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THE BASE ISOLATION OF THE NEW TRIESTE HARBOR LOGISTIC PLATFORM

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Abstract

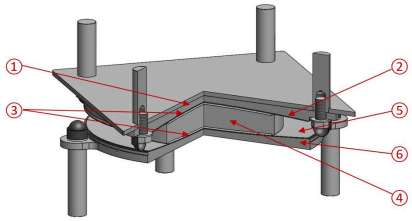
The growing of the goods traffic by shipping in Northern Italy stresses the need of having wide logistic platforms for the management of the goods, organizing their stock, ships docking and link with the main transport links, both routes or railways.

The new investment in Trieste harbor with its irregular plan will cover around 70.000 square meters of the existing bay and will improve the movement of goods from central Europe and Turkey for an estimated yearly turnover of 15 million Euros.

The new logistic platform is 470 meters long and 275 meters wide. It is made by a post-tensioned concrete slab of thickness 50 cm fully base isolates with 850 CE marked curved surface sliders supplied by Freyssinet.

Materials

The basic components of the double curved surface slider FREYSSINET ISOSISM PS are shown here below:



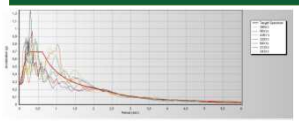
Where :
1. Top sliding plate
2. Primary sliding surface
3. Special Sliding material ISOGLIDE®
4. Median plate
5. Secondary sliding surface
6. Bottom plate

Figure 1. View of the platform

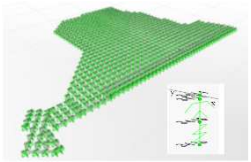
Tests at Isolab were performed on the new 70 MN testing bench able to test devices up to 70.000 kN static vertical load and up to 20.000 kN static horizontal load. The testing bench is also able to develop a vertical dynamic force up to 18.000 kN and a horizontal dynamic force up to 5.000 kN with a maximum stroke of 1.000 mm up to a velocity of 1.000 mm/s.

Figure 2. 70 MN Testing Bench at ISOLAB.

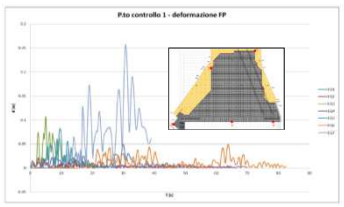
Structure Analisys



Accelerograms selected

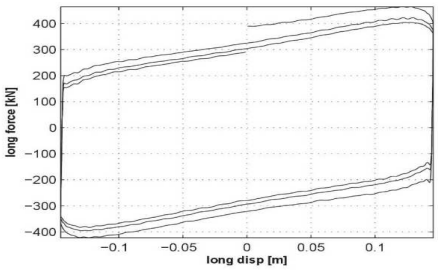


Modelling on SAP 2000



Results of the dynamic analysis

Tests Results



	Dynamic Friction [%]	Maximum Horizontal Force [kN]	Energy Dissipated [kNm]
Design	4	453	185.6
Experimental	3.9	415	179
Deviation	-2.5%	-8.4%	-3.6%

Figure 3. Double curved surface slider.

Table 1. Isolator design characteristics.

Data	Mark	Value
Maximum Isolator Displacement	d_E	0.20 m
Maximum Vertical non-seismic load - ULS	N_{sd} ULS	116000 kN
Maximum Vertical non-seismic load - SLS	N_{sd} SLS	8000 kN
Minimum Seismic Vertical Load	$N_{ed,min}$	1900 kN
Maximum Seismic Vertical Load	$N_{ed,max}$	8000 kN
Maximum Horizontal Load	V_{ed}	531 kN
Equivalent radius	R_{eq}	8.7 m
Dynamic Friction Coefficient	μ_{din}	4%
Isolation Period	T_0	5.91 s
Maximum Design Velocity	v_{ED}	0.244 m/s

Conclusions

Thanks to Freyssinet portfolio, joining and expertise of the Freyssinet Group, a complete solution is provided with specific technologies as applied to this major project has been provided from design level up to test and installation on site.
Curved surface sliders, designed according to EN15129 and CE certified, used in the isolation system are described together with the seismic performance and test performed to validate the behavior.
This shows how, nowadays, an integrated solution is important to grant a high level of reliability and quality of the products respecting at the same time the always tight construction schedules.

Figure 4. Double curved surface slider installed on site.

Contact

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