

Developments for Upgrading Facilities/Terminals for Large Vessels

E. D. Allen, *Moffatt & Nichol*

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- Navigation Channel Widths/Depths
- Turning Basins
- Berth Length
- Crane Size
- Wharf Loading/Appurtenances
 - Larger Crane Loads
 - Greater Berthing/Mooring Forces
- Revetment Loading (Bow Thrusters)

Channel Improvement Challenges:



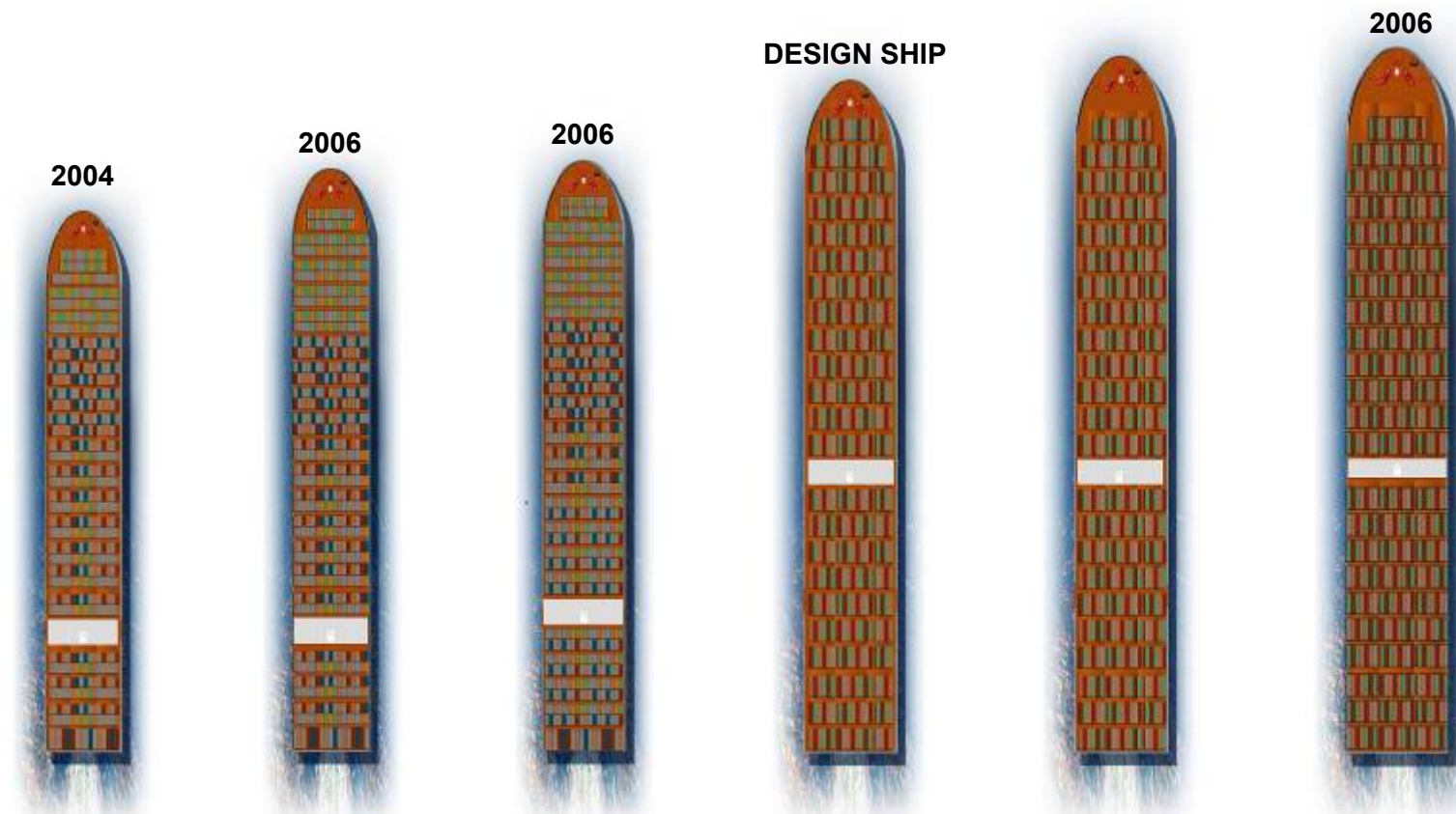
- Channels Under Federal Jurisdiction
- Deepening and Widening Approvals Require Many Years to Obtain
- Environmental Issues Potentially Slow Process Further
- Competition for Federal Funds for Improvements

- 22-Wide Cranes
- 1,300' + Length
- 184' Beam
- 51' Draft
- 25 Ton Thrusters





What Ship Size Should You Plan For?



	6,000 TEU	8,000 TEU	10,000 TEU	12,000-13,000 TEU	12,000 TEU	14,000 TEU
AN. SHIP CALLS		>200				
LENGTH	985	1089'	1150'	1265'	??	1302'
BEAM	134	142'	150'	158'	??	184'
BOXES	16	19	18	19	??	22
DRAFT	47'	49'	49'	50'	??	51'
		MSC HEIDI	XIN LOS ANGELES	NEW PANAMAX	SUEZMAX	MAERSK EMMA

“New Panamax” Vessel is Defined as Follows:



- 12,000-13,000 TEU
- 105,000 Short Tons (DWT)
- 366m Length (1,200 ft)
- 48.2m Beam (158 ft) (19 Container Wide)
- 15.5m (51 ft) Draft
- 61m (200 ft) Air Draft
 - Is this the future? Probably, for foreseeable future.

Current Terminal Design Vessels in USA



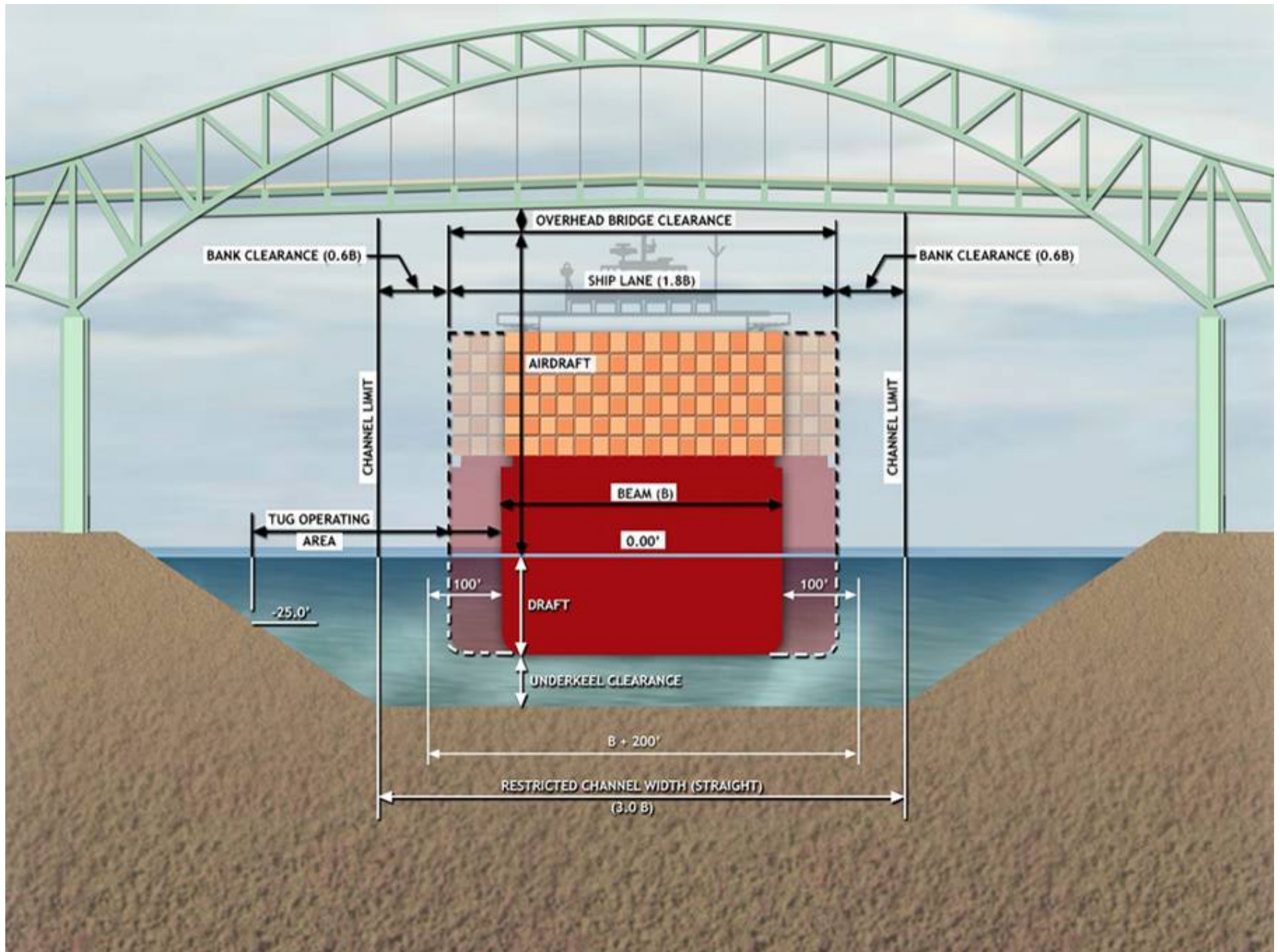
- New Panamax – (Previous slide)
- Suezmax – Similar to New Panamax
- Emma Maersk Class – in Some Cases for Berthing/Mooring Loads and Crane Outreach.

Ship Orders: 10,000 TEUs and Greater



Delivery Date

2009:	2-10,000, 5-13,000+
2010:	6-10,000, 8-11,000+, 8-12,000+ 16-13,000+, 10-14,000
2011:	3-10,000, 16-12,000+, 41-13,000+ 6-14,000
2012:	8-10,000, 11-12,000+, 14-13,000+
2013:	8-12,000+, 4-13,000+
2014:	4-10,000, 1-12,000+





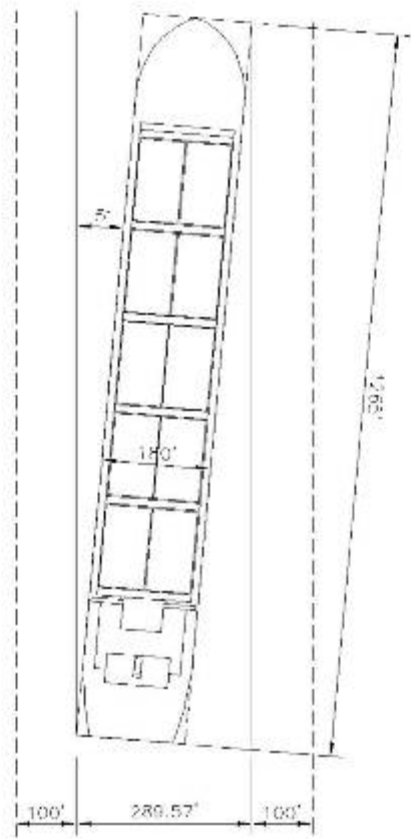
National & International Guidelines

- PIANC - Detailed (Update due 2010)
- USACE - Summary Fashion
- NAFAC - Summary Fashion
- ASCE - Summary Fashion (Update coming)



PIANC 1997——→ Updated 2010

- Revises and Updates Horizontal and Vertical Channel Dimensions
- Squat can now be Better Predicted
- Addresses Higher Windage, Larger Bulbous Bows, Wider Sterns, Minimal Parallel Mid Bodies
- Addresses Wave Energy vs. Ship Motion and Simulation



5° crab:

180' → 290'

158' → 270'

Increased path due to crab angle

Factors That Affect Channel Depth:



- Tidal Change During Transit and at Berth
- Static Draft
- Squat and Dynamic List
 - 1° list = 1.6 feet deeper (180' Beam)
 - 2° list = 3.1 feet deeper (180' Beam)
 - 3° list = 4.7 feet deeper (180' Beam)

More Factors Affecting Chan. Depth:



- Waves
- Net Safety Underkeel Clearance
- Bed Level Uncertainty

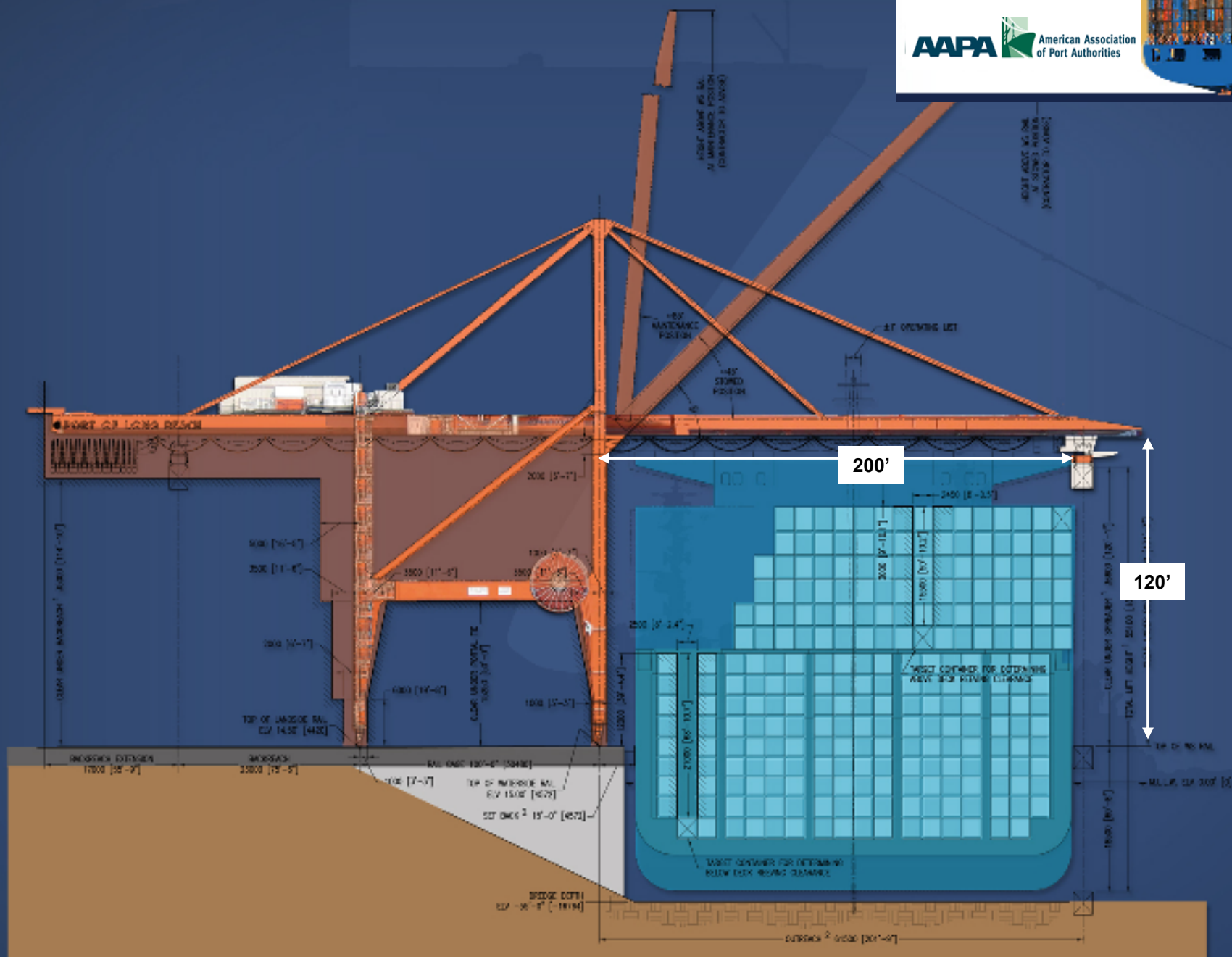
Factors that Effect Ship Motion:



- New PIANC Guideline for Allowable Container Ship Motion will be Based on Surge Motion Primarily
- Long Period Energy in Rectangular Basins are a Problem
- Problematic Basin are those with 90-120 Sec Natural Response Frequencies (Resonant Frequencies)
- “New Panamax” Size Shifts Response Away From 90-120 Sec Waves



How Does Ship Size Impact Wharf and Cranes?

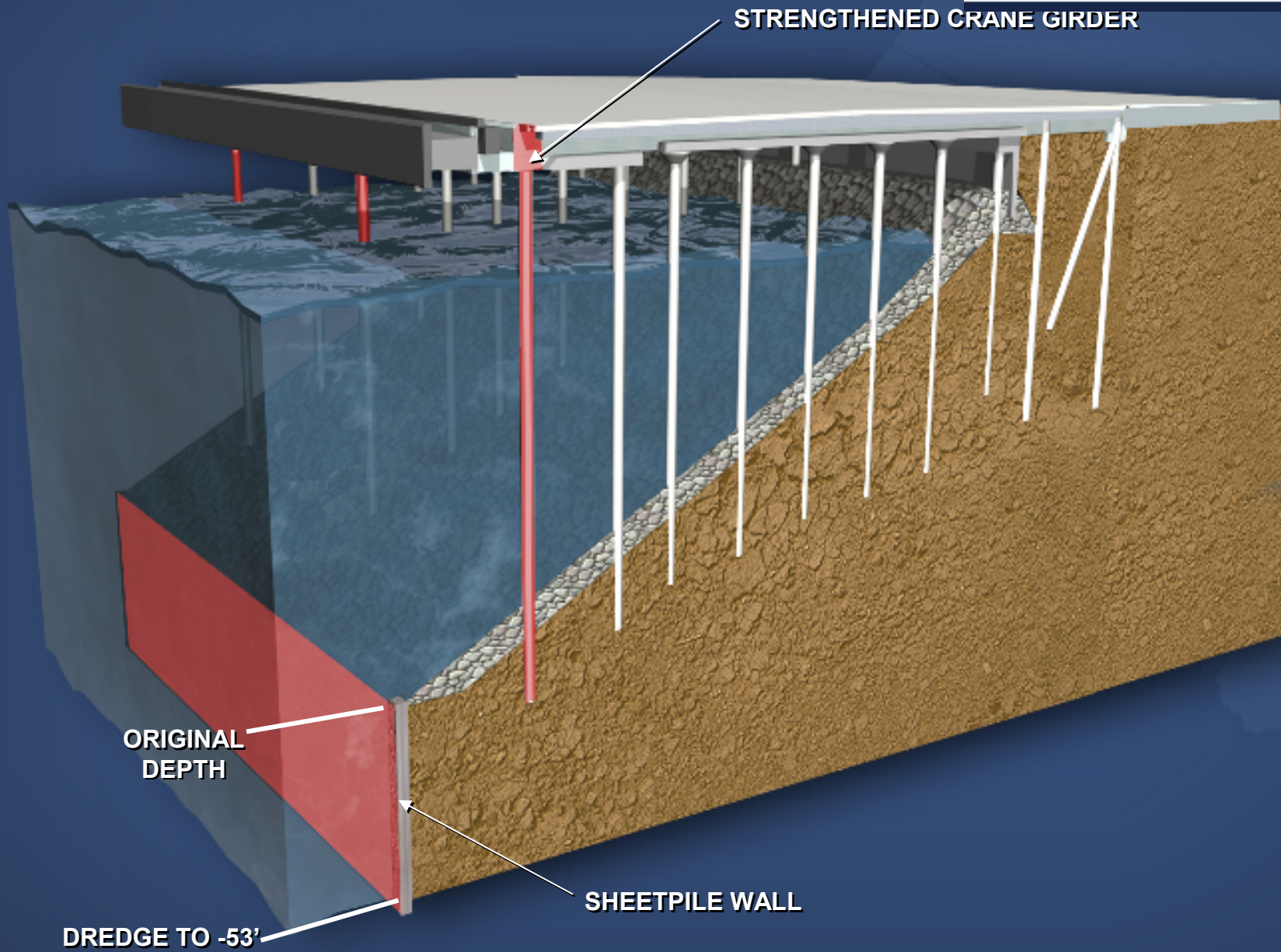


What Will Be Needed Landside?



- Wharf Structure Strengthening
 - Depth
 - Crane Loads
 - Fendering/Mooring
 - Rock Revetment Size
- Crane Upgrades
 - Rope Lengths
 - Wheel Modifications
 - Replacement/More Cranes?
- Ship-to-Shore Power
- Terminal Equipment Transformation

Modified Wharf



What's Needed at Wharf



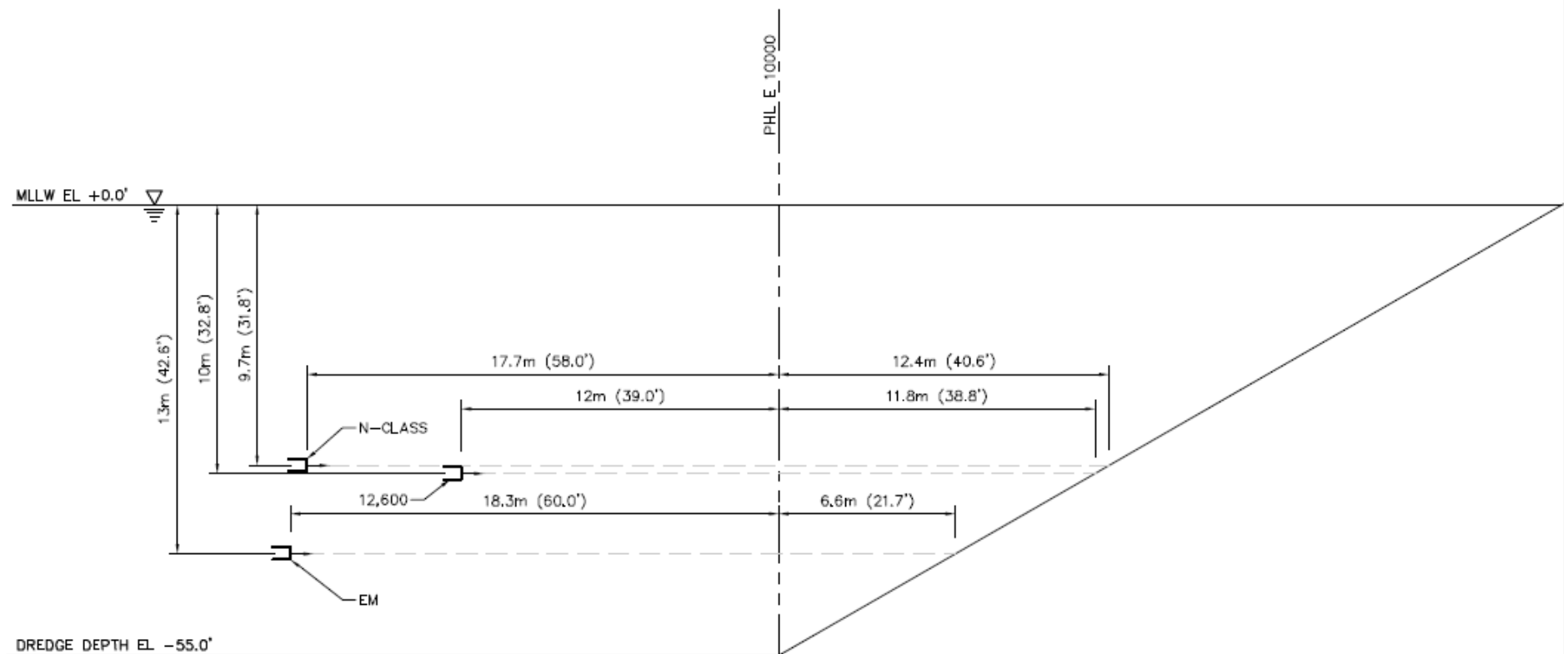
Fender Capacity	1570 ft/kips
Reaction Force	585 kips
Mooring Capacity	200 tons
Spreader Clearance	120 ft
Crane Outreach	201 ft (22 wide)
Ship Power	7.5+ MVA Min

What Rock Revetment Size is Needed:

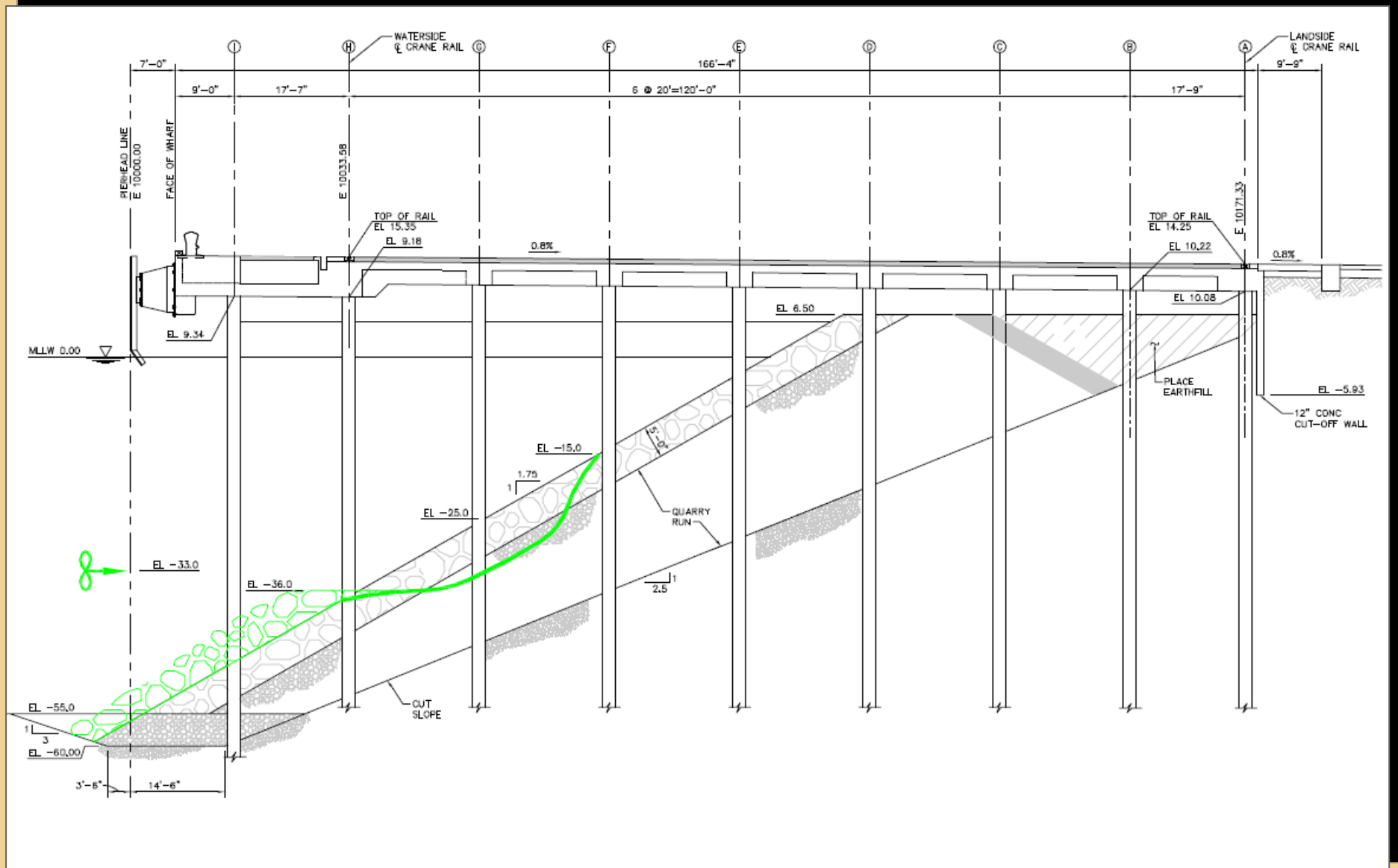


- Recent Physical Model Test Confirmed Higher Initial Velocity
 - Recent Test Refined Stability Coef. For Bow Thruster Force Against Rock Revetment
 - Full Scale Measurement Confirmed Factors Above
- “Results are Large Stone Requirements for Under-Wharf Revetments”

Physical Model Thruster Location Geometry



Potential Scour Profile



Infrastructure NOT Dependent on Ship Size



- Terminal Size
- Gate Size
- Yard Equipment
- Pavement
- Railyard Size

One 10,000 TEU Ship = Two 5,000 TEU Ships

Terminal Size Dependent Upon:



- Containers Discharged/Loaded per Day
- Dwell Time
- Storage Mode
- Intermodal Yard Operation – Hot Boxes Vs. Steady State

IY Size Dependent Upon:



- Volume of Intermodal Boxes
- Hot Boxes Vs. Steady State
- Ship Arrival Schedule

Other Infrastructure Challenges:



- Growing Highway Volume and Congestion
 - 12,000 TEU → 24 trains or 6,800 trucks
- Rail Terminal And Mainline Capacity/Frequency
- All, however, are Problems of Growth, Requiring more Investment and Labor

Initiatives to Deal with these Challenges



- Extended Gate Hours
- Congestion Pricing (Pier Pass)
- Shuttle Trains
- Virtual Container Yards
- Enhanced On-Dock Rail
- Dedicated Truckways
- Inland Port Concepts

What the Ports Need to Consider :



- Time to Get Permits!!
- Acceptable Channel Dimensions
- Logical Areas to Dredge
- Options
 - Zones to Pursue
 - Ship-in-Slip Potential
- Forward Plan
 - Mid Term VS. Long Term
 - Studies (Forecasts, Engineering)
- Terminal Transformation Issues
- Off Terminal Impacts
 - Road
 - Rail



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