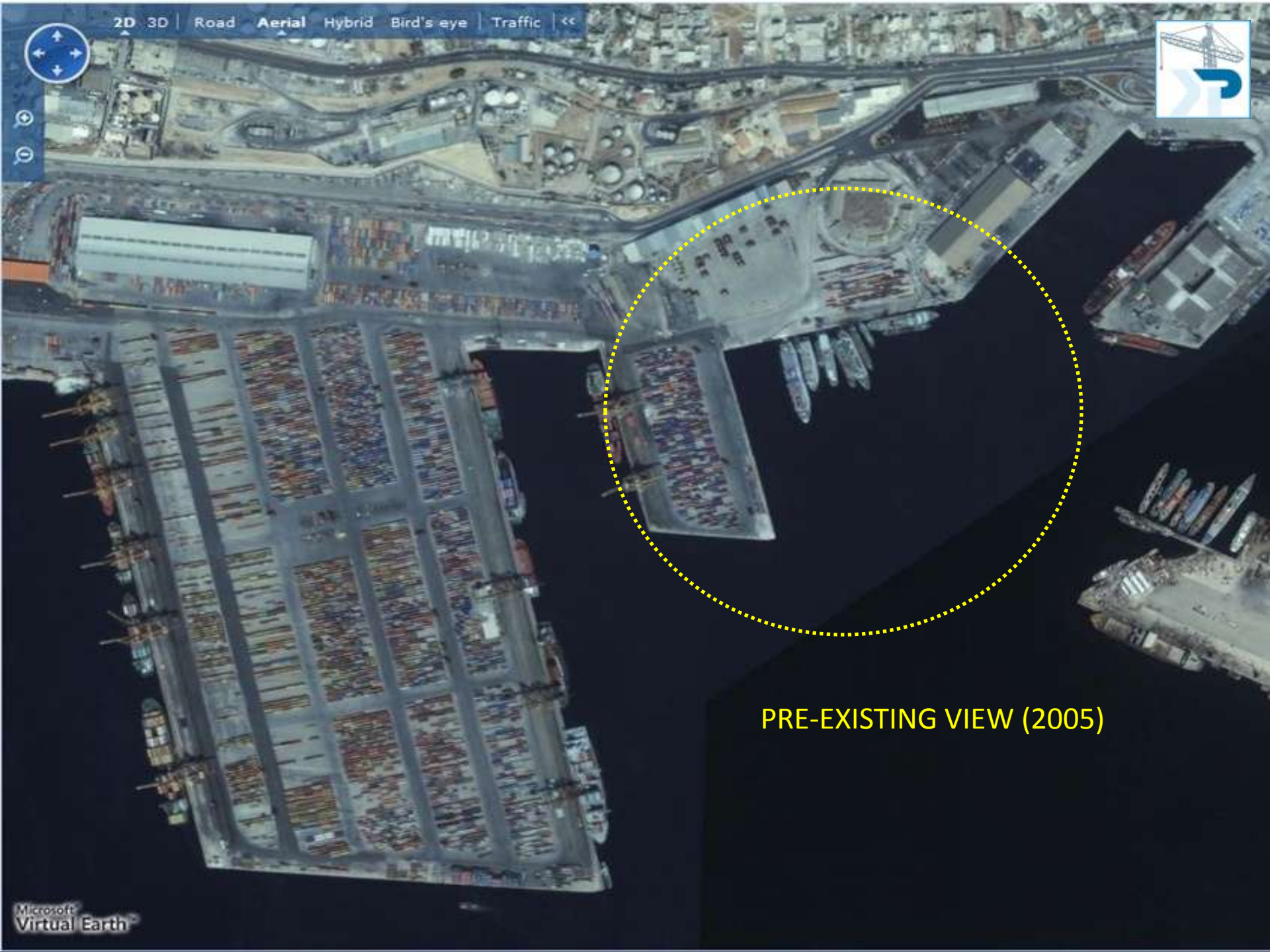
# Project: “El. Venizelos Container Terminal” in Neo Ikonio Construction of New Pier I»

PROJECT ASSIGNOR: P.P.A. SA

JANUARY 2007


2D 3D
Road
Aerial
Hybrid
Bird's eye
Traffic
PRE-EXISTING VIEW (2005)
Microsoft Virtual Earth

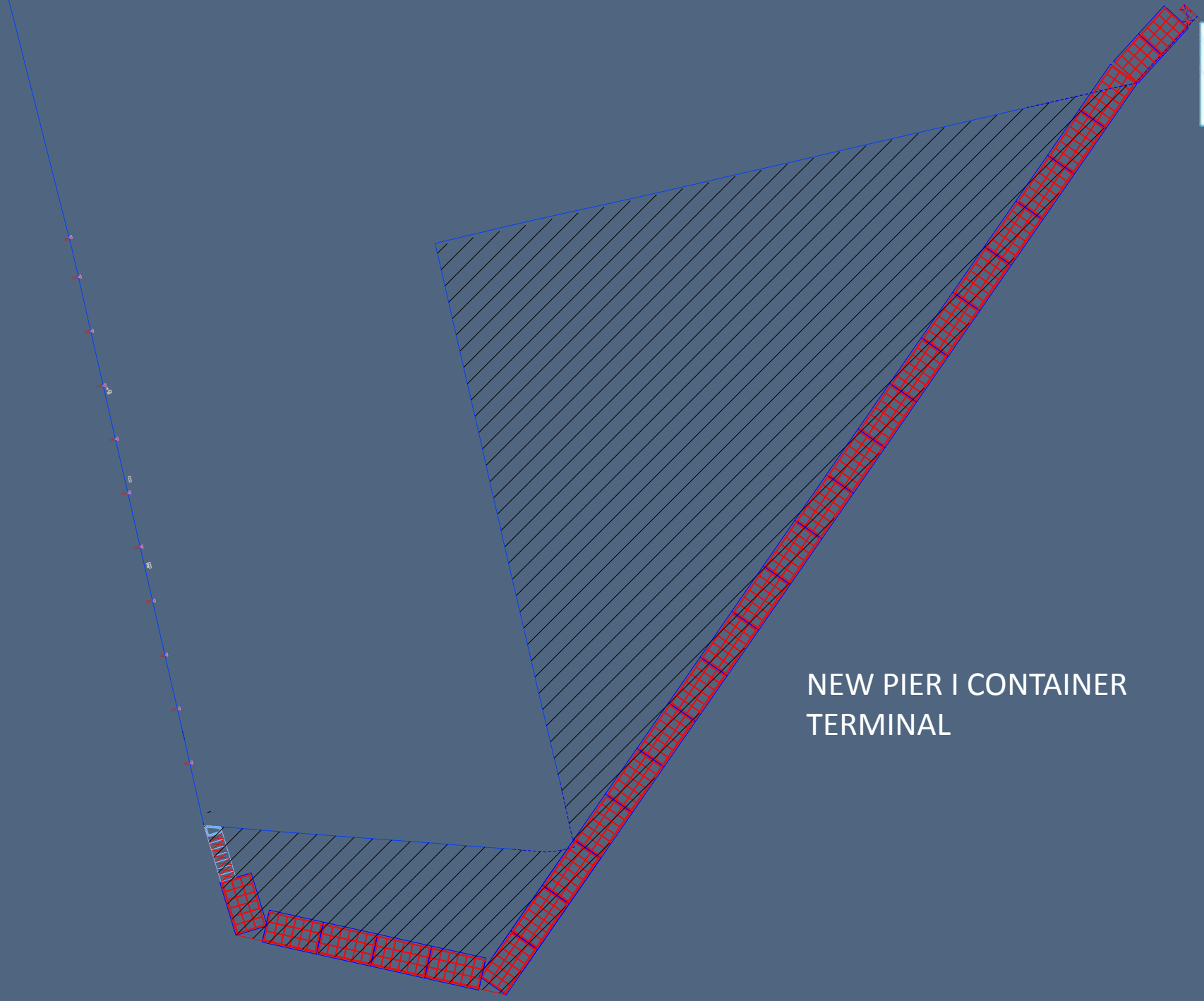
# PURPOSE OF PROJECT WORKS

- Expansion of shore container storage areas by 60,000 $m^2$

- Construction of pier measuring in length 500.00 m with a depth of 18.00 m (useful), able to accomodate mother ships




2007 PIER EXPANSION



NEW PIER I CONTAINER TERMINAL

# AMENDMENT OF INITIAL STUDY

**The initial study for the Project provided for the construction of the Pier using solid & cellular artificial blocks. In that case the depth would be far less than 18.00 m (useful), and at approx. 14.00 m.**

**The study was subsequently amended & it was decide that caissons would be used instead.**

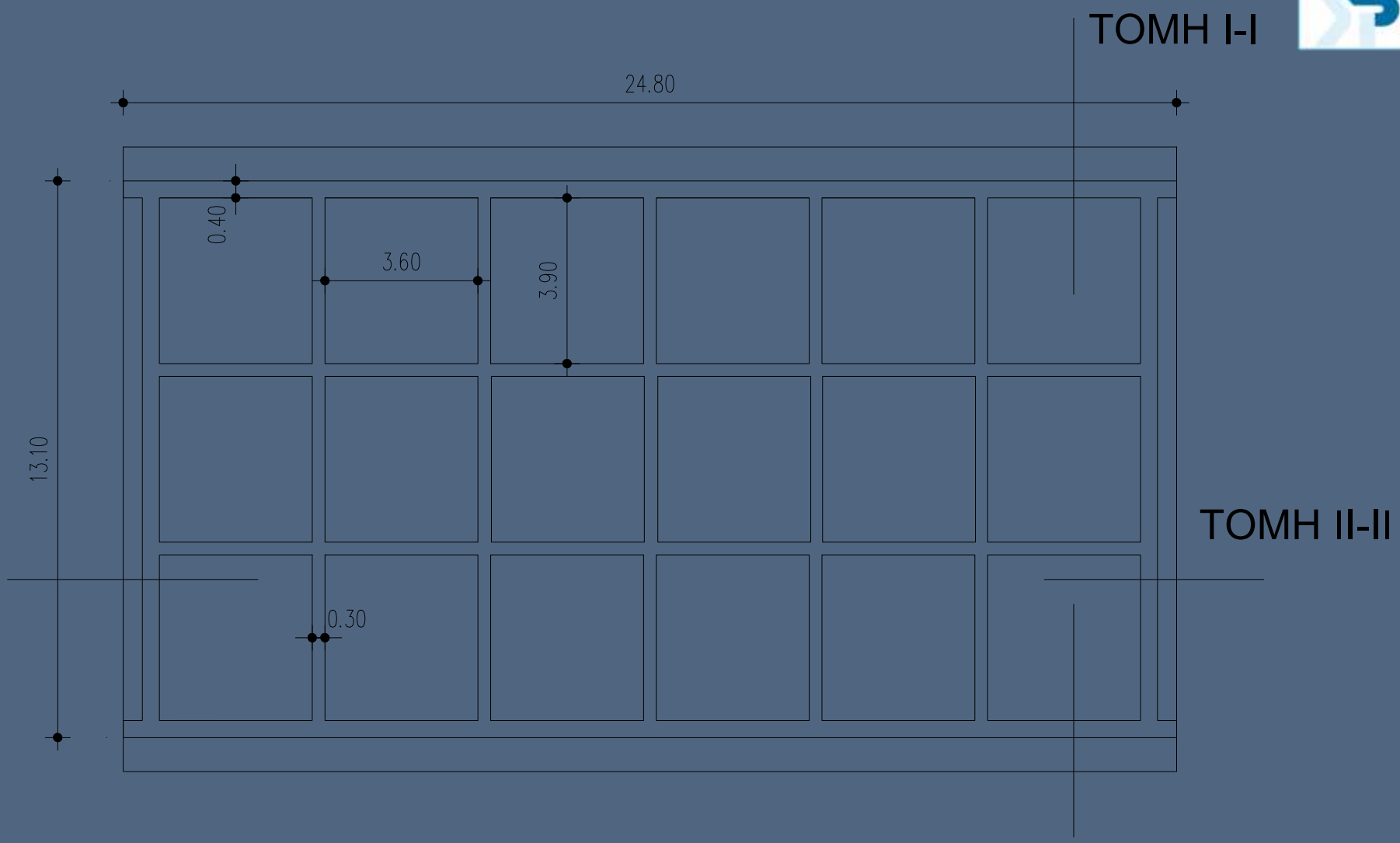
**The reasons dictating the replacement of the solid blocks by caissons were the following:**



- ✓ Safeguarding the monolithic character of the construction
- ✓ Improved tightness of the quay wall by using a smaller number of joints
- ✓ Prevention of sliding on the upper part of the quay wall, where in the past all sliding-repositioning had been observed as following seismic activity.
- ✓ Acceleration of construction time of the quay wall

**The new quay wall is comprised by 25 caissons measuring:**

- **24.80 m in length**
- **13.10 m in width**

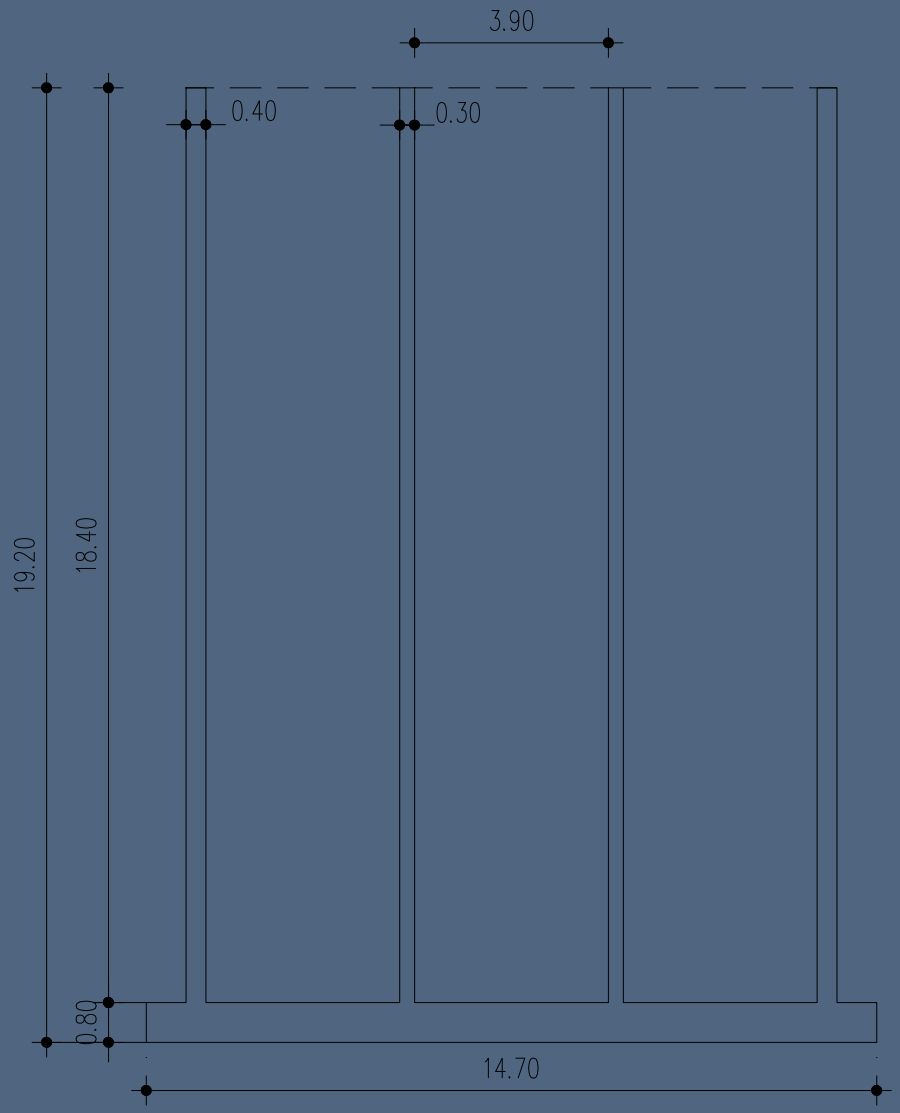



# CAISSON
# SECTIONAL PLAN

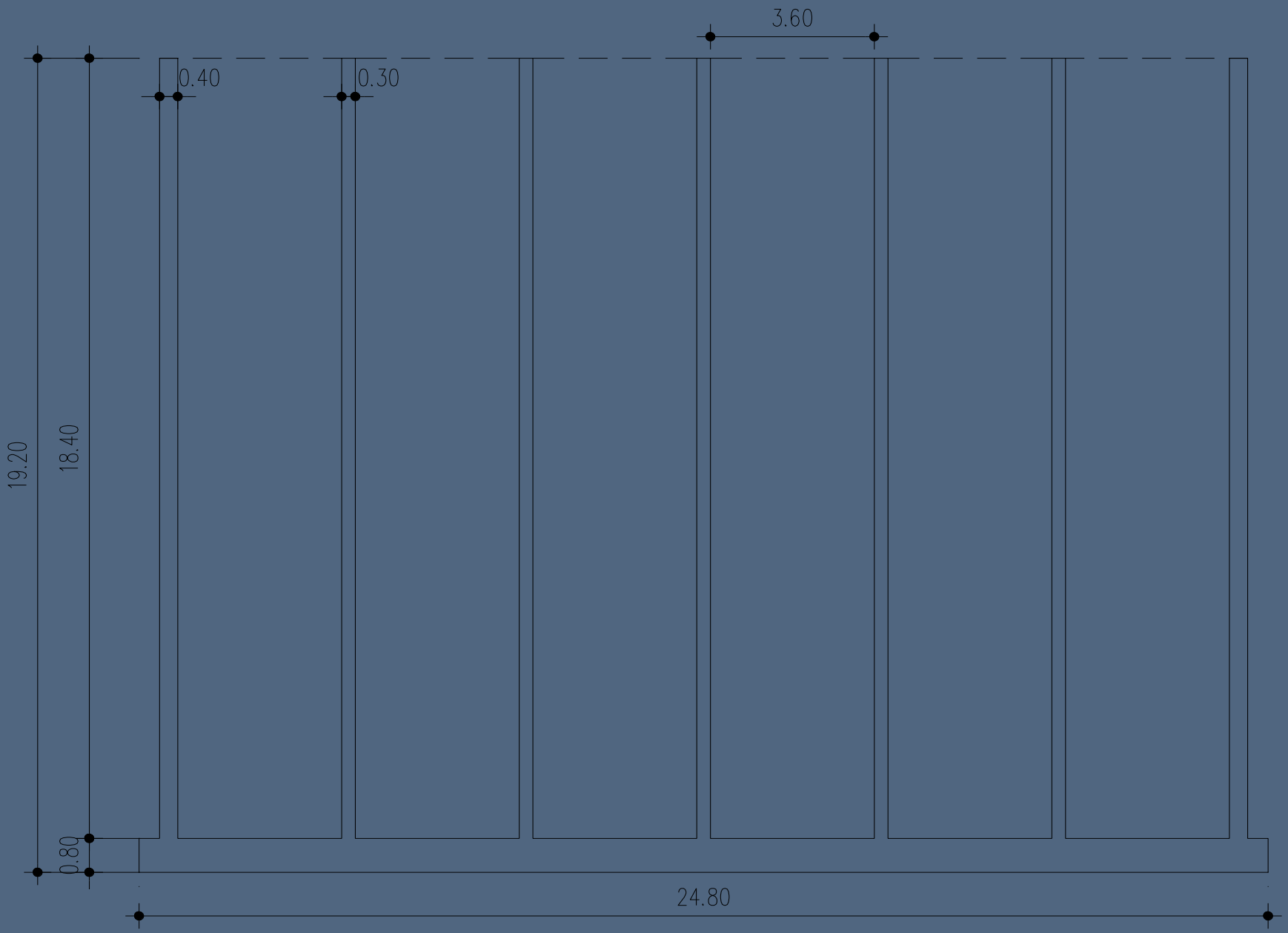
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- **19.20 m in total height, of which 0.80 m form the base & the remaining 18.4 m form its column.**

# TRASNVERSE SECTION I-I



# TRASNVERSE SECTION II-II



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- 24.80 m in length
- 13.10 m in width
- 19.20 m in total height, of which 0.80 m form the base & the remaining 18.4 m form its column.

- Total volume approx. 1,420.00 $m^3$ .
- and total weight 3,550.00 ton.

# Caisson Construction Stages

**The steps followed in Caisson construction are the following :**

1. **Construction on the floating self-sinking caisson platform :**



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   a. **Base with a height of 0.80 m**







# Caisson Construction Stages

**The steps followed in Caisson construction are the following :**

1. **Construction on the floating self-sinking caisson platform :**
   a. **Base with a height of 0.80 m &**
   b. **1st and 2nd floors measuring in height approx. 2x3.00=6.00 m**















# Caisson Construction Stages

**The steps followed in Caisson construction are the following :**

1. **Construction on the floating self-sinking caisson platform :**
   a. **Base with a height of 0.80 m &**
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2. **Launching of the Caisson & positioning of that alongside the floating self-sinking caisson platform.**






Ρ/Κ ΑΓ. ΝΙΚΟΛΑΟΣ Ν.Π 6498


ΚΛΕΑΡΧΟΣ Γ. ΡΟΥΤΣΗΣ Α.Ε.



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3. **On-site (at sea) construction of the next 4 floors (3rd-6th measuring in height approx. 4x3.00 = 12.00 m).**








SALAMIS LINES

# Caisson Construction Stages



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4. **Transport and casting at its final position.**






AMERICAN




FERRIES



# Caisson Construction Stages



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2. **Launching of the Caisson & positioning of that alongside the floating self-sinking caisson platform.**
3. **On-site (at sea) construction of the next 4 floors (3rd-6th measuring in height approx. 4x3.00 = 12.00 m).**
4. **Transport and casting at its final position.**
5. **Filling with rock ballast.**



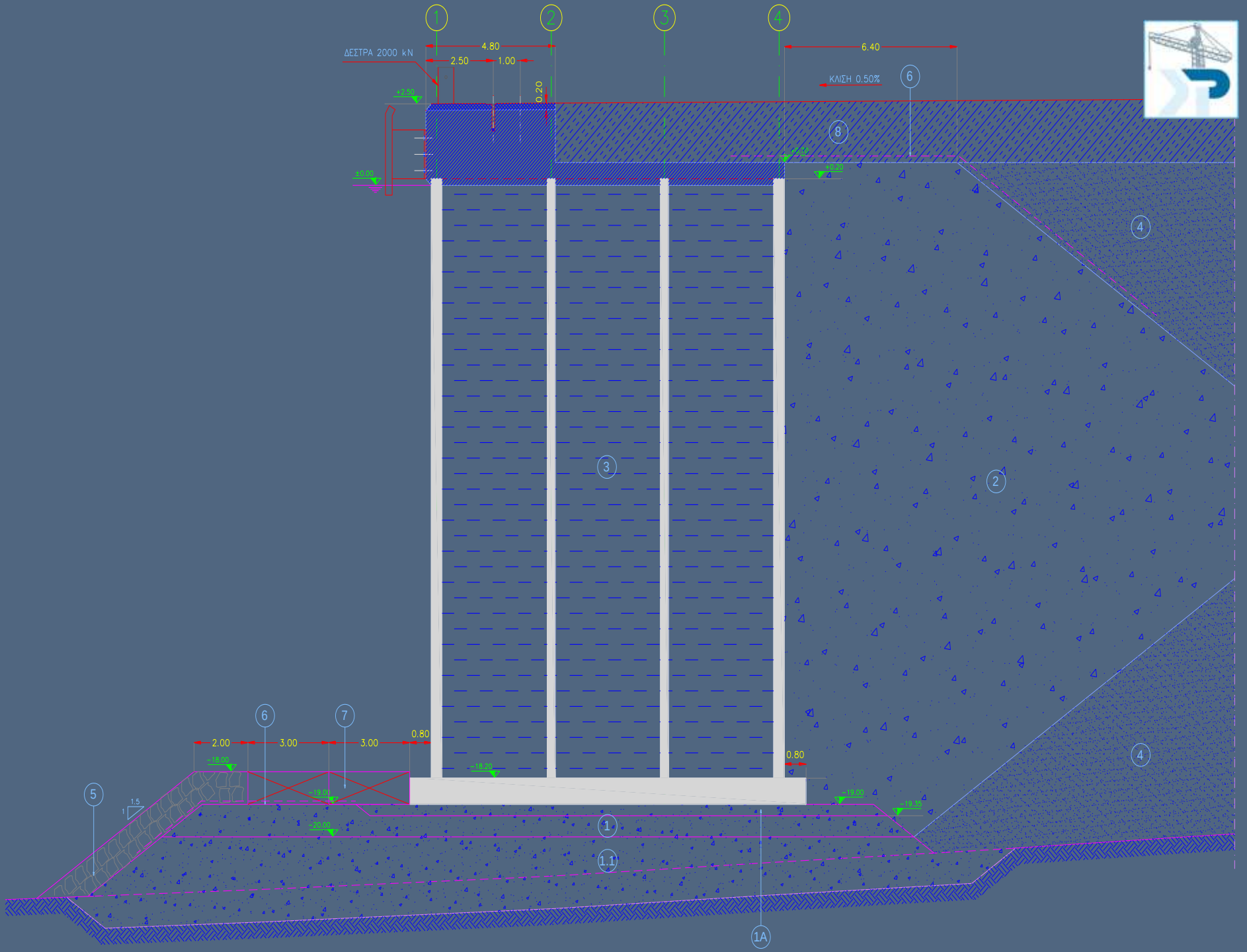
# Riprap foundation base

The Caissons in their final position are set down upon a trapezoidal cross-section foundation pad, which is constituted by graded rock material of extreme durability.

From top to bottom, the materials forming the Caisson foundation pad are as follows :

- Balancing ballast layer
- Layer composed of stone fragments weighing 5 – 10 Kgr
- Layer composed of riprap foundations weighing max. 0.50 – 100 Kgr

Below can be seen a standard cross-section of the Caisson & of the riprap foundation pad.


1
2
3
4
4.80
2.50
1.00
6.40
ΔΕΣΤΡΑ 2000 kN
0.20
ΚΛΙΣΗ 0.50%
6
8
4
3
2
4
6
7
2.00
3.00
3.00
0.80
0.80
5
1.5
1
1
1.1
1A

# Rock ballast production site







**Materials sifting & ballast selection for the balancing layer**



**<u>Ramp</u>**
**(to unload ballast material from the trucks to the platform – flap)**

# Ballast unloading from the platform over the point of construction of the riprap base






# Embankment condensation

After the placement of the Caissons has been finalized and the shore port zone has been embanked with sifted rock materials, follows the stage of Dynamic Condensation.

The fact that the structure will house Containers with stowage type 5+1 (10 ton/$m^2$) renders necessary the condensation of the embankment, in order to achieve high levels of resistance. For this purpose, a weight of 20 tons is free-dropped from a height of 20 meters and the process is repeated  seven times on the same spot.









# Construction of Superstructures

Then follows the construction of the Superstructure for the Project in three Stages.

Its configuration can accomodate ship-to-shore cranes type Super Post Panamax with a 30.00 m outreach and rolling on specially-designed girders.

Presented below are the Construction Stages of the Superstructure.

# Construction of Superstructures



**Stage 1 (from 0.00 m to +0.20 m)**

**Construction of a works floor over the filling ballast of the Caisson, with a height of 0.20 m.**





# Construction of Superstructures



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**Stage 2 (from +0.20 m to +0.70 m)**

**Construction of Superstructure Level I, with a height of 0.50 m & a width of 13.10 m.**









# Construction of Superstructures



**Stage 1 (from 0.00 m to +0.20 m)**

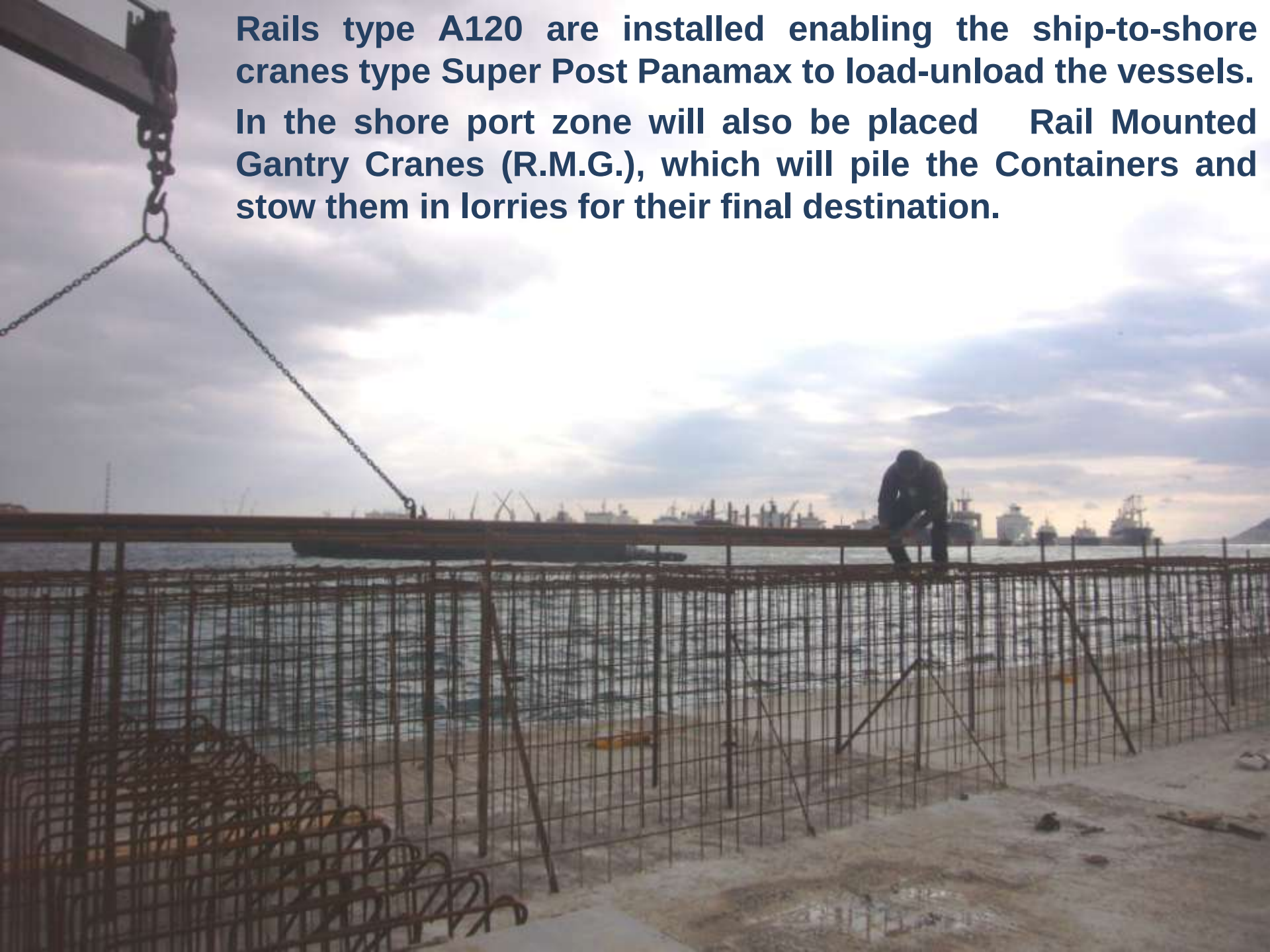
**Construction of a works floor over the filling ballast of the Caisson, with a height of 0.20 m.**

**Stage 2 (from +0.20 m to +0.70 m)**

**Construction of Superstructure Level I, with a height of 0.50 m & a width of 13.10 m.**

**Stage 3 (from +0.70 m to +2,50 m)**

**Construction of Superstructure Level II, with a height of 1.80 m & a width of 5.00 m.**



**Rails type A120 are installed enabling the ship-to-shore cranes type Super Post Panamax to load-unload the vessels.**

**In the shore port zone will also be placed Rail Mounted Gantry Cranes (R.M.G.), which will pile the Containers and stow them in lorries for their final destination.**







The cranes are powered by a cable chain within a Panzerbelt protection system, which is incorporated in the upper part of the Superstructure.

The Panzerbelt protection system uses a continuous semi-flexible cover which allows cable movement while protecting cables both from adverse weather conditions and from vehicles moving in the area.



**Bollards capable of pulling 200 tons are installed for the accommodation of mother ships.**







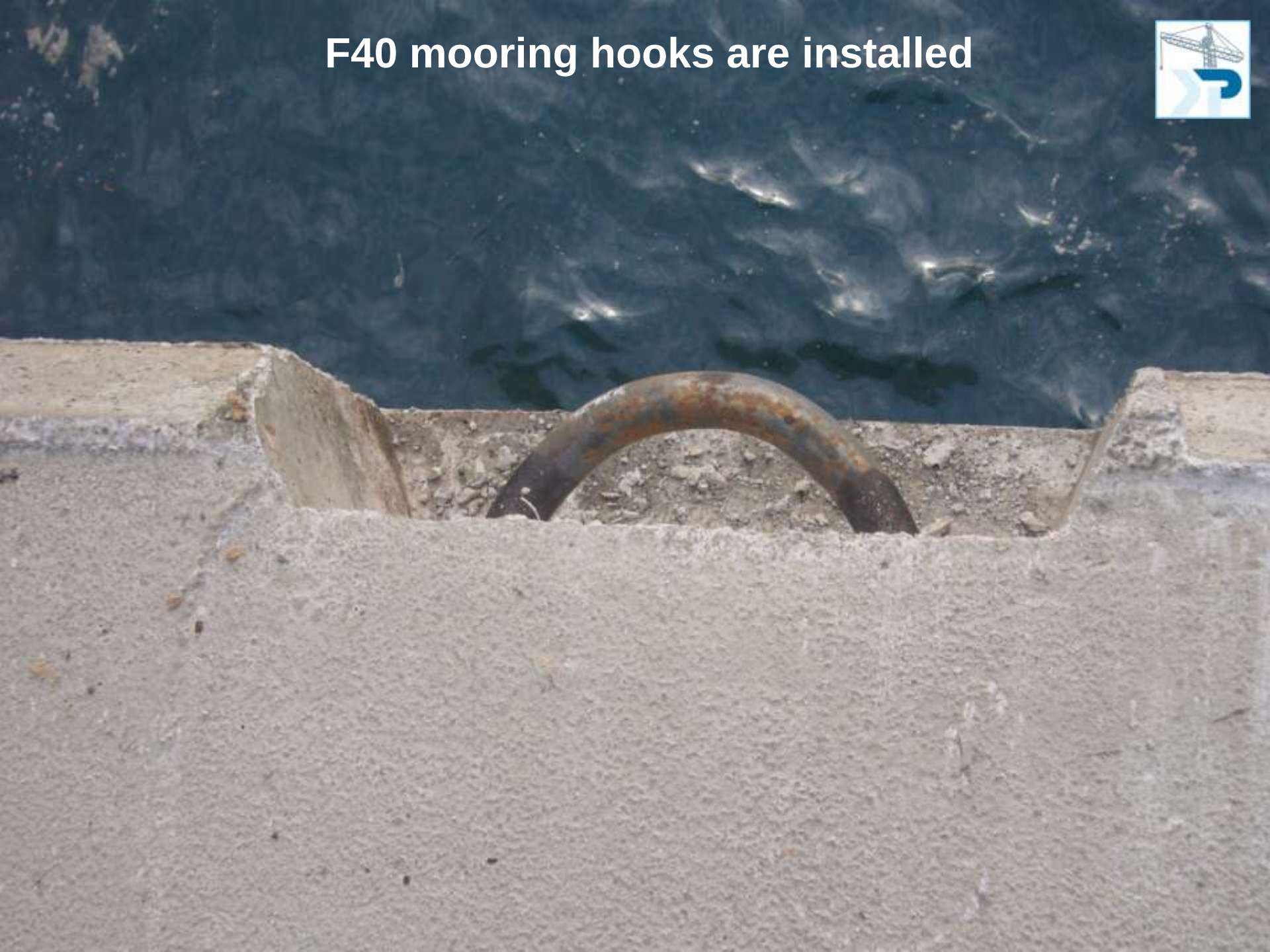

M S C







# F40 mooring hooks are installed



# Suitably-designed barrages will be installed





Along the length of the quay wall and within the Superstructure will be installed the following <u>Networks</u> :

1.Power

2.Water &

3. Fire Extinguishing



# Economic Significance of the Project



**With this Project the Piraeus Port Authority is rendered markedly competitive and attractive in commercial terms, as it constitutes the gateway to United Europe in its Southeastern part.**

**The 18.00 m (useful) depth of the quay wall, the additional land sites covering 56,100 m2 & the state-of-the-art facilities in conjunction with the connection of the Container Terminal with the National Highway & the National Railway network, will result to improved cargo transport for the Balkan region.**


SALAMIS LINES






M S C

# CONSTRUCTION STAGES




















LINES






LINES













# BALLAST ROCK MINING










CAT










VOLVO






LLOYD TRIESTINO







# DYNAMIC CONDENSATION













# CAISSON LAUNCHING






40
20
6M
80
60
40
20
5M
80
60
40
20
4M
80
60
40
20
3M
80
60
40
20
2M
80






5










40
20
6M
80
60
40
6
5


ΚΛΕΑΡΧΟΣ Γ. ΡΟΥΤΣΗΣ Α.Ε.










40
20
6M
80
60
40
20
5M
80
60







# CAISSON MOORING












AMERICAN








M S C


MCL


LORA 1


ΛΩΡΑΙ
NX 13














ΠΕΙΡΑΙΑΣ .IV


ΠΕΙΡΑΙΑΣ IV
2520