Assumptions

Calculations are made based on following standards:

1.EVS-EN 14388: 2007 Road traffic noise reduction devices – Specifications
2.EN 1794-1: 2011 Road traffic noise reduction devices – Non acoustic perfomance – Part 1: Mechanical perfomance and stability requierments
3.EVS-EN 1991-1-4: 2007: Wind actions

Other basic data:
1. Acoustic element is composed from polymeric elements with cross-section of 138x38mm. Technical data: see tests from Tallinn Technical University.
Density of acoustic element is $\rho = 8kN/m^3$
2. Steel S275
3. Steel frame – welded connections, height of weld =4mm. Cross-sections of steel frame, see attached drawings DWG file. Steelframe is galvanized after welding.
4. Unit connections are projected as hinged connections.

1. PlastRex acoustic element **does not absorb water**, therefore its selfweight is not changing in wet environment $\rho_{dry} = \rho_{wet} = 8kN/m^3 x0,038 = 0,3kN/m^2$

2. Weight of Plastrex wall when dry/wet $\rho_{dry} = \rho_{wet} = 8kN/m^3 x0,038x3,5 = 1,1kN/m$.

3. **A.3.3 condition** $d_{h\max} = (\frac{L_A}{40};50mm)$, when $L_A \leq 5m$.

L_A =1,6m $\Rightarrow d_{h\max} = \frac{1600}{40} = 40mm$

Normative windload for acoustic element q_w=**0,96kN/m2**.

Width of acoustic element is 138mm $\Rightarrow q_w$=0,96x0,138=**0,13kN/m**.

$d = \frac{5q_w L_A^4}{384EI}$ E=950N/mm^2. $\Rightarrow d = 18,9mm < d_{h\max} = 40,5mm$

Calculations in the clauses 4 and 5 have been made with the following engineering program:
Autodesk Robot Structural Analysis Professional 2013.
As a construction element, entire frame has been handled as one whole element.
Calculation scheme and results have been presented in graphic format in appendix - **PlastRexNoise Barrier - Autodesk Robot Structural Analysis Professional 2013.pdf**

4. **A.3.2. condition**: Maximum deflection a structural element d_{hmax}=30mm, when
3m < H_{nrd} ≤ 4,5m. H_{nrd} = 3,5m.
Structural element is dimensioned for the wind load **q_w=0,96kN/m2.**
Calculations verify that at this wind load the the maximum deflection of structural element is **30mm**.

B.3.3 condition: Element has to withstand the load that has been multiplied by load factor
Load factor for wind and static load S_w=1,5.
Dimensioned is bending strength of the structural element.
Calculations verify that maximum bending strength **δ_{max}=167,1N/mm2 < δ_d=250(steel S275)**

5. Structural element is dimensioned for dynamic load of road snow removal F=15kN, application height 1,5m from the ground surface.
Current load is dimensioned for the surface of structural element of 2x2m.

Dimensioning is verified with the load factor of 1,5. Dimensioned value is bending strength of the structural element.
Calculations verify that maximum bending strength is:
δ_{max}=212,3N/mm2 < δ_d=250(steel S275)

6. Cross section of acoustic element is **138mmx38mm**.
Element is influenced by dynamic load from snow removal f=0,138*15/(2x2)=**0,78kN/m.**

Following condition has to be met $\delta_{\max} = \frac{M}{W} < \delta_d$ Acoustic elements's calculated length is L=1,6m

M=0,78x1,6^2/8=0,25kNm

W=138x38^2/6=33212mm^3

δ_{max}=0,25x10^6/33212=**7,5N/mm2**

Average bending strength of acoustic element is 13,7N/mm2.
δ_d=13,7/1,25=11N/mm2 > δ_{max}=7,5N/mm2