MDC & Regulatory Update

Presentation for
2016 Locks Maintenance Workshop

Vicksburg, MS

February 10, 2016

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Marine Design Center

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US Army Corps of Engineers
BUILDING STRONG®

REGULATORY UPDATE

EPA Vessel General Permit (VGP) 2013

- Went into effect December 2013
- Good until December 2018

EPA Small Vessel General Permit (sVGP

- December 10, 2014 Congress Authorizes a three-year extension of the moratorium allowing small commercial vessels to discharge
- Currently, the sVGP will become effective in December 2017

REGULATORY UPDATE

Subchapter M

- Industry awaiting final rule from USCG
- Report in December 2015 from Workboat…

  "Early next year"
- Will we see it early this year (2016)???

REGULATORY UPDATE

Automatic Identification System (AIS)

- March 1 Deadline
- Class A AIS Device:
  - Vessels > 65 ft
  - Vessels > 1,600 GRT
- Class B AIS Devices for some other vessels

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REGULATORY UPDATE

Ballast Water Regulations

- Provisions in EPA 2013 VGP and from the US Coast Guard in 33 CFR 151 Subpart D
  - Training Requirements
  - Ballast Water Management Plans (also per 33CFR151)
  - Mandatory Ballast Water Management Practices
  - Ballast Water Numeric Discharge Limitation

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REGULATORY UPDATE

BALLAST WATER NUMERIC DISCHARGE LIMITATION

- USCG and EPA Limitations are the same.
- Both align with IMO (2004)
- Time Line: $<1,500\ m^3$ or $> 5,000\ m^3$ = After Jan 1, 2016 Dry Dock

  $1,500\ m^3 - 5,000\ m^3$ = After Jan 1, 2014 Dry Dock
- Requirements
  - Use Approved Ballast Water Treatment System (BWTS) or AMS
  - Use onshore treatment facility
  - Use public water supply
  - Do not discharge ballast water

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REGULATORY UPDATE

BALLAST WATER – GOOD NEWS

- VGP 2.2.3.5 says the following vessels are not required to meet the numeric discharge limitations*, but are encouraged to use additional management measures in ballast water discharge
  - Vessels that take on and discharge ballast water exclusive in one COTP Zones**
  - Unmanned, Unpowered Barges
  - Inland and Seagoing Vessels < 1,600 GRT

* - Still required to comply with training, BWM plans and management practices. 33CFR151 differs slightly from VGP.

** - See Next Slide

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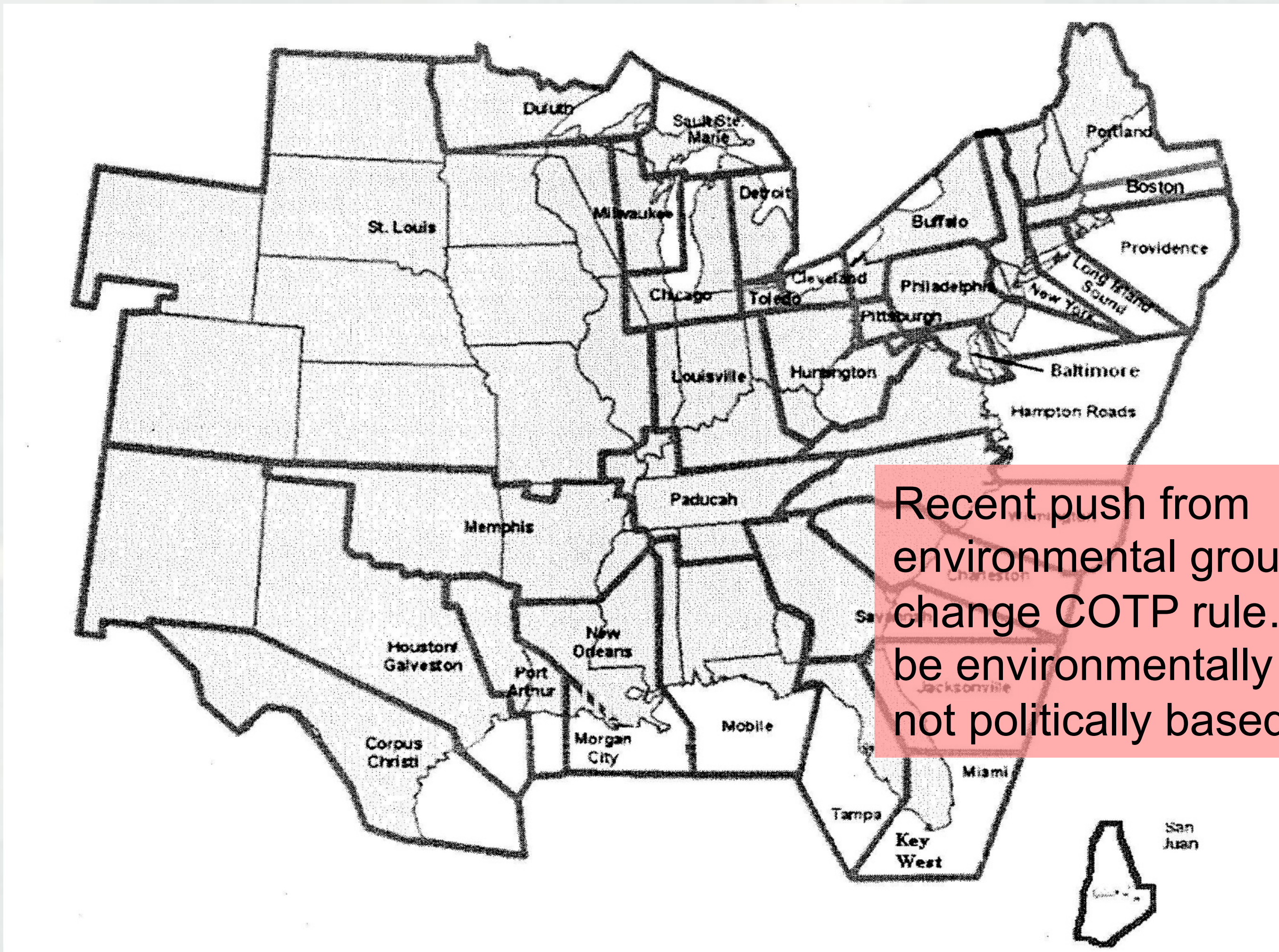
REGULATORY UPDATE

BALLAST WATER – CAPTAIN OF THE PORT ZONE



Recent push from environmental groups to change COTP rule…should be environmentally based, not politically based

REGULATORY UPDATE

ENGINE EMISSIONS FOR NEW OR REPOWERS

- Current Requirement for Marine Engines - EPA Tier III
  - Impact – Additional cooling load, separate cooling circuits
- Tier IV Phase In
  - 2014 – Engines rated above 2,000 kw (2,682 hp)
  - 2016 – Engines rated between 1,400 kw (1,877 hp) and 2,000 kw (2,681 hp)
  - 2017 – Engines rated between 600 kw (805 hp) and 1,400 kw (1,876 hp)
  - Engines rated below 600 kw (805 hp) – No Tier IV Phase In
- Tier IV ➔ Aftertreatment (**SCR, EGR**, DEF, DPF, DOC)

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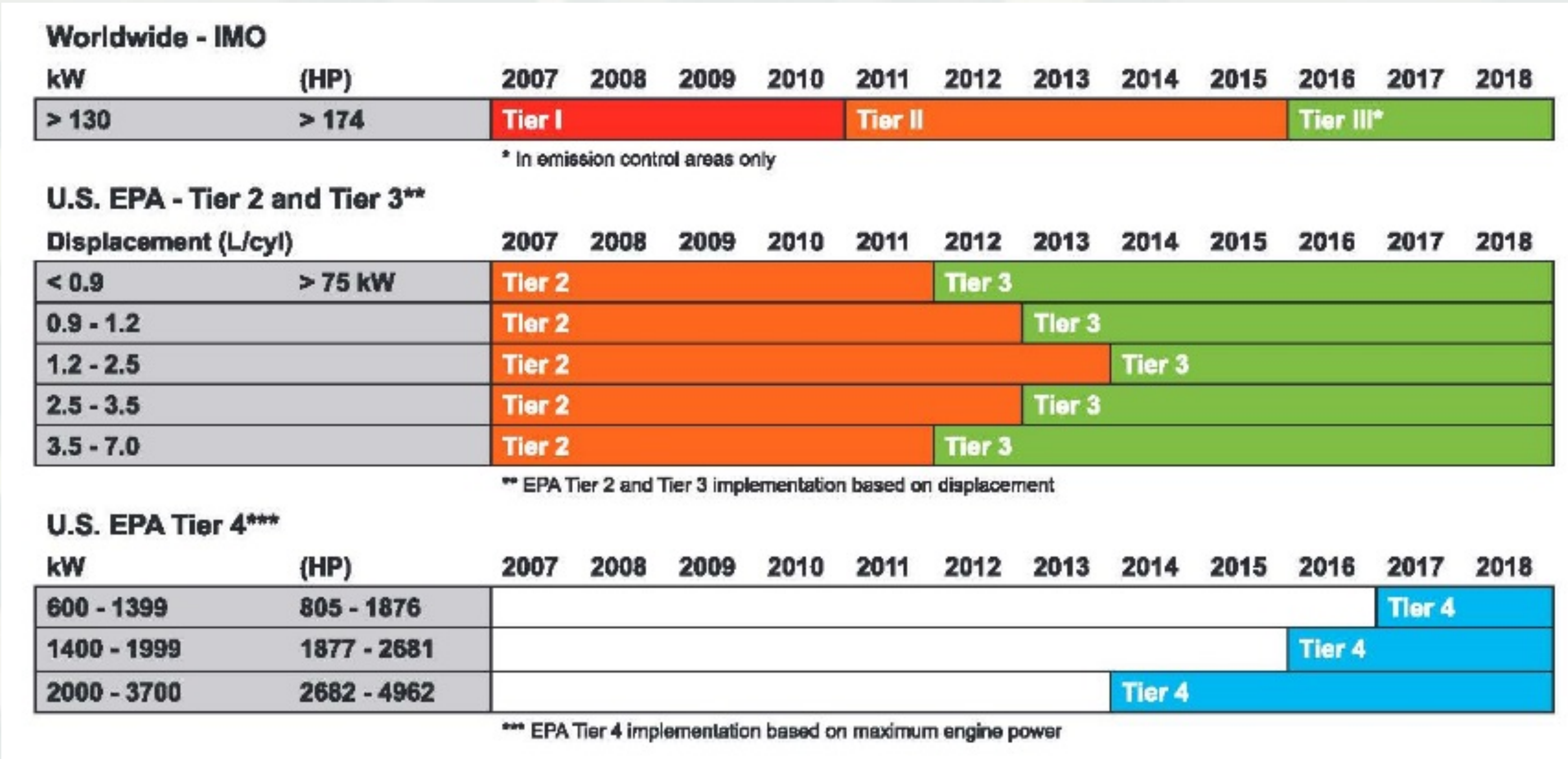

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REGULATORY UPDATE

ENGINE EMISSIONS

- Tier IV Engine Technology
  - Cummins QSK95 (4000 hp) => "own exhaust after-treatment systems"
  - CAT => Selling Integrated SCR Solution with Engines
    - C280, C175, 3500, C32ACERT (Ratings > 1875 hp)

REGULATORY UPDATE

ENGINE EMISSIONS

REPOWERING CONSIDERATIONS – TIER 3 & 4

- COOLING REQUIREMENTS…
  MORE COOLERS, LARGER COOLERS, MORE SPACE, MORE PIPE, ETC.
- AFTER TREATMENT EQUIPMENT & SYSTEMS
- Exhaust Routing
- Engine Mount Foundations
- Starting
- Controls

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MISTER PAT REPOWERING

MISTER PAT REPOWERING

MISTER PAT entered into service at the Tulsa District in 1996.

Main propulsion at time of delivery was:

- **Engines:** Two Caterpillar 3412 providing 671 BHP at 1800 RPM
- **Transmissions:** With two Twin-Disc MG-520
- **Shafting:** 5-1/2 inches,
- **Propellers:** 66 inch diameter with pitch of 54 inches, 4 blade, and .75 DAR

At time of delivery, the vessel was outfitted with air controls.

Due to wear on the engines, Tulsa District determined that it wanted to repower the vessel in 2013.

MISTER PAT REPOWERING

MDC repowering tasks:

- Procured equipment required for the repowering
- Produced a drawing package for the install
- Provided engineering support during the shipyard period
- Provided onsite support during test and trials

Non-MDC repowering tasks:

- Memphis District Ensley Engineering Yard performed the installation of the equipment
- Tulsa District had onsite representation during the entire shipyard period.

MISTER PAT REPOWERING

New Equipment:

- Two Caterpillar C32A, marine propulsion engines, “A” rated 1000 bhp at 1800 rpm, IMO II/EPA tier 3 complaint
- Two Reintjes WAF 562 marine transmissions, 4.546: ratio
- Two Sound Propellers, 66 inch diameter, 5 blades, .85 DAR
- Kobelt electronic propulsion controls

Challenges:

- **Cooling** – need more real estate for keel coolers (larger coolers, after cooler)
- **Exhaust** – larger exhaust lines
- **Fuel** – larger fuel inlet and outlet lines
- **Controls** – now are electronic; cable pull, console arrangement
- **Power supply for propulsion controls** – clean DC power for controls
- **Physical Layout -** engine mounts, layout, maintenance points/access
- **Ventilation** – No impact on this project

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M/V DAN REEVES

- Builder – Horizon Shipbuilding, Inc. (Bayou La Batre, AL)
- Delivered to Little Rock District in January 2015

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M/V DAN REEVES

- 95’x43’x10’ with 8’-6” Draft
- 2,300 BHP from (2) CAT C32 Tier III Engines
- Thrustmaster TH1500MZ Z-Drives with Custom 4 Blade Props and Nozzles
- (2) 150kW John Deere Gensets
- Accommodations for 8
- Fuel Capacity: 22,800 Gallons
- Capable of “Zero” Discharge Operations
- Use of EALs in the Z-Drive Systems

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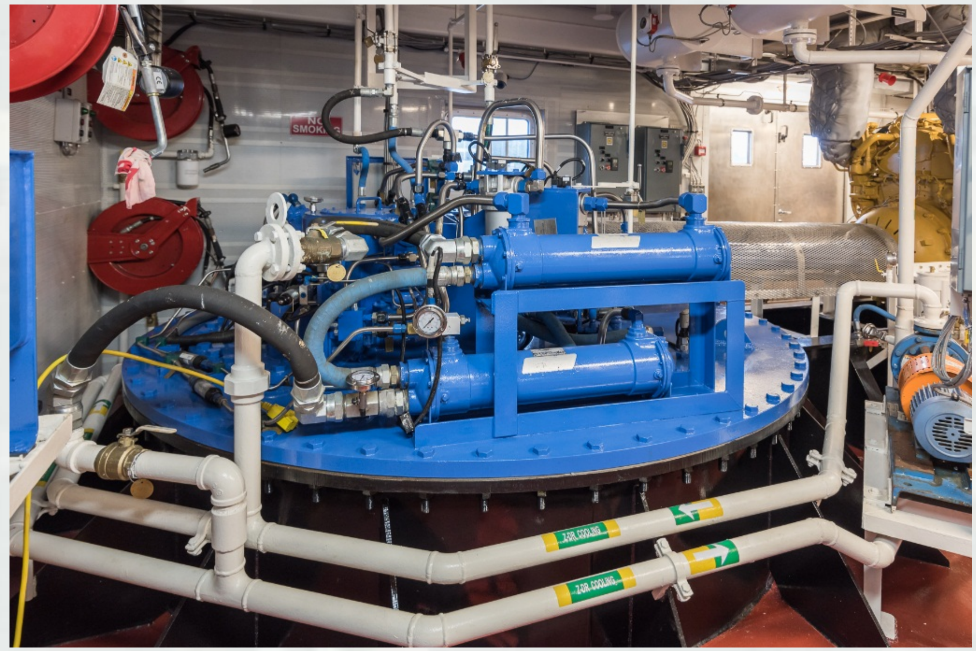
M/V DAN REEVES



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M/V DAN REEVES

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SHREVE REPAIRS

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SHREVE REPAIRS

- MDC and Philadelphia Contracting Working On Awarding Sole Source Contract To PaR Systems of Shoreview, Minnesota.
- PaR Systems is the owner of the intellectual property of the Ederer \Washington Crane originally installed on the barge.

The work to be accomplished under this contract will be:

- Design evaluation for API 2C as well as 3rd party verification
- Revisions to the design to meet API 2C or ASME B30.8
- Procurement of new equipment for restoration of the crane
- Installation, repair, and recertification of the crane

- Once contract is awarded, the process is scheduled to take 19 months from issuance of NTP to completion of work and return to the Corps of Engineers.

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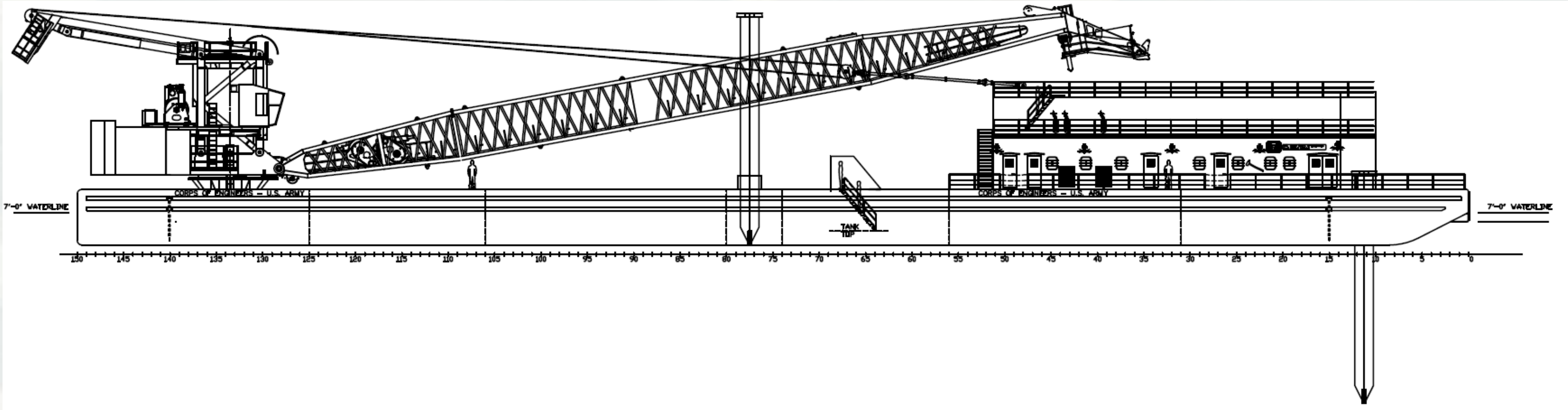
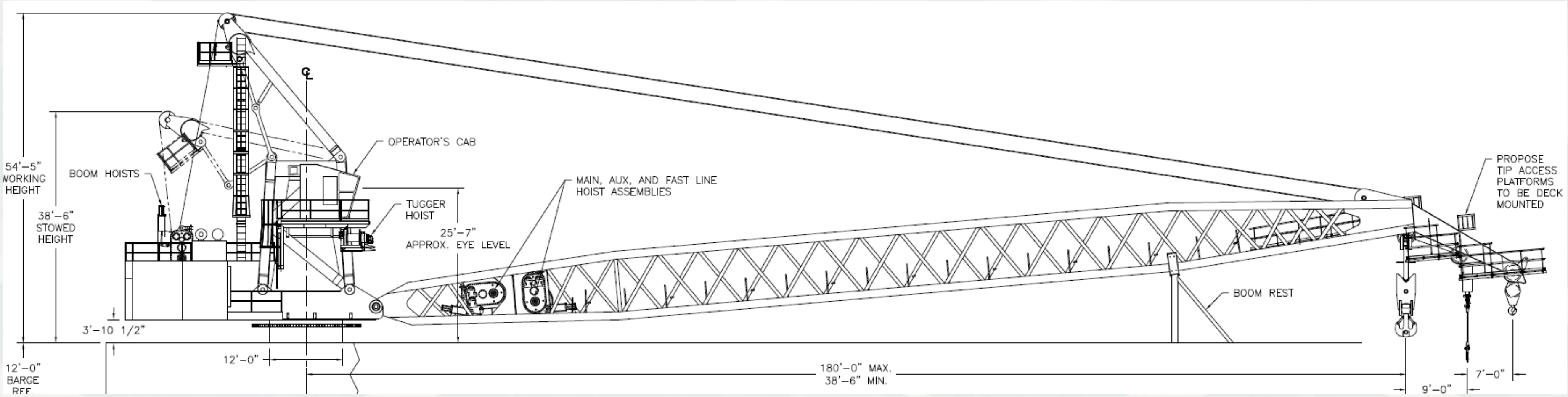
QUAD CITIES REPLACEMENT



QUAD CITIES REPLACEMENT



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QUAD CITIES REPLACEMENT

08-05-2015
Seatrax Crane Data Sheet
ONBOARD OR OFFBOARD (Hsig = 0 Ft)
Safe Working Load Chart
API SPECIFICATION 2C SEVENTH EDITION, MARCH 2012
Seatrax Series 144 Model S14440
170 Foot Boom
Windspeed = 22 knots
5 Degrees List 7 Degrees Trim
For a Construction Barge per Spec 2C section 1(c), using the API General Method
Serial Number: 503103
Identification Number: 503103

Working Radius Feet	8 Part Line Main Drum API Load lbs	10 Part Line Main Drum API Load lbs	2 Part Line Aux Drum API Load lbs	Single Line Fast Line API Load lbs	Personnel Rated API Load lbs
40	684,705d	846,379d	90,000d	55,030d	27,515d
45	684,705d	846,379d	90,000d	55,030d	27,515d
50	684,705d	846,379d	90,000d	55,030d	27,515d
55	684,705d	846,379d	90,000d	55,030d	27,515d
60	684,705d	845,555b	90,000d	55,030d	27,515d
65	684,705d	793,136b	90,000d	55,030d	27,515d
70	684,705d	746,282b	90,000d	55,030d	27,515d
75	684,705d	704,233b	90,000d	55,030d	27,515d
80	666,168b	666,168b	90,000d	55,030d	27,515d
85	631,737b	631,737b	90,000d	55,030d	27,515d
90	600,247b	600,247b	90,000d	55,030d	27,515d
95	571,512b	571,512b	90,000d	55,030d	27,515d
100	545,105b	545,105b	90,000d	55,030d	27,515d
105	520,796b	520,796b	90,000d	55,030d	27,515d
110	498,342b	498,342b	90,000d	55,030d	27,515d
115	477,549b	477,549b	90,000d	55,030d	27,515d
120	458,254b	458,254b	90,000d	55,030d	27,515d
125	440,320b	440,320b	90,000d	55,030d	27,515d
130	423,591b	423,591b	90,000d	55,030d	27,515d
135	408,016b	408,016b	90,000d	55,030d	27,515d
140	393,514b	393,514b	90,000d	55,030d	27,515d
145	379,935b	379,935b	90,000d	55,030d	27,515d
150	365,472ag	365,472ag	90,000d	55,030d	27,515d
155	349,168ag	349,168ag	90,000d	55,030d	27,515d
160	333,332ag	333,332ag	90,000d	55,030d	27,515d
165	318,010ag	318,010ag	90,000d	55,030d	27,515d
170	303,974ag	303,974ag	90,000d	55,030d	27,515d
181	169,027e	169,027e	90,000d	55,030d	27,515d

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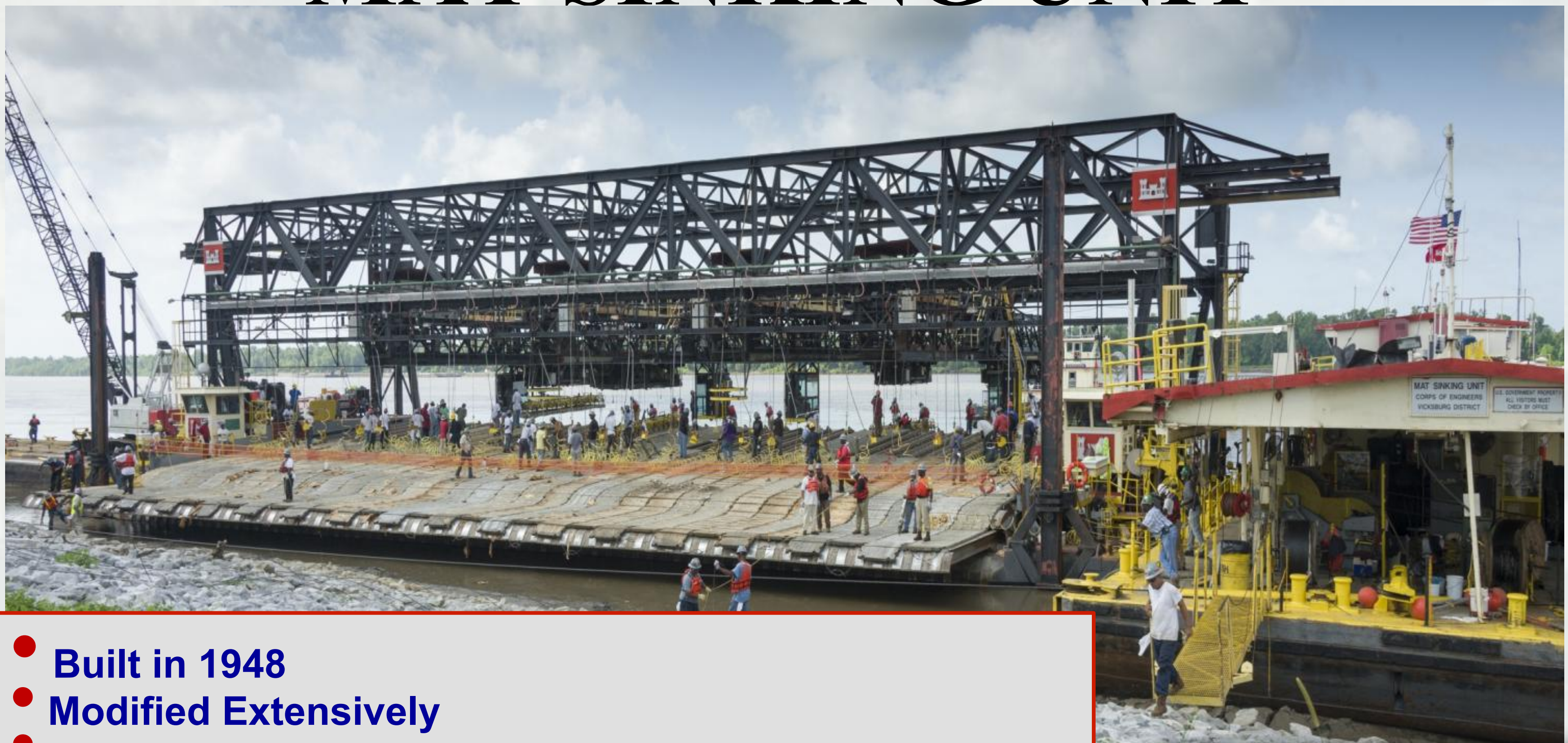
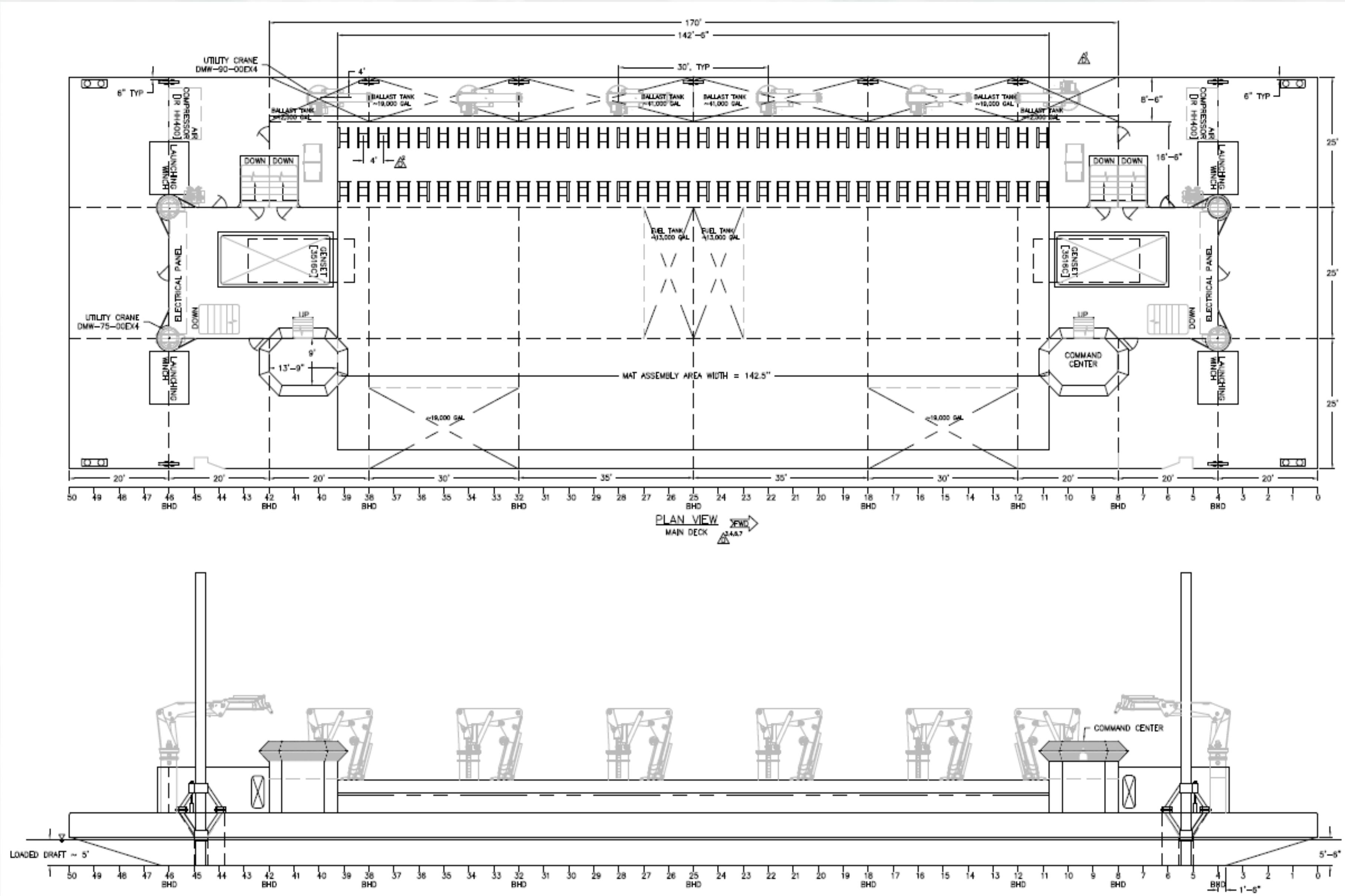
QUAD CITIES REPLACEMENT

- 300’ x 68’ x 12’ barge size
- ABS Classed crane barge design being performed largely in house
- Contracted with Seatrax for a Model S144 Crane
- Capable of lifting operations in excess of 400 tons
- Air draft under 45’ for high water operation
- 50’ spuds

MAT SINKING UNIT

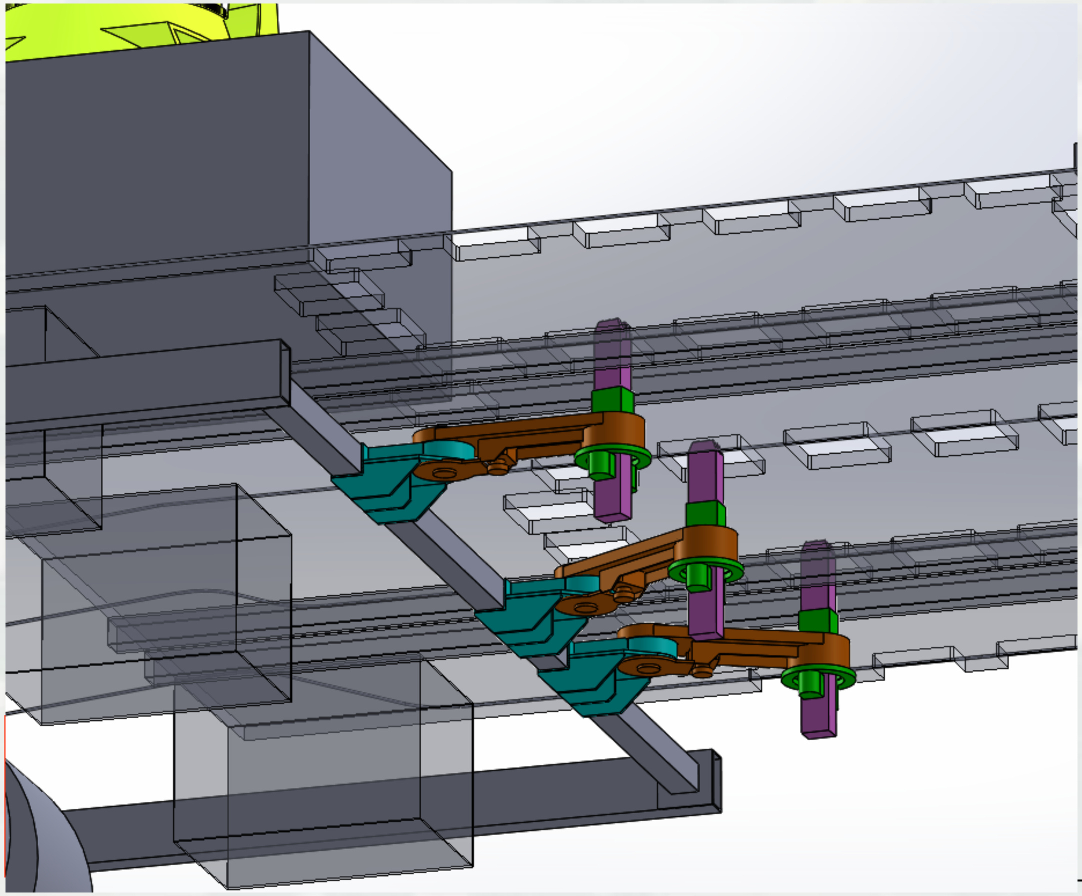


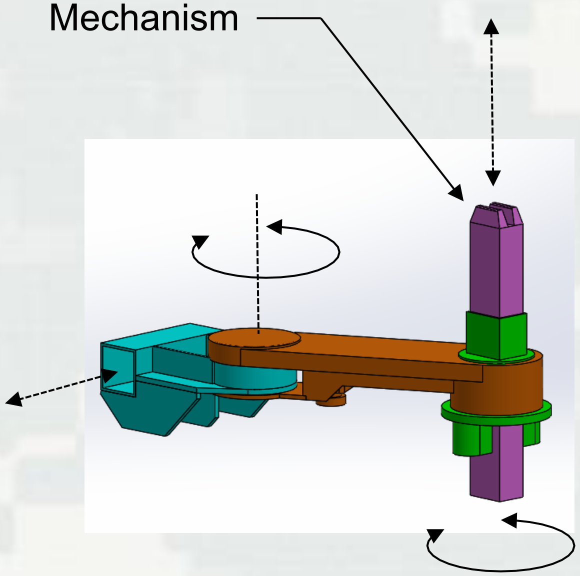
- Built in 1948
- Modified Extensively
- Safety issues cannot be dealt with
- Does not meet OSHA standards
- No automation
- No warning sensors
- Web of cabling required
- Repair costs average $5,000,000 per year


PLAN VIEW
MAIN DECK
FWD
170'
142'-6"
30', TYP
UTILITY CRANE
DMW-90-00EX4
UTILITY CRANE
DMW-75-00EX4
AIR COMPRESSOR [IR HH400]
LAUNCHING WINCH
ELECTRICAL PANEL
GENSET [3516C]
BALLAST TANK
FUEL TANK
DOWN
UP
COMMAND CENTER
MAT ASSEMBLY AREA WIDTH = 142.5'
LOADED DRAFT ~ 5'
BHD

MAT SINKING UNIT

Several custom robotic arms move underneath the deck where squares are placed to perform the cable tie procedure.





MAT SINKING UNIT

- National Robotics Engineering Center - Carnegie Mellon University
- Task I – Robotics Feasibility Assessment, On-site Information Gathering Survey – Completed
- Feasibility Study/Design Analysis (Sweet Spot) Commencing February 2016
  - Traction winch control system
  - Mooring winch unified control system
  - Safety System - personnel working with robotics
  - Machine vision system - positioning wire tie robotic arms
  - Prototype Robotics Construction (Pocket Mat Boat)
  - Development of Robotics System Technical Specifications
  - Systems Integration During Design & Construction

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OLMSTED WICKET LIFTER

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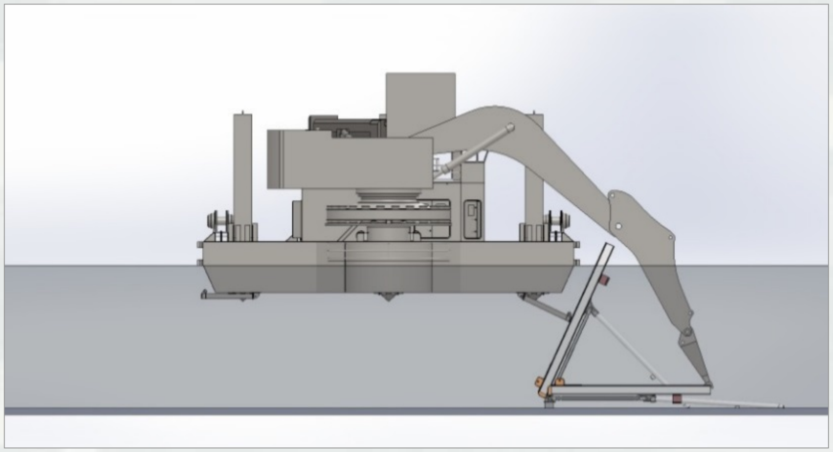
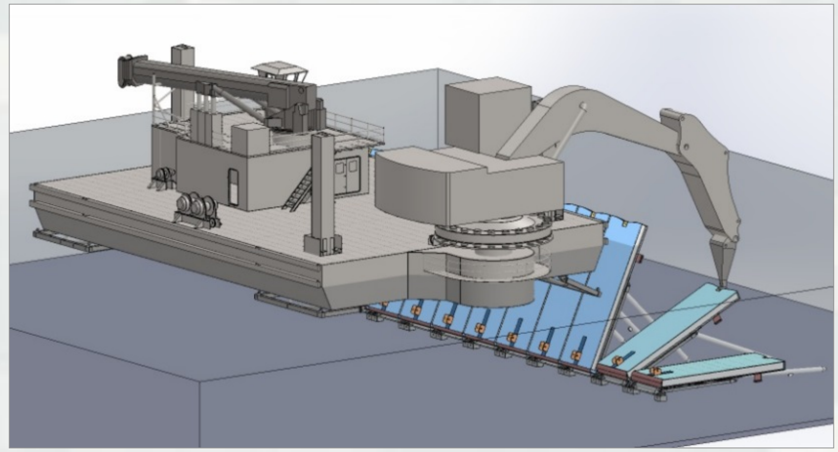
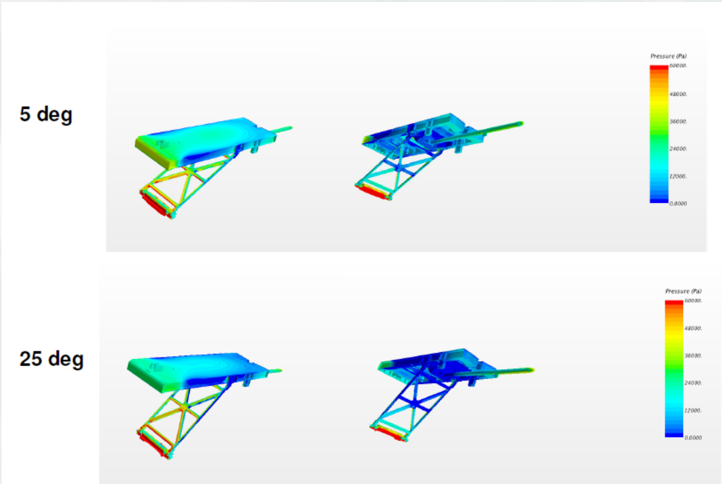
OLMSTED WICKET LIFTER

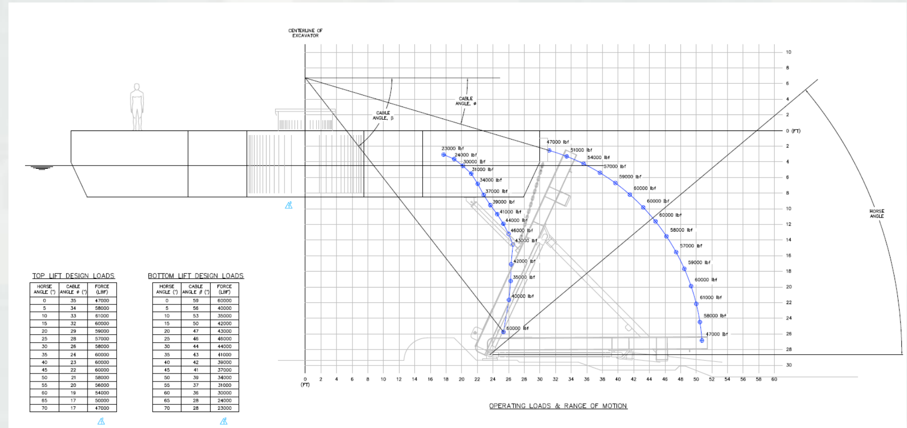




- Designed to raise/lower wicket dam, perform maintenance operations, remove debris

OLMSTED WICKET LIFTER





- CFD analysis to determine forces required for wicket lifting at various points along the range of motion

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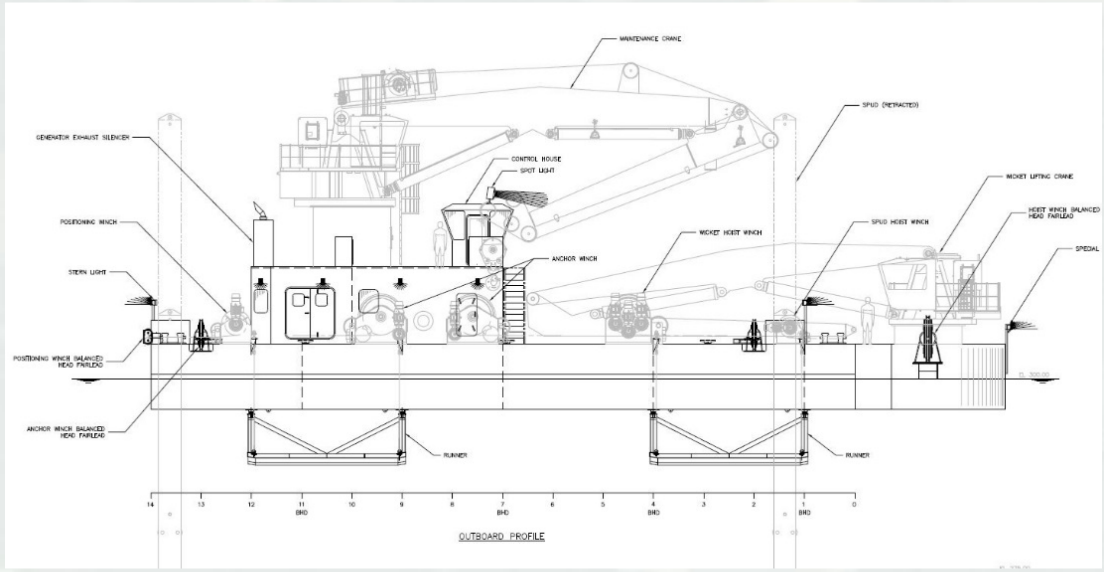
OLMSTED WICKET LIFTER



Notable Design Features

- Wicket Lifter Crane, Maintenance Crane
- Spuds
- Positioning, Anchoring, & Hoist Winches
- Deck Anti-Icing System
- Generators, Electrical System

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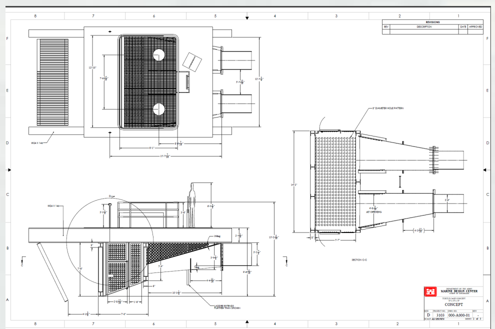
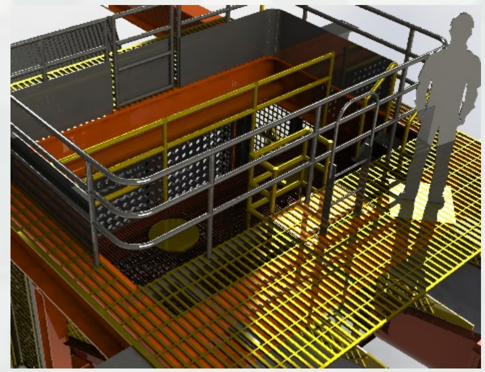
SOLIDWORKS

Sample Project Uses

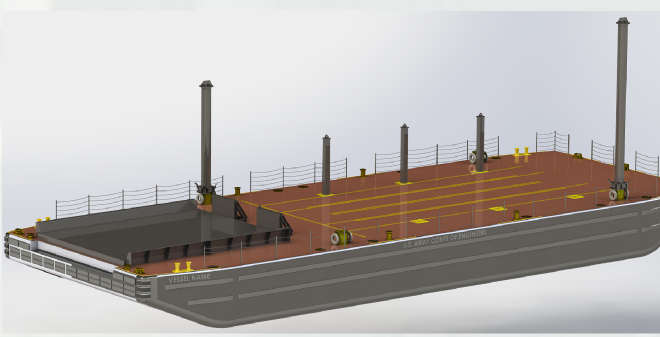
- Turtle Cage Modification Concept
  - Challenge – improve safety by installing protective cage around a work area
  - Benefits – visualization aided communication between team members in 2 different states.

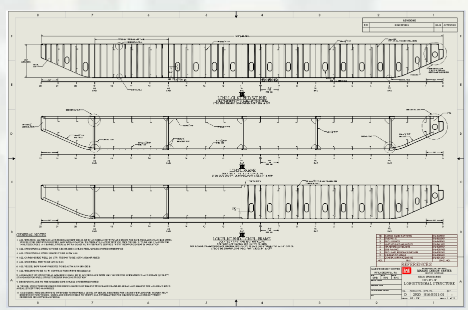


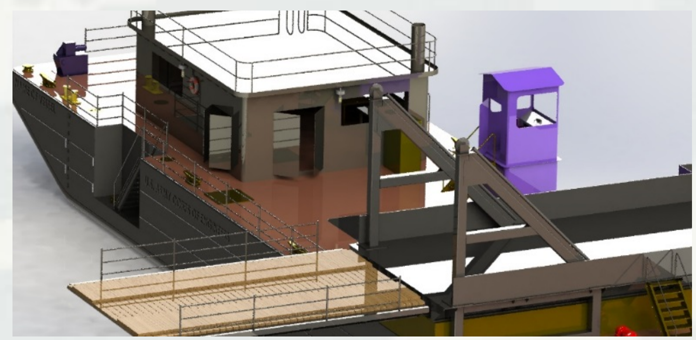


Ship Design

- Challenge – design 3D vessel and have it's drawings directly connected using prior MDC formats, styles and techniques.
- Benefits – Invest time in model will streamline drawing output and review process

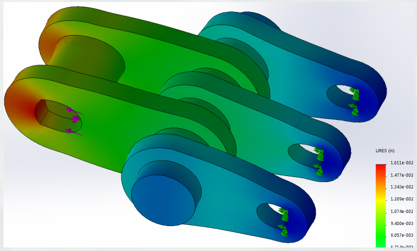


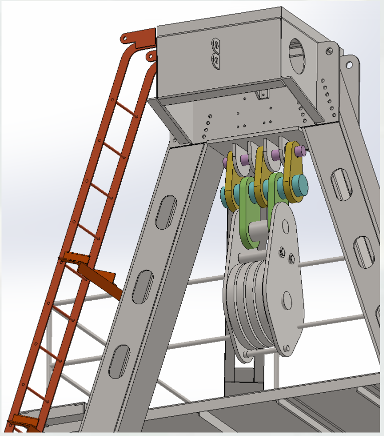




SOLIDWORKS

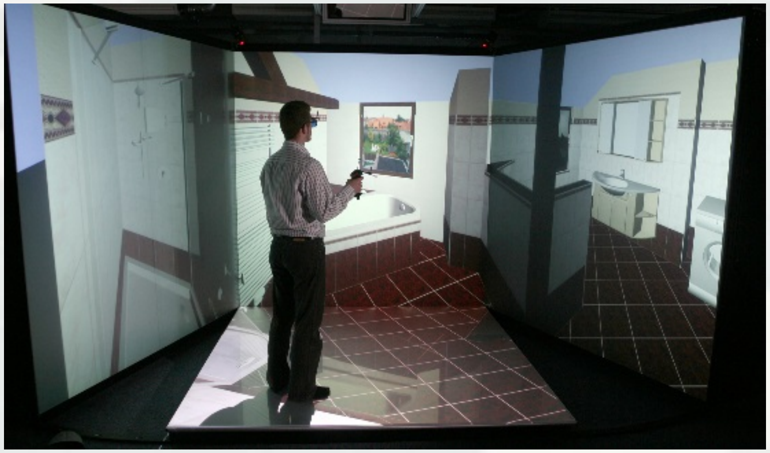
Structural Assessment/FEA





Virtual Reality Environments

- **C.A.V.E. and Occulus Rift systems are currently being looked at as ways to solve design challenges even better**
- **Use of holograms can help solve functionality issues**
- **Immerses engineers in a virtual environment where they can examine, measure & analyze while in the design phase.**



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DISCUSSIONS/QUESTIONS

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ADDITIONAL SLIDES REFERENCE

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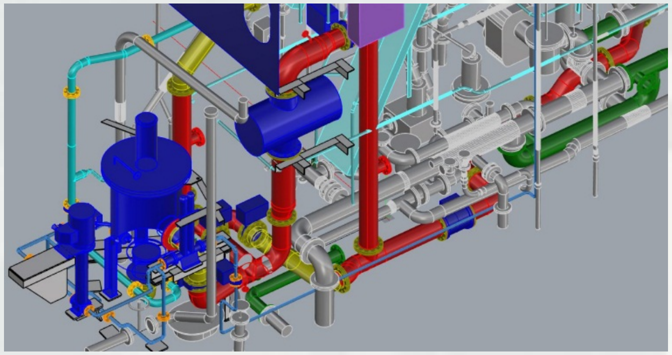
REGULATORY UPDATE

BALLAST WATER TREATMENT SYSTEMS

- Estimated to be $1M or more per installation
- No USCG Type Approved Systems on the market
  - While the criteria between the USCG/CFR and IMO are the same the USCG type approval process is more stringent than IMO
- Systems available are generally for ocean going, salt water environments. Performance for inland fresh water, with high turbidity is unknown.



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