on the walls or beams. A cantilever reinforced concrete canopy is fitted above the exit towards the "square", being extended from the floor slab. The side facing the tracks, where the platform is located, is covered with a canopy with independent metallic structure.
An additional link of the walls by means of lintels (level elevations +2,10 or +3,00m) is provided, mainly on longitudinal direction of the building.
From technological requirements, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.
The foundations of the building consist of a network of crossed reinforced concrete bases in the form of tie beams embedded at the upper and lower part of the foundations.
The entire structure transmits loads to the ground by means of a compacted ballast bed extended on the whole contour, completely under the platform, as well as an the other three sides from the "square".

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design) The importance class is III
Risk class:	1A according to OMT 290/2000

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- the platform at track 1: 150m long, 3m width which increases up to 6.05m in front of the building, with the height at the superior level of the track 1 track rail h=0,55m.
- the new intermediary platform, between tracks 1 and II, length L=250m, with variable width l= 6,00 m and the height at the superior level of the track 1 track rail h=0,55m.
- the new intermediary platform, between tracks III and 4, length L=250m, with variable width l= 6,00 m and the height at the superior level of the track 4 track rail h=0,38m.

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL. The ramps will have the following characteristics:

- 10m length, 2,40m width;
- 7m length, 2,40m width;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,745m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,295m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks 1-II

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,745m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,295m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks III-4

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,755m from the newly designed railway axis towards track III and 1,745 towards track 4, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,305m towards track III and 2,295m towards track 4;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x

2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	
	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done (as the case may be); in the cohesive soil layer formed by brown, grey and dark clay, dusty clay and clayey sandy dust, soft plastic … strong plastic which are present up the base of the borehole, respectively on the general filling (the railway earth platform – see railway infrastructure works), on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).
The confirmation of the foundation soil characteristics by the geotechnical enginner is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);

- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure are provided at:

track 1: Length =75m; Width = 5,90m; in curve
track 1-II: Length =159m; Width = 5,90 m; in curve
track III-4: Length =159m; Width = 5,70 m; in curve

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves. GTC-type transversal beams adapted to the width of the canopies are used for the canopies placed on curves (see general layout plan for station canopies);
- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)

The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are placed according to the plan (which takes anto account the speed and the gauges on curve)

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete
Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.

During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.

For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Concrete platform for supporting the fire fighting water storage tanks

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station
The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast

iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank
The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Valves and metering cabin
The valves and metering cabin is made of C12/15 cast-in-place reinforced concrete and has the plan dimensions of 2,00x2,00m and h= 2,25m. The walls and the inferior slab have 25cm thickness, and the superior slab has a thickness of 10cm. The covering slab will be placed at 0,20m above the set-up terrain and it will have an embedded frame with a cast iron manhole cover. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The valves and metering cabin will be laid on a well compacted ballast bed of 15 cm thickness over which a 10cm thick concrete levelling underlay was previously poured.
The cabin will be placed on top of the borehole, making insulation with a 2cm bituminous mastic around the shaft necessary.

Mud separator (desilter) - earthworks
The mud separator will be mounted buried, at 5,00m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.
To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Archita – Vanatori Interval

FELEAG FLAG STATION

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- the platform at track I: 150m long, 3m width, with the height from the superior level of the track I track rail h=0,38m.
- the platform at track II: 150m long, 3m width, with the height from the superior level of the track II track rail h=0,38m

In order for people with disabilities to have an easy access in the railway flag station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1, 725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways

- length	variable, function of its position on the platform
- gate opening	2 510 mm

MURENI FLAG STATION

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), the importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:
- the platform at track I: 150m long, 3m width, with the height from the superior level of the track I track rail h=0,38m.
- the platform at track II: 150m long, 3m width, with the height from the superior level of the track II track rail h=0,38m

In order for people with disabilities to have an easy access in the railway flag Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1, 8m towards track I and 1,75m towards track II from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,35m, respectively 2,30 towards track II; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways

- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 04. Pedestrian tunnel

Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 and 2 by a staircase with a width of 1.90m, orientated parallel to the platforms, and covered with the metallic canopy.
The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, closed, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

SASCHIZ FLAG STATION

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- the platform at track I: 150m long, 3m width, with the height from the superior level of the track I track rail h=0,38m.
- the platform at track II: 150m long, 3m width, with the height from the superior level of the track II track rail h=0,38m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities will be installed.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Tracks I and II platform:

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1, 725m from the newly designed railway axis;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
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Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete.

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- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 04. Pedestrian tunnel

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Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 and 2 by a staircase with a width of 1.90m, orientated parallel to the platforms, and covered with the metallic canopy.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, closed, having a rectangular shape, on the section beneath the railway and

partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
The excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

MURENI TRACTION SUBSTATION

Control room

According to Code P100-3-2008 for seismic proof design - „Provisions for seismic assessment of existing buildings", by applying the quality evaluation methods and rapid calculation methods for structural design, the following have resulted:
In the actual form, the building has a seismic safety degree R>0,5=Rmin and a high seismic risk RsIII, due to its structure not complying with the existing norms, as well as the materials from which it was built.
Cheking and repairing solutions for noted degradations of the structural elements are provided.
A part of the existing cable channels will be dismantled and demolished without affecting the existing foundation and new simple concrete cable channels with striated caps will be built.
The existing reinforced concrete tie beam of the foundation will not be affected during the demolition and construction of the new cable channels.

Exterior constructions

By modernizing electric power supply network of the contact line, the inside chamber of the traction substation is proposed to be fitted in regard to the construction works. Thus, all the exterior constructions (concrete brackets for the electric fittings, supports for the bar frame, foundations for boxes for clamps) will be dismantled.
New exterior constructions are provided for installing the new brackets supporting the electrical equipment, manhole chimney, new foundations for electrical transformers, boxes for clamps, encase for the returning feeder, 110kV switch, pumping station, oil separator (expeller) and also for the various cable raceways.

Foundations for supports
The foundations of the cast-in-place supports are made of C12/15 class reinforced concrete. To avoid the high frequency of maintainance works, the use of SCA-type centrifugated reinforced concrete supports was chosen, remaining for the required depth to be achieved by the depth of the pole hole.
In terms of plan dimensions, the foundation is block-type with dimensions of 1,20x1,20 x 1,20m.

Foundations for equipments
The foundations for equipments are made of C12/15 cast-in-place reinforced concrete with different dimensions depending on the requirements of the equipments associated with them. They are placed on a 20cm thick well compacted ballast bed.

Foundations for transformers
The foundations for transformers are made of C20/25 cast-in-place reinforced concrete having a box shape, with drain holes to direct the oil leaked from the transformers towards the oil and hydrocarbon expeller.

Cable raceways
Two types of cable raceways were provided for this project in terms of plan dimensions: 0,80x1,20m and 1,20x1,20m with a 15cm thickness of the walls and will be made precast, from C25/30 class reinforced concrete. The raceways will be covered with reinforced concrete slabs made of 8cm thick precast elements modulated by plan dimensions of 1,04x0,245m and 1,29x0,245m.

Site enclosure
The enclosure made of precast reinforced concrete elements shall be done on the entire length of the site.

Other elements
The runways of the transformers will be replaced according to the afferent drawn plans.
The clamping elements of the reinforced concrete frames will be replaced according to the presented details.

Category and class of importance
According to the seismic proof design Code P100/1-2006, part I, the importance class is III and according to the Government Resolution 766/97 (H.G. 766/97) for approving some regulations for quality in constructions, the importance category is C – normal.

Vanatori Station

Seismic conditions : the design seismic zone is characterized by the parameters:
a_g = 0,12g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter:
$s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil

The wind load zone is characterized by the perameter:
q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain.

Site conditions : The maximum freezing depth is of 100cm, according to STAS 6054-77.

Geotechnical conditions:

According to: **Geotechnical boreholes FTE 94, FTE 95, FV 1, FV 2, FPV 8, FPV 9, FPV 10, FPV 11, FPV 12** – Vanatori Station (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :

- a filling layer was encountered at the surface (0.10 - 6.40 m) and in boreholes FTV 9 si FTE 95 vegetal soil layer was encountered (0.10 – 0.70 m); in borehole FTE 94 they are missing
- next, up to the depth of 2.50 – 4.50m, a cohesive horizon consisting of brown, yellowish-brown, dark clay, rich clay, dusty clay and clayey dust, ranging from consistent plastic to strong plastic, which develop up to depths of 2.45 – 10.0m (at the base of borehole FV 2). This complex is missing in boreholes FPV 8, FPT 10 and FPV 12.
- further, up to depths of 6.00 – 10.00m (at the base of boreholes FV 1 and FPV 11) a brown, yellowish-brown weak cohesive-non-cohesive horizon was intercepted, consisiting of sandy clay, clayey sand, dusty sand, dusty sand with gravel, sand with sparse gravel and gravel with sand. This horizon is missing in borehole FV 2
- Up to the base of the boreholes (10.00m), a marley complex made of grey marley rich clay, marley clay, marl, clayey marl was encountered. This complex has not been encountered in boreholes FV 1, FV 2 and FPV 11, and a yellowish-brown, plastic consistent dusty clay was encountered in borehole FTE 94.

Underground water depth level : between -3.00 and -8.30m

For the cohesive horizon – brown, wellowish-brown clays (c), rich clays (rc), clayey dusts (cd) - situated above the underground water level, the intercepted soils can be characterized as follows:

With medium … very high plasticity
With the plastic consistent … strong plastic consistency state
A practically saturated moisture content

High ... very high compressibility

General filling works with variable thickness (~1 ÷ 4m) are executed on the entire area of the station for the designed railway route.

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

The station building is a ground floor structure of rectangular shape, having dimensions of 13,40m x 41,00m , and the free interior height is 4,00m.
The structural frame is made of confined bearing masonry. Cast-in-place reinforced concrete tie columns, bounded to the masonry by means of horizontal reinforcement fitted in the joints, are provided at corners and wall intersections.
The floor consists of a cast-in-place reinforced concrete slab casted over the masonry by means of the general tie beam and a number of beams which compensates the local lack of retaining walls.
The wooden framework of the roof is rested on the walls or beams. A cantilever reinforced concrete canopy is fitted above the exit towards the "square", being extended from the floor slab. The side facing the tracks, where the platform is located, is covered with a canopy with independent metallic structure.
An additional link of the walls by means of lintels (level elevations +2,10 or +3,00m) is provided, mainly on longitudinal direction of the building.
From technological requirements, the concrete slab at elevation ±0,00 descends in some areas under this level, the continuity of the floor being achieved by means of a double floor covering.
The foundations of the building consist of a network of crossed reinforced concrete bases in the form of tie beams embedded at the upper and lower part of the foundations.
The entire structure transmits loads to the ground by means of a compacted ballast bed extended on the whole contour, completely under the platform, as well as an the other three sides from the "square".

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III

Risk class: 1A according to OMT 290/2000.

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- the platform at track 1: 150m long, 3m width which increases up to 6.05m in front of the building and the tunnel, with the height at the superior level of the track 1 track rail h=0,55m.
- the new intermediary platform between tracks III and 4 : length of 250m, with a 6,05m width with the height from the superior level of the track III track rail, h= 0,38 m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.

The ramps of the three platforms will have the following characteristics:

- 10 m length, 2,40m width;
- 7m length, 2,40m width;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;

- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks 1-II

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks III-4

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, a compacted ballast bed is executed then the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;

- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing	985 mm
- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done in the general filling (the railway earth platform – see railway infrastructure works) on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical designer is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);

- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure are provided at:

track 1: Length =75m; Width = 5,90m; in alignment
track 1-II: Length =159m; Width = 5,90 m; in alignment
track III-4: Length =159m; Width = 5,90 m; in alignment

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves;
- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are midway from the distance between the axes of the designed railway tracks 1-II and III-4

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete
Importance category: according to H.G. 766/1997 – **C** (normal importance).
Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at track 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from track I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).

The excavation shall be done partly manually and partly mechanical.
On the side towards track 4 ,the excavation, done vertically, is propped with metal sheet piles anchored at the upper side to the tracks of the railway. Otherwise, the excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.

For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.
The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading rampss, equipment foundations, containers etc.)

Loading/unloading ramp – serves as an intermediary point for handling goods where the railway transport is switched to road transport and vice versa. For ensuring the link between the two means of transportation, the elevation mark of the embankment is +1,12m with respect to the upper level of the railway track. A 1% draining slope shall be ensured towards the “square”. The collecting this water may be achieved by connecting to a local water drainage system. The ramp is connected to the road access area by an inclined plane havin a maximum 9% slope.
The composition of the structural frame is the following:

– on the entire contour of the ramp, including the sides of the connection to road access zone, a retaining wall made of precast reinforced concrete elements will be built, function on the 1,725m compulsory distance from the railway axis. The founding elevation for foundations is -1,31 m with respect to S.U.L., the retaining wall being built on a simple concrete leveling layer, cast on to a ballast bed;

– inside the enclosure thus created, from the level of the developed ramp or of the existing filling, a completion earth filling having min. 98% compaction is built as a support layer for the ramp covering and for the inclined connection plane;

– the covering is executed using a 23cm thick reinforced road concrete layer, laid over a 20cm well compacted filter bed;
– a pedestrian staircase is provided at the end opposite to the road access connection;
– a protection railing is provided on the entire contour, except for the road access and the unloading side from the railway.

Concrete platform for supporting the fire fighting water storage tanks

The platform, with the dimensions of: 4,00 x 10,03 and 30cm thickness will be made of reinforced concrete (C12/15) according to plans. The concrete covering for reinforcements: c=4.5cm. The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a previous plain concrete (C 6/7.5) levelling layer of 5 cm was poured. Built-in metal plates(10x150-150) with cleats(2ϕ12 din pc52) were provided in the concrete platform for mounting the tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Fire fighting water pumping station
The fire fighting water pumping station is made of monolith reinforced concrete C12/15 and has the dimensions 2,00x 2,00m and h= 2,25m in the plan. The walls of the station and the inferior slab have a 25 cm thickness, and the superior slab is 10cm thick. The covering slab will be placed at 0,20m above the set-up terrain and it will include a built-in frame with a cast iron cover for manholes. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The allow the drainage of accidental water, a sump with dimensions of 30 x30cm and h= 40cm was provided within the station.
The water pumping station will be set up on a well compacted ballast bed of 15 cm thickness, on top of which a previous simple concrete leveling layer of 10 cm was poured.
In the interior of the pumping station a concrete base-plate for the electropump will be made with the dimensions of 50x50cm and h= 10cm.

Concrete platform support for domestic sewage water-tight tank
The platform, having dimensions of : 4,00 x 8,62 m and 30cm thickness, will be made of reinforced concrete (C12/15) according to the plans. The concrete covering of the reinforcements: c= 4.5cm. . The platform will be placed on a well compacted ballast bed of 20 cm thickness, on which a simple concrete (C 6/7.5) levelling of 5 cm was previously poured.
Metal plates (10x150- 150) were provided in the concrete platform, with cleats (2ϕ12 from PC52) built-in the concrete for the possible installation of tanks by means of clamping devices (clips). The position of the built-in metal plates can be adapted on the construction site according to the clamping equipment chosen for the tanks.

Mud separator (desilter) - earthworks

The mud separator will be mounted buried, at 5,00m from the existing ground elevation and it will be placed on a 3cm thick sand support, layed on a reinforced concrete platform.
To realise the platform an excavation (supported) will be performed. A well compacted 20cm thick ballast layer will be executed at the base of the excavation. The actual platforms, which will be some reinforced concrete slabs (C12/15 class) of 15cm thickness and with the plan dimensions of 3,90 x 3,90m, will be constructed over this layer.
The reinforcement will be done with ø12 PC52 /20 cm bars, arranged in both directions.

Valves and metering cabin

The valves and metering cabin is made of C12/15 cast-in-place reinforced concrete and has the plan dimensions of 2,00x2,00m and h= 2,25m. The walls and the inferior slab have 25cm thickness, and the superior slab has a thickness of 10cm. The covering slab will be placed at 0,20m above the set-up terrain and it will have an embedded frame with a cast iron manhole cover. For access a ladder with reinforcing steel steps of 16 mm diameter embedded in the wall will be provided.
The valves and metering cabin will be laid on a well compacted ballast bed of 15 cm thickness over which a 10cm thick concrete levelling underlay was previously poured.
The cabin will be placed on top of the borehole, making insulation with a 2cm bituminous mastic around the shaft necessary.

Earthworks (excavations, side propping up, fillings and compactations) and the setting up of the foundation soil for all the additional constructions were provided.

Vanatori – Albesti-Tarnava Interval

Albesti-Tarnava Station

Seismic conditions : the design seismic zone is characterized by the parameters: a_g = 0,12g (MRI = 100 years) and T_C = 0,7 sec., acc. to the P100–1/2006 Norm.

Climatic conditions : The snow load zone is characterized by the parameter: $s_{0,k}$ = 1,5 kN/m^2 (MRI = 50 years) acc. to the design code CR 1-1-3–2005, "$s_{0,k}$" being the characteristic value for the snow load on the soil
The wind load zone is characterized by the perameter: q_{ref} = 0,4 kPa (MRI = 50 years) acc. to the NP-082-04 design code, "q_{ref}" being the reference pressure mediated on a 10 min period at a height of 10m above the terrain.

Site conditions : The maximum freezing depth is of 100cm, according to STAS 6054-77.

Geotechnical conditions:

According to: **Geotechnical borehole FTE 101, FTE 102, FTE 103 – Albesti-Tarnava** Station (theme data : ASTALROM / ITALFER)

The geotechnical boreholes have the following stratification :

- a 2.5m thick filling layer was encountered at the surface;
- next, up to the depth of 8.15m, a layer consisting of yellowish-brown dusty clay, plastic consistent, was encountered;
- further, up to the investigation depth (10.00m), a marley complex formed from grey dusty clayey marl non-cohesive horizont consisting of brown, dusty sand, dusty sand with gravel and sand with gravel, with medium puddling, was encountered.

FTE 102

- a 0.90m thick layer of vegetal soil was encountered at the surface
- next is, up to the base of the borehole (15.00m), an alternance consisting of weak cohesive soils (yellowish dusty sand) with cohesive soils (brown clayey dust), and non-cohesive soils (dusty sand with gravel)
- further, up to the investigation depth (10.00m), a marley complex formed by grey, dusty clayey marl.

FTE 103

- a vegetal soil layer having a 30cm thickness was intercepted at the surface;
- next, up to the 5.20m depth, is a cohesive horizon made of strong plastic, yellowish-brown dusty clay and sandy dusty clay;
- further, up to the investigation depth (10.00m), a non-cohesive complex formed by loose sand and sand with gravel

Underground water depth level : FTE 103 : - 5.70 m

For the cohesive horizon –yellowish-brown, dusty clay (dc) and sandy dusty clays (sdc)- situated above the underground water level, the intercepted soils can be characterized as follows:

With high plasticity
With the plastic consistent…rong plastic consistency state
A very moist … practically saturated moisture content
High compressibility

For the yellowish weak cohesive horizon – dusty sand (ds) and dusty sand with rare gravel (ds+g) – situated above the underground water level, the intercepted soils can be characterized as follows:

A very moist … practically saturated moisture content
High compressibility

Also, if during the works, they find out that the boreholes in the project were not made exactly on the object location, they shall make supplimentary studies/checking bore holes, in the structure location to see if the information from boreholes for the design stage are correct. In case there are differences, the designed works shall be adapted based on the results of these checking geo-technical studies, an aspect that may lead to some supplimentary costs.

Object 01. Passenger building

According to P100-3-2008 Code for seismic design "Regulations for the seismic evaluation of existing buildings", by applying the qualitative evaluation methods and checkings by rapid procedures of structural calculus, the following have resulted:

In the actual state, the building has a insufficient degree of seismic ensurance, R<0,5=R_{min} and a high seismic risk, RsII, due to a composition not complying with the actual norms, din cauza unei alcatuiri neconforme cu normele actuale, as well as the materials from which it was built. After consolidation, the building will have R>0,5=Rmin and RsIII.

Intervention solutions and rehabilitation works have been provided in order to restore and increase its horizontal load bearing capability by the following measures:

Consolidation of the floor slab (cracked) by embedding four metallic profiles in the bearing walls and bt removing the existing metallic structure;

Cladding the basement walls in which the profiles are embedded with 10cm thick reinforced concrete;

The consolidation of the archway in the facade towards the tracks by introducing a reinforced concrete frame;

Cladding with 6cm thick reinforced concrete on both faces of an interior wall for increasing the total stiffness of the structure.

Checking and repairing the decays observed in the structural elements.

Object 02. Platforms

Structure:	Retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design) The importance class is III
Risk class:	1A according to OMT 290/2000

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- the platform at track 1: 150m long, 3m width which increases up to 6.05m in front of the building and the tunnel, with the height at the superior level of the track 1 track rail h=0,38m.
- the new intermediary platform, between tracks 1 and II, length L=250m, with width l= 6,05 m and the height at the superior level of the track II track rail h=0,55m.
- the new intermediary platform, between tracks III and 4, length L=250m, with width l= 6,05 m and the height at the superior level of the track III track rail h=0,38m.

In order for people with disabilities to have an easy access in the railway Station, 3 (three) ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL. The ramps will have the following characteristics:

- 10m length, 2,40m width;
- 7m length, 2,40m width;

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations for the canopy poles will be built;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks 1-II

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);

- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

Intermediary platform tracks III-4

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping;
- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they will be executed in the cast in place reinforced concrete zone);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film is laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and on the central jointing zone these slabs are rested on a C8/10 simple concrete layer with dimensions of 30x15cm;
- The space between them will be completed with C16/20 cast-in-place reinforced concrete ;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98%

compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.
- height of railing 985 mm

- vertical beam diameter	Ø60,3mm
- handrail diameter	Ø48,3mm
- railing types:	In landing
	In slope
	For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

The direct foundation of the CANOPIES will be done (as the case may be); in the filling layer (FTE 101), in the weak cohesive soils zone (yellow, dusty sand) and cohesive (brown, clayey dust) according to FTE 102, or in the cohesive horizon made up of strong plastic, yellowish-brown dusty clay and sandy dusty clay (FTE 103), on a 30cm thick compacted ballast bed (with degree of compaction D > 98% and ensuring a p_{conv}= 1,5daN/cm^2).

The confirmation of the foundation soil characteristics by the geotechnical enginner is absolutely necessary, after performing the excavations/fillings (as the case may be).

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Site, dimensions:** New canopies with metal structure is provided at:

track 1: Length =75m; Width = 5,90m; in alignment
track 2-III: Length =159m; Width = 5,90m; in alignment
track IV-5: Length =159m; Width = 5,90m; in alignment

S T R U C T U R E D E S C R I P T I O N :

- Block and bolster box type reinforced concrete monolith foundations. These will be placed according to the foundation plan. In case of grounds with problems (macropore, moisture sensitive, contractile, water with vertical oscillating level, new filling, etc.), a compacted ballast bed will be carried out on which the foundation will be built;
- The completely metallic superstructure is made of: metallic poles with tubular section (V-shaped with the tip pointing down), transversal beams with variable caisson section, longitudinal purlins with caisson cross-section(2U) and windbracing around the purlins. To enable the correct mounting and the expansion of longitudinal purlins (L=12 m), the system of fastening to the cross beams was provided with oval-shaped holes and a 50mm space was fitted between the ends of the purlins to allow the bearing of any execution

deviations in the longitudinal plane. This superstructure enables the placement of canopies both in alignment and in curves;

- The canopy covering is made of corrugated steel sheet protected on the sides and the central part is covered with polycarbonate. Two longitudinal gutters were provided all along the canopy and also malleable cast-iron discharge pipes to collect the rain water coming down to the canopy poles.
- The entire superstructure is painted in the plant according to the colour specified in the project (on site only bolted connections which do not require any thermic processes able to hard the paintjob are allowed)
- The actual configuration of the canopies allows the placing of the contact line poles (as the case may be) in the 12m span of the canopy, the contact line poles piercing the polycarbonate covering through contour sealed holes.

Attention is drawn to the following issues:

1. All the longitudinal, transversal and vertical tracing elevations of the canopy have as reference marks: the railway track axis, the canopy axis and the ±0.00= designed SUL of each track:

a. the longitudinal axes of the foundation for canopy poles are midway from the distance between the axes of the designed railway tracks 1-II and III-4

b. transversally, the tracing of the axis for foundations of canopy poles will be done having the pedestrian tunnel axis as a reference mark; the tracing will be done 6m left and 6m right with respect to the same axis

c. the foundation elevation is given with respect to the ±0.00= designed SUL for each track

2. Bear in mind that both the canopy (with the corresponding foundations) and the newly designed platforms, follow the longitudinal profile of the designed tracks: horizontal, ascending, descending, as the case may be.

3. The correlation between vertical elevations of the pillars that are positioned on the beams of the tunnel and the columns and adjacent foundations of the canopies is important, so as to ensure continuity at the upper level of the transversal beams and purlins, as well as the achievement of the gauge on the entire length of the canopy.

4. No other equipments or devices shall be clamped on to the structural elements of the canopy, except for those provided by the design project (the appraisal of the designer is compulsory for any modifications).

Object 04. Pedestrian tunnel

Structure: cast-in-place reinforced concrete

Importance category: according to H.G. 766/1997 – **C** (normal importance).

Importance class: according to P100 – **III**

The tunnel is set perpendicularly on the railway lines package. The access in the tunnel is done:
- at line 1 by a staircase with a width of 1.90m, orientated parallel to the neighboring passenger building, and covered with the metallic canopy from line I.
- at the intermediary platforms, by two staircases located on the axis of the platform, each having a 1,90m width.

The pedestrian tunnel is a reinforced concrete structure having two types of cross-sections. The first one, having a rectangular shape, on the section beneath the railway and partially on the sections beneath the platforms, in the zones where the flights of the stairs start towards the platforms. The second one, U shaped, includes most of the above-mentioned flights.
The site water has an aggressive carbonic character.
Therefore the reinforced concrete is made of C25/30 class concrete, with I 42,5 (R) cement and P_8^{10} permeability degree. The reinforcing steel is OB37 and PC52.
The simple levelling concrete is C6/7,5.
The heavy type waterproofing (high density polyethylene, geotextile coat and aluminum foil) which prevents water from entering the tunnel, is protected by a 12,5cm thick masonry layer.
Pumps are used for lowering the ground water level below the level of the excavation.
During the construction of the tunnel the circulation on the 1 and 2 lines will be ensured with the aid of two temporary bridges (G22, V_{max}= 30km/h).
The excavation shall be done partly manually and partly mechanical.
On the side towards track 4 ,the excavation, done vertically, is propped with metal sheet piles anchored at the upper side to the tracks of the railway. Otherwise, the excavation shall be done vertically (the first 2,00m) with timbering, the rest being done with slope.

For the execution of the conopy over the existing pedestrian tunnel from the Albesti – Tarnava station in the case of the two exits to the city, the following repair and development works are provided in order to install the new metallic structure necessary for the conepy:
For the exit to *the city* a reinforced concrete perimetric beam base (socle) with dimensions of 25x50cm is built, into which the clamping system necessary for the metallic structure of the canopy is installed. The metallic structure of the canopy is composed of two transversally fixed lattice girders with horizontal props alongside the nodes from the superior part of the beams. The metallic structure is made of rectangular pipes.
For the exit to the railway lines a reinforced concrete perimetric beam base having a variable height is built, its role being to prevent the material resulted from the ballast prism from entering the tunnel's staircase. The new metallic structure of the canopy is clamped to the old socle of the staircase by means of chemical anchorage. The ends of the existing reinforced concrete socle will be lengthen by 2.125m.

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 294.3 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.

The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

Loading/unloading ramp – serves as an intermediary point for handling goods where the railway transport is switched to road transport and vice versa. For ensuring the link between the two means of transportation, the elevation mark of the embankment is +1,12m with respect to the upper level of the railway track. A 1% draining slope shall be ensured towards the “square”. The collecting this water may be achieved by connecting to a local water drainage system. The ramp is connected to the road access area by an inclined plane havin a maximum 9% slope.
The composition of the structural frame is the following:

– on the entire contour of the ramp, including the sides of the connection to road access zone, a retaining wall made of precast reinforced concrete elements will be built, function on the 1,725m compulsory distance from the railway axis. The founding elevation for foundations is -1,31 m with respect to S.U.L., the retaining wall being built on a simple concrete leveling layer, cast on to a ballast bed;

– inside the enclosure thus created, from the level of the developed ramp or of the existing filling, a completion earth filling having min. 98% compaction is built as a support layer for the ramp covering and for the inclined connection plane;

– the covering is executed using a 23cm thick reinforced road concrete layer, laid over a 20cm well compacted filter bed;

– a pedestrian staircase is provided at the end opposite to the road access connection;

– a protection railing is provided on the entire contour, except for the road access and the unloading side from the railway.

Typical I.S. shelter buildings

In order to place the containers necessary for transforming them into typical I.S. shelter buildings, a continous reinforced concrete foundation has been designed having a bottom width of 30cm and a 80cm base. The foundation depth is at the -1.20m quota. Passage openings are placed in three different positions, making the connection with the three manhole chimneys, according to the design project. The clamping into foundations system will be finalized when purchasing the containers. According to the probing performed, the filling in the station's platform consists of wet, thickseted crushed stone and gravel having a 1.60m thickness. Water occured as ground water sheet at a depth between -7.55 and 7.80 from SUL, saturating the small gravel sands layer, and its level is oscillating during the high floods from the Tarnava River alluvial lowland.

The direct foundation of the shelter building on general filling (the railway ground platform – see the railway infrastructure works) will be built through a 15 cm thick compacted ballast bed (with a degree of compaction D>98% and the ensuring of Pconv=1.5daN/cm^2).

Albesti-Tarnava - Sighisoara Interval

Sighisoara Station

Climatic conditions: the characteristic snow load at soil level according to CR 1-1-3-2005 is s0,k = 1,5 kN/m^2; the reference wind pressure according to NP-082-2004 is 0,4 kPa , and the velocity between 31 ÷ 35 m/s.

Seismic conditions: Control period (corner) Tc=0,7s and ag=0,12g ; according to the P100-1/2006 Norm.

Object 02. Platforms

Structure:	retaining wall-type prefabricated foundations with prefabricated slabs and partially cast-in-place concrete
Importance category:	According to H.G. 766-oct 1997 the building belongs to normal importance category (C)
Importance class:	According to P100/2006 Norm (seismic design), The importance class is III
Risk class:	1A according to OMT 290/2000

For ensuring a circulation speed of 160 km/h, the railway Station will be reconfigurated, therefore we propose the reconstruction of the platforms, as follows:

- the platform at track 1: 380m long, 3m - 4,3m variable width, with the height from the superior level of the track 1 track rail h=0,55m;
- intermediary platform between tracks II and III: 425m long, 5,60m – 6,20m variable width, with the height from the superior level of the track 3 track rail h=0,55m;

- platform between tracks III and IV: L= 383m long, 1,77m – 2,25m variable width, with the height from the superior level of the track IV track rail h=0,55m;

- platform between tracks IV and V: L= 383m long, 1,30m – 1,37m variable width, with the height from the superior level of the track IV track rail h=0,55m

In order for people with disabilities to have an easy access in the railway Station, ramps for people with disabilities and a level crossing will be installed. The level crossing will be made from a support layer created from cast in place reinforced concrete laid-down on a ballast layer at SUL.

Metallic lamp posts (lantern type) with h= 4,0m, equipped with light fitting, are provided for lighting the platforms.

Track 1 platform

The asphaltic covering shall be stripped in front of the passenger building and the hard covering will be restored, while the foundations and the concrete slab of the existing platform will be brought to the railway gauge by milling the concrete.

- The prefabricated slabs will be dismantled at the ends of the platform and the existing hard covering will be stripped;
- The excavation will be carried out in longitudinal ditches using propping, according to the indicated cross-sections;
- The position of the vertical elements is traced with respect to the railway axis;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed;
- The ballast layer will be completed up to the level provided by the project, it is compacted, the polyethylene film is laid down;
- The C16/20 reinforced concrete slab is cast, after which the 5cm asphalt layer is executed.

Platform between tracks II and III:

- The prefabricated slabs on the margin of the platform will be dismantled and the existing hard covering layer will be stripped;

The following technology will be carried out:

- The excavation will be carried out in longitudinal ditches using propping, and in front of the existing foundations of the canopy poles it shall be done in 1m long sections of trenches (plots), according to the details in the plan;
- The drain associated with the retaining wall shall be constructed right after the mounting of the prefabricated elements, in front of the canopy foundations;

- After compacting the bottom of the excavation, the C2,8/3,5 simple concrete layer necessary for positioning the retaining wall-type precast elements is poured;
- The edge of the platform will be traced at 1,725m from the newly designed railway axis, after which the foundations of the canopy poles shall be executed;
- The position of the vertical retaining wall-type <ZP> prefabricated elements made of C25/30 class reinforced concrete is traced with respect to the railway axis and they will be mounted on the part towards the track at a distance of 2,275m; the part opposite to the railway track will be made of a C8/10 simple concrete continous foundation
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed (they shall be made of cast-in-place reinforced concrete);
- The earth filling between the retaining wall-type elements will be executed up to the level provided by the project; it is compacted having a 98% compactation degree, the 20cm thick ballast layer and the polyethylene film are laid down;
- The <DP> type prefabricated slabs are mounted on the retaining wall-type elements by means of a 1,0cm thick M100 mortar layer and the space remaining between them and the border is completed with C16/20 cast-in-place concrete;
- A 5cm thick asphalt hard covering will be poured on the entire surface of the platform;
- The ends of the platform will be closed with a 35cm thick C8/10 simple concrete wall**.**

For the platforms between tracks III-IV and IV-V:

- The existing prefabricated slabs will be dismantled, the excavation shall be carried out in longitudinal trenches using propping, according to the indicated cross-sections and respecting the railway gauge;
- The position of the vertical elements is traced with respect to the railway axis;;
- The cable drawing pits, foundations for lamp posts and floor lamps, installation networks etc. are traced and constructed;
- After which the ballast layer will be compacted, the polyethylene film is laid down, the concrete is cast, after which the asphalt is poured;

The access ramps at the ends of the platforms are constructed, according to the platform general layout.

Please be noted that in the case of the construction of all platform elements, the reference markers are SUL and the railway tracks axis.
All platforms will have 1% slopes for discharging rainwater towards the tracks, the water being collected by the drains which will be executed along the platforms.

Ramps for people with disabilities

The structural frame of the ramp for people with disabilities will be made of C8/10 concrete in the foundations, C16/20 class concrete in the 10cm thick lightly reinforced cast-in-place concrete slab and a 5cm thick asphalt hard covering. An earth filling having a 98% compactation will be done between the concrete elements of the ramp and the natural terrain. The filling ground for the ramp will be procured from the contractor's warehouse. Between

the filling layer and the cast-in-place concrete slab, a 15cm thick ballast layer and a polyethylene foil were provided. The ramps for people with disabilities will be fitted with metal protection handrails throughout their entire length.

Level crossings

A pedestrian passage way will be layed out between the platform from the I track and the intermediary platforms for the easy access of people with disabilities. The level crossing will be made of a 10cm thick C16/20 concrete slab having a 30x30cm continuous foundation layed on a ballast layer at the SUL level. The level crossing will be provided at its ends with metal railings for restricting access.

Foundations for lamp posts

The lamp posts from the platforms of the station will be mounted on independent(isolated) foundations having the plan dimension of 0,45m x 0,45m and a 1,00m height, made from C12/15 class reinforced concrete. The independent foundations will have foundations -0,45 quotas (elevations) with respect to the +0,55 finite superior elevation of the fitted platforms.

Platform railings

The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The distance between the vertical beams varies from one railing to another, because aestethics was aimed.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the circulation surface of the platforms.
To enable a correct clamping, the railings will be placed at 90mm from the exterior margin of the platform.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The access to and from the access ramps of the platforms is ensured through The Platform Gate.
The Gate, like the railings, is an ironworks product, being formed by two parts which have the possibility to be clamped to the vertical beams of the railing. This is done through two pairs of semi-collars which enables them to rotate around the vertical beams. The assembling of the semi-collars is done using M6 bolts.
The gates can be fitted with combination clamps or locks in order to prevent them being opened by someone else other than the railway station staff.

- height of railing 985 mm
- vertical beam diameter Ø60,3mm

- handrail diameter	Ø48,3mm
- railing types:	In landing In slope For stairways
- length	variable, function of its position on the platform
- gate opening	2 510 mm

Object 03. Canopies

C H A R A C T E R I S T I C S

- **Importance category**: According to H.G. 766, Oct. 1997 (decision to approve some regulations for quality in constructions), the building belongs to normal importance category (C);
- **Importance class:** According to P100 Norm (seismic design), the importance class is III;
- **Risk class :** According to OMT 290/2000 : 1A risk class;
- **Location, dimensions:** The dimensions and the existing location will be kept the same.

R E H A B I L I T A T I O N O F C A N O P I E S

Rehabilitation works were provided for the canopy in SIGHISOARA railway station.

1. The following will be completely remade: waterproofing system of the canopy and the rain water discharge system (sheet gutters, discharge pipes and collection openings).
2. The main structure of canopy will be completely remade as follows:
   - checking the prefabricated poles and beams elements;
   - checking the supports of typical prefabricated elements (***beams on columns and ECP elements on beams***);
   - remaking the plastering and the metallic edges for reinforced concrete poles;
   - remaking the damaged areas: exfoliated concrete, rust stains, visible reinforcements etc.
3. Staging and types of repair works for the damaged reinforced concrete at canopies (according to the Technical Specifications , pct. 4.7):
   a. Preparation of the reinforced concrete support layer
   b. Repairing the fissures (injecting, filling the joints and sealing the cracks)
   c. Protection of the corroded reinforcing bars
   d. Rebuilding the damaged concrete surfaces with special mortars/concretes
   e.Additional consolidation measures (reinforcing bars welding, concrete casting, consolidations with carbon fiber fabrics and strips).
4. The repairing measures presented above shall be adapted, depending on the case, after assessing the condition of the canopy (based on adequate uncovering) and of each element separately, having the Designer's approval.

5. The following were provided to comply with modern standards:
   - aluminum false ceilings and gables,
   - ornamental plastering for the canopy poles

Attention is drawn to the following issues:

The rehabilitation works (capital repairs) can differ from one situation to another and hidden works can occur (situation that can be analyzed only after uncovering the waterproofing, dismantling the plastering and the damaged concrete, dismantling the platforms).

To avoid endangering the canopy stability (foundations, poles, plates, beams) during the works for this element and for the afferent platform, it is mandatory to perform propping and ensuring the structural elements (poles, beams, ECP-type roof elements) with windbraced solid scaffolds and adequate propping (timbering with wood boards and solid steel piling).

The provided uncoverings and the rehabilitation works shall be performed with specialized staff and hand tools, avoiding strong shocks and vibrations which can affect the structure. It is compulsory to contact the designer in order to establish reparation solutions for any damages or hidden vices noted during construction.

The overcharging of the elements due to uncontrolled depositing must be avoided: the debris resulted from the uncovering works performed on the cover, the superior part of the ECP, will be removed immediately in order not to cause additional loading and loading with asymmetric loads on the roof and on the canopy structure. The support elements of aluminum false ceilings (support distance piece) will be fastened to the existing reinforced concrete structure of the canopy by being hooked with flat metal strip (section 4 x 40mm) on the lateral sides and in the center of the canopy; (as an alternative, the flat metal strip can be inserted between the ribs of ECP type prefabricated caissons and will rest on the upper part of the prefabricated caissons). ***It is not allowed to perform any intervention (boring, etc) to the ribs of ECP type prefabricated elements.*** The distance between the support elements ("T"-shaped flat metal strip inserted between the longitudinal joints of the ECP caissons) will be established by the supplier of false ceiling out of aluminum strips.

It is important to observe the railway clearance on the entire length of canopy.

It is not allowed to fasten other equipment or devices than those provided in the project to the structural elements of the canopy (the designer's approval will be required for any modification).

Object 04. Pedestrian tunnel

For the tunnel in the Sighisoara station two canopies will be built for the access stairs from the 9th and 7-8th lines. The following consolidation and development works for the two situations are provided:

For the 9th railway line tunnel access, a part of the new metallic structure of the canopy will be clamped to the existing reinforced concrete beam base and for the rest a reinforced concrete beam base will be built in extension on a 1.00m length. The clamping system for

the existing beam base will be done by means of chemical anchors and reinforcing steel cleats will be installed in the newly created beam base. The metallic structure of the conepy is composed of two transversally fixed lattice girders with horizontal props alongside the nodes from the superior part of the beams. The metallic structure is made of rectangular pipes.

For the 7-8th railway line tunnel access, a part of the new metallic structure of the canopy will be clamped to the existing reinforced concrete beam base and for the rest a reinforced concrete beam base will be built in extension on a 1.50m length. The clamping system for the existing beam base will be done by means of chemical anchors and reinforcing steel cleats will be installed in the newly created beam base. The metallic structure of the conepy is composed of two transversally fixed lattice girders with horizontal props alongside the nodes from the superior part of the beams. The metallic structure is made of rectangular pipes.

In the case of the pedestrian tunnel the following works will be carried out:

- the soffit surface of the tunnel's undercrossing will undergo scrupulous visual analysis for determining the flaws occurred in the structure in time;
- the arising cracks and defects will be marked;
- all cracks exceeding 0.4mm or the ones over 0.1mm in the zones where the reinforcement is corroded or where rust stain routes appear will be opened, observations about its state being made; this operation is done manually, by light hammering with a chasing chisel, careful chipping with sharp chisels and small hammers weighing up to 250g, by light and short hits, without touching the steel reinforcement;
- the corroded reinforcement will be cleaned with the wire brush by removing the corrosion products;
- the cleaned surfaces will be dusted by wiping with a hair brush or by blowing compressed air;
- the alkalinity of concrete is checked with an 0.1% phenolphthalein alcoholic solution. If the concrete is turning red to intense purple it is considered that it is alkalinous enogh to ensure the protection of the steel reinforcement. If it is established that the concrete has lost its alkalinity (the concrete does not gain color), the operation is repeated until either the alkaline concrete or the reinforcement is reached. The concrete which lost its alkalinity will be removed;
- the clean concrete surfaces which are to be repaired with a cement mortar will be washed with water;
- after washing, the concrete zone is completely dried after which the execution of the repair works is pursued;
- in the case of the frame-beam from the end of the tunnel's staircase (the access way next to the CED building), the consolidation solution consists of setting up of some unidirectional woven carbon fiber sheets (according to the details in the design plan);

Tunnel railings

According to the configuration of the tunnel openings of the underground tunnels, two types of railings, similar as shape but different as length and two types of railings which differ by their way of clamping at the end above the access way to the underground tunnel.
The railings are stainless steel welded metal constructions. They are composed of vertical pipe beams Ø60,3 x 5mm which end at the upper part with Ø48,3 x 2,6mm fittings, 3 Ø33,7 x 2,6mm baulk and a Ø48,3 x 2,6mm handrail. A vertical network of Ø21,3 x 2,6mm pipes is welded between the two lower baulks.
The clamping of the railings on to the platforms is done with the help of M10 metal anchors which fixes the base of every vertical beam on to the border around the access way to the underground tunnel.
A cylindrical cap, which also has the purpose of hiding the ends of the metal anchors, is mounted over the base of every vertical beam before welding the base to the beam.
The handrail is a Ø48,3 x 2,6mm stainless steel welded structure consisting of straight bars jointed by means of curved elbow pieces. The clamping of the handrails to the walls is done using screws and plastic dowels through a flange connected to the proper handrail by a curve fitting.

Object 08. Protection fence between tracks

Structure: metallic poles with Euromesh and metallic pillars introduced in the ground. .
Importance category: According to H.G. 766-oct 1997 (decision for the setting up of some regulations concerning the quality in constructions), the objective is included in the D category of importance
Importance class: According to the P100 Normative (seismic design), the importance class is IV
The fence has a total legth of 1317.6 m with the following characteristic:
- is made up of demountable zinc coated wire mesh Ø5mm and a zinc coated frame made from angles, having a dimension of 2520 x 1570mm.
- the supporting metallic poles Ø70mm of the panels are placed at a 2,70m interaxis distance.
- they have a constant height of 1,70m
- the metallic poles are driven in the ground by vibration and have a 70mm diameter.

The anticorrosive protection of the metallic elements will be done using 2 minium Pb primer coat layers and 2 alkyd enamel layers.
For the case when passing with electric trucks from one track to another through specially developed level track crossings is necessary, special gates were fitted in the protection fences.
The access of trucks from one platform to another is ensured by The Protection Fence Gate. The gate is metallic, similar to the protection fence, and it is build from angle frame on which a 5mm wire mesh is welded.

The lower part of the gate is provided with 3 running wheels which enable the gate to be shifted along the the protection fence on a special profile fixed with special bolts on a reinforced concrete foundation raft.
A Ø32 x 2mm pipe is welded on the angle frame, at the upper part, enabling the gate to pass underneath 3 grooved roll wheels, fixed on the protection fence, providing the gate with protection against falling.
The closing of the gates is ensured by means of a lock driven through two ears (one welded on the gate frame and the other welded to the frame of the fence) in order for only the railway staff to be able to open the gates.

- height of gate	1 500 mm
- gate opening	2 700 mm
- total length of the gate	3 265 mm
- running roll diameter	Ø90 / Ø62
- runway profile	triangular
- guiding roll diameter	Ø64 / Ø28
- length of runway	5350 mm

Object 10. Other constructions (loading/unloading ramps, equipment foundations, containers etc.)

The retaining wall (+the railing) will be reconstructed at the ramp of the existing storehouse, on a length of 47m + 3.33m.

Other constructions on the interval

GSM-R antenna foundation 30 locations

Constructive system

The foundation of the GSM-R antenna is an indirect foundation, consisting of a foundation raft and a micropile system.
The GEWI-type, S670/800 and 63.5mm diameter micropiles represent fitting elements which transfer a traction or compression force applied to a bearing layer in the foundation soil according to the principles regarding the execution of geotechnical works. Both soil and rocks are envisaged when considering the foundation soil.
Bar-shaped S 670/800 steel with Ø 63,5 mm is used as tension stressed element, in the form of micro alloy, hot-rolled and being improved with fins of the screw thread with right-side threading.
The characteristics of the bar shaped steel will be according to the requirements on structural steel norms EN 1992-1-1, annex C. the corresponding checks will be done in accordance with the EN ISO 15630-1 norms.
Regarding dimensioning of the single-bar anchorage, the specification book contains information on the fixing force and the limit of the anchor allowable test stress according to the provisions of the EN 1537 norms.

The execution of the borehole is performed function of the soil condition – using no casing, casing or partial casing. The borehole will be carefully cleaned for mounting the anchor.
The diameter of the borehole will be chosen so that the anchor, including the creel-type spacer, will be installed properly, without the pipes serving as coating being damaged due to the sharp edges of the boring casing , as an example. If needed, the diameter of the hole shall be adapted with respect to the diameter of the socket joint.
After fitting the anchor, or just before that, the hole is injected with cement mortar. The superior side of the anchor will not be covered with mortar so as to allow the fitting of the anchor head.
The anchor cantilever and the pipe fitting are covered with a thick layer of protection mass against corrosion. After tensioning the anchor, the head of the anchorage is waterproofed and covered using a metallic/plastic cap which is also filled with protection mass against corrosion.
The drilling system shall be used simultaneously with the concrete injection system.
The drilling head will be chosen depending on the designed length of the micropile and the proposed geology.
The aggressiveness of the surrounding environment must be verified and special measures must be taken if needed. If there is no sufficient experience for the given conditions, then the choosing of the micropile system shall be done by an expert who is familiar with the properties of the system (drilling head, micropiles diameters), and these will eventually be checked using test micropiles.
The drilling head will be screwed on to the circular pipe, after which the pipe shall be installed in the fitting of the drilling rig. The pipe shall be drilled in the soil according to the soil composition. The extension of the pipe is done by manually screwing the connection fitting.
The extension of the pipes is done by manually screwing the connection fittings. The injection of the cement suspension can be performed during drilling, through an injection adapter by screwing, or after, through an injection adapter screwed on the circular pipe.
After the hardening of the cement suspension, the tensioning plate shall be mounted and will be fixed using a bolt nut. The bolt nut can be manually fixed.
The execution of the micropile head must be done according to the detail drawings.
A supplementary geothechnical probing will be performed after the opening of the construction site for verifying the stratification of the soil.
The type of foundation which will be used is determined, together with the designer, depending of the soil characteristics.
The anchorage system of the GSM-R pylon designed and provided (by the GSM pylon manufacturer) will be embedded in the foundation block before the pouring of the concrete.

The antennas will be protected by fencing them with a fence made of self-bearing zinc-coated wire mesh panels (2510x2035) and metallic zinc-coated metallic poles made of pipe. The poles will be introduced in C8/10 simple concrete foundations, laid on a well compacted ballast layer.

Foundation for GSMR container

Constructive system
In order to place the containers necessary for transforming them into shelter buildings for GSMR antennas, a block reinforced concrete foundation has been designed having plan dimensions of 700x350. The foundation block is crossed by a cable network in various positions. The clamping system for clamping the containers to the foundations will be finalized when purchasing the containers.
The freezing depth is of 1.00-1.10m on the Brasov – Sighisoara railway section, according to STAS 6054/77.
The containers will be protected by fencing them with a fence made of self-bearing zinc-coated wire mesh panels (2510x2035) and metallic zinc-coated metallic poles made of pipe. The poles will be introduced in C8/10 simple concrete foundations, laid on a well compacted ballast layer.

Location of foundations for containers and GSMR antennas

Site Name	New km	Location	foundation required
SITE 0: BRASOV-DARSTE	***166+944***	***166+944***	***foundation for: 2 GSMR shelter + mast***
SITE 1: BRASOV		In Station, near OCC	foundation for mast
SITE 2: BRASOV bis	173+300	173+300	fondation for: 2 GSMR shelter + mast
SITE 3: STUPINI		In station, near container CE	foundation for mast
SITE 4: BOD		In station, near building CE	foundation for mast
SITE 5: FELDIOARA		In station, near container CE	foundation for mast
SITE 6: MAIERUS	200+000	200+000	foundation for: 2 GSMR shelter + mast
SITE 7: APATA		In station, near building CE	foundation for mast
SITE 8: APATA-ORMENIS	210+920	211+00	foundation for: 2 GSMR shelter + mast
SITE 9a: ORMENIS TUNNEL	213+042	At the entrance of the tunnel Ormenis, Brasov side WITHOUT MAST, JUST BIG CE CONTAINER	BIG CE CONTAINER
SITE 10: Racos		In station, near building CE	foundation for mast
SITE 10bis: Racos-Augustin	***228+580***	***228+600 (on the line Racos-Augustin)***	***foundation for: 2 GSMR shelter + mast***
SITE 10ter: Racos-Augustin	***227+600***	***227+600 (on the line Racos-Augustin)***	***foundation for: 2 GSMR shelter + mast***
SITE 10quat: Racos-Augustin	***225+600***	***225+600 (on the line Racos-Augustin)***	***foundation for: 2 GSMR shelter + mast***
SITE 11a: HOMOROD TUNNEL	226+465	At the entrance of the tunnel HOMOROD, Brasov side WITHOUT MAST, JUST BIG CE CONTAINER	BIG CE CONTAINER
SITE 12: HOMOROD-CATA	234+500	234+500	foundation for: 2 GSMR shelter + mast

SITE 13: CATA		In station, near building CE	foundation for mast
SITE 14: PALOS	243+800	Near Palos	foundation for: 2 GSMR shelter + mast
SITE 15a: Tunnel BEIA	249+630	At the entrance of the tunnel BEIA, Brasov side	foundation for: 1 shelter + mast
SITE 15b: Tunnel BEIA	250+334	At the entrance of the tunnel BEIA, Sighisoara side	foundation for: 1 shelter + mast
SITE 16a: Tunnel ARCHITA 1	251+919	At the entrance of the tunnel Archita 1, Brasov side	foundation for: 1 shelter + mast
SITE 16b: Tunnel ARCHITA 1	252+446	At the entrance of the tunnel Archita 1, Sighisoara side	foundation for: 1 shelter + mast
SITE 17a: Tunnel ARCHITA 2	253+686	At the entrance of the tunnel Archita 2, Brasov side	foundation for: 1 shelter + mast
SITE 17b: Tunnel ARCHITA 2	253+939	At the entrance of the tunnel Archita 2, Sighisoara side	foundation for: 1 shelter + mast
SITE 18: ARCHITA		In station, near building CE	foundation for mast
SITE 19: FELEAG	261+730	262+000	foundation for: 2 GSMR shelter + mast
SITE 20a: Tunnel MURENI	265+384	At the entrance of the tunnel Mureni, Brasov side	foundation for: 1 shelter + mast
SITE 20b: Tunnel MURENI	266+250	At the entrance of the tunnel Mureni, Sighisoara side	foundation for: 1 shelter + mast
SITE 21bis: Vanatori-Mureni	***270+000***	***270+000***	***foundation for: 2 GSMR shelter + mast***
SITE 21: VANATORI		In station, near building CE	foundation for mast
SITE 22: ALBESTI		In station, near CONTAINER CE	foundation for mast
SITE 23: SIGHISOARA		In station, near BUILDING CE	foundation for mast
CATA-ARCHITA	247+183	BIG CE CONTAINER	BIG CE CONTAINER

3. ENVIRONMENTAL PROTECTION

During the construction period, the building contractor is obliged to take all measures for:

- compliance to the classification decision issued by the competent authority for Environmental Protection;
- reduction of pollutants discharged during the functioning of vehicles and equipment to be used, by performing technical inspections at the commencement of works and not only;
- maintaining air quality in the protected areas, according to the norms in force and in compliance with the requirements in the reglementation document issued by the competent authority for Environmental Protection;
- eliminating the danger of soil and thus underground water being contaminated with oil products, by performing oil changes for equipment in special stations;

- protection of surface and underground water by complying with the stipulations of Law no. 107/1996, reissued with the subsequent amendments and completions;-"Law for water";
- eliminating material losses (cement milk), which can lead to water alkalinity, by carefully performing the casting of concrete for foundations;
- performing a staggering as efficient as it is possible, so that the exterior noise level to remain within the limits stated by the norms in force;
- ensuring a management system for materials necessary for conducting the works in appropriate conditions (the management of building materials shall be made only within the limits of the land owned by the owner, without disturbing the surroundings);
- respecting the protection zones for pipes and networks which cross the construction site, as well as the conditions imposed by the obtained notifications;
- evacuating all materials left after the construction from the construction site;
- restoring the soils affected by the works to their initial state;

The aim of the taken measures is to minimize the negative effects during the period of the works, minimizing the losses from the carried out activity, ensuring the selective collection of the waste resulted from the technological operations and of the domestic waste, as follows:

The selective storage of waste coming from the site management in sealed bins in order to avoid their scattering, in compliance with the current legislation:

- Regulations for organizing and functioning of the public sanitation service in Brasov - HCL 627/2007
- Commandment nr.1121/2006 regarding the establishment of identification methods of containers for various types of materials for the purpose of selective collection;
- Law 132/2010 regarding the selective collection of waste in public institutions (Selective waste collection containers shall be placed in every office/room of the public institution. These will have the following colours: blue for paper and paperboard waste, yellow for metal and plastic waste and white/green for white/coloured glass);

– Transport of recoverable waste, as they result, in the warehouses specified by the beneficiary;
– The transport of these wastes resulting from the carried out works, in authorized warehouses and according to the requirements in the Technical Specifications and in The Technical Report, the speciality of Environmental Protection;
– The transport of non-recoverable waste (resulting from bringing the surface of technological platforms, the access roads and the technological roads to their initial state) in authorized warehouses and according to the requirements in the Technical Specifications and in The Technical Report, the speciality of Environmental Protection;

During the service period, the impact on the environmental factors is estimated to be positive as a result of the works designed and performed in accordance with the current Environment Protection legislation.

4. OCCUPATIONAL SAFETY AND HEALTH MEASURES CONCERNING WORK AND FIRE SAFETY

- Law no. 307/2006 regarding the protection against fire;
- Law no319/2006 regarding occupational safety and health measures;
- HG no. 300/2006 regarding the minimum safety and health requirements for temporary or mobile construction sites;
- HG no. 971/2006 regarding the minimum requirements for occupational safety and/or health at the workplace signalling;
- HG no. 1.091/2006 regarding the minimum requirements concerning occupational safety and health at the workplace;
- HG no. 1.146/2006 regarding the minimum requirements for health and safety for the use of work equipment by workers;
- Specific instructions for occupational safety and health on railway infrastructure authorized by Directive CNCF "CFR" S.A. no. 26/2008.

From the " Specific instructions for occupational safety and health on railway infrastructure" of C.N.C.F. "CFR" S.A. the following chapters shall especially be respected:

- Chapter II – Provisions specific to railway;
- Chapter IV – Provisions specific to the track branch;

Apart from the existing norms, which are compulsory, a series of additional measures are necessary for preventing accidents:

- warning signals shall be installed at the limits of the working area;
- workers must not sit. on the tracks or in the gauge during breaks;
- security agents for signals and for warning signals.

5. SITE MANAGEMENT

The site management works for carrying out the civil engineering works in the station will comprise the General Contractor Site Management from the that station. The work beneficiary, C.N.C.F. "CFR" S.A. will provide the space necessary for the site management, access ways etc. to the building contractor. The general contractor will fit a work platform in the premises of the station on which at least one container for a construction site office, a warehouse and a restroom shall be placed. The utilities necessary for the site management (electricity, water, sewerage) shall be provided by the temporary station linkage, fitted according to the actual laws. The technological platform shall be surrounded by a fence and will have security service.

The site management necessary for carrying out the civil engineering works will comprise:

- accessways;
- tools, gear, devices, equipment and necessary resources;

- sources for energy, water, sewerage,as the case may be;
- execution charts for works;
- organizing the spaces necessary for the temporary storing of materials, the specific measures for preservation during storage and avoiding decays (technological platform necessary for carrying out the works);
- specific measures regarding occupational safety and health measures, as well as preventing and fire fighting, resulting from the nature of the operations and of building technologies contained by the documents concerning the execution of the objective;
- measures for protecting the surroundings (transmission of vibrations and severe shocks, large dust release, ensuring the necessary access ways);
- constructions, installations and work equipment of the specialized contractor, in accordance to the requirements of the project, which would allow him to satisfy the execution and quality responsibilities, for the relationship with the general contractor and the engineer, as well as those regarding the control of construction works;
- all materials, installations, devices, equipments and quality control systems, in accordance with the provisions in the project, the tender specification book, standards and norms in force.

Protecton of the carried out works, of the materials on the site and their security are the responsibility of the constructor (contractor).

Restrictions regarding the placing of site management facilities and of production bases, soil, materials and equipment storage

The placement of site management facilities is forbidden nearby:

- watercourses (in the beds and on the shores of watercourses);
- protected areas;
- archelological sites and natural monuments;
- areas with trees;
- areas affected by landslides and on areas floodable terrains;
- railway infrastructure safety zone.