Cavotec Alternative Maritime Power supply-Shore to ship supply

AAPA Engineering Jacksonville January 11th 2006

Rev. 03

By Ottonel Popesco : COO Cavotec Group

How we are organised

Global Presence

Manufacturing "Centres of Excellence"

Cavotec Alfo - Germany
Cavotec Connectors - Sweden
Cavotec Fladung - Germany
Cavotec RMS - France
Cavotec Specimas - Italy
Cavotec Gantrex - Canada
Cavotec Micro-control - Norway

Local Manufacturing Units

Cavotec - Australia
Cavotec - China
Cavotec MoorMaster - Germany
Cavotec - Sweden
Cavotec - USA

Totally 27 Operational Companies

Cavotec Global Sales Network

Cavotec Australia
Cavotec Benelux
Cavotec Chile
Cavotec China
Cavotec Denmark
Cavotec Finland
Cavotec France
Cavotec Gantrex USA
Cavotec Gantrex Mexico
Cavotec Germany
Cavotec Italia
Cavotec India
Cavotec Latin America
Cavotec Middle East
Cavotec Norway
Cavotec Russia
Cavotec Singapore
Cavotec Gantrex South Africa
Cavotec Sweden
Cavotec United Kingdom
Cavotec USA

Where we work

Ports & Maritime

Radio remote controls

Panzerbelt

Automated Mooring Systems

Azipod type

Motorised Cable Reels

Update August 4th 2005

Cavotec

AMP Systems

Solutions for the shore connection
Why ?

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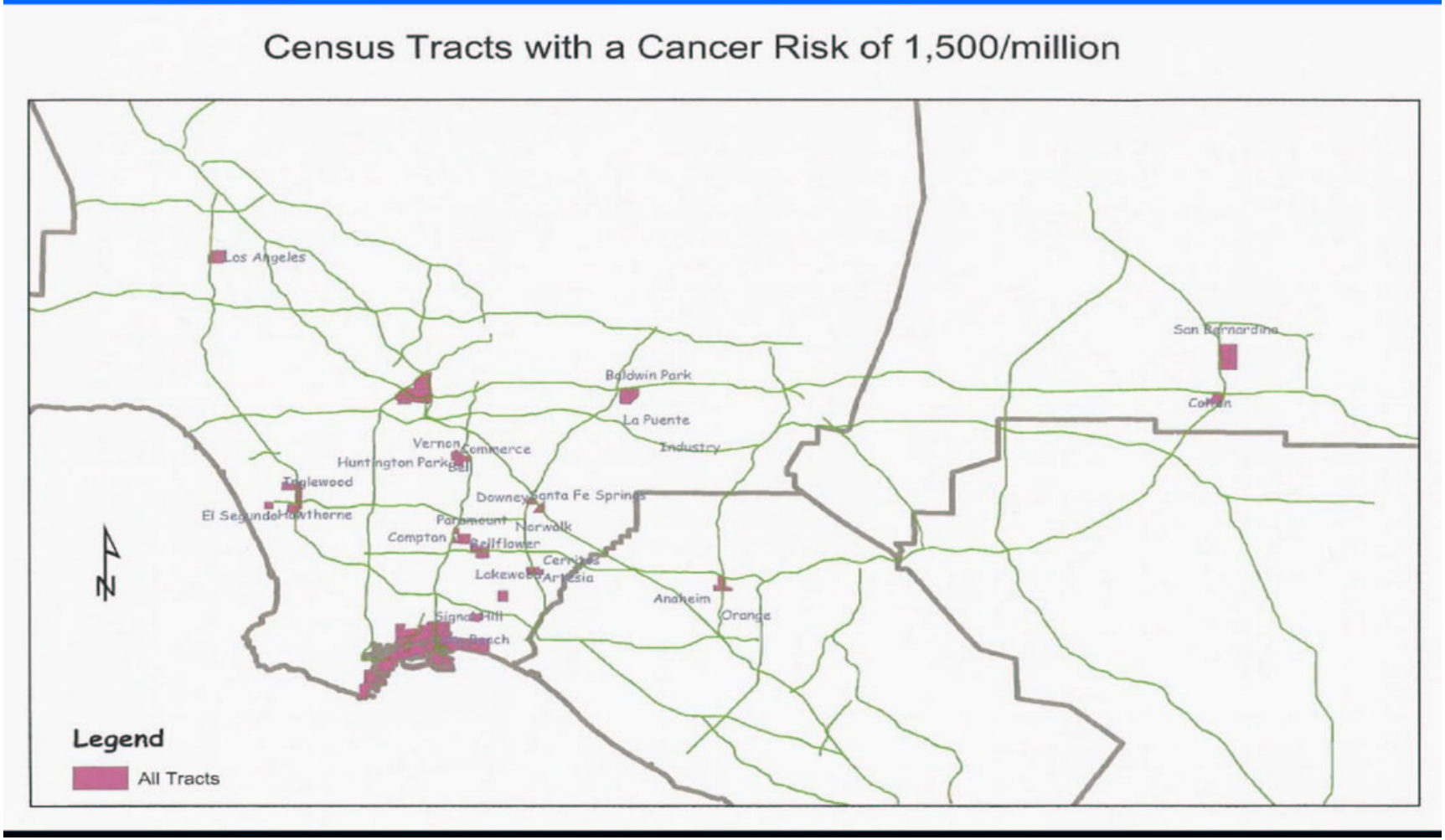
Cancer



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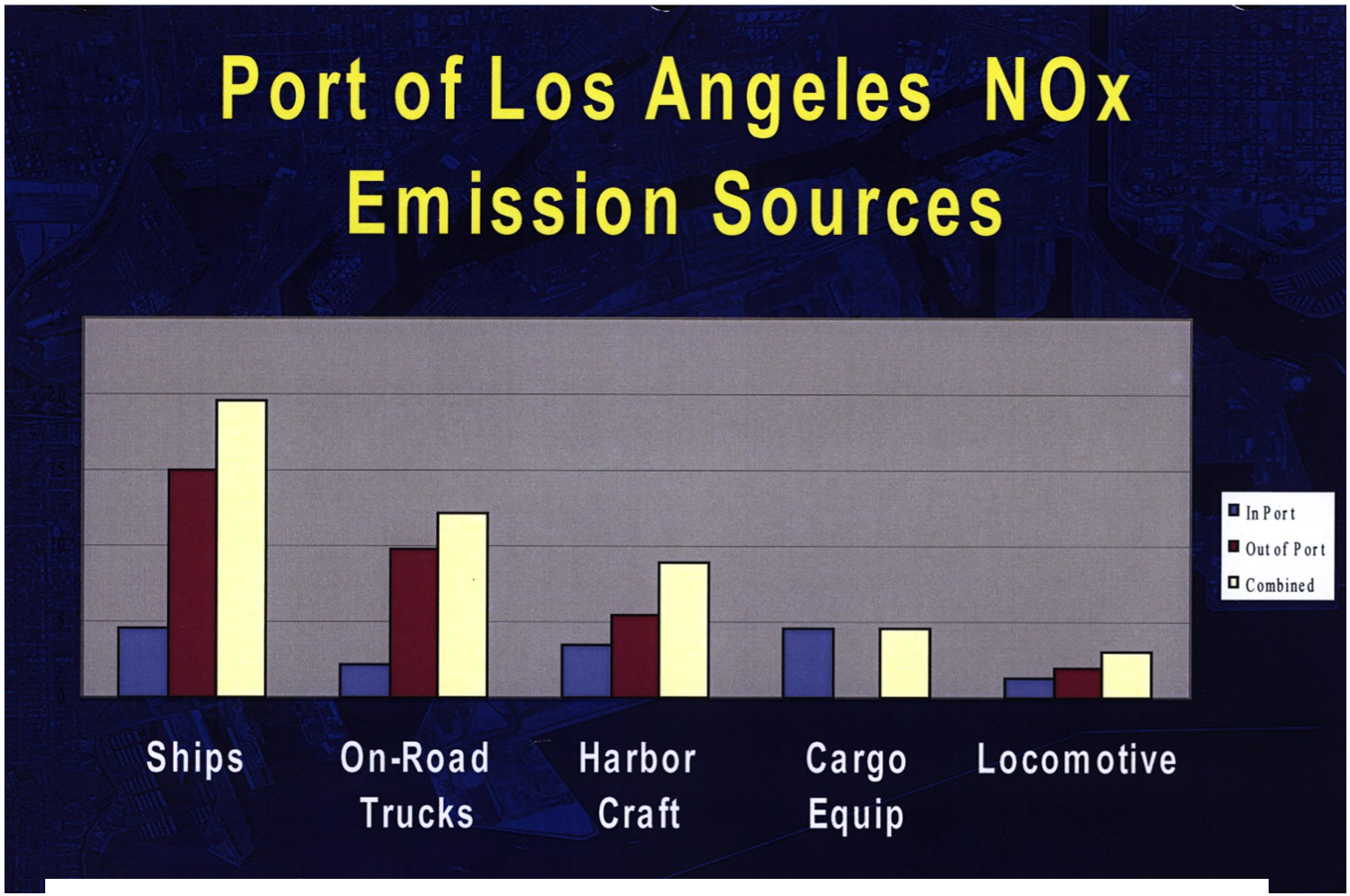
Pollution Surveys



Source :By courtesy of the Port of Los Angeles

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Pollution in Baltic Sea

MEMORANDUM OF UNDERSTANDING
ON SUSTAINABLE PORT AND MARITIME POLICY
IN THE BALTIC SEA REGION

New Hansa
OF SUSTAINABLE PORTS AND CITIES

The Solution

The alternative is to electricaly power the ships when docking.

The Cavotec Group now has more than 18 years of experience in this matter and is involved in sales and the development for shore-to-ship electrical power supply.

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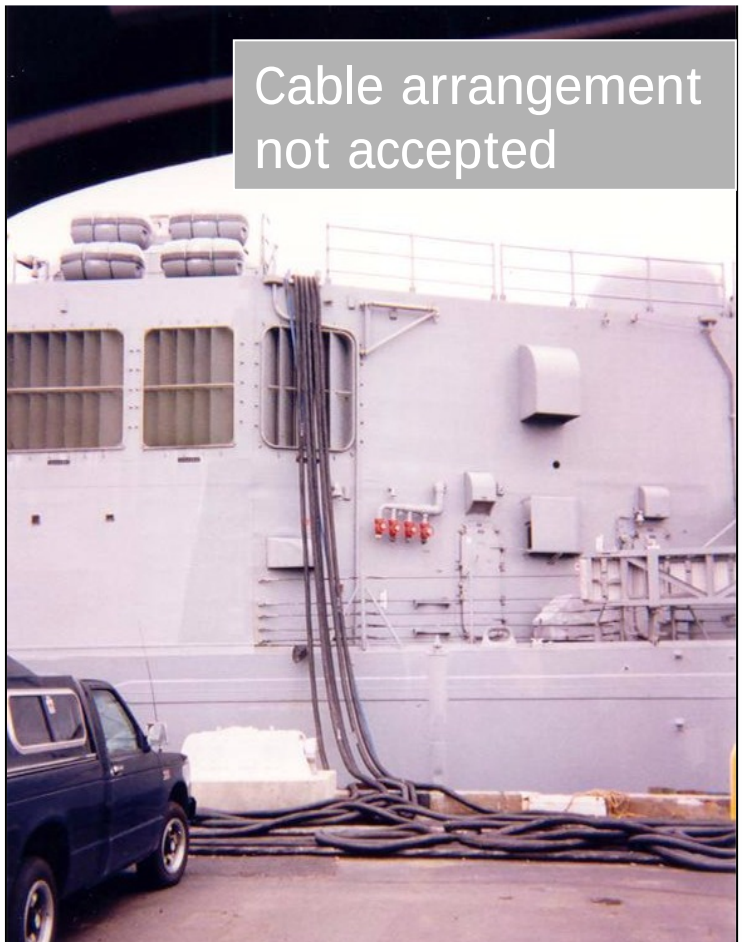
Technical challenges



Shore Power in a Naval Yard

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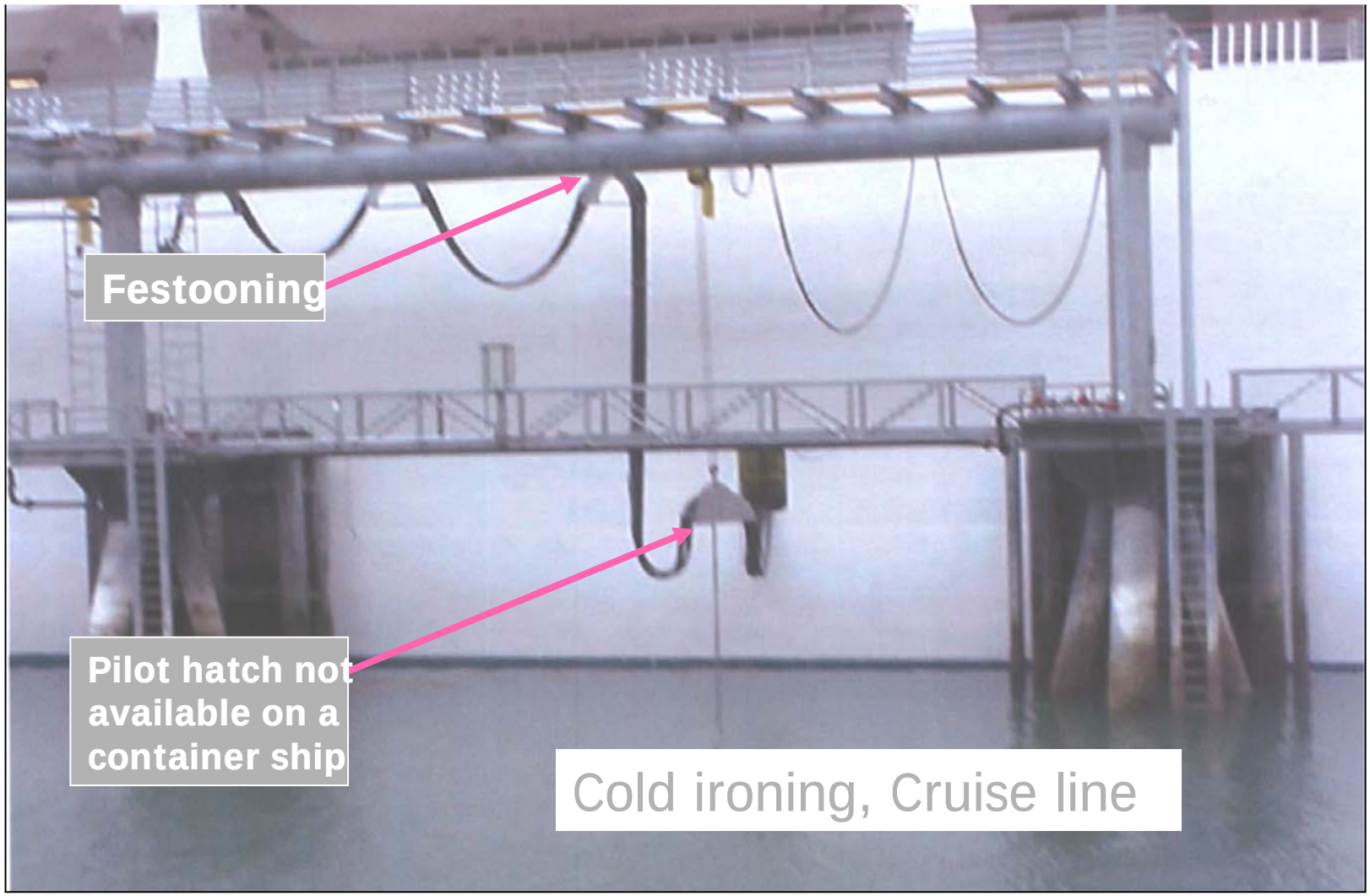
Technical challenges



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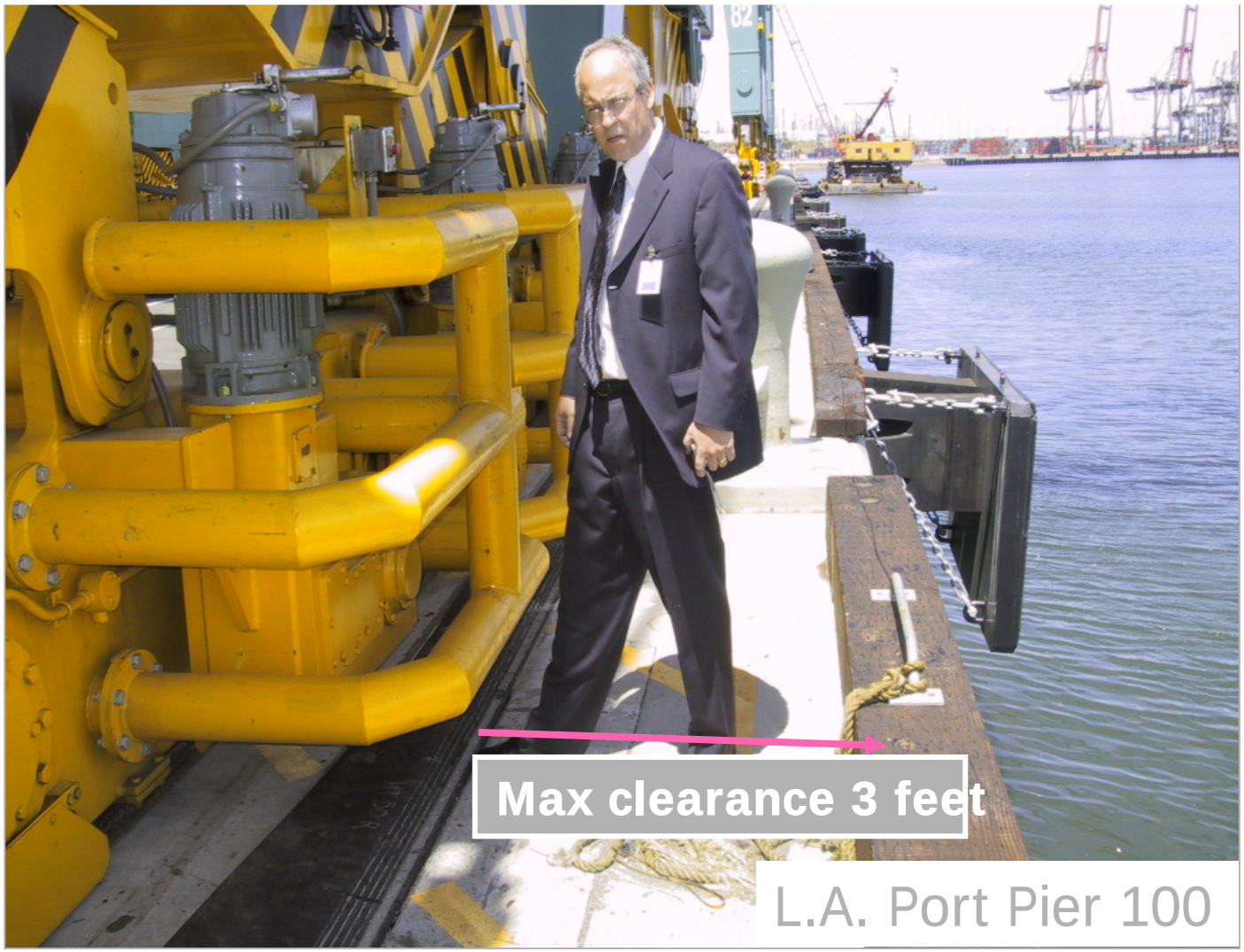
Technical challenges



Ports in California

US West Coast shore electrical connections

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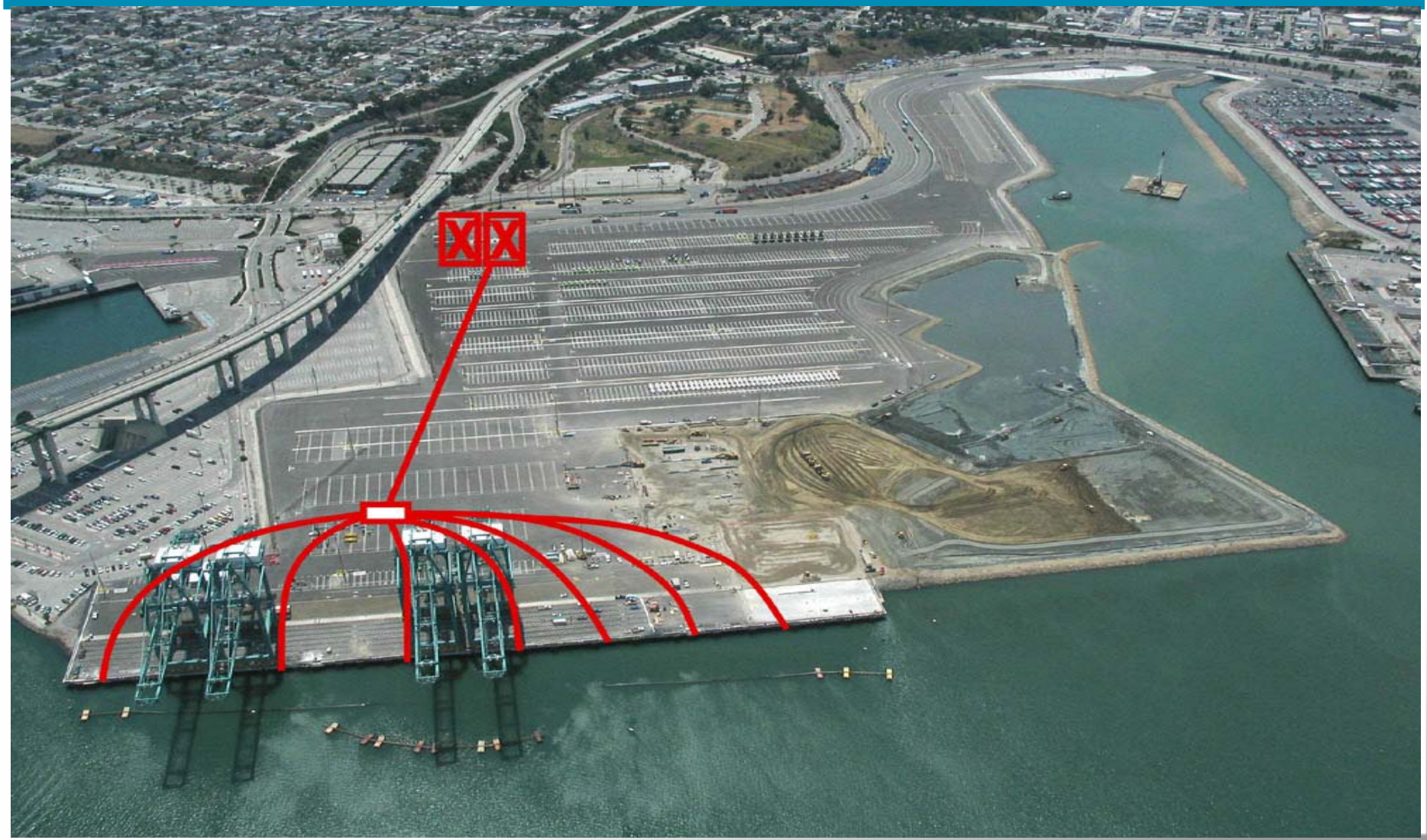
First Shore connection facilities in POLA Pier 100



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Shore connection facilities in POLA

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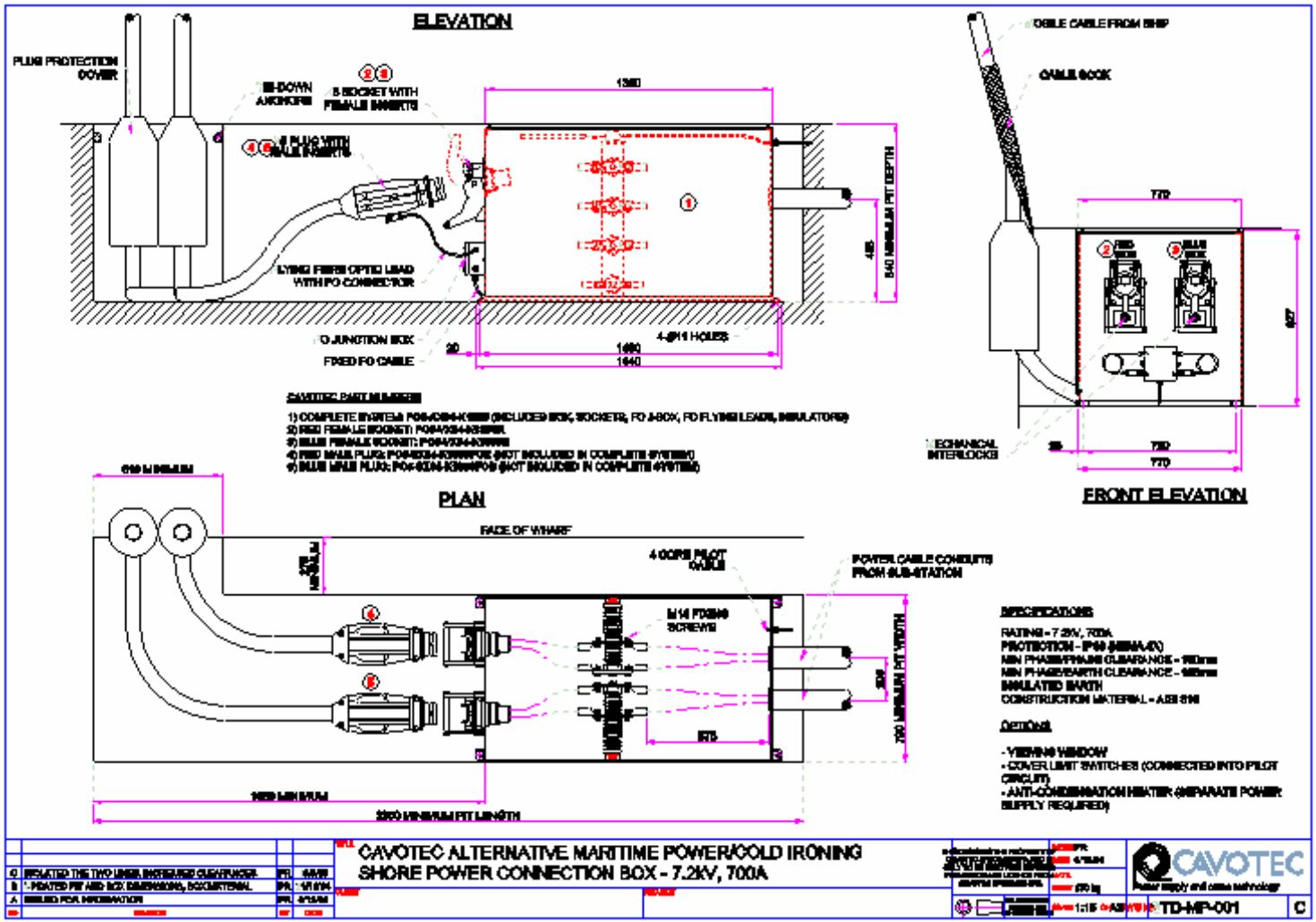
Standard Shore connection facilities in POLA & POLB



Shore Connection Solutions for Shipping Lines

- **Barge System**
- **Fully Ship Integrated System**
- **Semi Fixed Container(s)**
- **All in One Removable Container**
- **Shore based system**

Barge system

All equipments for the shore connection:

- HV and LV Cable Management System
- Transformer
- Switchgear

are installed on a barge floating close to the ship during the docking

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Barge System

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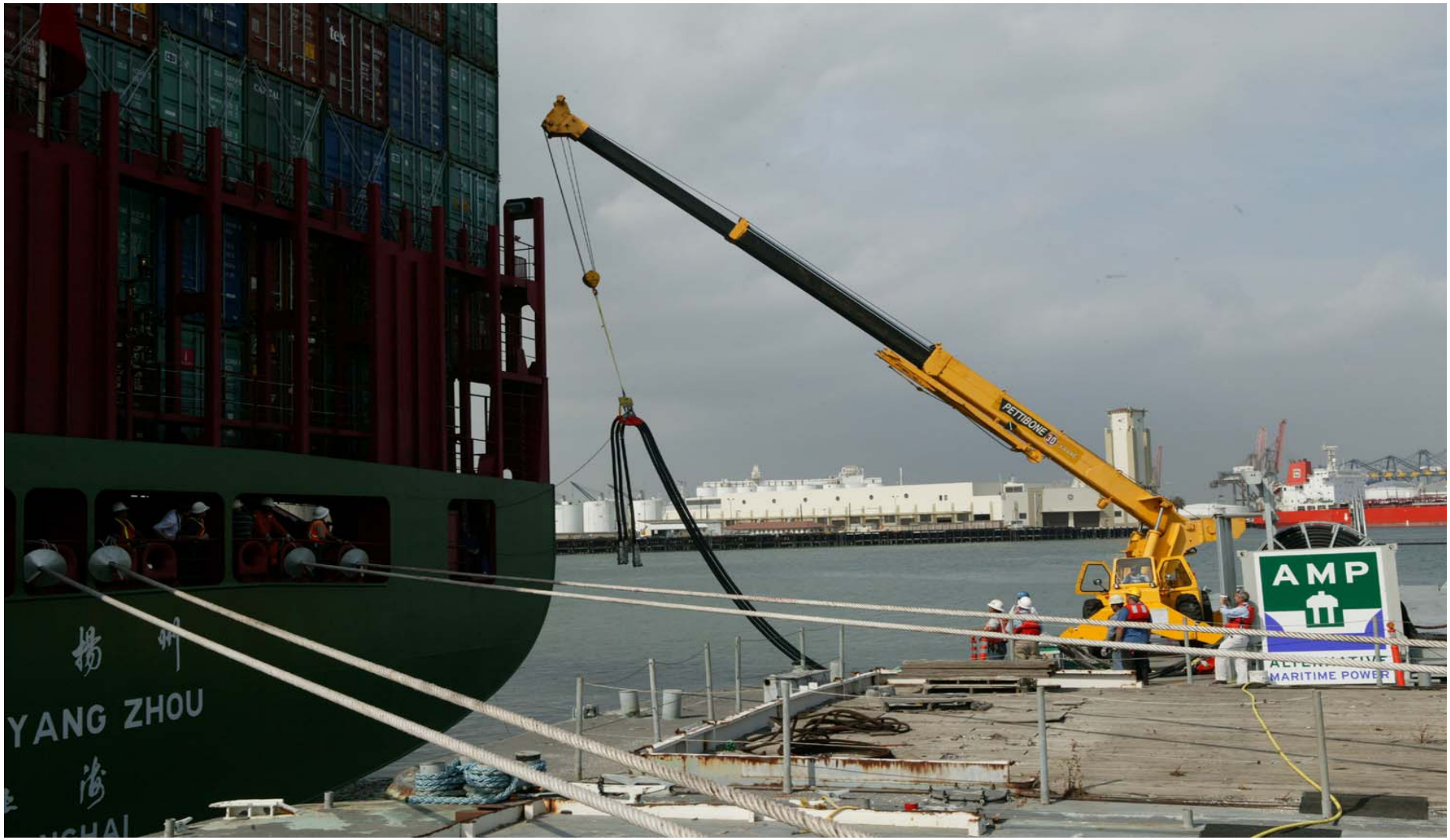
Barge System



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Barge System

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Barge System

Barge System

Advantages of Barge System

1. Minimal modifications of ship design are required

Disadvantages of Barge System

1. Only one ship per barge
2. Labor intensive to connect and disconnect
3. Few safety features
4. Extremely expensive

Fully Ship Integrated System

All equipments for the shore connection:

- Cable Management System
- Shore connection panel
- Transformer (for LV ships)
- Shore incoming panel are integrated in the ship design

Fully Ship Integrated System: Concept

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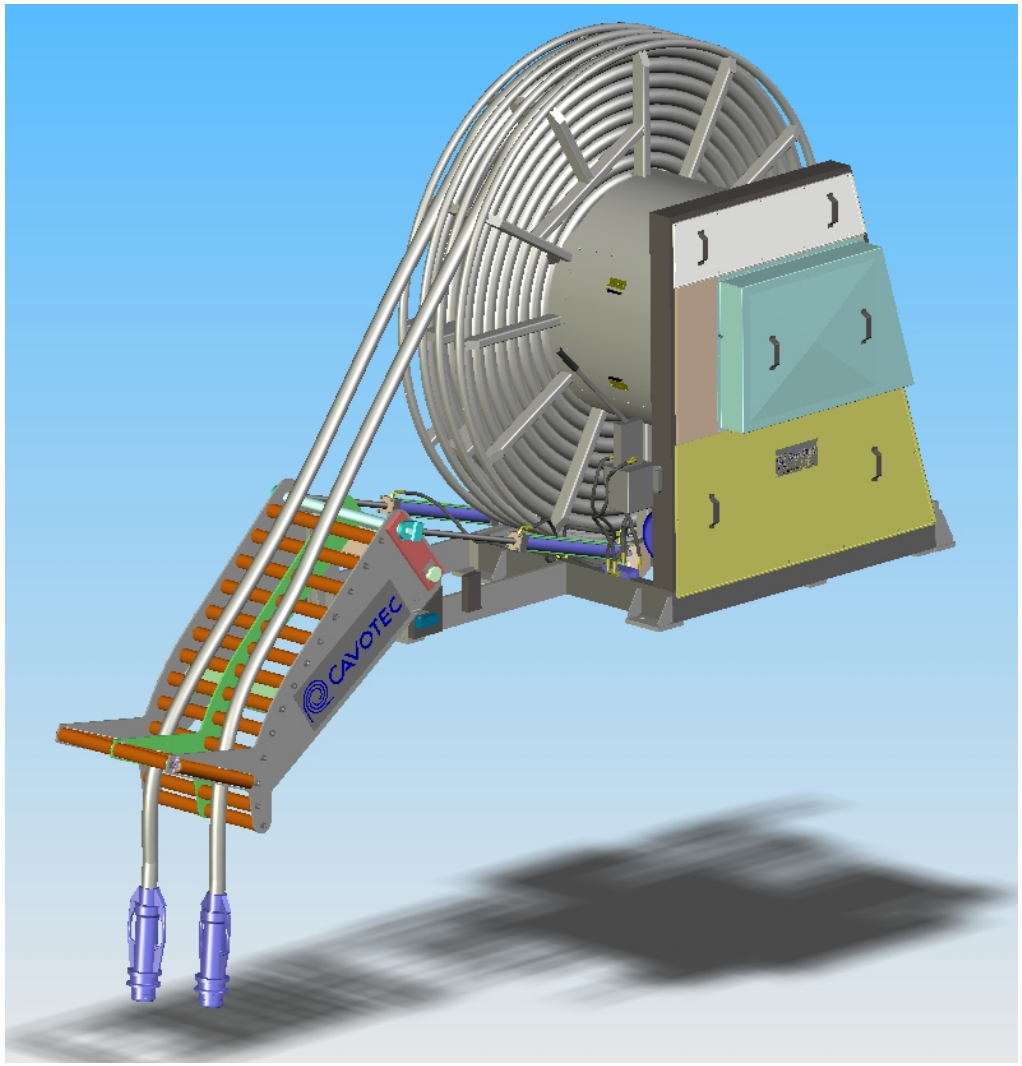
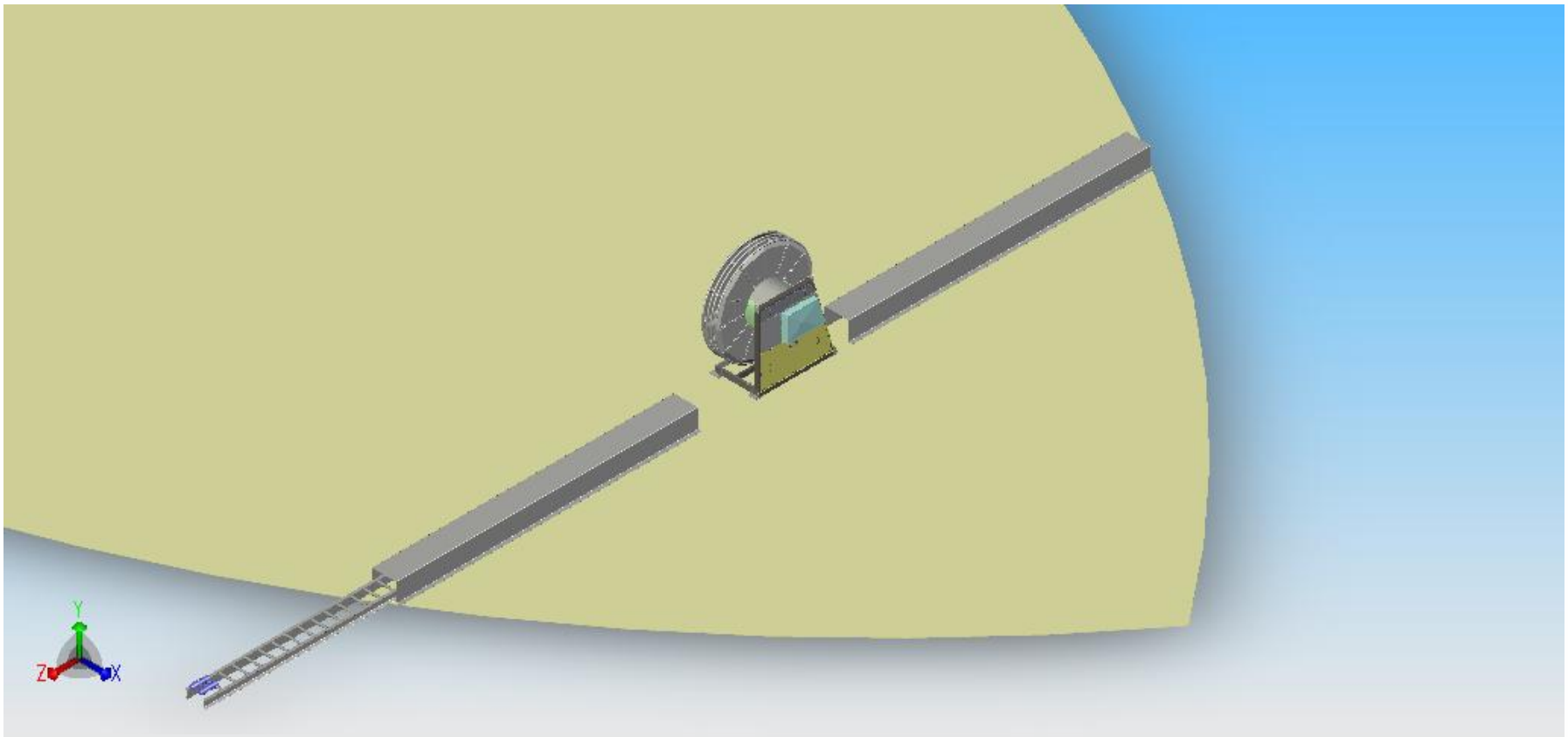
Fully Ship Integrated System: Concept



Fully Ship Integrated System: Concept



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Fully Ship Integrated System: Evergreen Hatsu Marine

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Fully Ship Integrated System : Evergreen Hatsu Marine

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Fully Ship Integrated System : NYK Atlas

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Fully Ship Integrated System : MSC Rania

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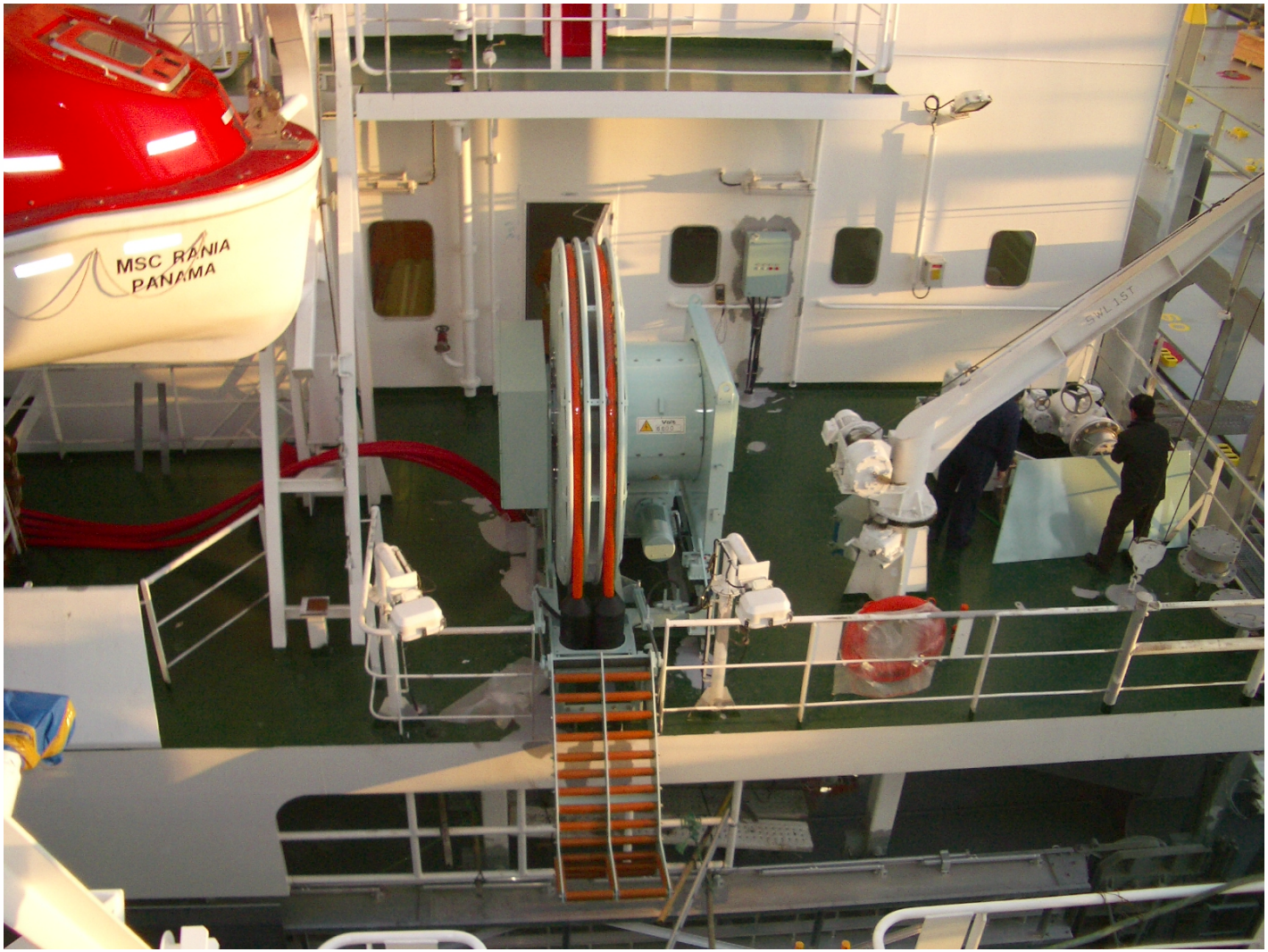

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Fully Ship Integrated System : MSC Rania

Fully Ship Integrated System : MSC Rania

Fully Ship Integrated System

Advantages of Integrated System

1. All the components of the AMP system are located in appropriate environments.
2. Safety levels are increased as there are no temporary connections or trailing cables.
3. Reliability of the system is maximized.
4. There no loss in loading capacity
5. Connection time to the shore electricity is minimized.
6. Cheapest solution for New buildings
7. The vast majority of Shipping Lines are adopting a fully integrated system

Disadvantages of Integrated System

1. The AMP system is not easily removable and transferable to another vessel.
2. Decision to fit AMP must be made in early stage of ship construction.

Semi Fixed Container(s)

Electrical equipments for the shore connection:

- **Shore connection panel**
- **Transformer (for LV ships)**

are installed in one or two containers fix on board of the ship

Cable Management System can be installed on the ship or with the electrical equipment in the container(s)

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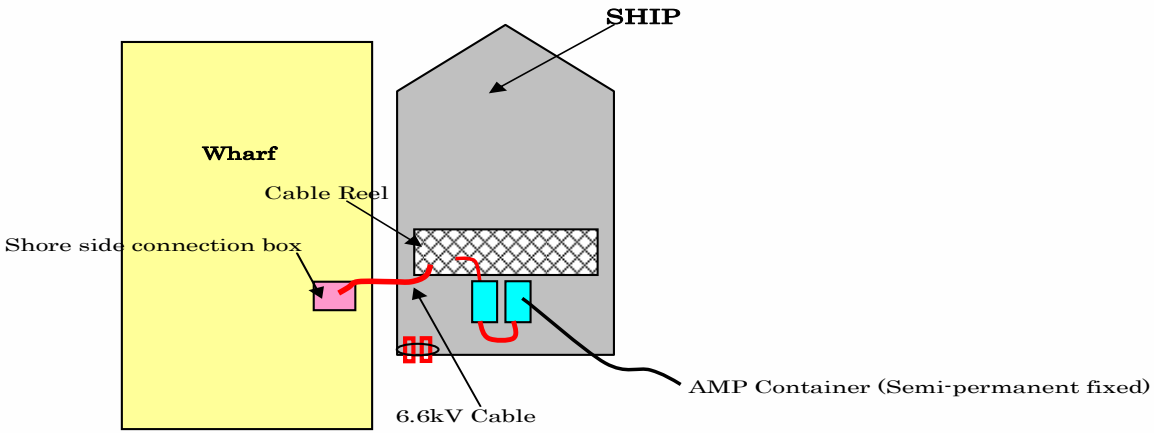
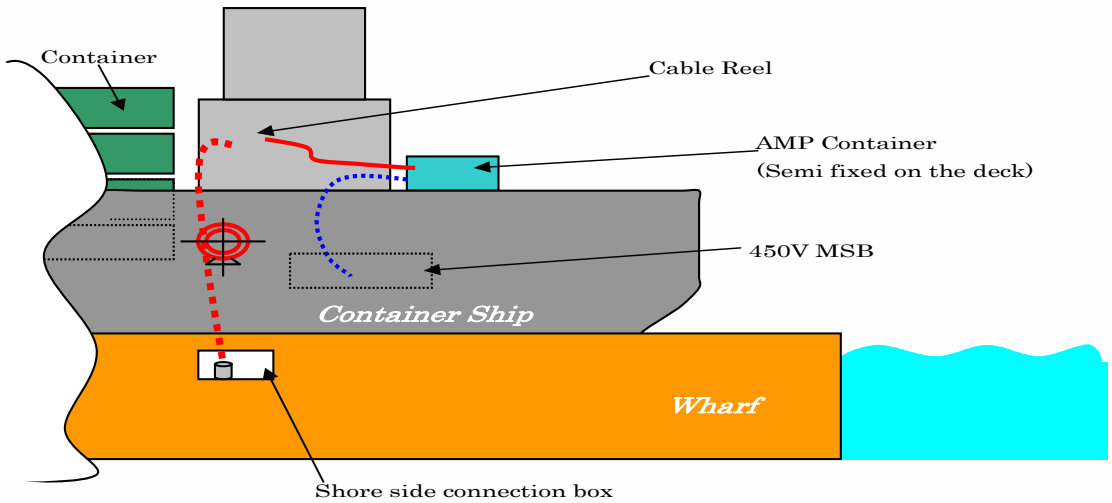
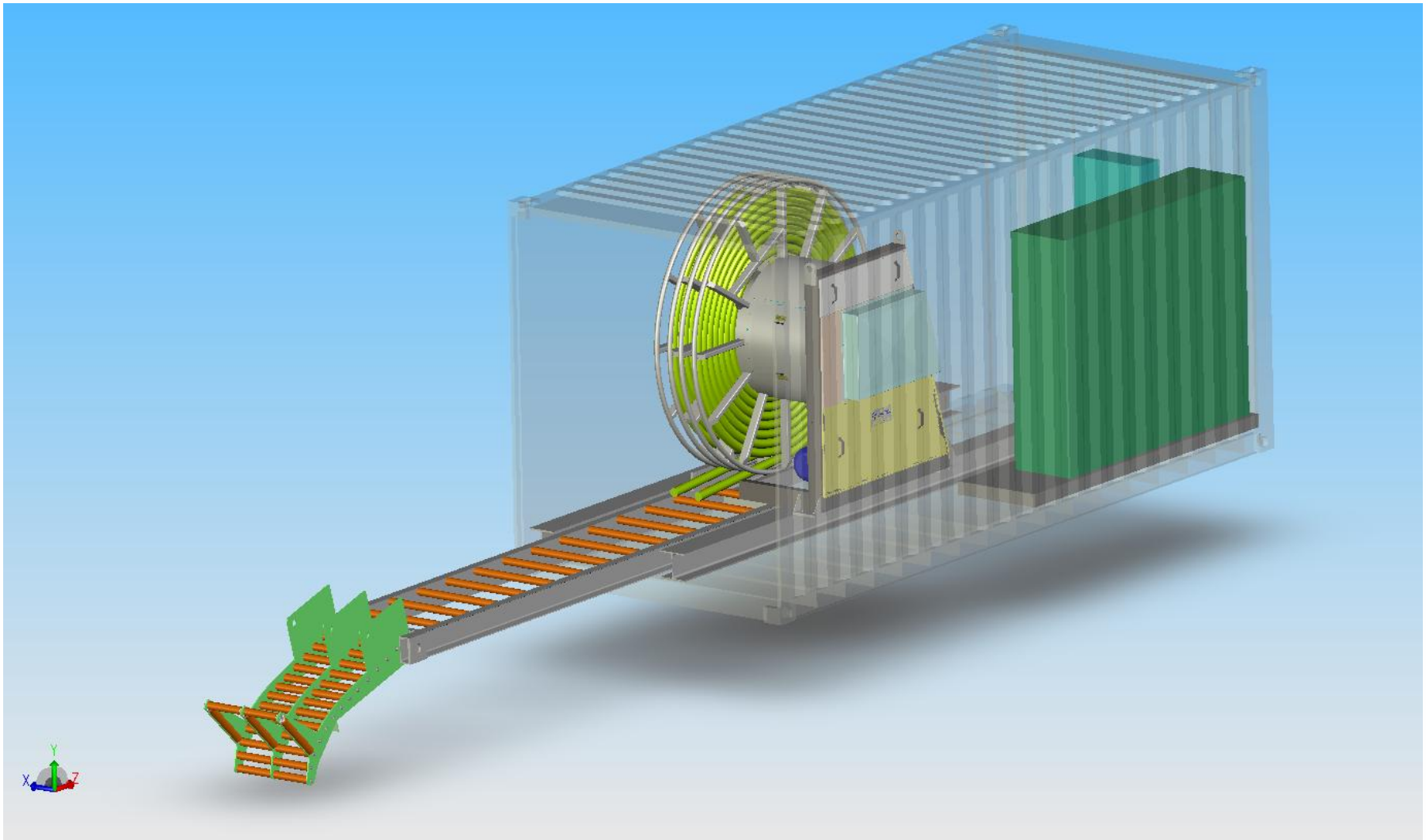
Semi Fixed Container(s)





Alternative Maritime Power

Semi Fixed Container(s)



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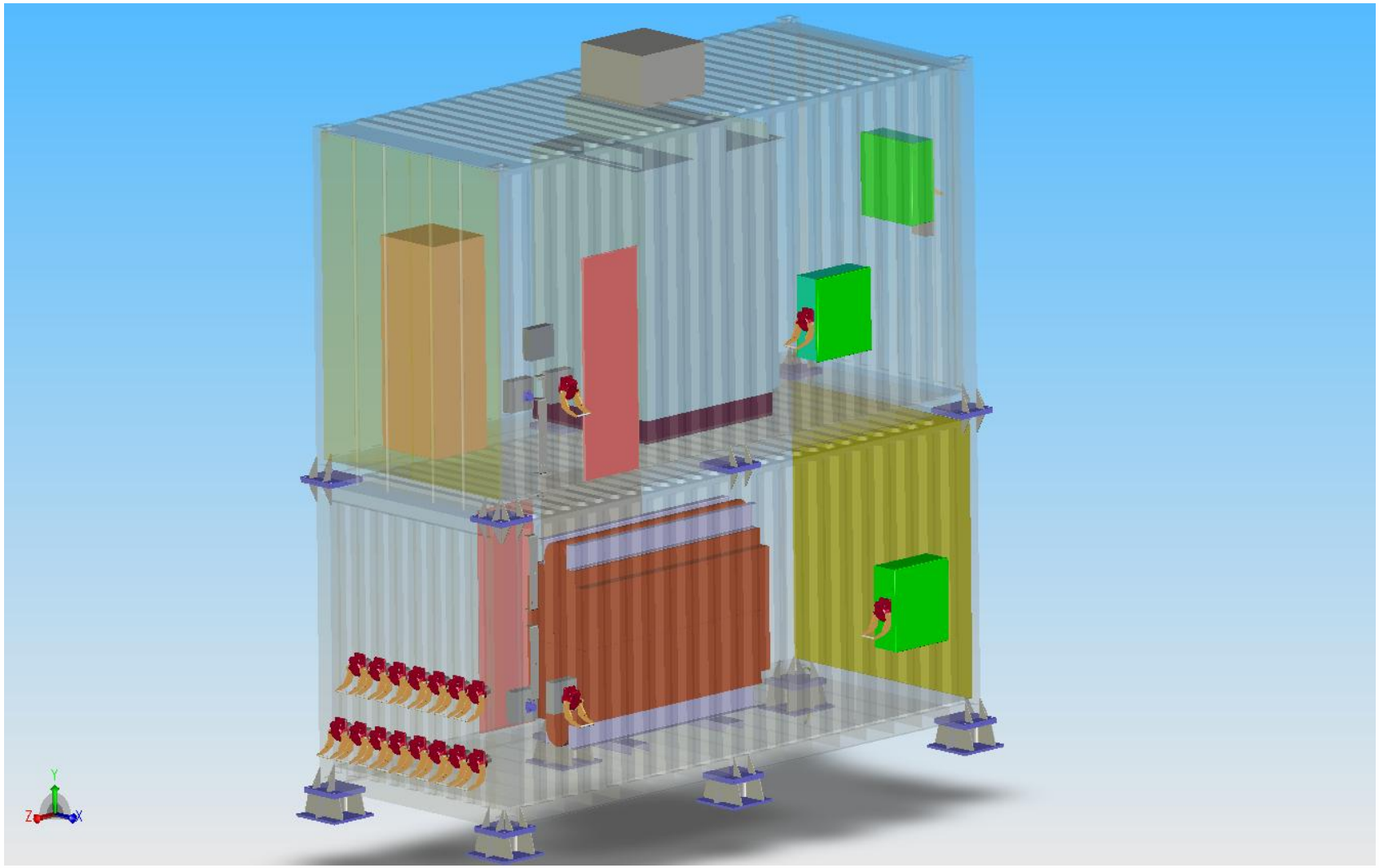
Semi Fixed Container(s)



Semi Fixed Container(s)

Advantages of Semi Fixed Containers System

1. Cheapest solution in case of old-ship refurbishment
2. The equipment can be transferred to another vessel in the event of the routing of the ship changing(every 2/3 years if needed)

Disadvantages of Semi Fixed Containers System

1. An AMP container system is required for each ship and an AMP system in a container (fitted with all necessary, lights heating, A/C, fire protection and detection systems and safety devices).
2. All the equipment including sensitive items such as VCB's are located in an area where there are likely to be adverse environmental conditions
3. New re-classification of the ship is needed.

All in One Removable Container

All equipments for the shore connection:

- **Cable Management System**
- **Shore connection panel**
- **Transformer (for LV ships)**
- **Shore incoming panel**

are installed in a container that will be stored in the Port and it will be loaded on the ship during the mooring

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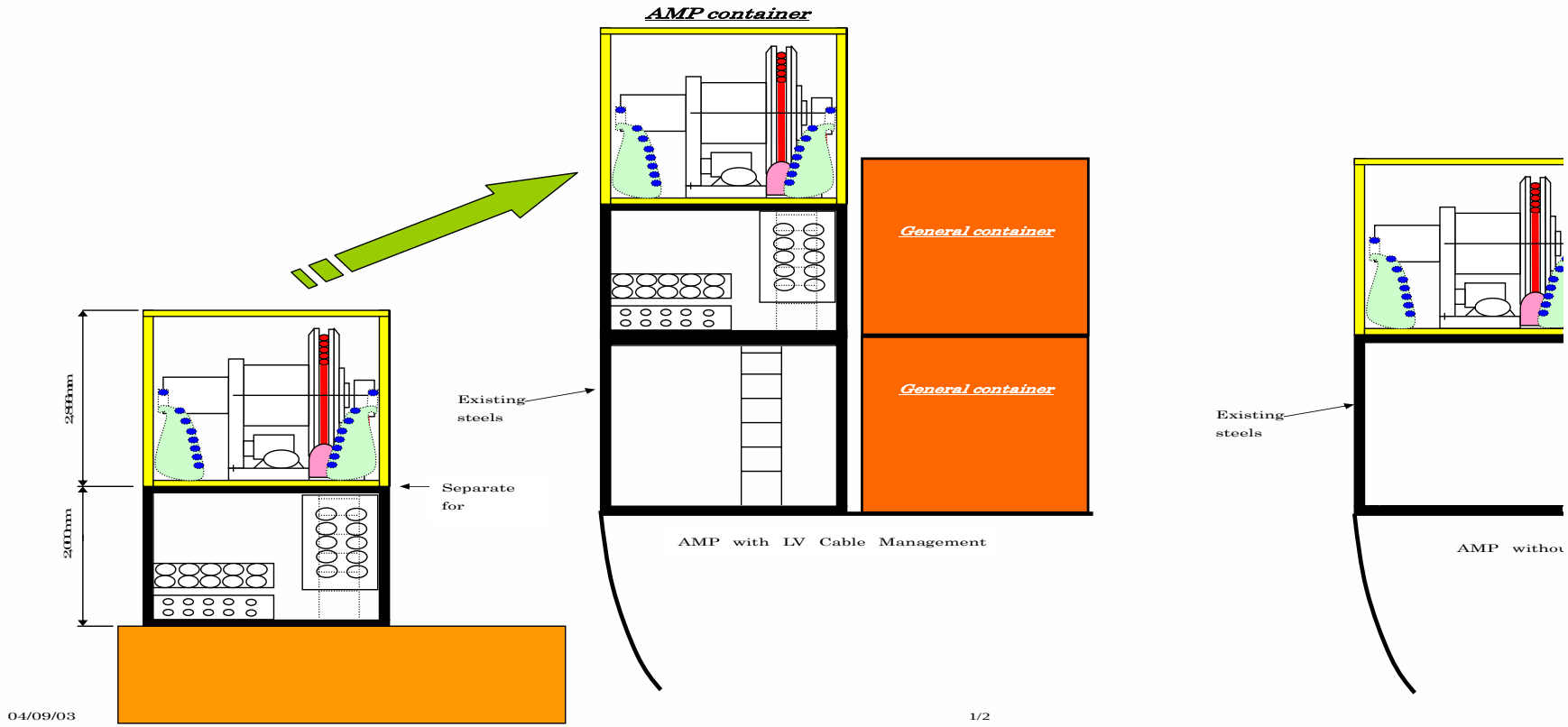
All in One Removable Container



At Port Of Los Angeles

At Normal

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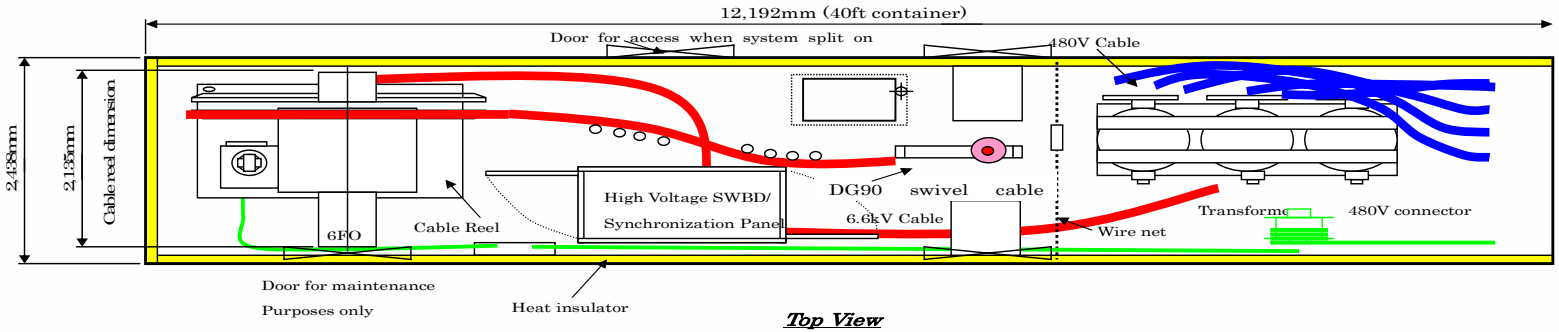
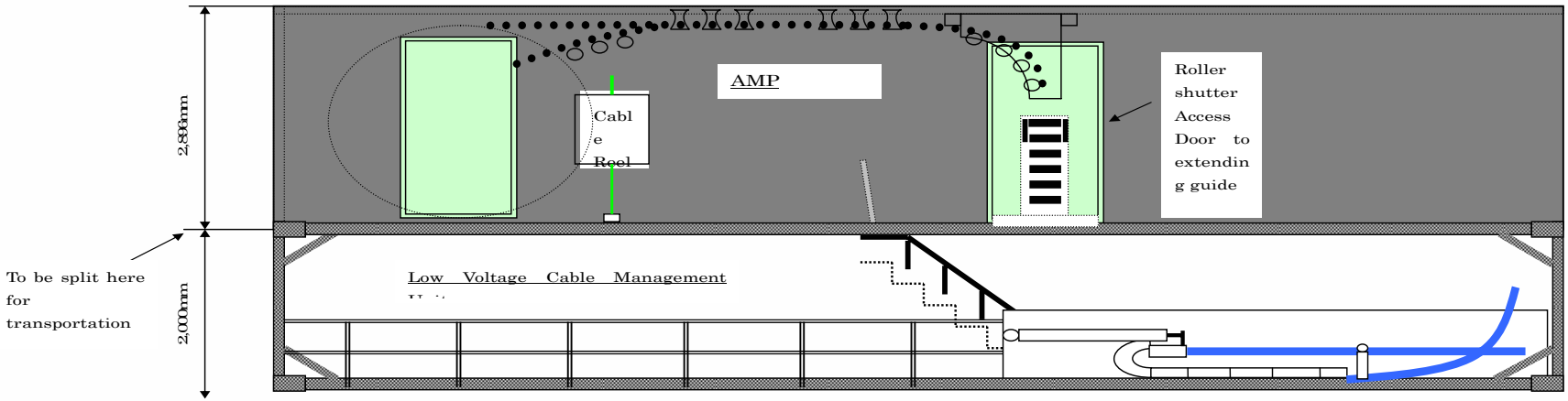
All in One Removable Container

Cavotec AMP Mobile Container



Top View



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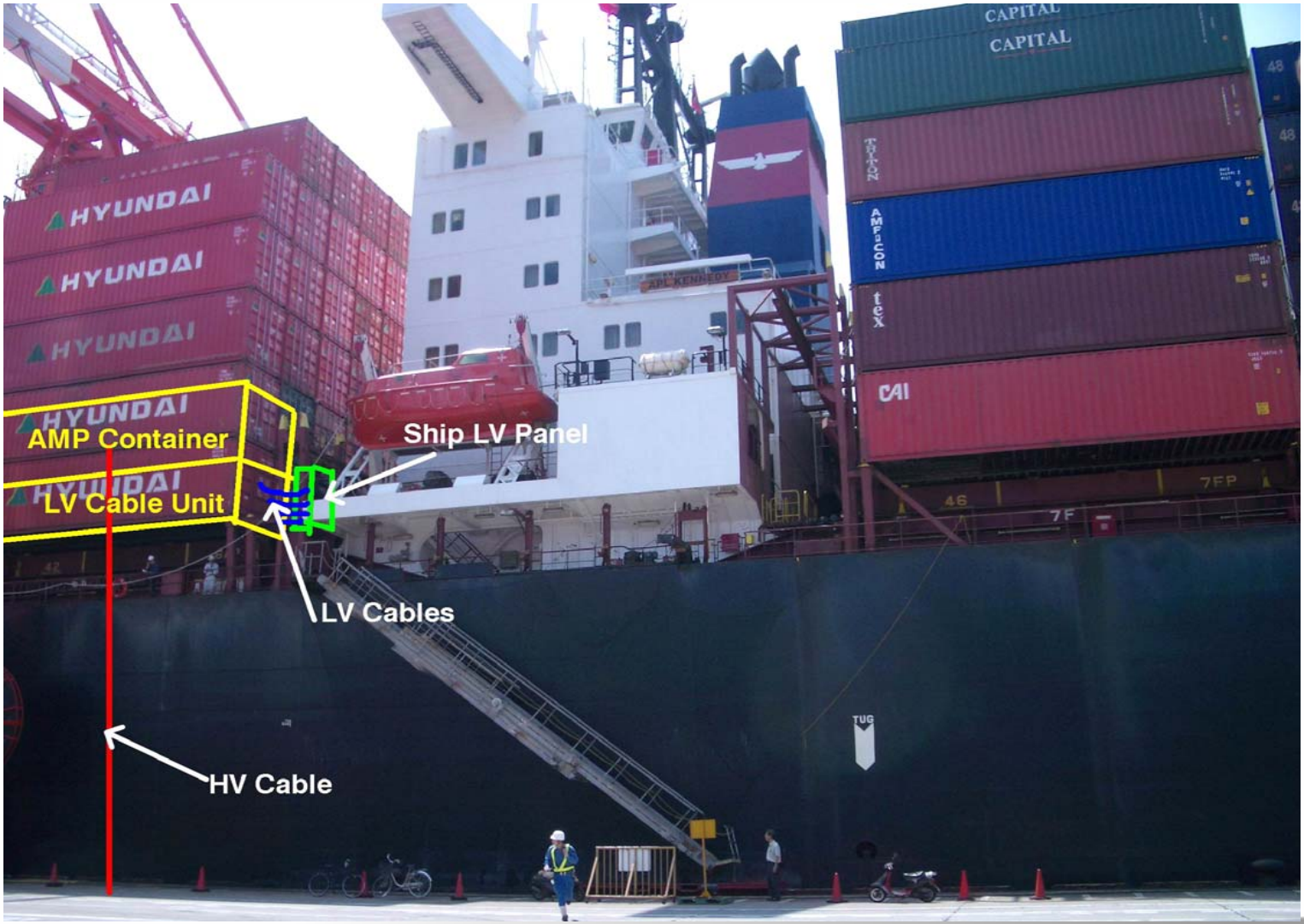
All in One Removable Container



All in One Removable Container

Advantages of All in One Removable Container System

1. Small investment if amortized over fleet of ships
2. Can be placed on any ship equipped for shore connection

Disadvantages of All in One Removable Container System

1. Time consuming to connect(1 hour)
2. There may also be delays in bringing the AMP container to the ship which will lengthen the time running the diesel generators.
3. Many items such as Circuit Breaker/Transformer will not tolerate shock loads when lifted
4. Ship crew will be needed to handle the AMP container and to couple the container to the ship electrical system.
5. At the present time Cavotec is working with only 1 shipping line for this solution.

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Shore Connection Solution for Tankers BP

Shore connection system

Advantages of Shore based system

1. Cheap solution for shipping lines(1 fixed unit for many ships)

Disadvantages of Shore based system

1. No space on shore for the AMP system
2. Labor intensive for connection

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Which solution ?

For Newbuildings and for ships where design permits the implementation, the fully ship integrated system is preferable. Lower cost and higher reliability make this solution the most convenient.

For old-ship refurbishment or when it is possible a short term re-routing of the ship, a semi-fixed container system would be appropriate.

The All in One Removable Container System may only be appropriate where the shipping line also owns / operates the berth. Open questions remain about responsibility and time needed to connect the ship to the shore.

The barge system has to be consider as an emergency solution. It has no advantages in cost saving or operation time

The shore based is most suitable for tankers and cruise lines

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Shore Connection Solution for icebreakers

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Shore Connection Solution for US Cost Guard

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Shore Connection Solution for Ferries

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Shore Connection Solution for Aircrafts

For aircrafts Shore Power Supply is a standard. Ships will follow ....

Cavotec Connector 2 x 260A

References

References with orders for AMP for container terminals up to date, January 10th, 2006

- NYK Japan
- CSL China
- Peter Dohle Germany
- NSB-Conti Germany
- Evergreen Taiwan
- MSC Switzerland
- CP Offen Germany for P&O
- Patjens Germany for P&O
- Yang Ming Taiwan
- B & N Transocean Finland

Total 61 container ships delivered or on order with AMP