WS Atkins International Limited

TITAN

PROJECT ANTEA
ROAD SAFETY ASSESSMENT STUDY

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1. INTRODUCTION

1.1 Commission and Terms of Reference

The Atkins Highways and Transportation Team in Athens, Greece, was commissioned by ANTEA CEMENT S.A. Company to undertake a Safety Audit for the proposed roads (a) between the Titan Cement Plant Site and the National Highway Fushe Kruje – Lezhe (NH-PS Road) and (b) between the Flysch Quarry and the Cement Plant Site (FQ-PS Road).

The scheme proposals can be summarized as follows:

NH-PS Road

- A highway with a total length of approximately 5,700 meters between the Cement Plant Site in Borizane and the Fushe Kruje - Lezhe National Highway.
- 2 junctions along the length of the highway, including the junction with the National Highway, and one railway crossing.

FQ-PS Road

- A highway with a total length of approximately 3,500 meters between the Cement Plant Site in Borizane and the Flysch quarry.
- A bridge over the Droja River.

This Road Safety Audit (RSA) work was undertaken by the following review team:

- George Nellas, Transport Planner and Highway Engineer
- Evangelos Kareklas, Traffic and Highway Engineer
- Aristea Kostakou, Highway Engineer

The RSA was conducted according to the Methodology for Road Safety Assessment, November 2007, as proposed by the review team and approved by ANTEA CEMENT S.A. Company and the EBRD-IFC. This methodology references the procedures and scope set out in the Highway Agency' s Design Manual for Roads and Bridges (DMRB), Volume 5, Section 2, Parts 2 and 3, "Road Safety Audit" Standard HD 19/03. As a result, the review team undertook a Stage 2 Road Safety Audit for the NH-PS Road and a Stage 1 Road Safety Audit for the FQ-PS Road.

1.2 Scope

The Audit Brief was provided by Mr. Nick Pantazaras, Lead Civil Engineer and nominated representative of ANTEA CEMENT S.A. Company. Appendix A of this report lists the contents of the Audit Brief.

1.3 Report Procedure

The Audit comprised a desktop review of the Audit Brief and the relevant design drawings and reports, which have been carried out during summer and fall 2007. The team has examined and reported only on the road safety implications of the design provisions as presented in these design drawings and reports and has not specifically examined or verified the compliance of the designs to any other criteria.

The issues raised through this Road Safety Audit are detailed in Section 2 with recommendations to be considered as the scheme design and implementation progress.

Section 3 presents the Level of Risk (LoR) table and Section 4 includes the implementation plan of the proposed mitigation measures.

2. ISSUES RAISED AND LEVEL OF RISK ESTIMATION

2.1 The NH-PS Road

2.1.1 General Alignment

NH-PS 01: Embankments (Fills)

Location: Throughout the proposed link road (Mainly Chainage 1+920.70, 2+134.57 - 2+160.79, 4+018.90 - 4+218.90, 4+786.15 - 4+790.72, 5+204.64 - 5+247.38 at both sides of the road)
Summary: The embankments along the route, which are generally supported with retaining walls, are a concern due to the severe implications of any incident that could result if vehicles were to leave the carriageway. Although guardrails are shown in the "typical cross section" drawings, it is not clear where they are installed along the road. The associated LoR is considered to be medium.
Recommendation: Ensure the appropriate level of containment is provided throughout, taking into account the likely severity of any accident that involves a vehicle leaving the carriageway. This is normally accomplished with the installation of guard-rails. Although these are included in the design, their locations are not clearly marked in the relevant drawings.

NH-PS 02: Cuts

Location: Throughout the proposed link road (Mainly Chainage 1+268.44 - 1+294.91, 1+427,70 - 1+454.39, 1+488.21, 3+324.95, 3+517.72 - 3+720.70, 3+788.88 - 3+968.90, 3+993.90 - 4+018.90, 4+293.90 - 4+363.90, 4+937.97, 5+389.97 - 5+669.56)
Summary: Cuts with high slopes are a concern because of the risk of falling rocks or slope instabilities. The associated LoR is considered to be high.
Recommendation: Ensure the appropriate level of safety is provided throughout, taking into account the likely severity of any accident that involves falling rocks or slope instabilities. This is normally accomplished through wire fencing or other appropriate protective measures.

2.1.2 Intersections

NH-PS 03: Intersection with NH

Location: Main Junction with NH at chainage 0+000 and 0+468. The proposed road alignment will follow the existing shown in the following Figure 1.

Figure 1 Alignment of NH – PS Highway Along Existing Road

Summary: This junction with the NH will accommodate significant traffic volumes and high percentage of HGV. The associated LoR is considered to be high.
Recommendation: Re-examine and improve intersection furniture such as road markings (especially striping), cat eyes, lighting and signaling.

NH-PS 04: Intersection with Thumane - Mamurras Road

Location: Intersection with existing road at chainage 0+468
Summary: This junction will accommodate high percentage of HGV. The associated LoR is considered to be medium.
Recommendation: Re-examine and improve intersection furniture such as road markings (especially striping), cat eyes and lighting.

NH-PS 05: Railway Line Crossing

Location: Crossing at chainage 0+364 (See Figure 2)

Figure 2 Location of Railway Crossing

Summary: This crossing is designed to be unguarded. No other furniture (such as moving barriers) is provided. The associated LoR is considered to be at present low. It could develop to LoR high in the future if traffic on the railway increases.
Recommendation: Re-examine and improve crossing furniture such as barriers, automatic control, road markings (especially striping), cat eyes, lighting and signaling.

2.1.3 Non-Motorised Users

NH-PS 06: Pedestrian crossings and walkways

Location: Along the road and especially at intersections and major access / egress locations such as the cemetery and the pilgrimage site (chainage 1+050 and 5+230). These are shown in the following Figure 3.

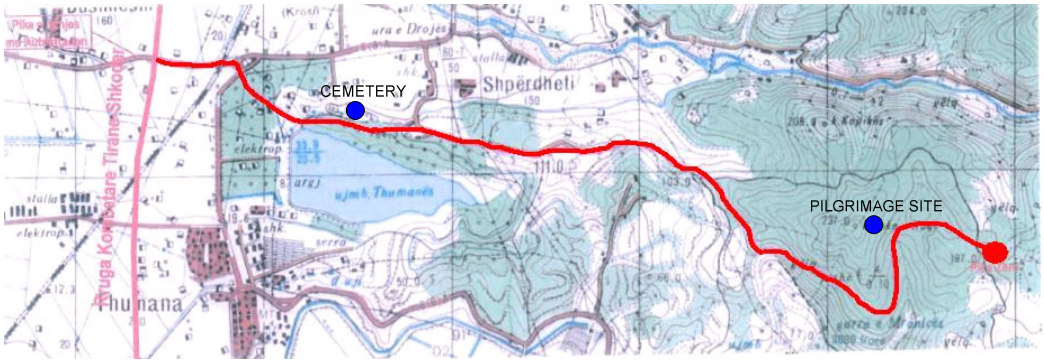

Figure 3 Location of the Cemetery and Pilgrimage Sites

Summary: No pedestrian facilities are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV. The associated LoR is considered to be high.
Recommendation: Design and provide pedestrian facilities at locations 1+050 and 5+230.

NH-PS 07: Facilities for cyclists, equestrians

Location: Along the road and especially at intersections and major access / egress locations such as the cemetery and pilgrimage site (see locations above).
Summary: No facilities for cyclists and equestrians are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV. These trip makers could share the same facilities with pedestrians with proper design. Some provision also needs to be made for movements of animal herds (i.e. either explicitly forbid them from moving on the road or provide certain crossings). The associated LoR is considered to be medium.
Recommendation: Design and provide suitable facilities where needed.

2.1.4 Road Signs, Carriageway Markings and Lighting

NH-PS 08: Signs and markings

Location: Along the road and especially at intersections and major access / egress locations such as the cemetery and pilgrimage sites.
Summary: The level of signing and carriageway marking appearing on the drawings needs to be increased to serve non motorized users and to provide better information and regulation for motorized users. Visibility restrictions and local access control must also be addressed. The associated LoR is considered to be low.
Recommendation: Design and provide additional road signs and carriageway markings.

NH-PS 09: Lighting

Location: Throughout the road but most importantly at the intersection locations.
Summary: No lighting is shown on drawings. Absence of lighting will create deteriorated road safety conditions at night or bad weather especially at the location of intersections, crossings and major accesses. The associated LoR is considered to be high.
Recommendation: Design and implement road lighting.

2.1.5 Other Issues

NH-PS 10: Access to Cemetery and Pilgrimage Sites

Location: 1+050, 5+230
Summary: Parking along the curb can be unsafe especially when mixing with the movement of HGVs along the road. Access to the site needs to be designed marked and signed. The associated LoR is considered to be high.
Recommendation: Design and provide appropriate parking and access facilities to the pilgrimage site.

2.2 The FQ-PS Road

2.2.1 General Alignment

FQ-PS 01: Embankments (Fills)

Location: All along the road.
Summary: The embankments along the route, some of which are supported with retaining walls, are a concern due to the severe implications of any incident that could result if vehicles were to leave the carriageway. Although guardrails are shown in the "typical cross section" drawings it is not clear where they are installed along the road. The associated Level of Risk (LoR) is considered to be medium.
Recommendation: Ensure the appropriate level of containment is provided throughout, taking into account the likely severity of any accident that involves a vehicle leaving the carriageway. This is normally accomplished with the installation of guard-rails. Although these are included in the design, their locations are not clearly marked in the relevant drawings.

FQ-PS 02: Cuts

Location: All along the road.
Summary: Cuts with high slopes are a concern because of the risk of falling rocks or slope instabilities. The associated LoR is considered to be high.
Recommendation: Ensure the appropriate level of safety is provided throughout, taking into account the likely severity of any accident that involves falling rocks or slope instabilities. This is normally accomplished through wire fencing or other appropriate protective measures.

2.2.2 Bridge

FQ-PS 03: Bridge

Location: 2+500
Summary: This bridge will serve a high volume of HGVs. It will also serve pedestrians, equestrians, animal movements and other means of transport. This mix of traffic is a concern to road traffic as no special provisions (such as walkways) are shown on the bridge. The associated LoR is considered to be high.
Recommendation: Ensure the appropriate level of safety is provided on the bridge through the design and implementation of appropriate facilities for other bridge users.

2.2.3 Non-Motorised Users

NH-PS 04: Pedestrian crossings and walkways

Location: Along the road and especially at the bridge.
Summary: No pedestrian facilities are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV. The associated LoR is considered to be high.
Recommendation: Design and provide pedestrian facilities where needed.

NH-PS 05: Facilities for cyclists, equestrians

Location: Along the road and especially at the bridge.
Summary: No facilities for cyclists and equestrians are shown on the drawings. This could result to unsafe pedestrian conditions especially since the road is expected to carry high volumes of HGV. These trip makers could share the same facilities with pedestrians with proper design. Some provision also needs to be made for movements of animal herds (i.e. either explicitly forbid them from moving on the road or provide certain crossings). The associated LoR is considered to be medium.
Recommendation: Design and provide suitable facilities where needed and especially at the bridge location.

2.2.4 Road Signs, Carriageway Markings and Lighting

NH-PS 06: Signs and markings

Location: Along the road
Summary: The level of signing and carriageway marking appearing on the drawings needs to be increased to serve non motorized users and to provide better information and regulation for motorized users. Visibility restrictions and local access control must also be addressed. The associated LoR is considered to be medium.
Recommendation: Design and provide additional road signs and carriageway markings.

NH-PS 07: Lighting

Location: Throughout the road but most importantly at the bridge location.
Summary: No lighting is shown on drawings. Absence of lighting could create deteriorated road safety conditions at night or bad weather especially at the location of the bridge. The associated LoR is considered to be low.
Recommendation: Design and implement road lighting if necessary.

3. LoR TABLE

The table underneath summarizes the level of risk estimates by road link and identified issue as they were assessed in Section 2.

Issue identity	LoR		
	Low	Medium	High
NH-PS 01		●	
NH-PS 02			●
NH-PS 03			●
NH-PS 04		●	
NH-PS 05	●		
NH-PS 06			●
NH-PS 07		●	
NH-PS 08	●		
NH-PS 09			●
NH-PS 10			●
FQ-PS 01		●	
FQ-PS 02			●
FQ-PS 03			●
FQ-PS 04			●
FQ-PS 05		●	
FQ-PS 06		●	
FQ-PS 07	●		

4. IMPLEMENTATION PLAN

The implementation of the plant roads (the NH-PS and FQ-PS Roads) has already received the necessary permits from the competent Albanian Authorities. Nevertheless, the recommendations put forward in this report - as finally accepted by the relevant Authorities - should be designed and implemented before the operation of the plant roads and should be monitored thereafter. An exception to the above is the automation of the railway crossing control which should be implemented when the National Railroad develops sufficient traffic to warrant such control. Until that time, manual control by a manned post would be sufficient. Also, the installation of traffic signs at road junctions is related to the general traffic management policies of the competent Authorities. For example, the competent National Highway Authority may not accept the operation of few traffic signals on a national highway that operates mostly without such signals.

Furthermore, the implementation of off-road parking facilities and accesses can be implemented by ANTEA only if the necessary land is made available by the competent Albanian Authorities.

As per the Highway Agency' s Design Manual for Roads and Bridges (DMRB), Volume 5, Section 2, Parts 2 and 3, "Road Safety Audit" Standard HD 19/03, two more Safety Audits need to be implemented, i.e., the Stage 3 Safety Audit has to be conducted during implementation and the Stage 4 Safety Audit should be conducted during operation of the plant roads.

Road safety needs to be monitored regularly (at five year intervals) using accident statistics collected by the competent Authorities such as the traffic police and hospitals in the area. This analysis could be undertaken by ANTEA only if these Authorities approve access to the relevant data. In the case where statistically significant "black spots" are identified, respective mitigation measures will need to be appropriately designed and implemented. Their effects will be the subject of further road safety assessments.

APPENDIX A

AUDIT BRIEF

Audit Brief

Drawings

The NH-PS Road

1. Horizontal road alignment (route) plan(s) **02 BR DD Plan-Final**
2. Right of Way Limits. **02 BR DD Plan-Final/187 BR-DD Land acquisition map.**
3. Vertical profiles. **16 BR DD Longitudinal Section-Final.**
4. Cross sections at regular intervals. **49 BR DD Cross Sections-Final.**
5. Location and drawings of junctions. **26 BR-DD Junctions with existing roads.**
6. Geometric road design data such as curvatures, longitudinal and transverse gradients, max allowable speed limits, sight distances, etc. **BR-DD reporti i Projekt Zbatimit.**
7. Road signs, road markings, and lighting, including
    a. Vertical fixed signs **42 BR-DD Road sign and marking**
        i. Road markings **42 BR-DD Road sign and marking**
8. Guard rails **41 BR-DD Guard rail H4/24 BR-DD Typical cross section**
9. Standards & regulations used to carry out the road design. **Italian Standards CNR/AASHTO**

Drawings

The FQ-PS Road

1. Horizontal road alignment (route) plan(s) **Horizontal_Plan.dwg**
2. Right of Way Limits. **Expropriation Inventory.dwg**
3. Vertical profiles. **Profile.dwg**
4. Cross sections at regular intervals. **Cross_Sections????.dwg(6 files)**
5. Locations and drawings of junctions: **Road_Layers.dwg, Culverts_800-1000.dwg, Retaining_walls.dwg, Head_Walls_Reinforcing.dwg**
6. Geometric road design data such as curvatures, longitudinal and transverse gradients, max allowable speed limits, sight distances, etc.: **Horizontal_Plan.dwg, Profile.dwg**
7. Road signs, road markings, and lighting, including **Road_Signs.dwg**
8. Standards & regulations used to carry out the road design: **Projekt-Kusht per Projektimin e Rrugere Automobilistike, Drejitoria e Pergjithshme e Rrugere, Tirana, 2004**