

AUTOMATED

MOORING SYSTEMS

IS IT THE FUTURE?

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moffatt & nichol

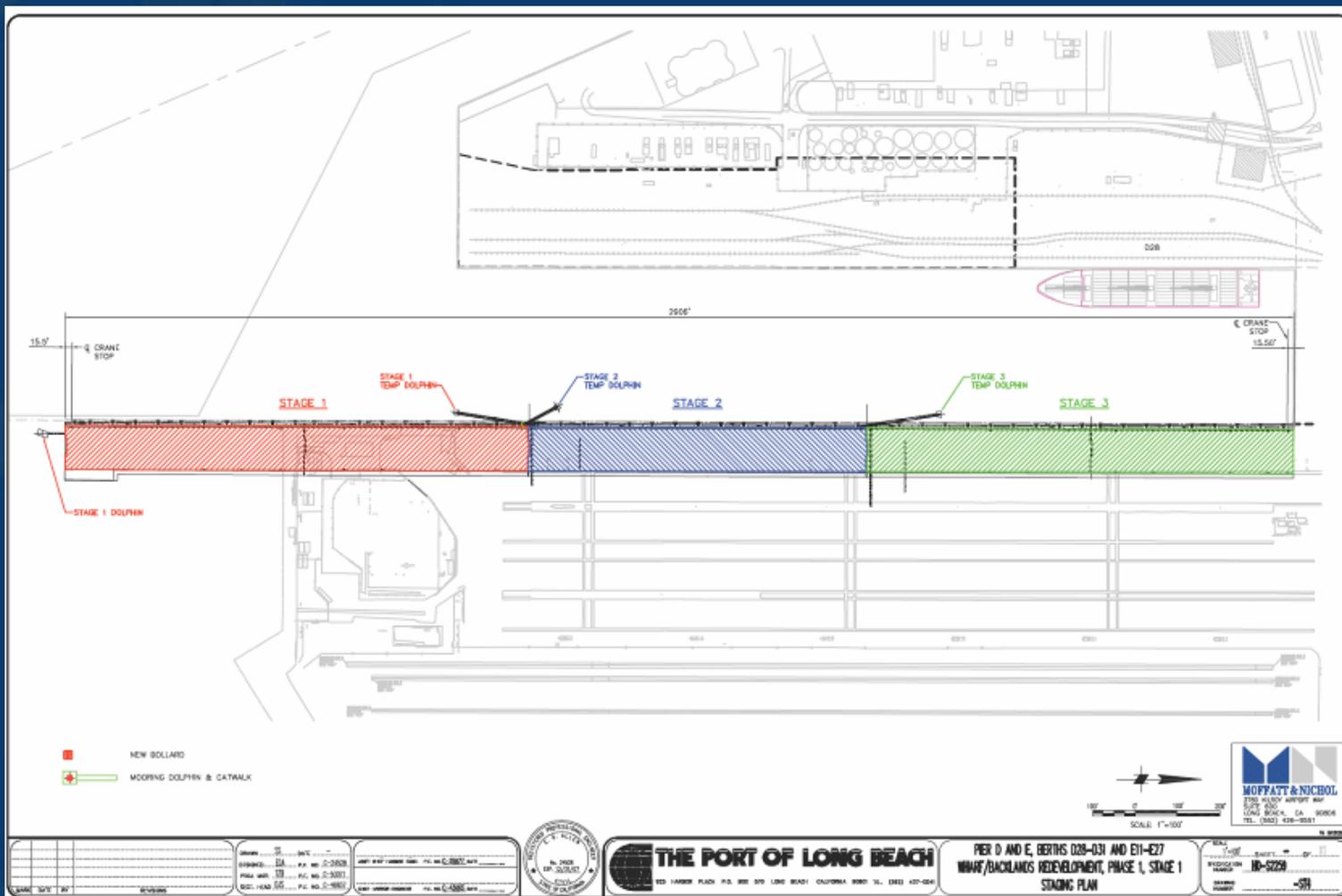
November 8, 2007



Problem Definition

- Pier Reconstruction in Stages
- Accommodate 2 Ships During Construction
- Remaining Berth Length Inadequate
- Mooring Within Construction Area

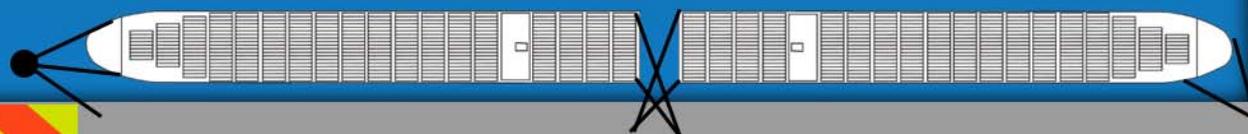
Staging Plan With Dolphins



STAGE 1



Construction Zone

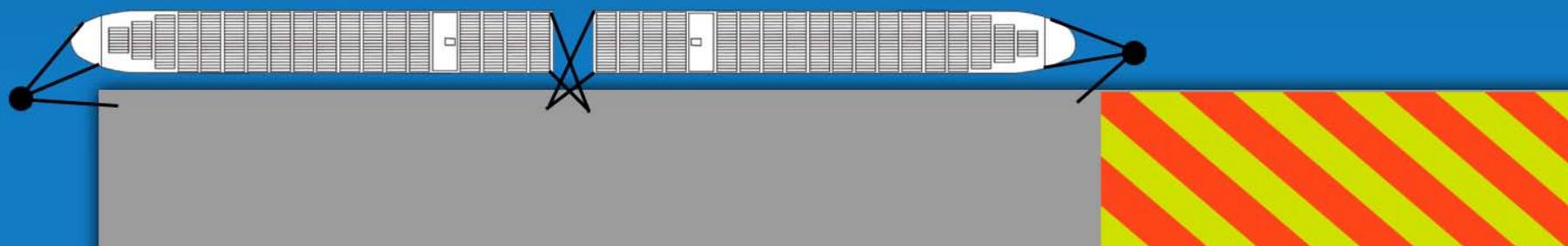


STAGE 2



Construction Zone

STAGE 3



Construction Zone

Impacts of Standard Mooring to Construction & Operations

- Dolphins in Areas to be Dredged
- Dolphins Complicate Pile Installation
- Line Handling Safety
- Capstan??

Possible Solution

- Retrofit Existing Berths with VMS
- Build VMS into New Berths
- Eliminate Need for Dolphins
- Minimize Ship to Ship Clearance

STAGE 1



Construction Zone



STAGE 2



Construction Zone

STAGE 3



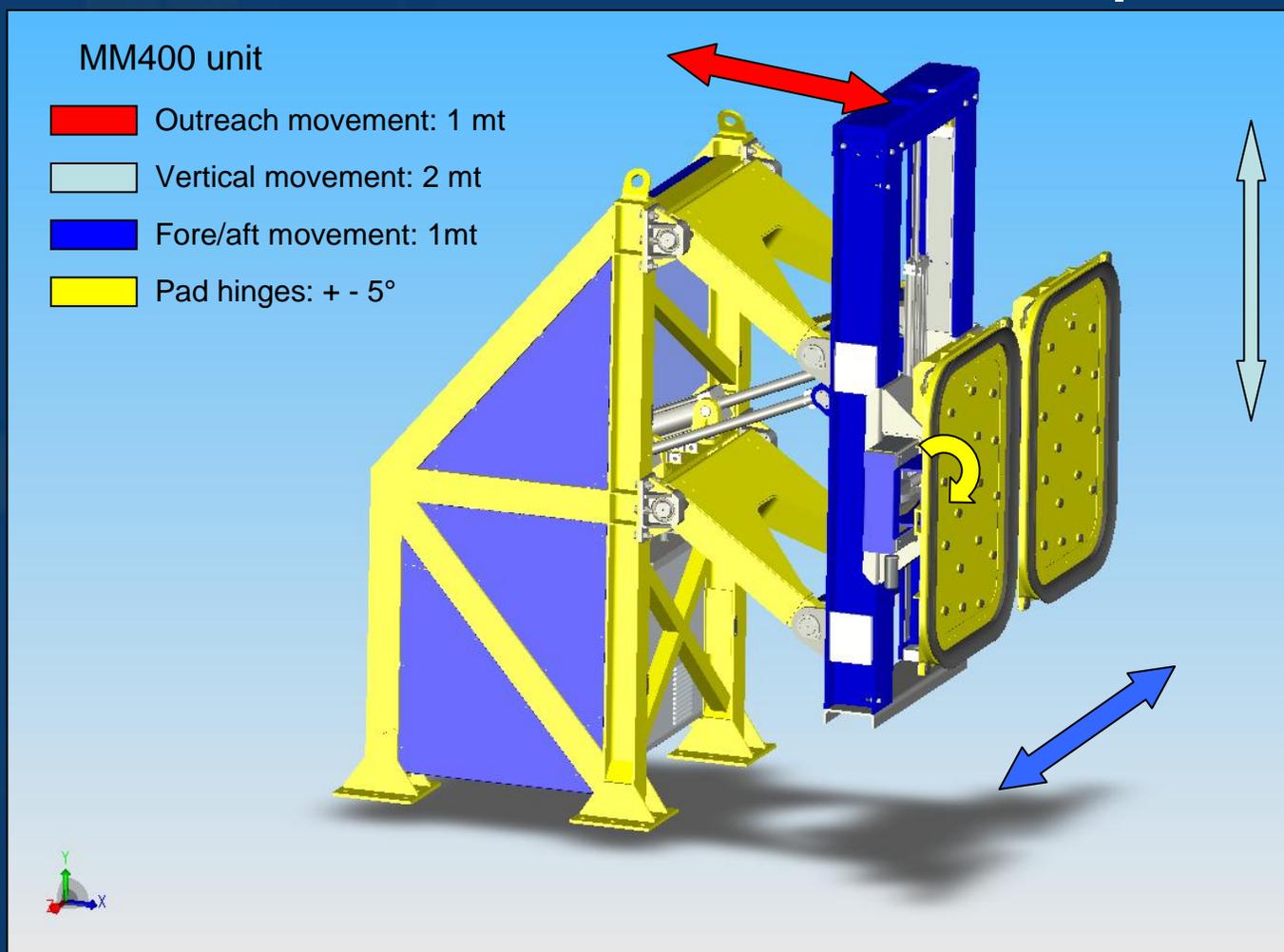
Construction Zone

How VMS Works

- Vacuum Pads Provide Mooring Forces
 - Typically 20 Tons/Pad
- VMS Adjusts to Ship Movement
 - Stepping Function
- VMS Limits Ship Movement
 - Prevents Kinetic Energy Build-Up

MoorMaster® – Automatic Mooring System

Technical Description

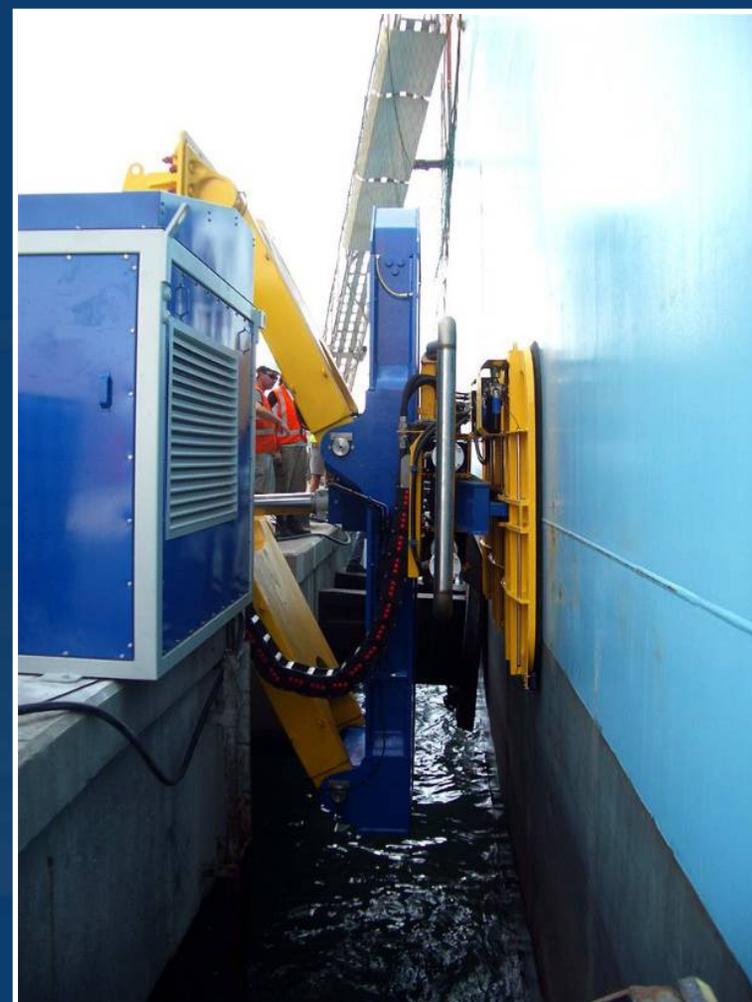


MoorMaster® – Automatic Mooring System

- **Proven Safety**
 - The technology is safe and reliable and has been in daily commercial use since 1999.
- **Over 25,000 automatic moorings to date without failure**
- **Vacuum power system backed up by generators**

MoorMaster® – Automatic Mooring System

- Port of Sallah – APM Terminals
 - MoorMaster® 600
 - Shore based automatic mooring system
 - Capacity: 4x600 kN (4x60 tons)
 - Installation August 2006



Potential Benefits & Savings - TERMINALS

- Increases infrastructure capacity
- Elimination of non productive berth areas
 - In-between ships
 - At end of quay



Potential Benefits & Savings - LABOR

- One man operation – no line handlers
- Less time for tug assist at berthing

Potential Benefits & Savings – SHIPS GEAR

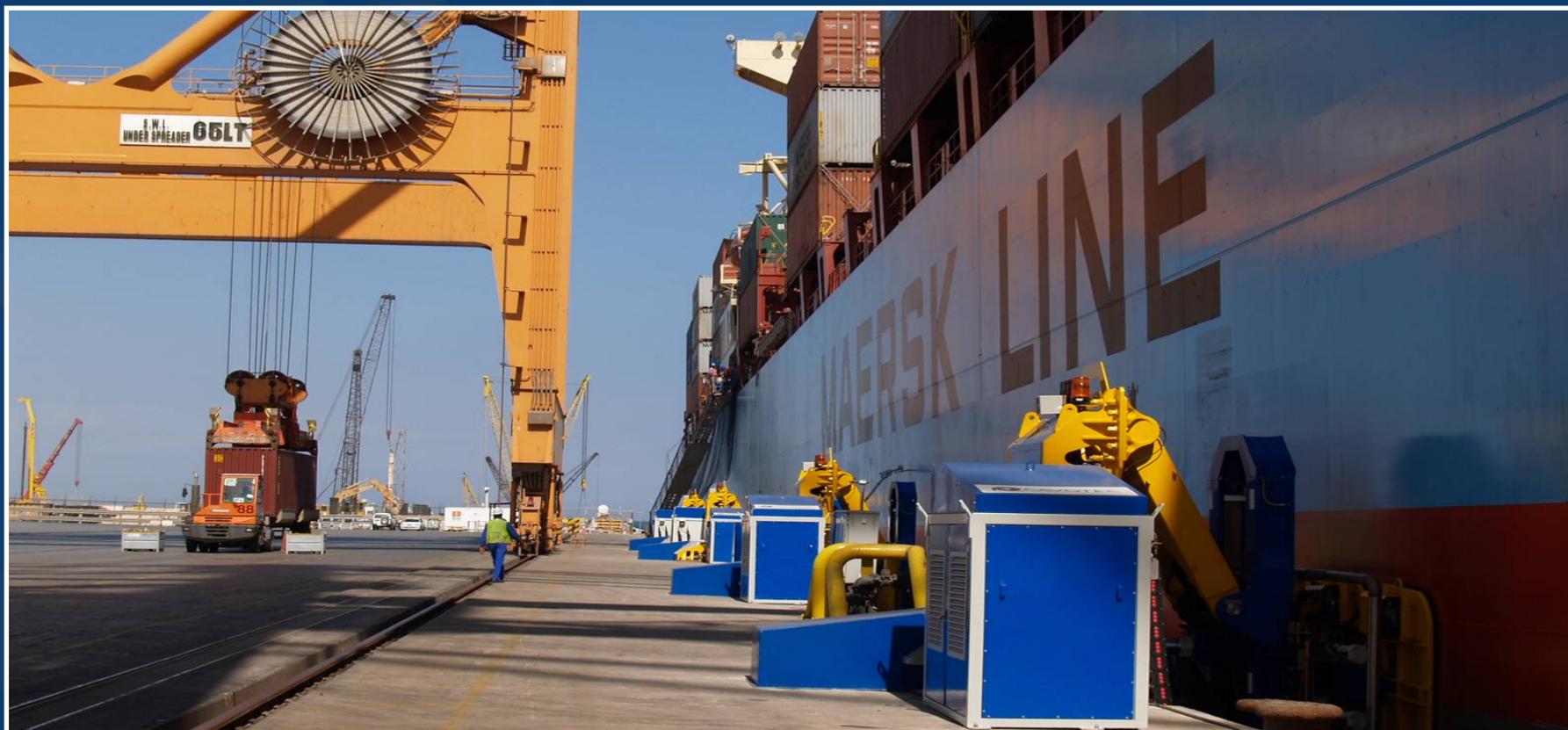
- Less wear and tear on lines
- Less wear and tear on winches, equipment

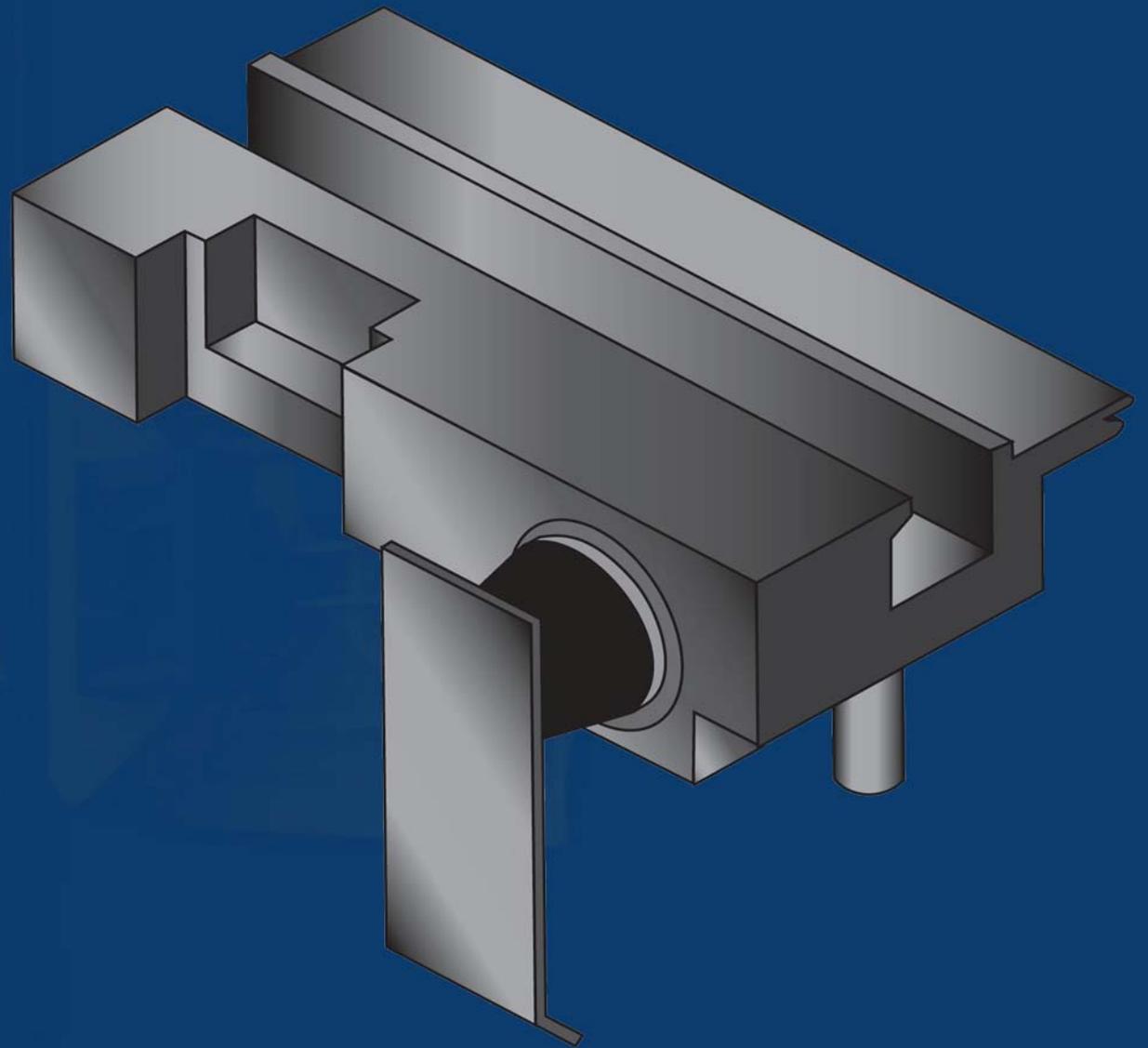
Design Considerations

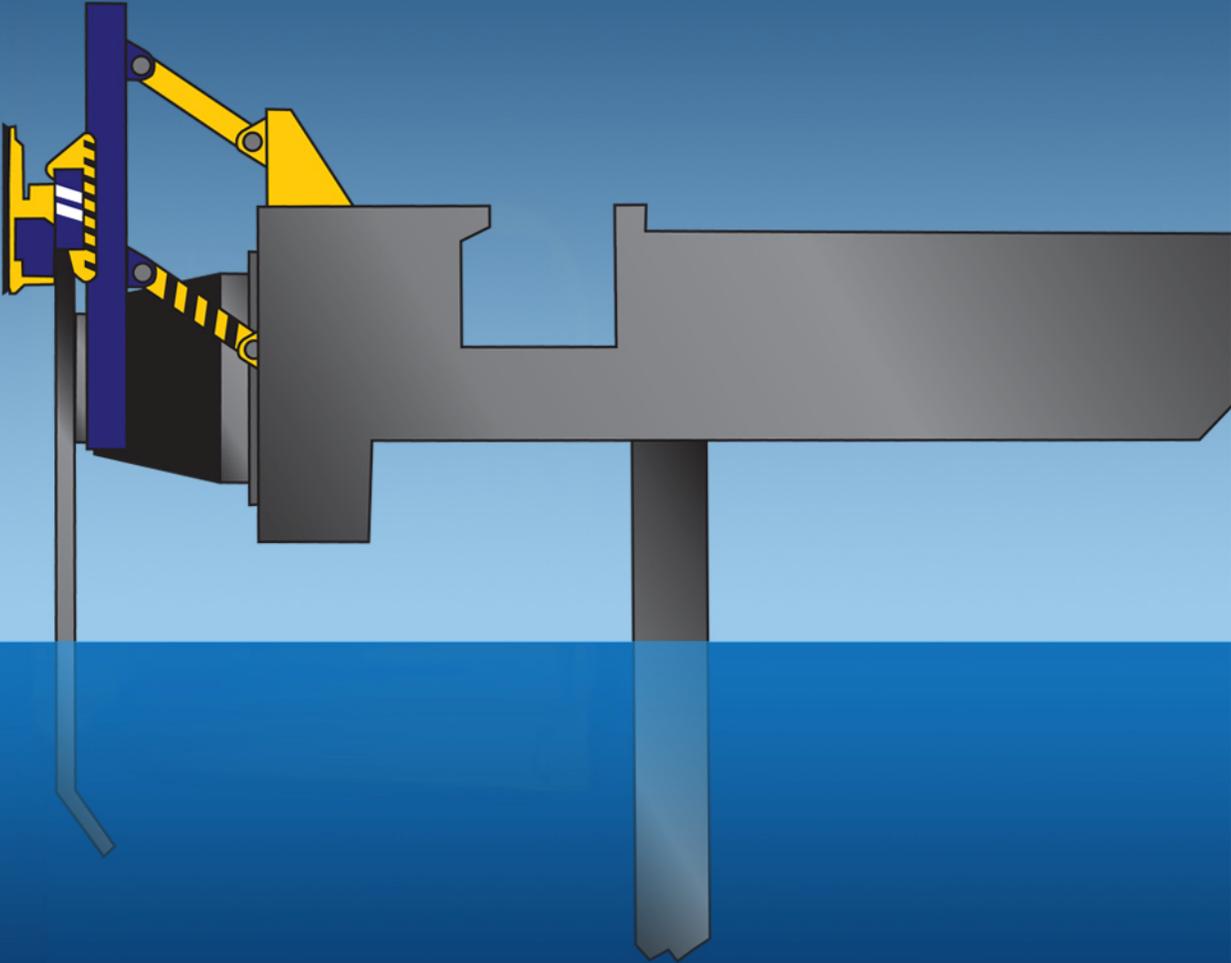
- Deck “Furniture”
- Crane Clearance
- Equipment Housing
- Wharf Loading

MoorMaster® – Automatic Mooring System

- MoorMaster® – A New Solution



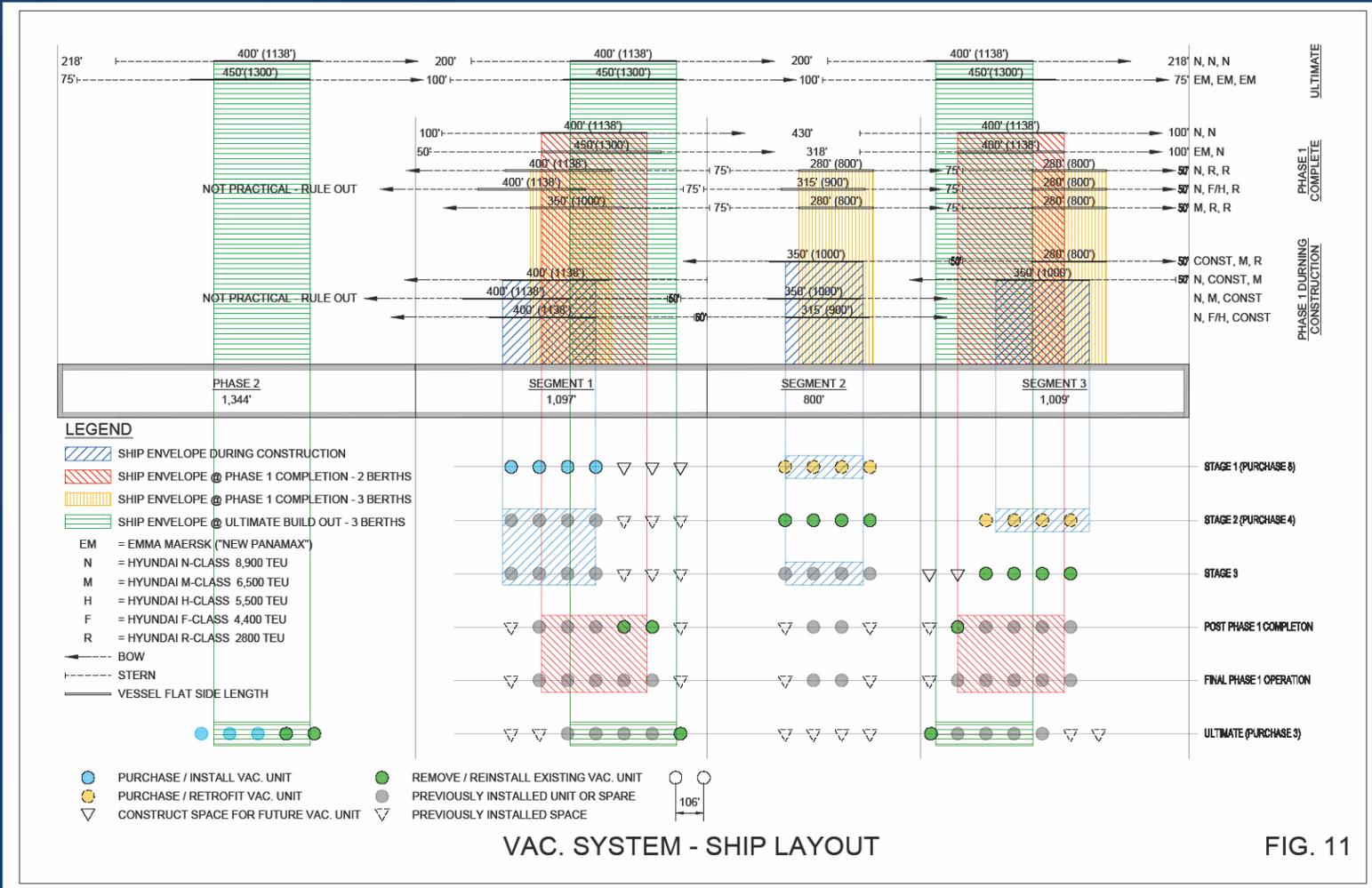




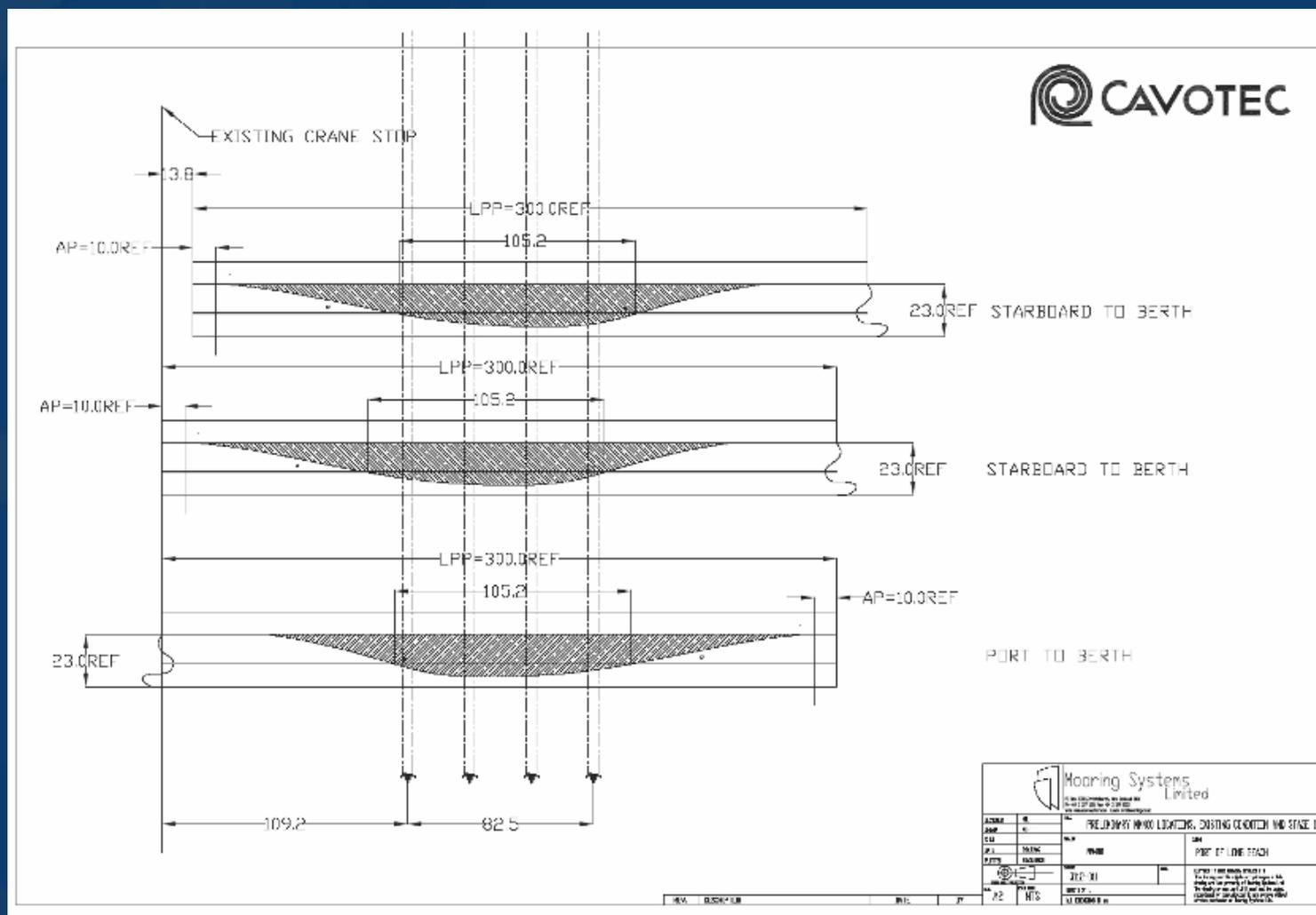
Evaluation

- Retrofit – New Build – Relocation
- Labor Implications
- Tug Time Savings
- Ship Line Damage Savings
- Costs

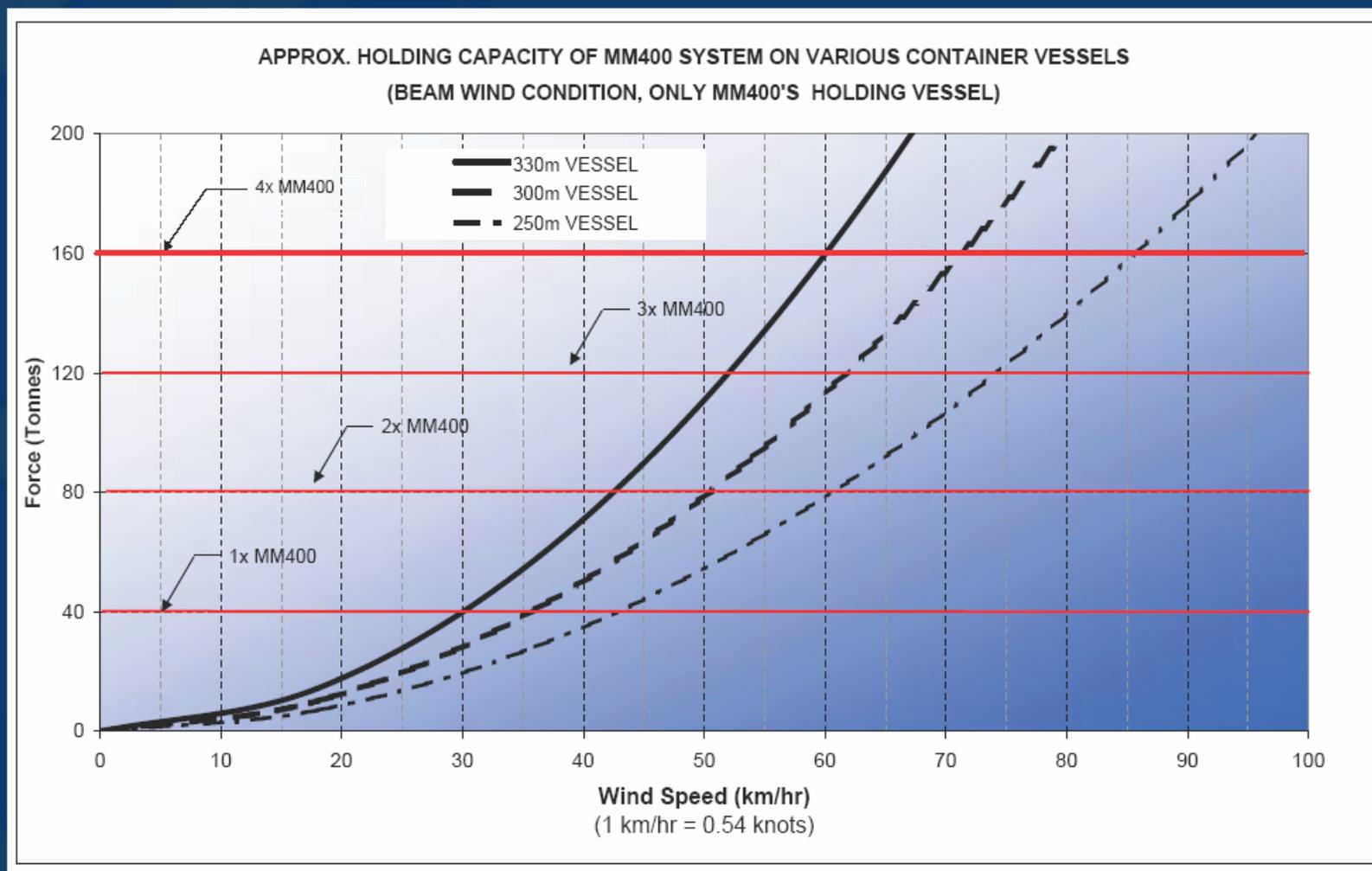
Vacuum System - Ship Layout



Vessel Flat Side vs Unit Locations



Force vs. Wind Speed Chart



Cost Tables (2008 Present Value)

<u>Lines</u>		<u>VMS</u>
\$2.9M	Capital	\$8.6M
0	Maintenance	\$0.7M
\$33.2M	Labor	\$28.6M
\$36.1M	TOTAL	\$37.9M

(Over 20 years based on 2 ships/berth/week)

Summary

- Can Provide Options in Tight Mooring
- Can Reduce Ship Movement
- Cost Effective if Labor Savings Can Be Realized
- It's the Future??