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Sound Barriers Produced by PLASTREX - Assessment of Load Bearing Capacity



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1. Introduction

Noise Barriers produced by PlastRex consist of the steel frame, into which the fillings from polymeric material are fixed. Panels are 3480 mm high and 4950 mm long. The polymeric fillings consist of strips 138 mm wide, 38 mm thick. The strips are connected by couple of C profiles welded in longitudinal direction, axial distance between these profiles is 1650 mm. Details are given in technical documentation [2]. Panels can be installed into steel HEA profiles. Material parameters of load bearing structures are given in table Tab.1

Tab. 1 Material parameters

	Elasticity Modulus	Yield Strength	Strength
Steel S275	210 GPa	275 MPa	410 MPa
Polymeric material	950 MPa	-	13,7 MPa

2. Loads (classification)

On the basis of static calculations delivered by manufacturer [3], it is possible to conclude, that PlastRex Noise Barriers fulfils requirements of STN EN 1794-1 for following load states:

- wind load 26 m/s. The panels placed at the end of the noise barrier (area up to 2 h from the end of noise barrier, see Fig. 1) should be prune down to 3300 mm. For the terrain category III the panel satisfies this criterion in original length (4950 mm) also at the end,
- load pressure from traffic (800 Pa),
- dynamic load from snow clearance (for maximum speed of snow plough 60 km/h - load 15 kN.

Tab. 2 – Wind pressure depending of the panel placement

Wind speed	Mid placement (D)		End placement (B)	
	Terrain – Cat II	Terrain – Cat III	Terrain – Cat II	Terrain – Cat III
24 m/s	778 Pa	498 Pa	1022 Pa	871 Pa
26 m/s	913 Pa	584 Pa	1597 Pa	1022 Pa
30 m/s	1215 Pa	778 Pa	2127 Pa	933 Pa

* Bold denotes the loads used in this classification

** The height of noise barrier including parapet was considered 4 m.

Tab. 3 – Terrain categories

Terrain categories	Terrain description
Cat II	Flat area
Cat III	Woods, suburbs, villages

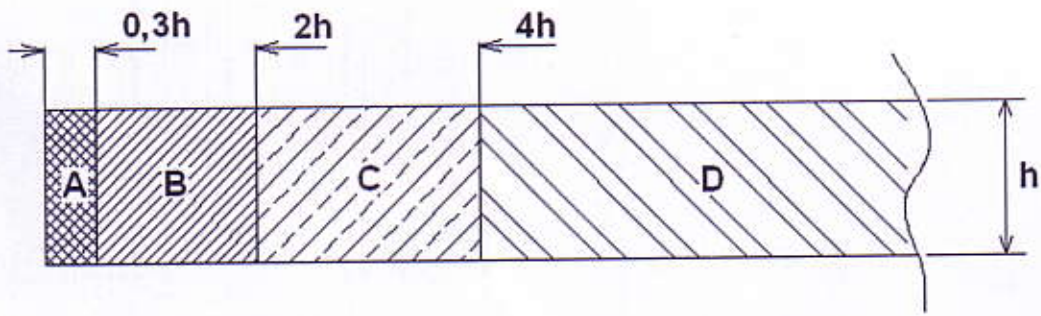


Fig. 1 Wind areas along the sound barrier (h is the height of the sound barrier)

2. References

1. STN EN 1794-1:2011 Road traffic noise reduction devices – Non acoustic performance – Part 1: Mechanical performance and stability requirements
2. Technical documentation – PlastRex, Tartu rd84a, 10112 Tallin, Estionia.
3. PLASTREX, Noise Barrier Calculations, Tartu rd84a, 10112 Tallin, Estionia.

4. Appendix – Control Calculation

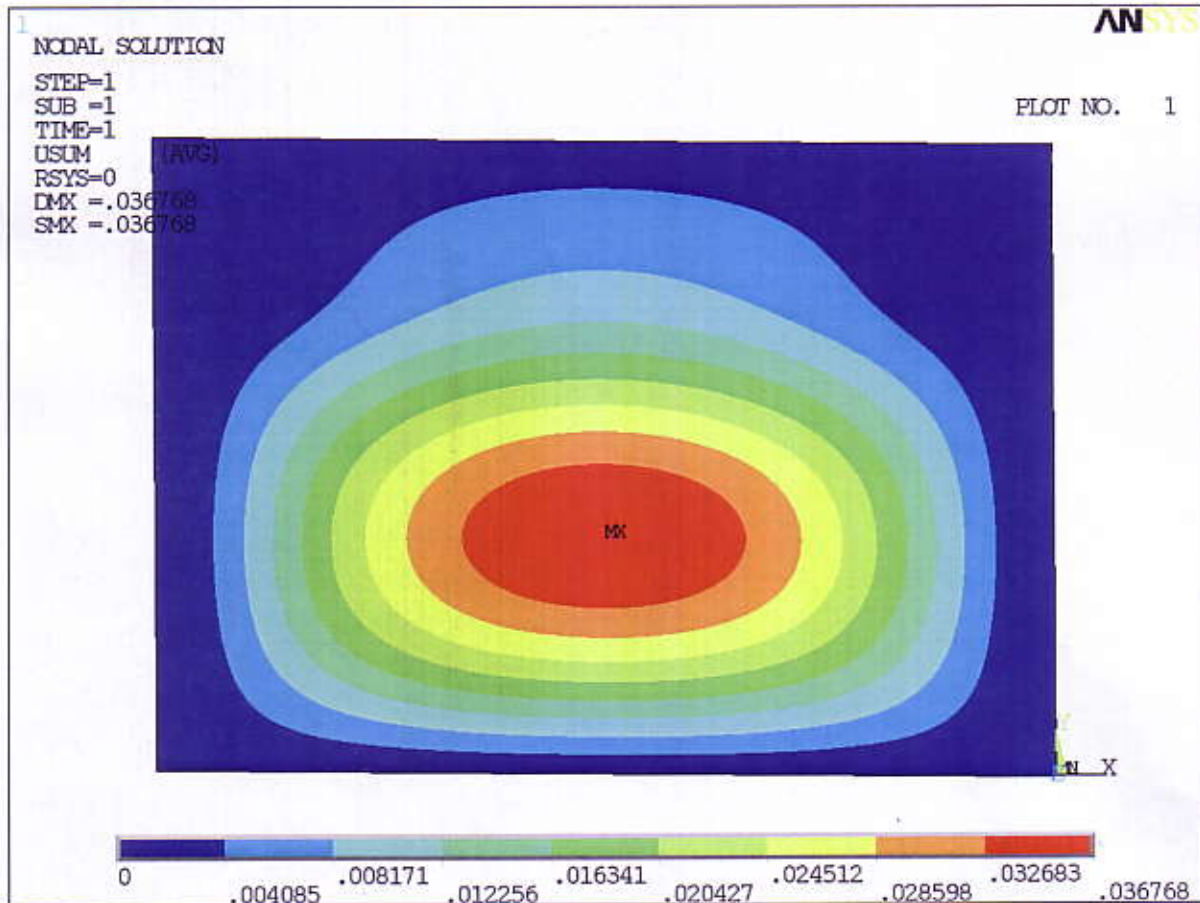


Fig. 2 Deflection - Wind load (pressure 1022 Pa)

Tab. 4 – Wind pressure depending of the panel placement

Load State	Load Specification	Stress in Steel [MPa]	Deflection [mm]
LS2	wind load (1022 Pa)	177 MPa	37 mm
LS3	snow clearance (15 kN)	236 MPa	50 mm

Conclusion:

Max. deflection \leq 50 mm.

Max. stress in steel \leq 250 MPa

The maximal stress in steel frame is below ultimate limit stress. The maximal deflection is below maximal allowed deflection.