



ArcelorMittal

Steel sheet piles – International Experience

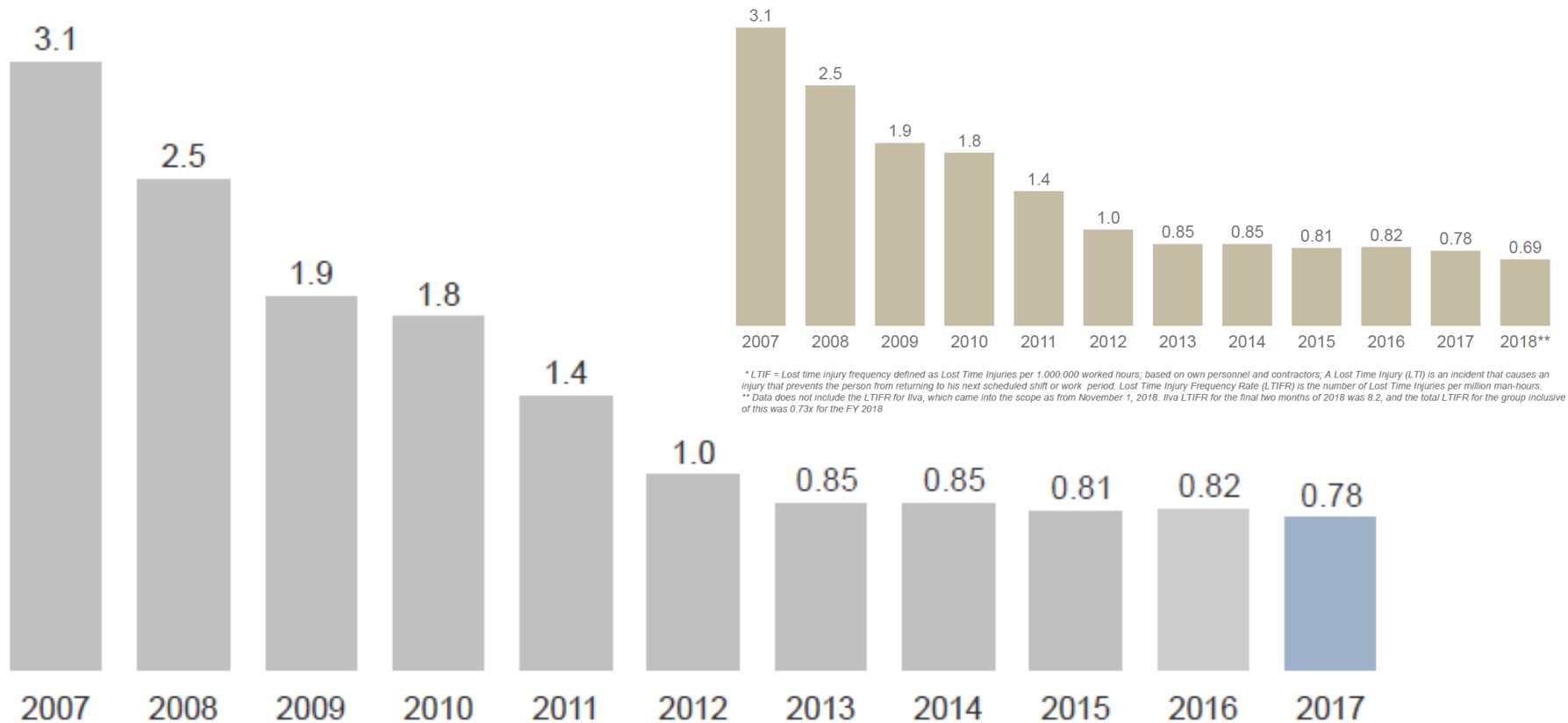
Påledag 2019 | Göteborg

ArcelorMittal

Safety is our priority



Health & Safety Lost time injury frequency (LTIF) rate* Mining & steel, employees and contractors



* LTIF = Lost time injury frequency defined as Lost Time Injuries per 1,000,000 worked hours; based on own personnel and contractors; A Lost Time Injury (LTI) is an incident that causes an injury that prevents the person from returning to his next scheduled shift or work period. Lost Time Injury Frequency Rate (LTIFR) is the number of Lost Time Injuries per million man-hours.
 ** Data does not include the LTIFR for Iva, which came into the scope as from November 1, 2018. Iva LTIFR for the final two months of 2018 was 8.2, and the total LTIFR for the group inclusive of this was 0.73x for the FY 2018

Our goal is to be the safest metals and mining company

* LTIF = Lost time injury frequency defined as Lost Time Injuries per 1,000,000 worked hours; based on own personnel and contractors

ArcelorMittal Europe

Allowing us to be closer to markets, customers and needs



78,000 employees

working in **400** different sites

industrial presence in **16** countries

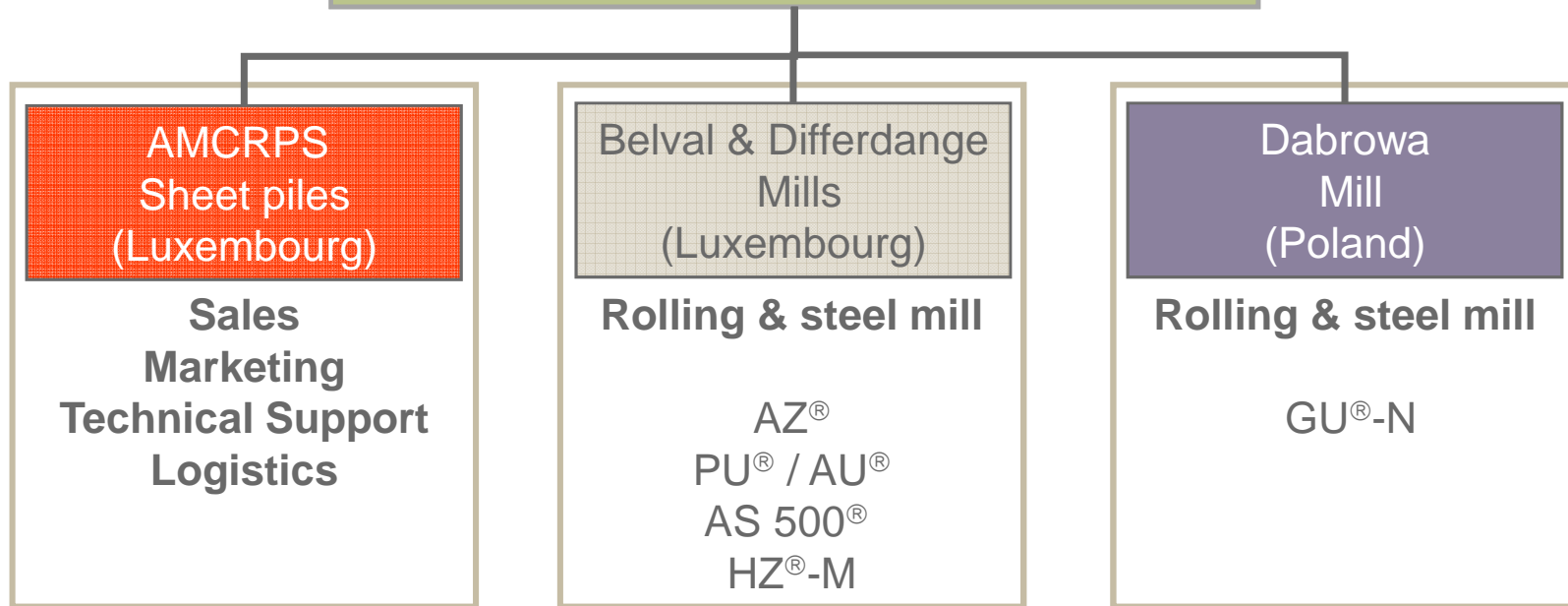
40,941 Mt shipments* in 2017

Europe	2015	2016	2017
Revenue (US\$billion)	31.9	29.3	36.2
Ebitda (US\$billion)	2.4	2.5	3.6
Operating income (US\$million)	171	1,270	2,359
Crude steel production (Mt)	43,853	42,635	43,768
Shipments (Mt)*	40,676	40,247	40,941

* ArcelorMittal Distribution Solutions shipments are eliminated in consolidation as they primarily represent shipments originating from other ArcelorMittal operating subsidiaries.

ArcelorMittal – Sheet Piling

ArcelorMittal Europe – Long Products



worldwide
market leader
in steel sheet piles

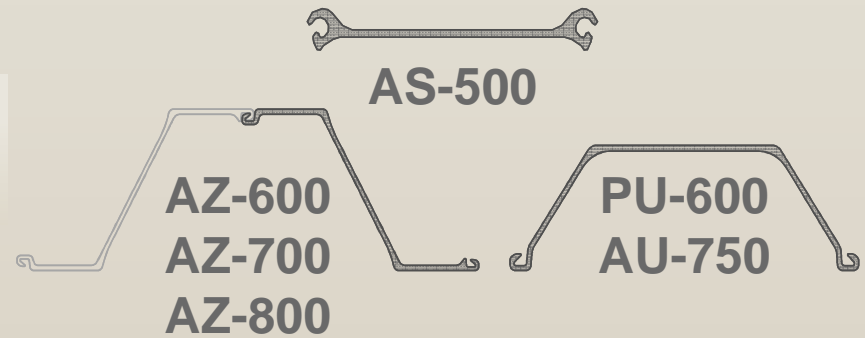


Hot Rolled Steel Sheet Piling Mills and product range



Mill's capacity

Belval
Luxembourg



Dabrowa
Poland

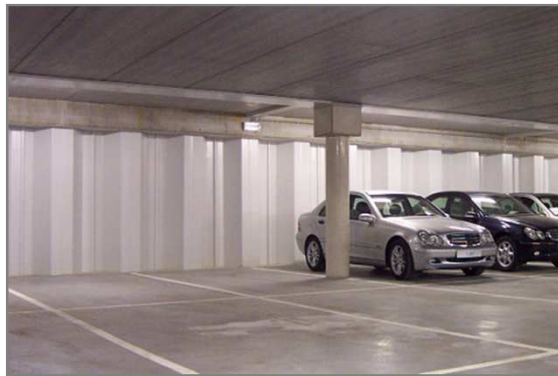


Differdange
Luxembourg

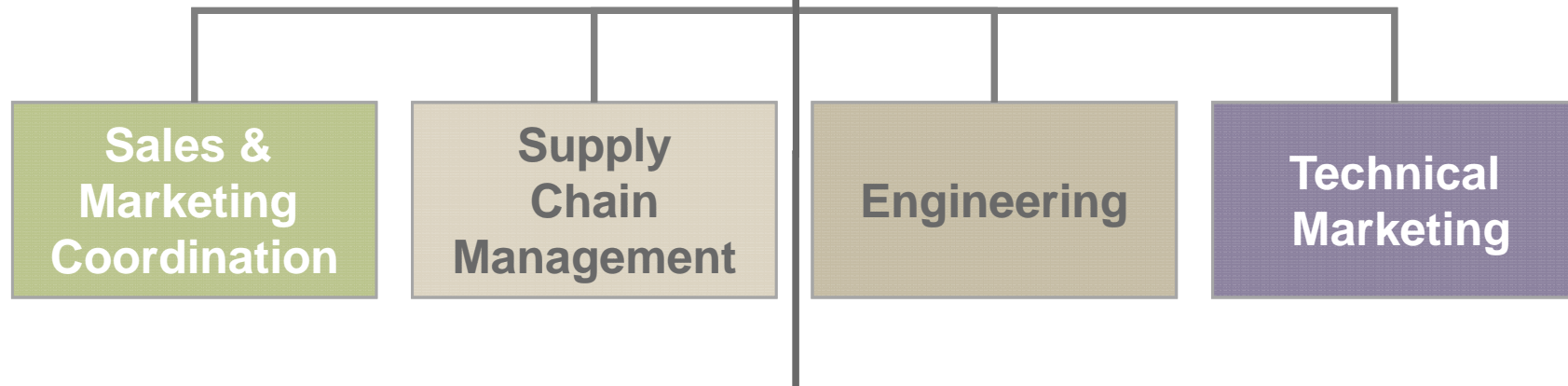


Total Capacity 900kt

ArcelorMittal Sheet Piling - Organization



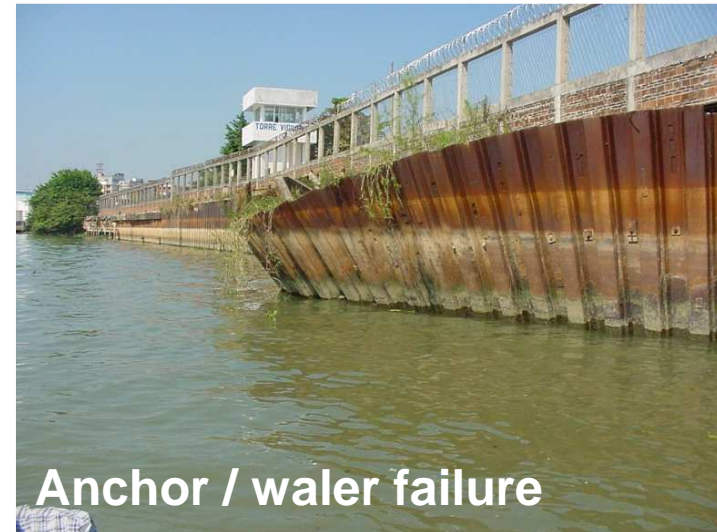
**ArcelorMittal
Sheet Piling
Luxembourg**



ArcelorMittal worldwide dedicated sales network

Sheet piles: 'technical sales', predominantly for projects

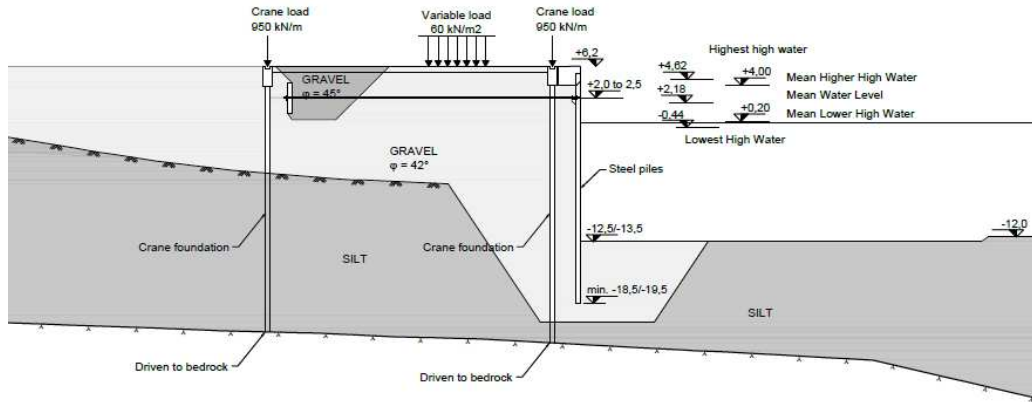
Our task is to prevent ...



Kleppsbakki Extension, Sündahöfn, Reykjavik, Iceland



Project consisting of a 470m quay wall extension



- To cover
 - Design Assistance
 - Tailor-made production
 - Driving method statements
 - Fabrication drawings
 - HP rock shoes
 - Coating
 - Logistics
 - New HP as rock level different than initially thought



Design Assistance / Checking

- Verification of steel sections of front wall (HZ/AZ combi wall)
 - Verification of steel stresses including the effects of corrosion and coating
- Verification of steel HP-piles
 - Verification of bearing capacity

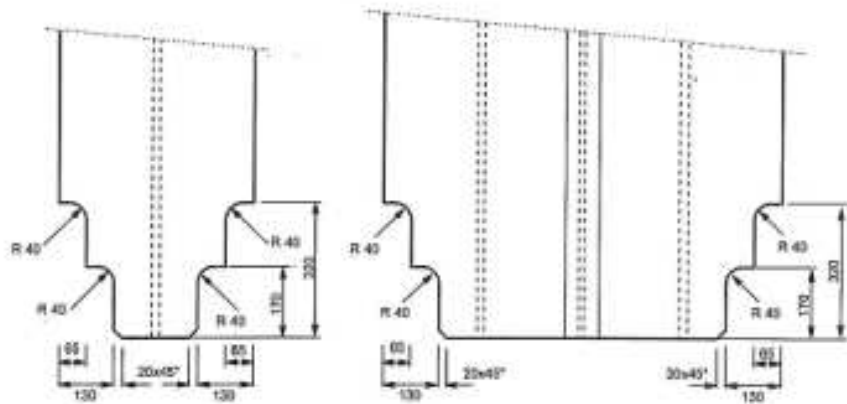
Tailor Made Production

- Toe strengthening of the HZM king piles was also requested

info-sheet : MAY 08



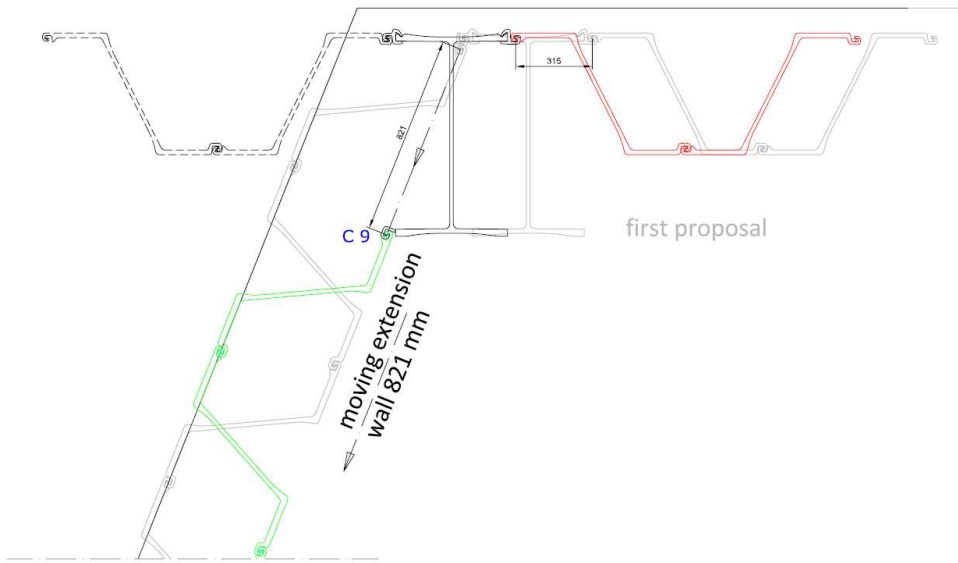
Noched pile toe for HZ single or double king piles
Etalage au pied pour simple ou double élément porteur HZ
Fußabtreppung für HZ Einzel- oder Doppel-Tragbohlen



Installation Method Statements & Pile Driving Recommendations

- Installation Method Statements were developed for
 - The HZ/AZ Wall
 - For the AZ part of the Wall
 - For the HP piles
- Included Templates/Execution/DrivingTolerances/ Detail Drawings
- Pile Driving Recommendations included sizing of Vibro hammer and Hydraulic Hammer and recommendations for hard driving conditions

Driving Plan / Fabrication Drawings / Coating

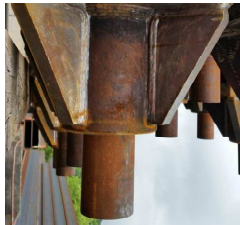


HP Piles – Rock Shoes

- HP rock shoes changed from



To



And were delivered welded onto the HP Piles



Logistics

- AM offered the material as FOB Stowed i.e. loaded on the vessel so that the Client would not have to arrange handling and loading HZM + AZ coated sheet piles and also so that AM Sheetpiling could intervene and instruct loading operations
- AM Sheetpiling sent an inspection team to check that the loading of the sheet piles did not affect the coating
- AM Sheetpiling offered extra coating material to the Client, for him to fix any scratches

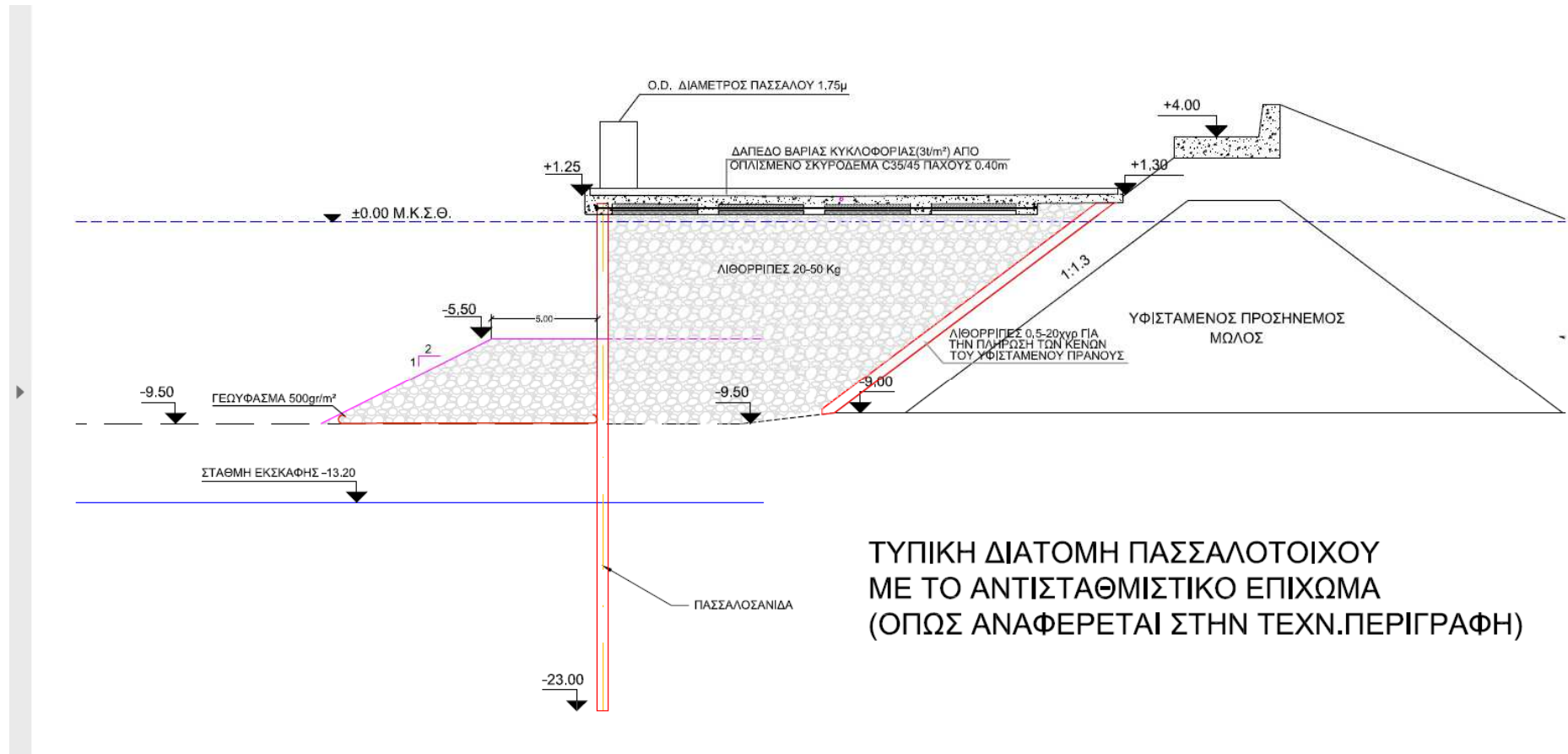
Further Involvement

- Bedrock level demanded an increase in the length of some of the HP piles, that were delivered to the jobsite.

Floating Dock – Cyprus



All going well until...

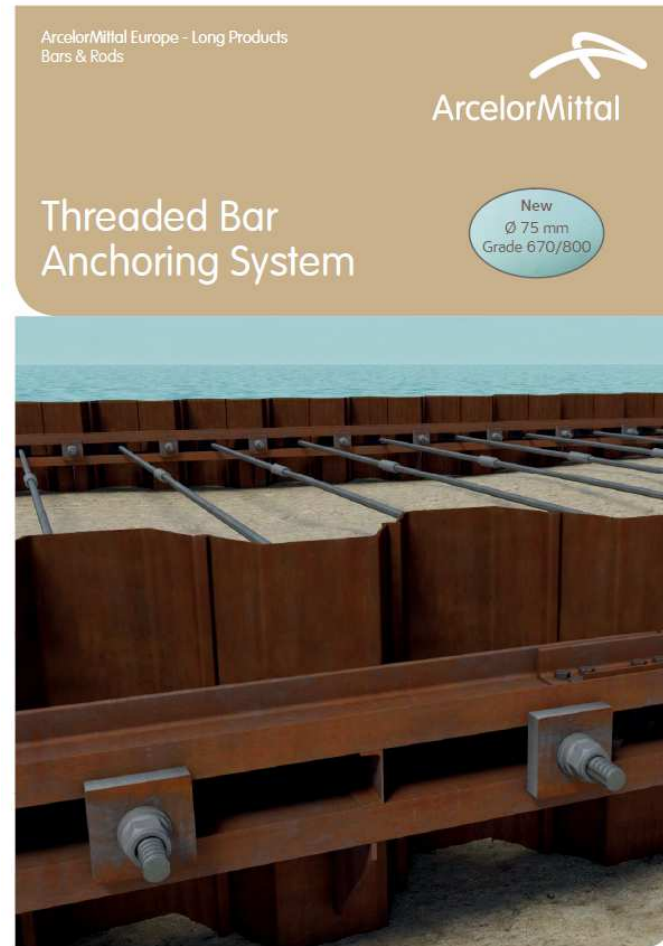
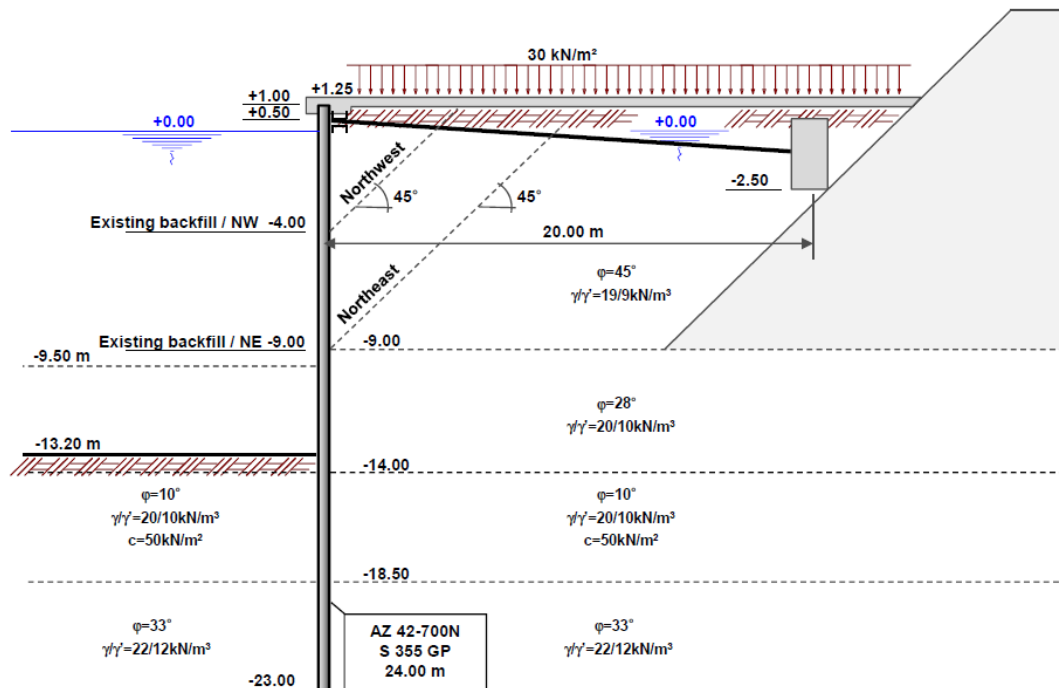


ΤΥΠΙΚΗ ΔΙΑΤΟΜΗ ΠΑΣΣΑΛΟΤΟΙΧΟΥ
 ΜΕ ΤΟ ΑΝΤΙΣΤΑΘΜΙΣΤΙΚΟ ΕΠΙΧΩΜΑ
 (ΟΠΩΣ ΑΝΑΦΕΡΕΤΑΙ ΣΤΗΝ ΤΕΧΝ.ΠΕΡΙΓΡΑΦΗ)

Design rapidly done using real time on-site data for calibration...

Sections Northeast / Northwest

Assumptions to be verified by the customer



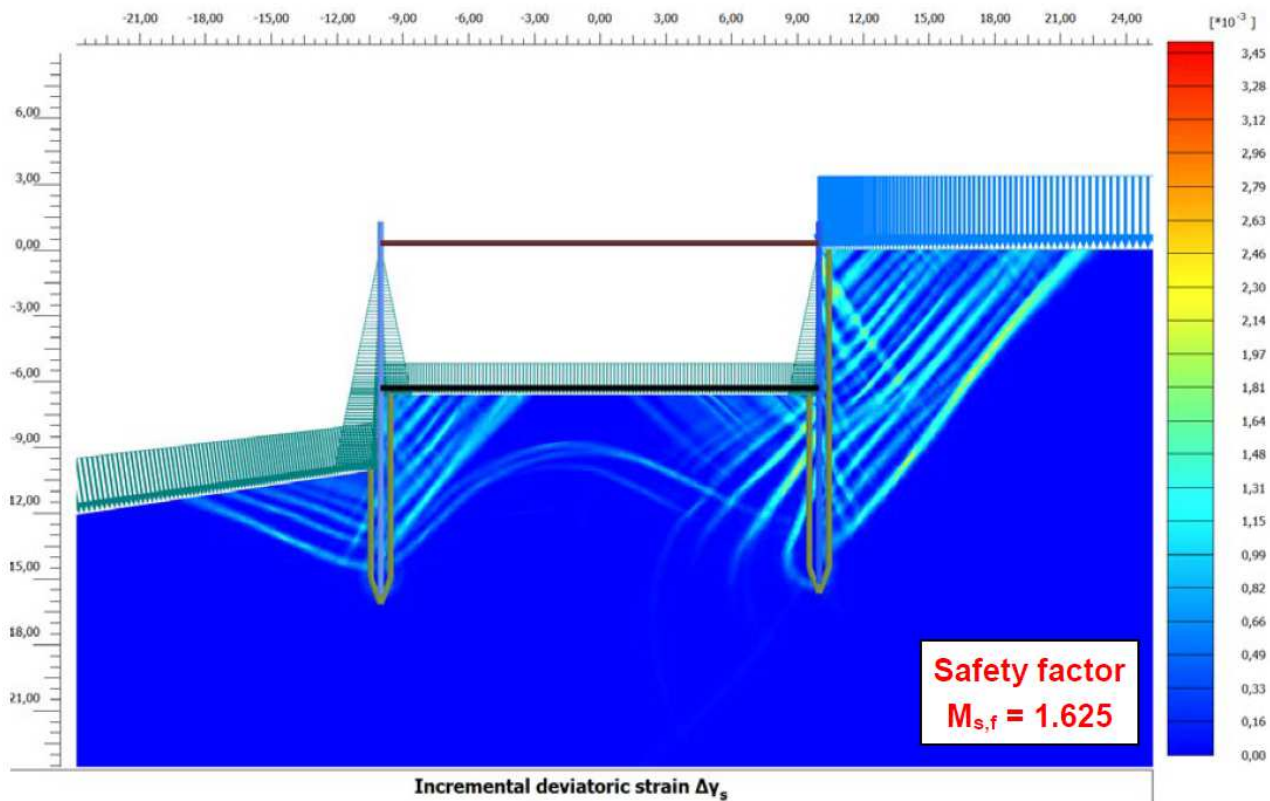
It all went well in the end...



Back to the North with the Pommern Dock, Finland



PLAXIS calculations performed for this unique solution



Pommern Dock – in progress



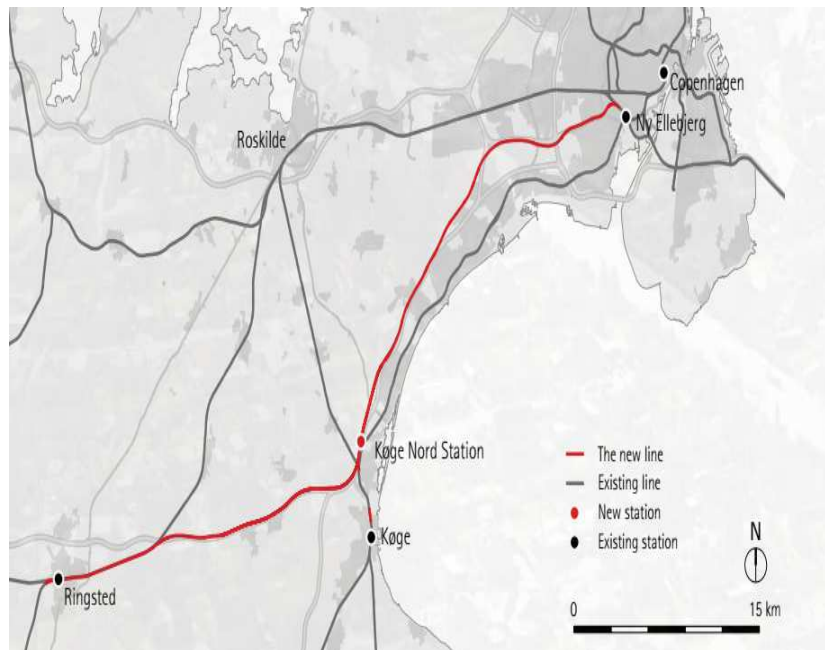
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Pommern Dock – in progress – bottom slab complete



- PLAXIS design
- 10 dispatches (FCA) as per Client's instructions and limited space on site
- Project located on island not easily accessible.

Copenhagen – Ringsted High Speed Railway



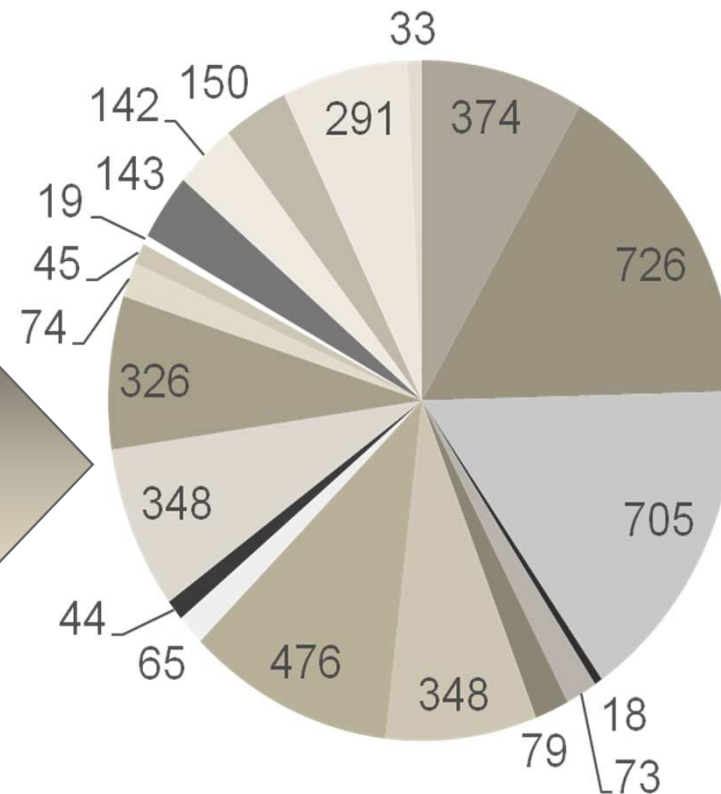
- Denmark's Fastest Railway - Speeds up to 250 km/h
- 56 km double –track route / 1.4bil €
- Civil Works construction 2014 – 2016
- Test-running mid 2018

Logistics – There could be a problem...

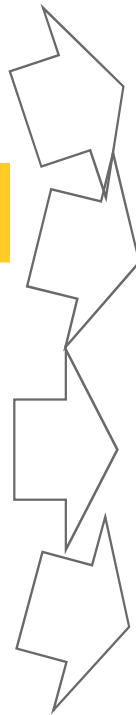
SSP Tonnage for TP4

- Total tonnage for one project only (TP4) 4.5kt, However split into many orders of different specifications and also having to be delivered quickly...

SSP Tonnage per order for TP4



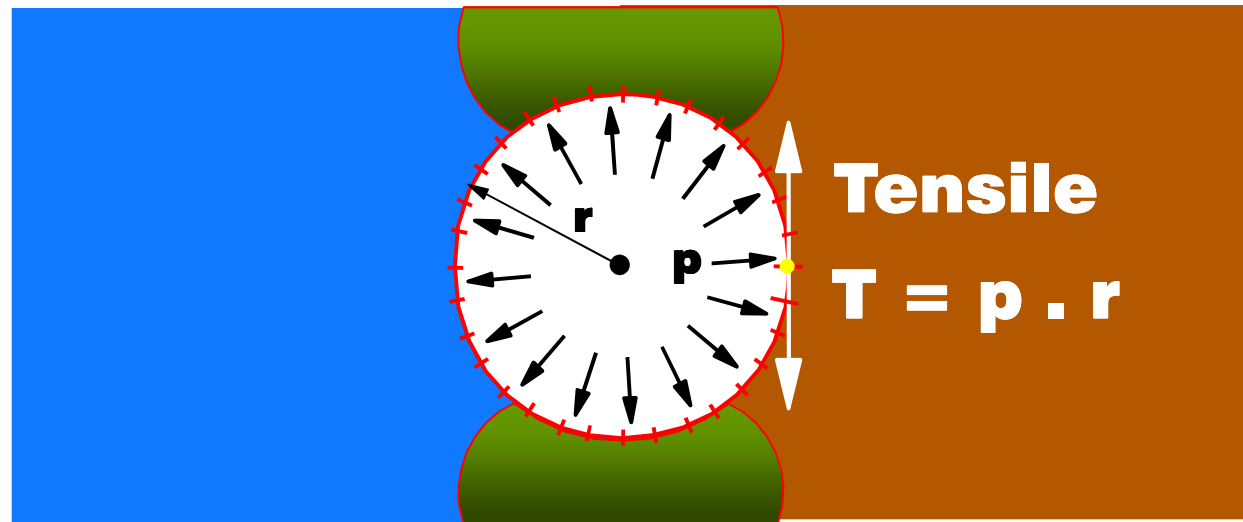
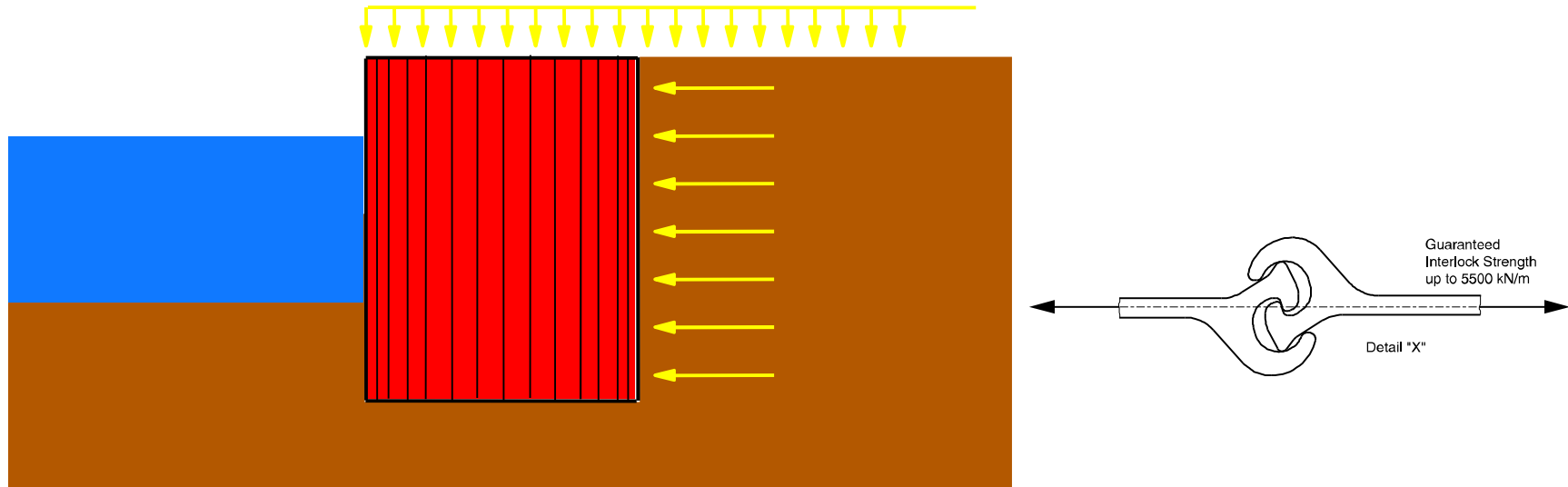
Logistics – Problem Identified (lack of capacity) and Solved (another hub added)

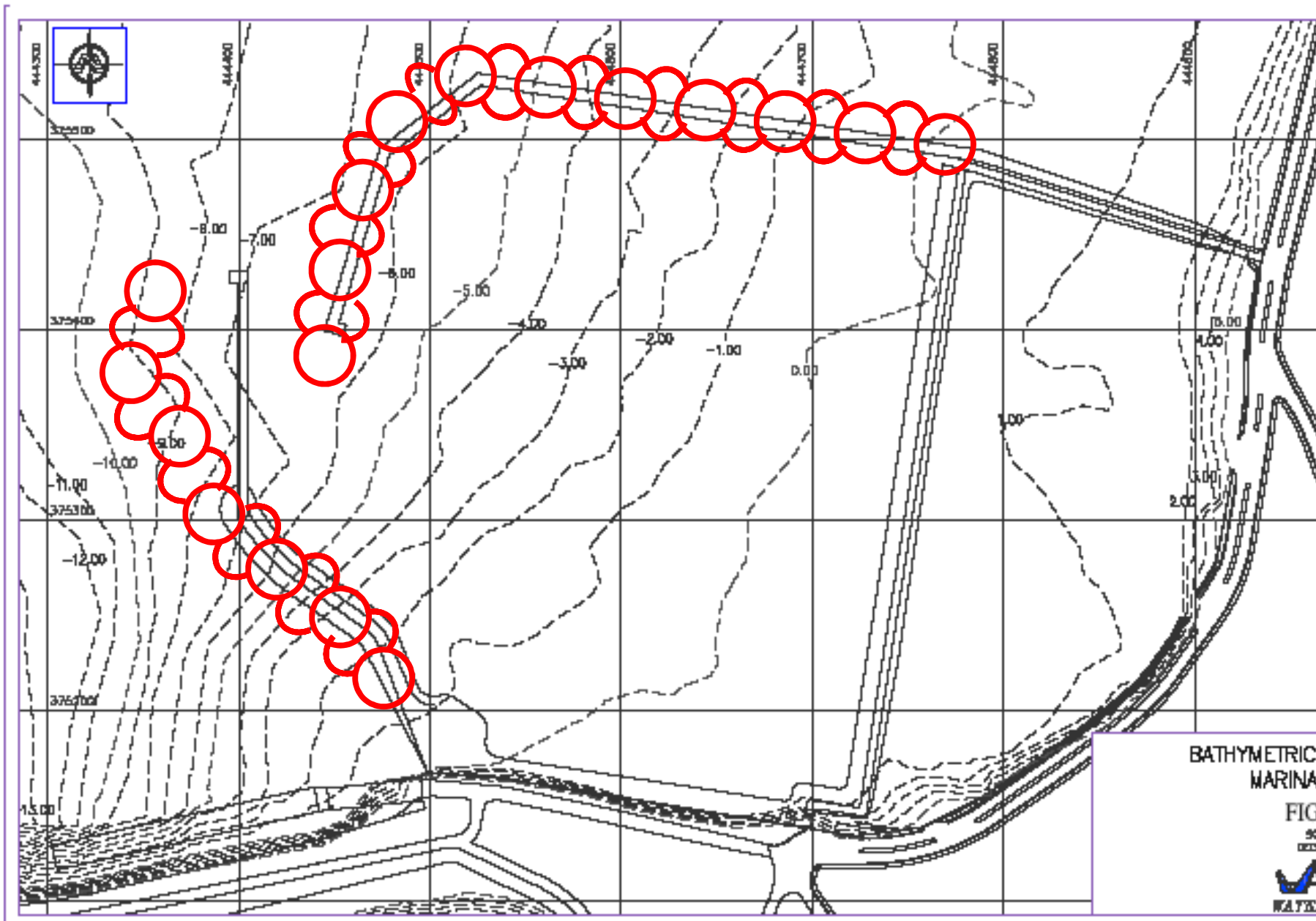


Marina "Pez-Vela" Costa Rica



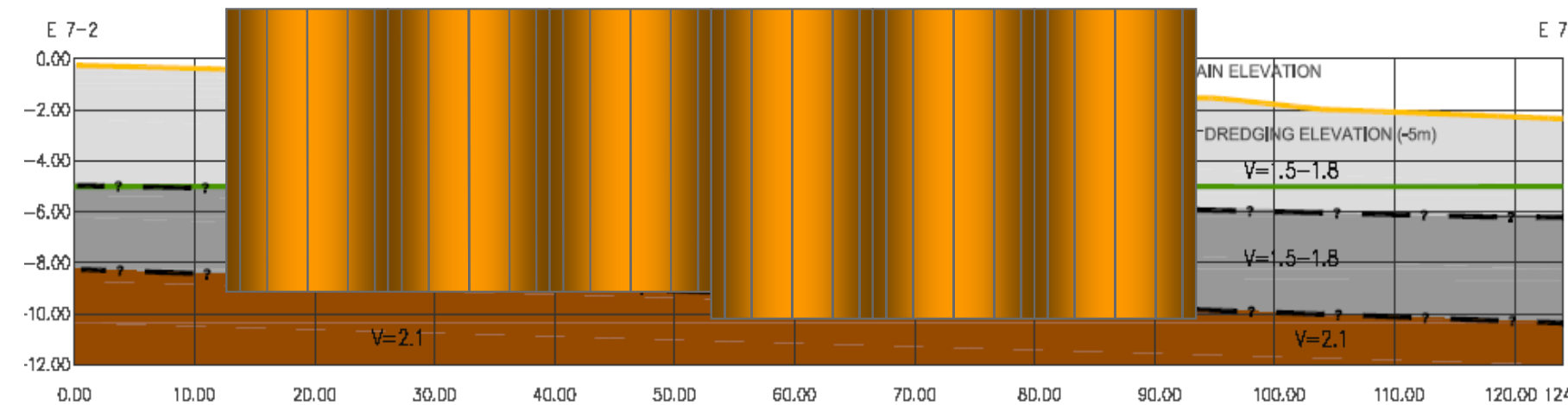
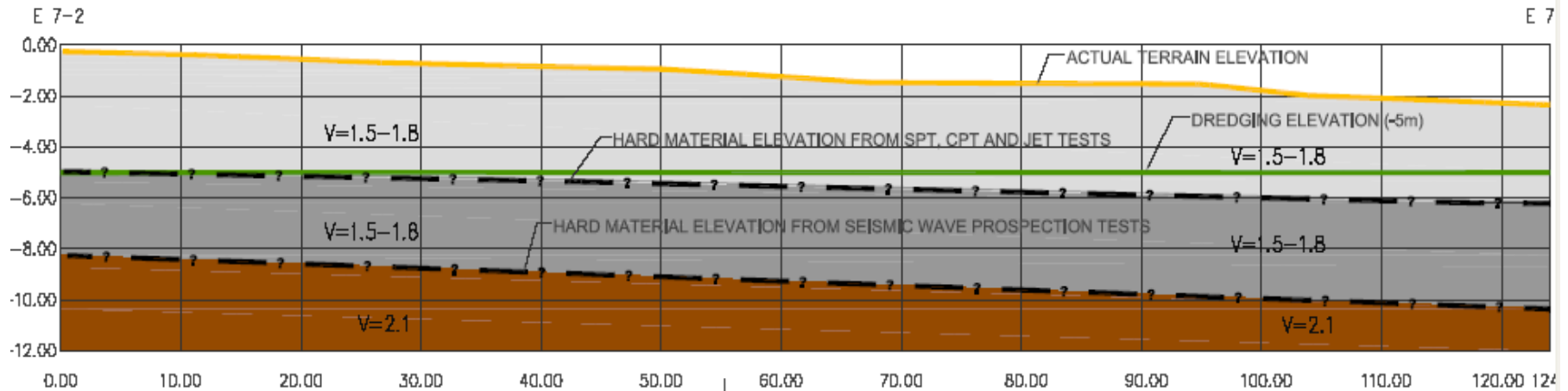
Flat cell structures







Adaption to soil conditions



Template for cells, d~12,00m



Template for cells, d~18,00m



Lifting of piles



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Standard and junction piles





First cell – rough sea!



Growing out into the ocean, crew 1



Growing out into the ocean, crew 2



Project overview, Feb. 2008





Pile driving



Pile driving



Backfilling of Cells - example



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Backfilling of Cells – Costa Rica





Backfilling of Cells – Costa Rica



Two sides of the wall



What to look out for in steel sheet piling projects

- Steel Sheet Piling Projects are in effect a construction method using prefabricated elements.
- As such, in order to enjoy the benefits, preparation is of the essence.



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Thank you for your attention ...



... and let's stay connected