

# USS MISSOURI (BB: 63)

## PROTECTING HISTORY

Gary Barnes, CDR, USN-Ret, MFC

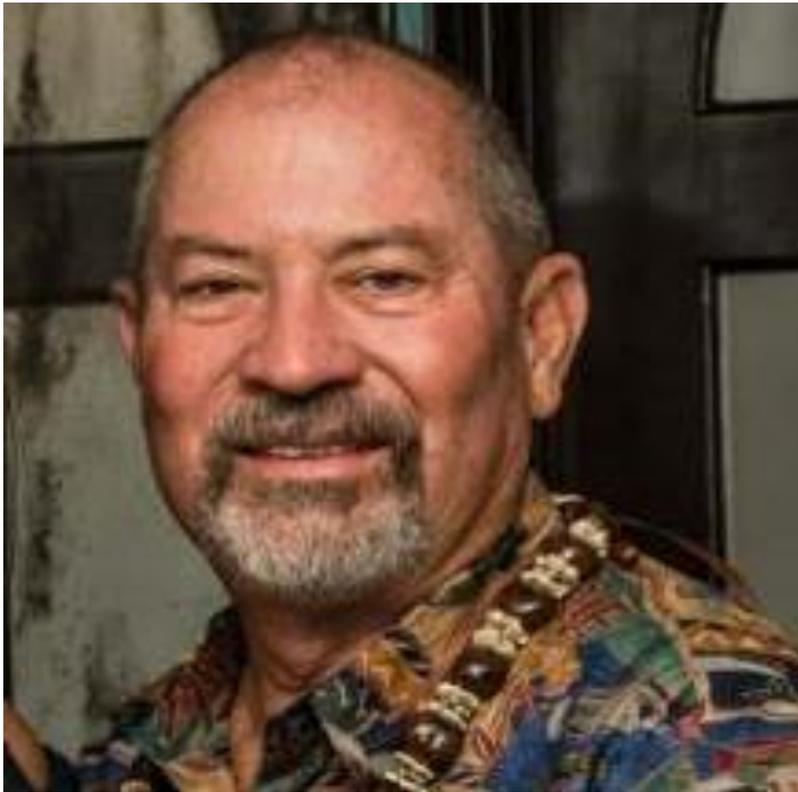
Jordan Barnes, Tropical J's, Inc.

Timothy Akes, CAD Effects



# EXPO





## **Gary Barnes, MFC**

Co-Owner, Tropical J's

### **Session Type:**

Shade and Weather

Gary C. Barnes, MFC is a retired Naval Intelligence Officer with numerous assignments around the globe including a stint as an Assistant Naval Attaché to the then Soviet Union. His wife Jeri started the company making handheld umbrellas while Gary was still in the Navy. Gary took an early retirement from the Navy to assist with Jeri's fledgling handheld umbrella business. The company quickly went from handheld umbrellas to outdoor wood-framed market umbrella, awnings, tents for the eco-tourism and small tensile structures.

Today they are the largest outdoor shade company in the State of Hawaii with over 25 employees.





## **Jordan Barnes**

Tropical J's

### **Session Type:**

Shade and Weather

Jordan Barnes is both Design and Sales Manager with Tropical J's, Inc. Raised in the industry under Gary's tutelage, his passion for creative designs and custom manufacturing challenges has helped guide the second generation of business towards exciting and ever-evolving shading solutions.





## **Timothy Akes**

Owner, CAD Effects

Representative, MPanel

### **Session Type:**

Shade and Weather

Timothy Akes is the owner of CAD Effects, LLC and the representative in the Americas for MPanel Software Solutions, LLC which specializes in fabric design & engineering software and services for industrial fabrics industry clients.

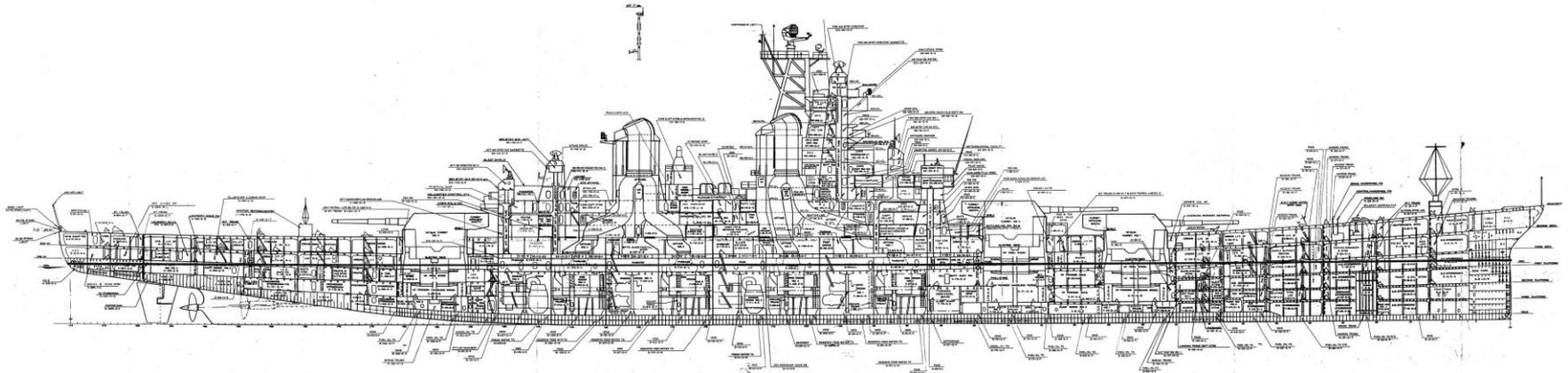
More than 25 years of experience with Computer Aided Design software and hardware has gained him a vast amount of knowledge on the subject.

**cadeffects**

**MPanel**  
SOFTWARE SOLUTIONS

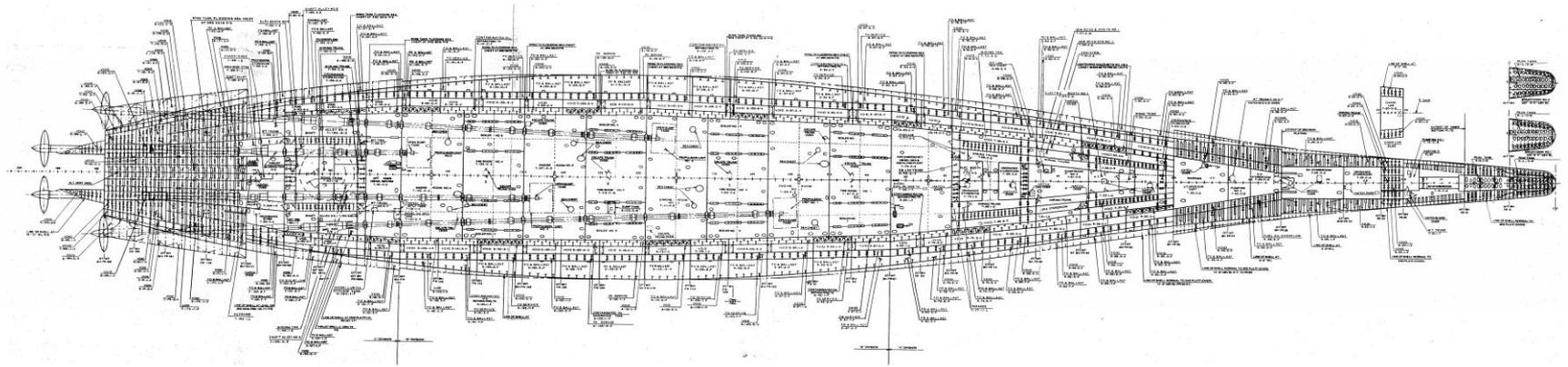
We are honored to have been enlisted on another mission to protect the surrender deck of the Battleship USS Missouri (BB-63).

This landmark installation on the Mighty MO covers the exact location that marked the surrender and subsequent end of WWII. We were called upon to replace the vintage “temporary” weather tarps on deck with a new modern tensile fabric structure of comparable appearance to the original installation. Our design and execution honors the original and historical WWII construction found on board the Mighty MO during its historical commissioning.

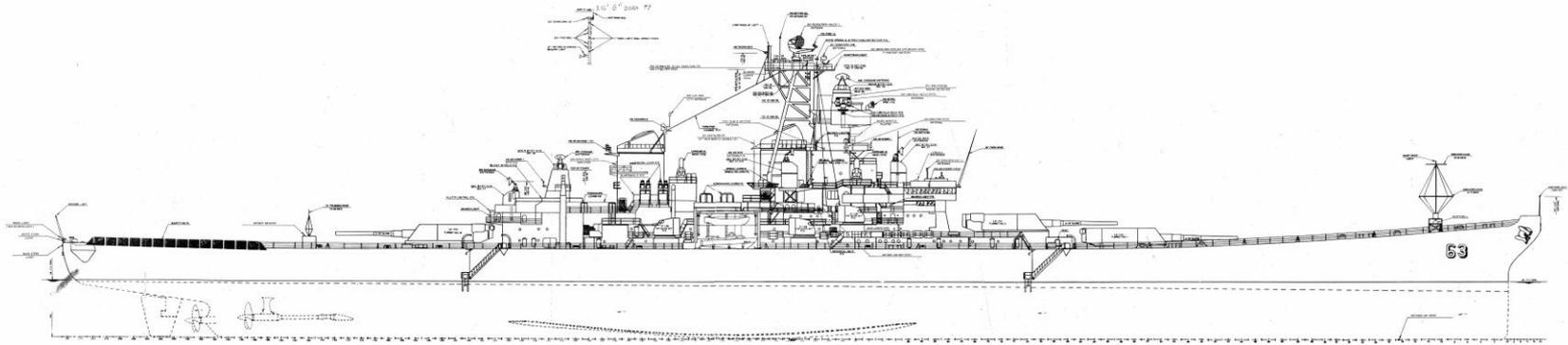


Born in the midst of World War II, the shipyard workers at Brooklyn's New York Navy Yard constructed the battleship in time for her launch on January 29, 1944.

She was commissioned as the USS *Missouri* on June 11, 1944 with Capt. William M. Callaghan in command.



On September 2, 1945, in Tokyo Bay aboard the USS Missouri, representatives of the Allied and Axis powers met in solemn ceremony to “conclude an agreement by which peace can be restored”. General MacArthur concluded the ceremony by saying: “Let us pray that peace be now restored to the world, and that God will preserve it always. These proceedings are closed!” With those words, World War II was over.



Repair and preservation efforts on a ship of this size and significance never cease. Three years ago, the USS Missouri Memorial Association approached us to deliver a near maintenance free fabric tensile structure as part of a vast preservation effort. It was requested that every aspect of our endeavor appear truly original as not to detract from the significance of the situation. Furthermore, due to the seemingly constant stream of visitors and tours, all work needed to be performed and completed after hours in a timely fashion with minimal impact as to not be obtrusive nor interfere with the experience.

**SHE CURRENTLY RESIDES IN PEARL HARBOR,  
MOORED A SHORT DISTANCE FROM  
THE USS ARIZONA MEMORIAL**



# “ORIGINAL” COVER





25

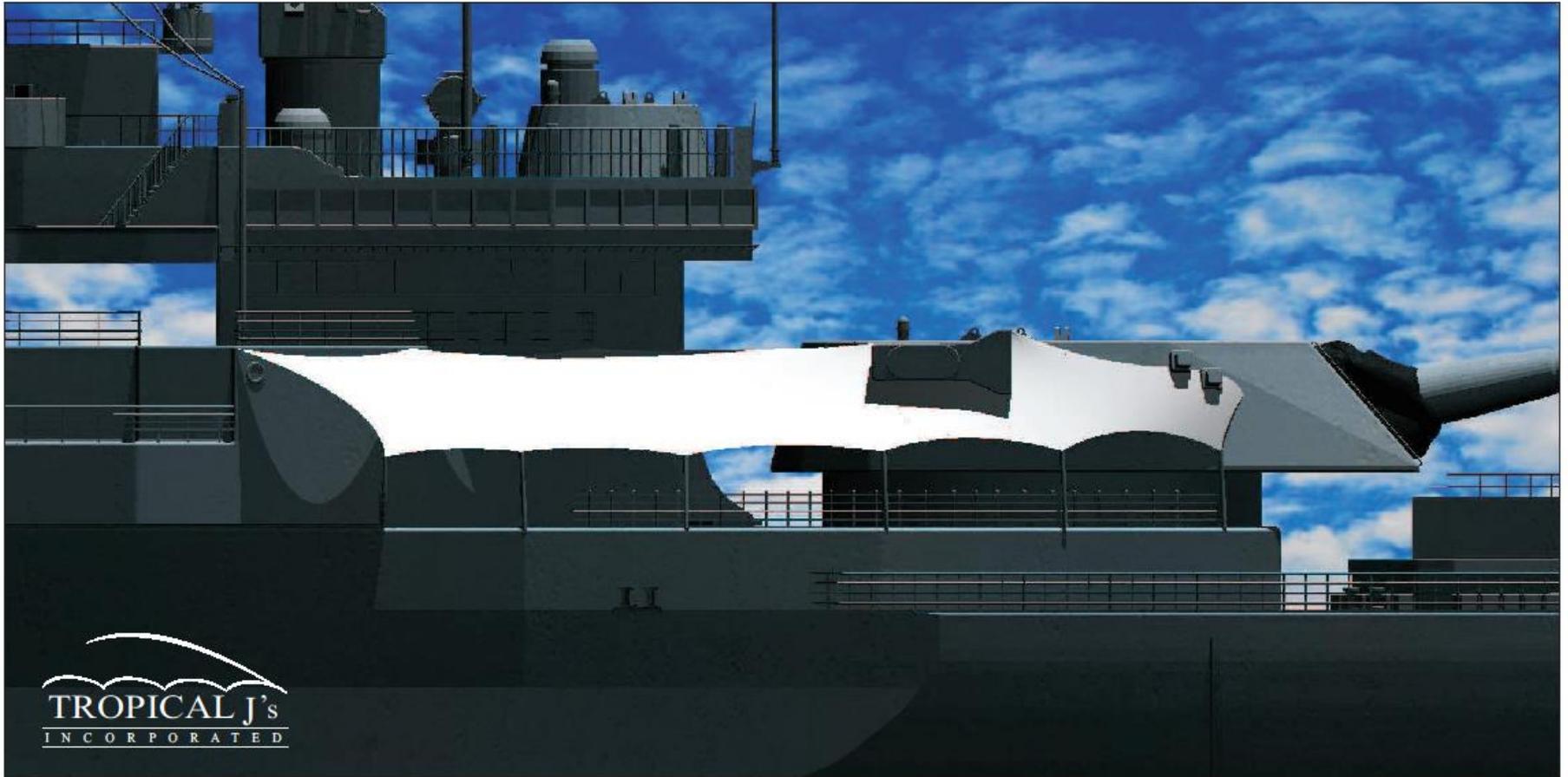
**“ORIGINAL” COVER**

# “ORIGINAL” COVER





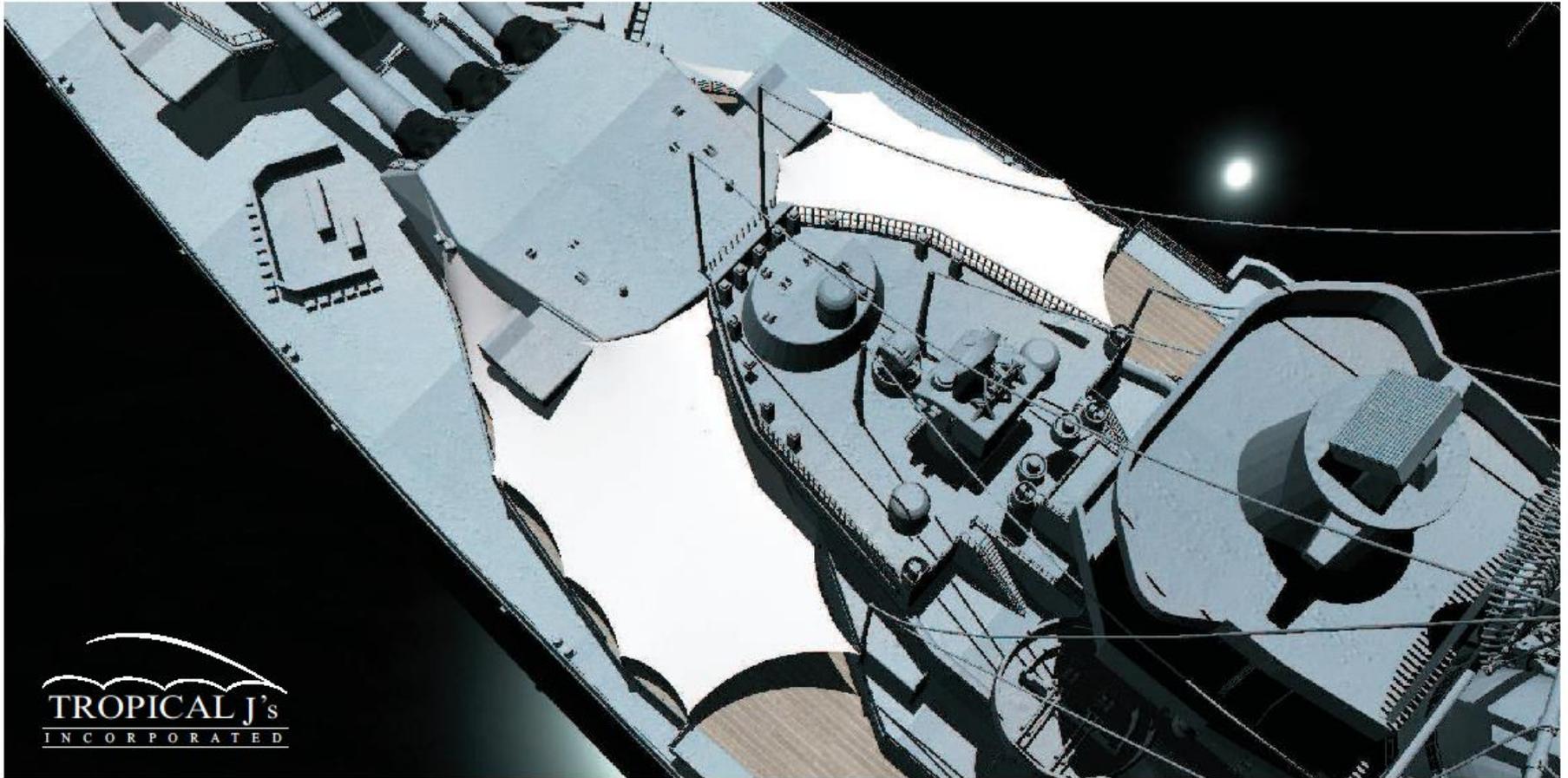
# PRELIMINARY LASER SCANNING



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016  
Image 1 of 10



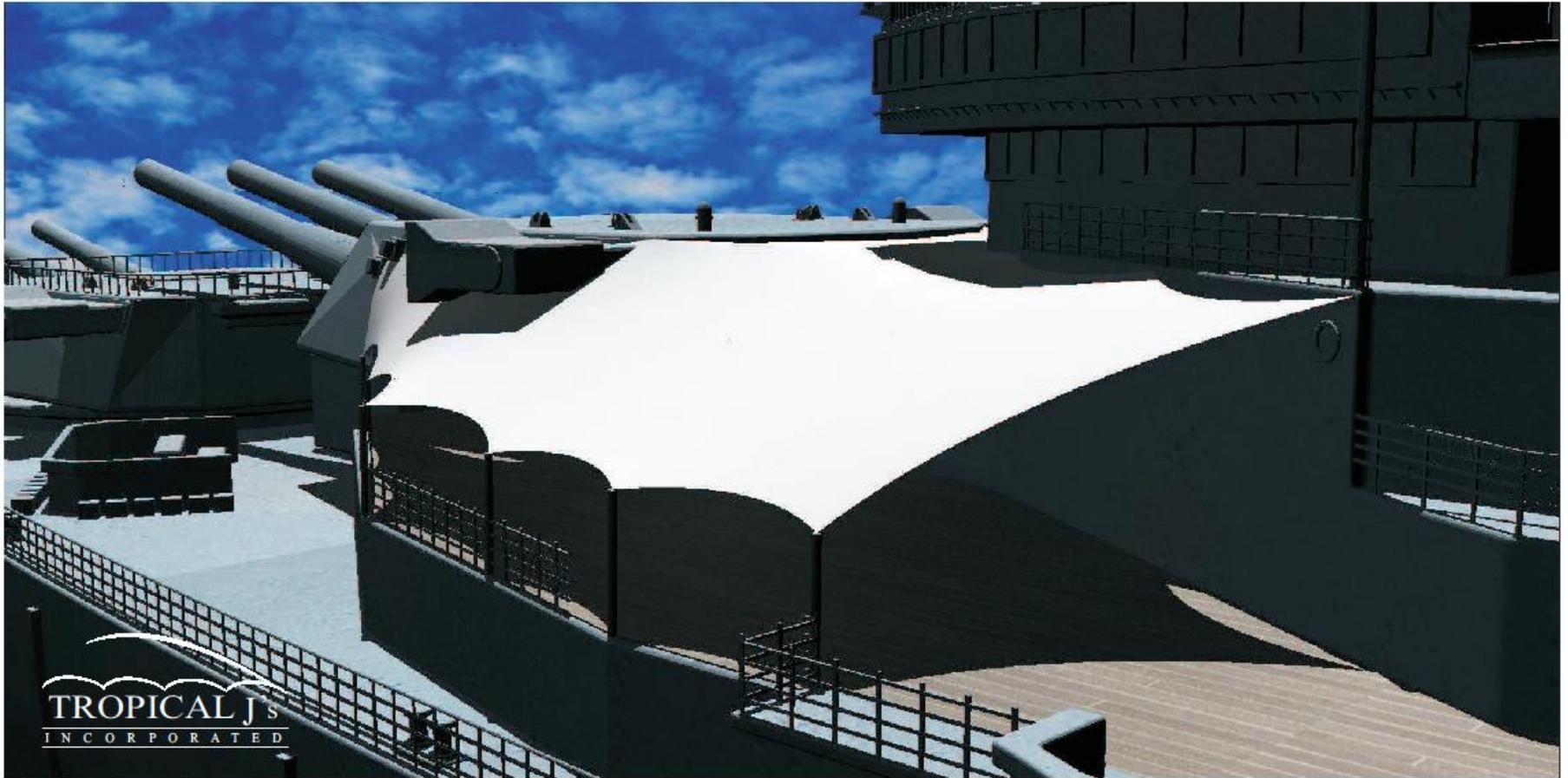
TROPICAL J's  
INCORPORATED



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016  
Image 2 of 10



TROPICAL J's  
INCORPORATED

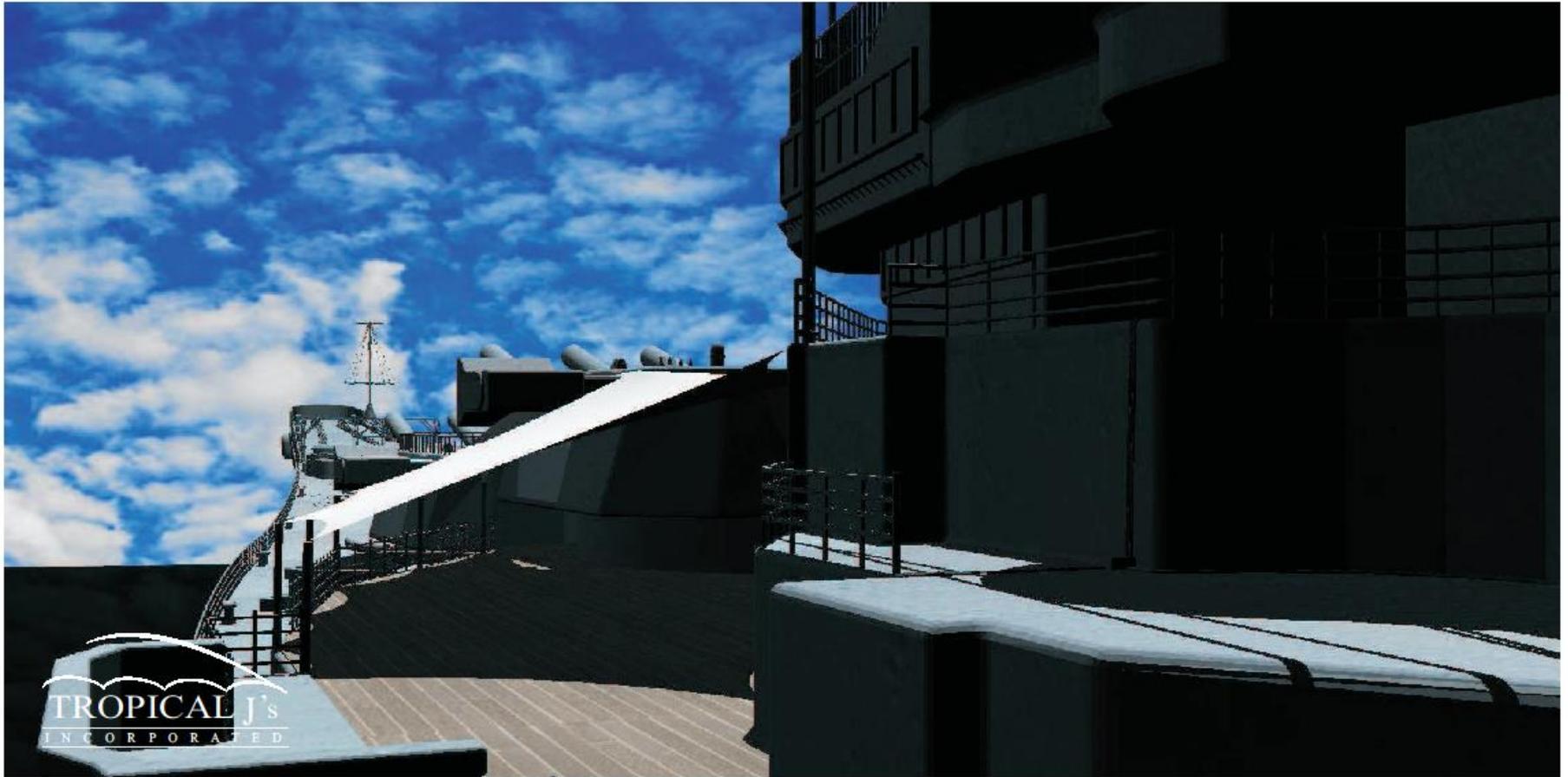


# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016

Image 3 of 10

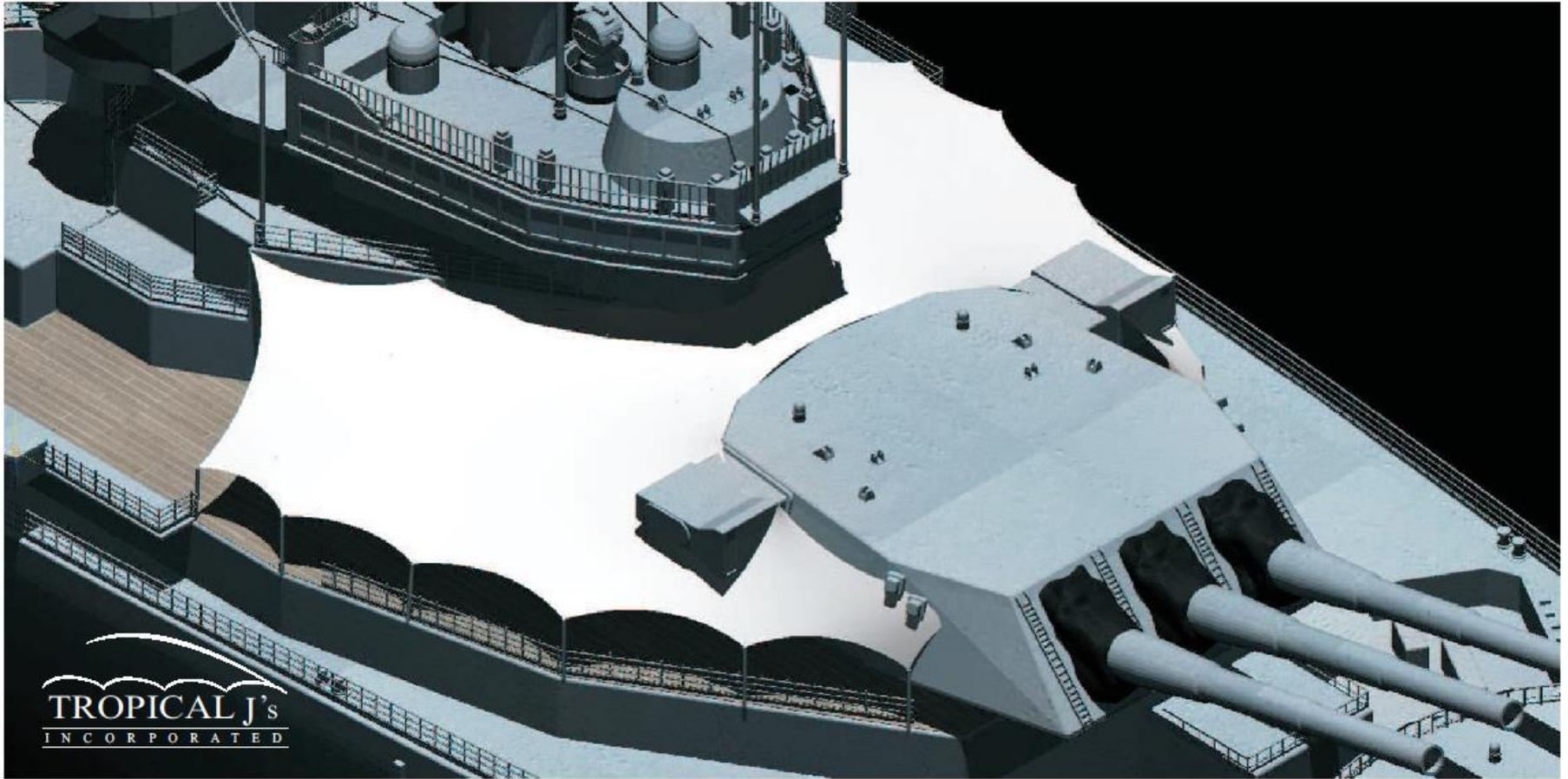


# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016

Image 4 of 10



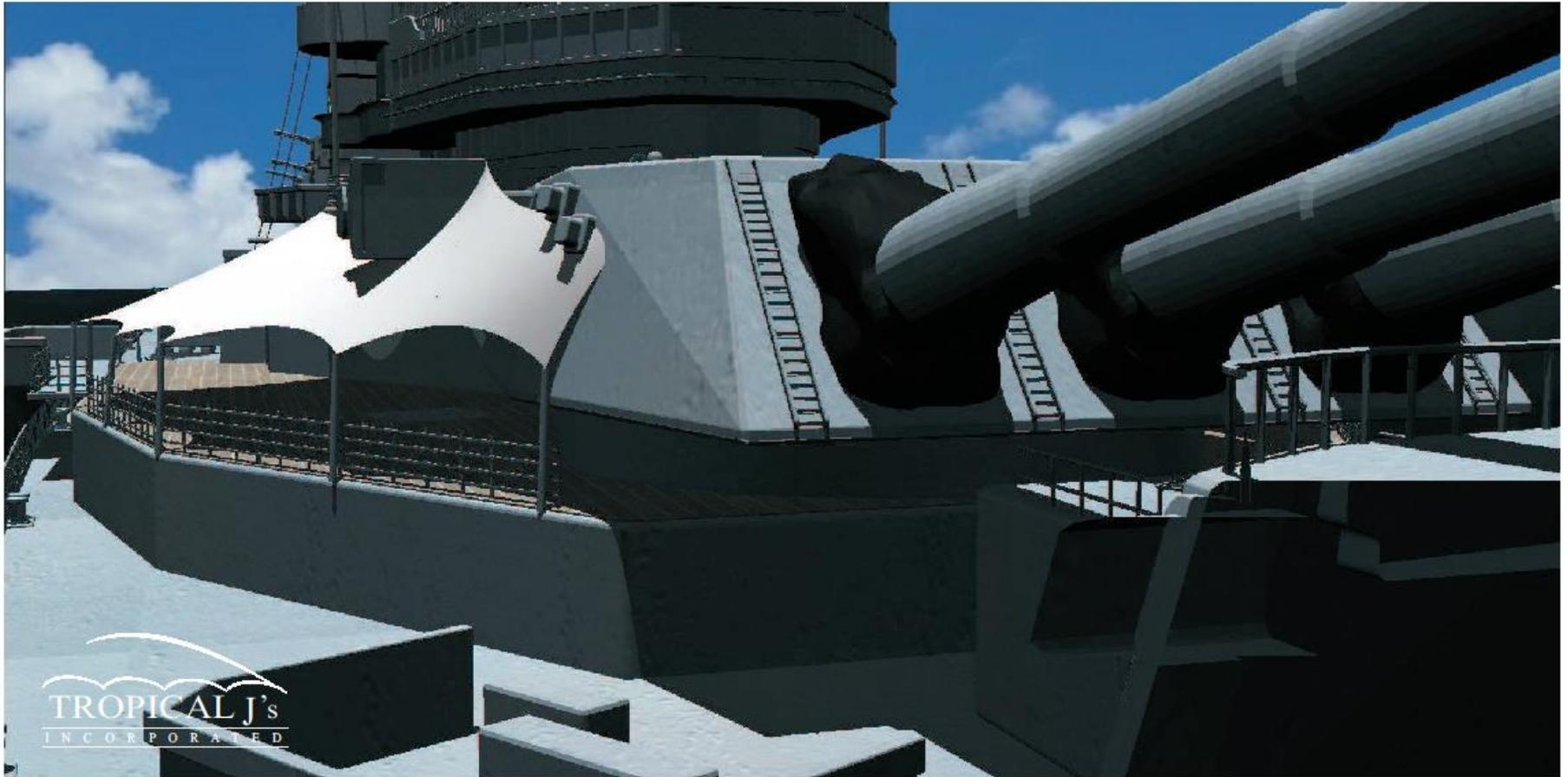
TROPICAL J's  
INCORPORATED



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016  
Image 5 of 10



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016  
Image 6 of 10



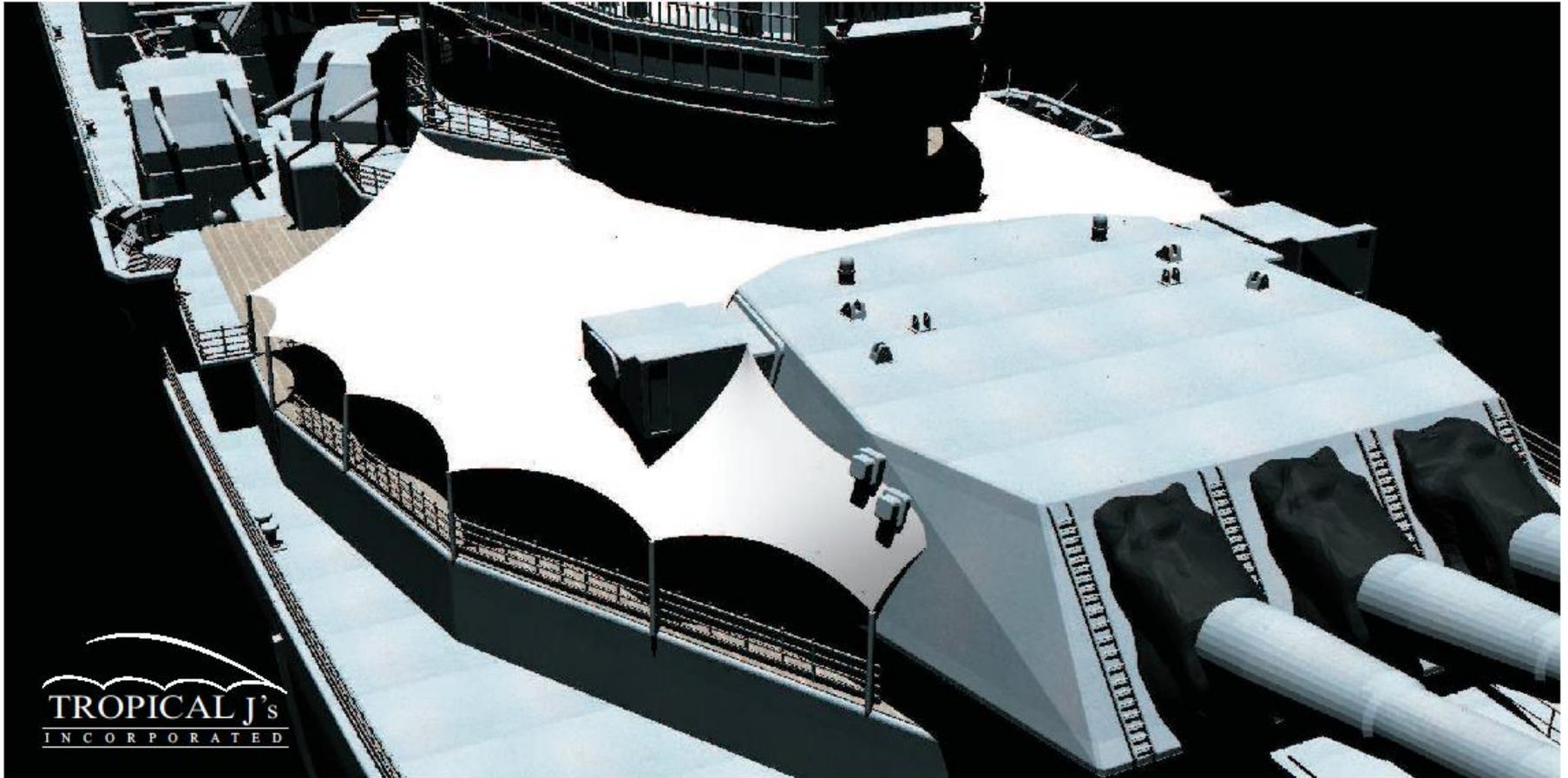
TROPICAL J's  
INCORPORATED



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

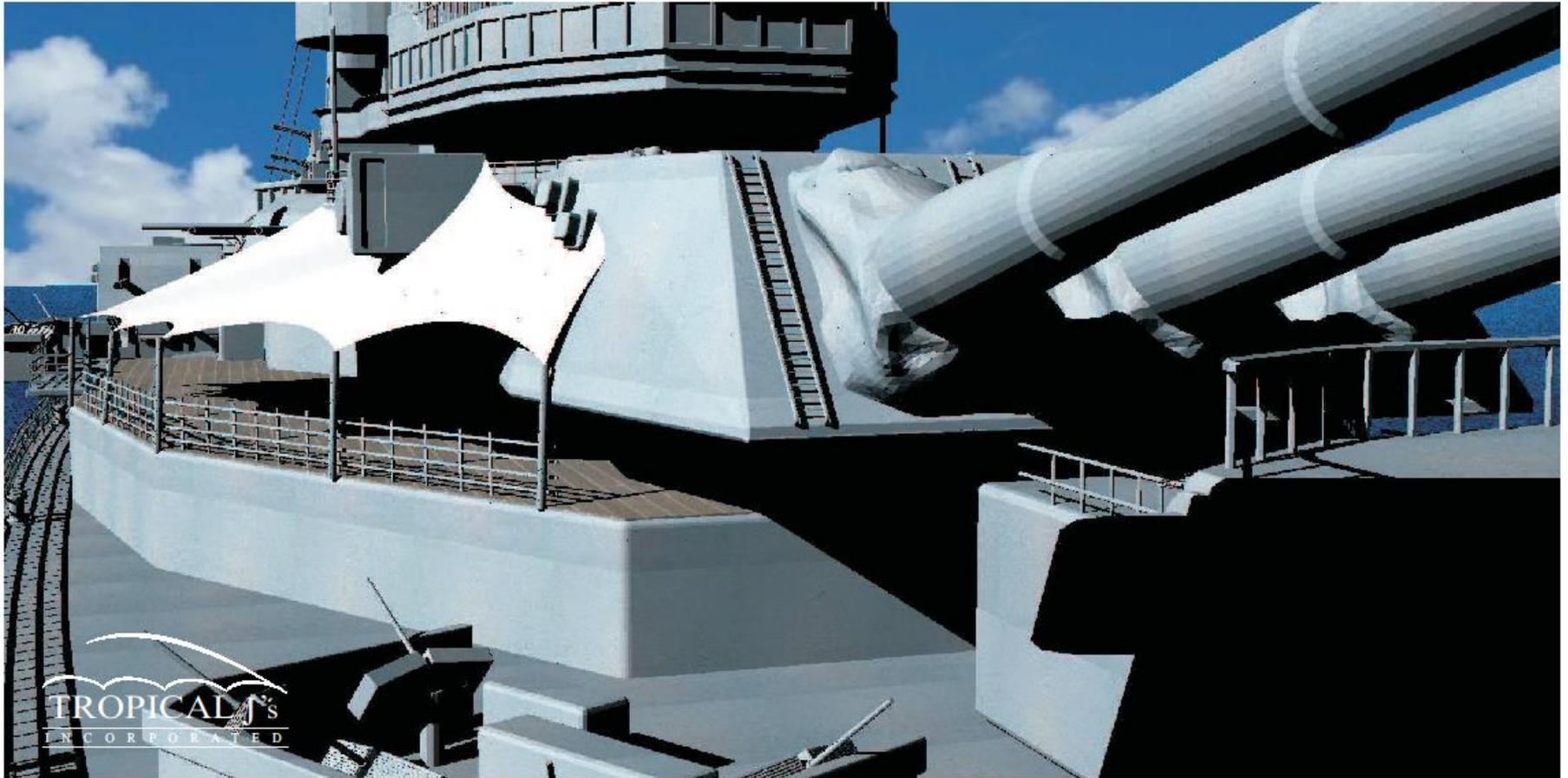
July 2016  
Image 7 of 10



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

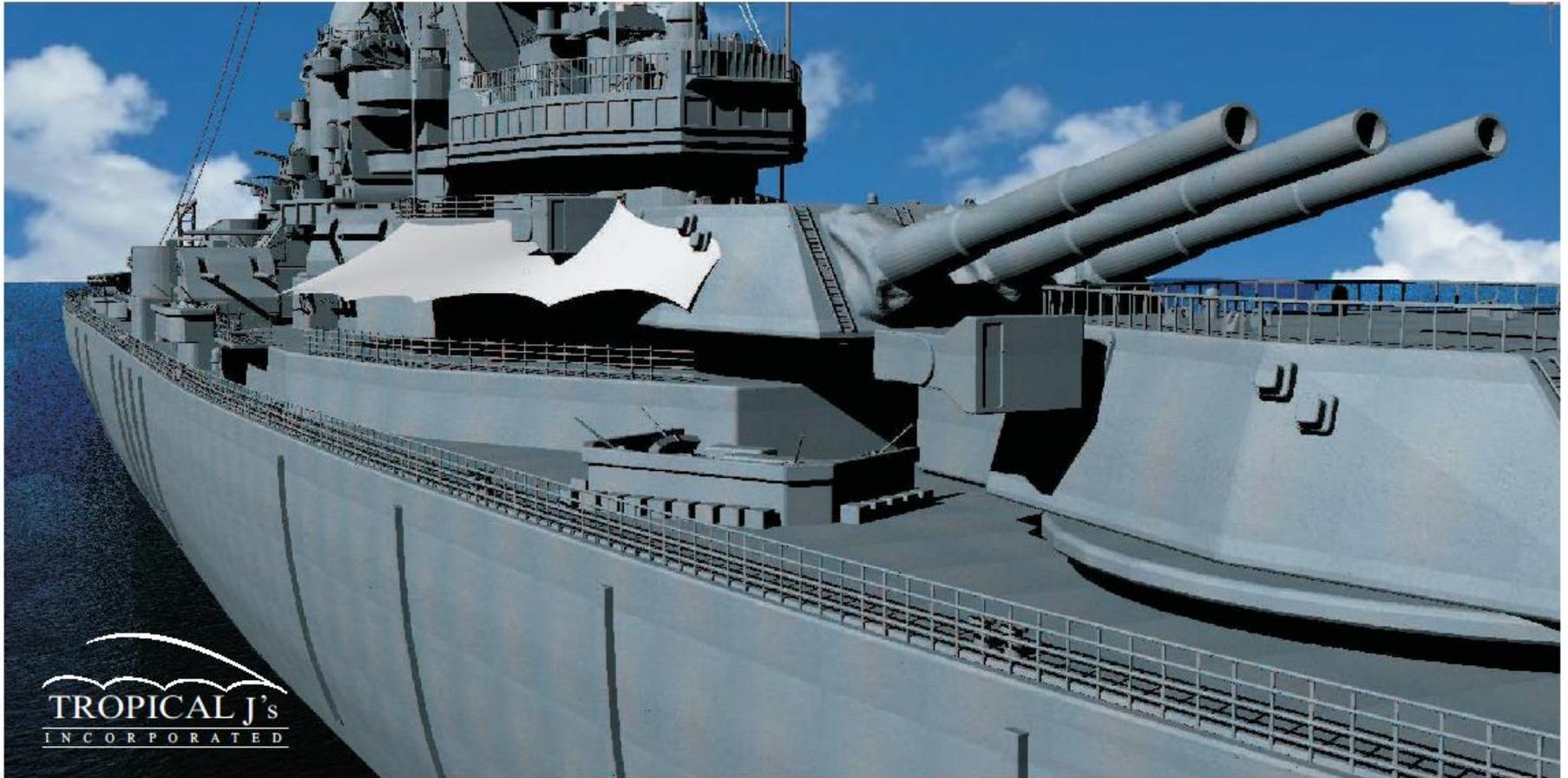
July 2016  
Image 8 of 10



# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016  
Image 9 of 10



TROPICAL J's  
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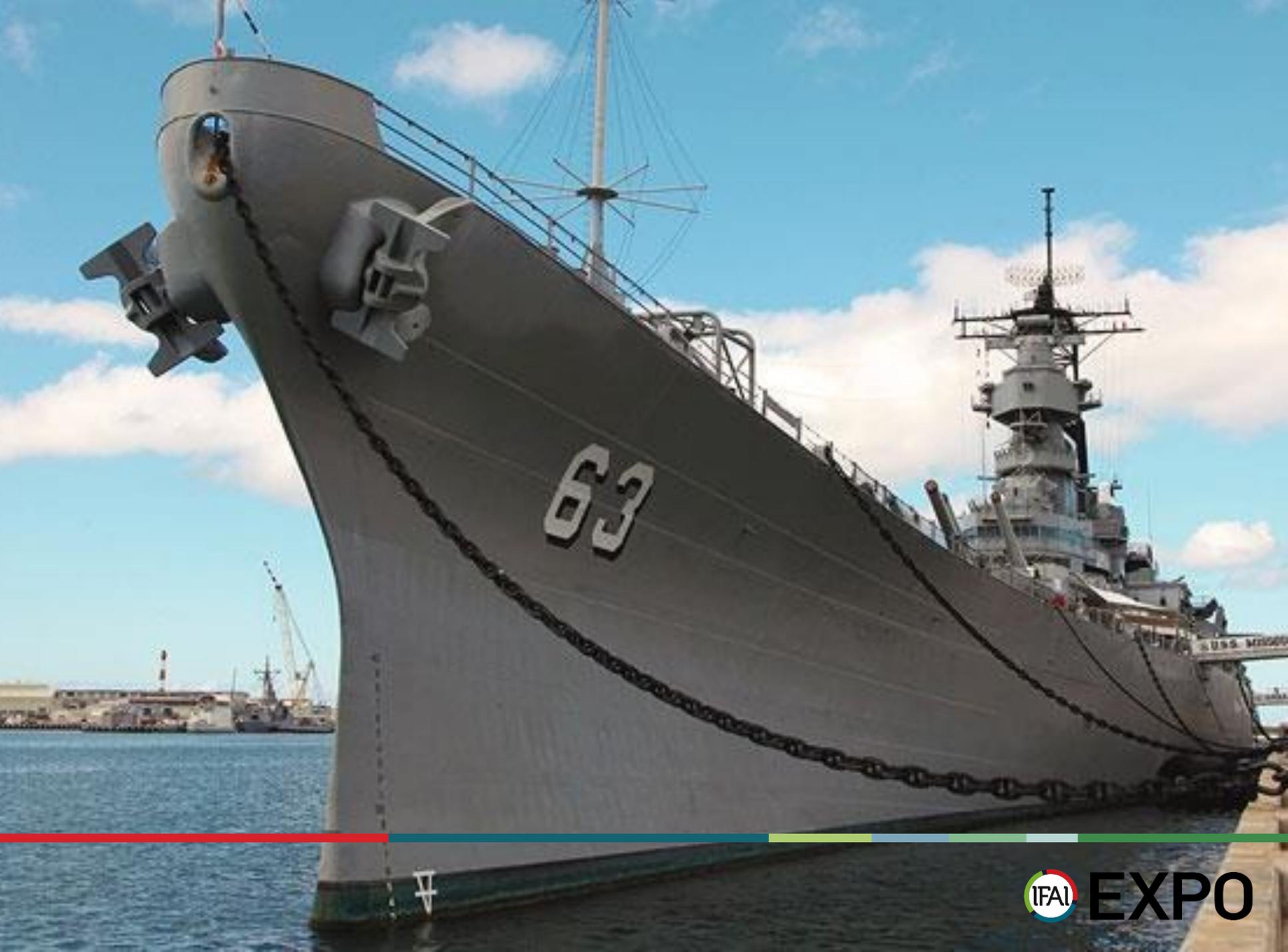


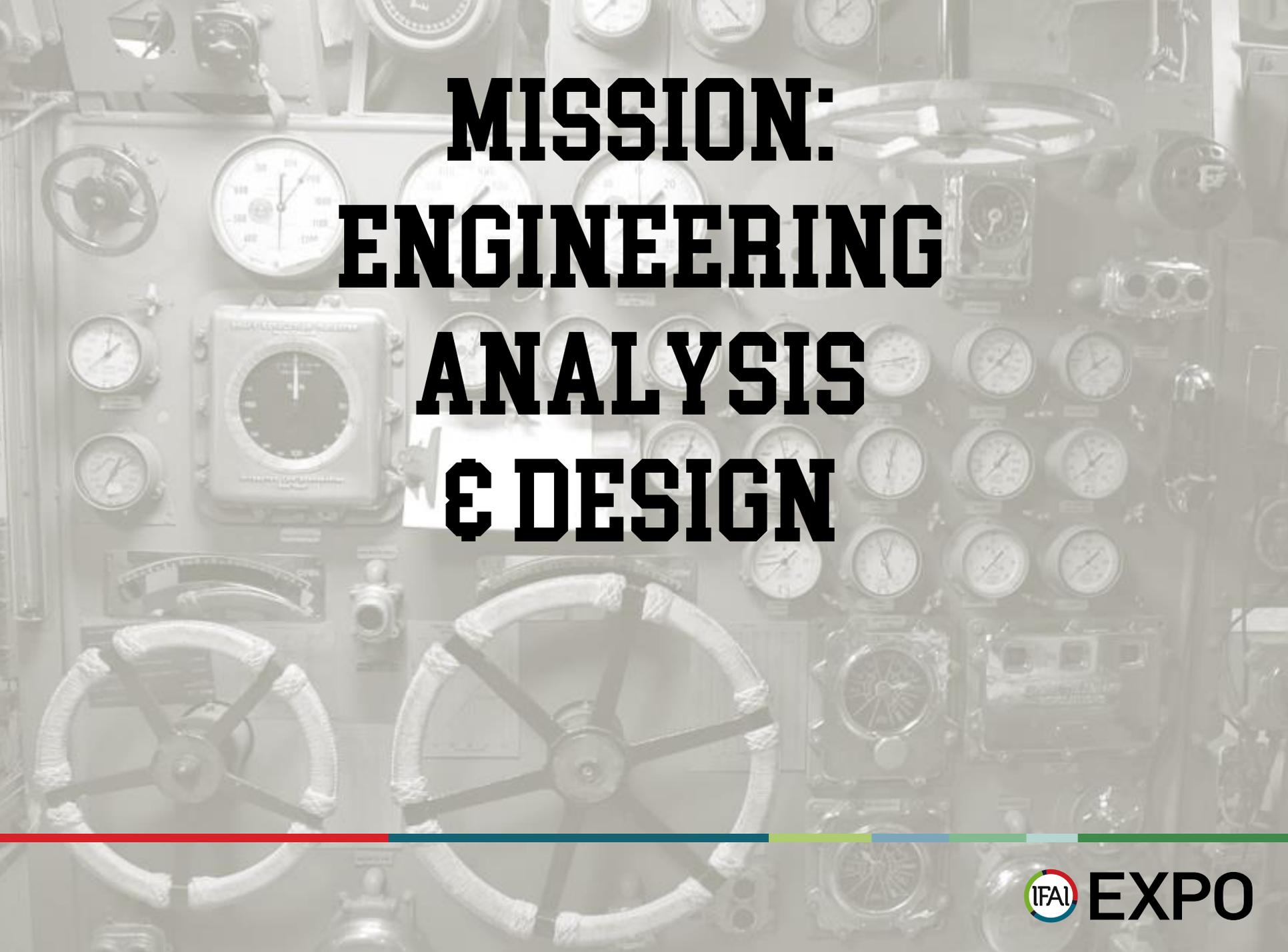
# CONCEPT

USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept

July 2016

Image 10 of 10





**MISSION:  
ENGINEERING  
ANALYSIS  
& DESIGN**

- **CUSTOMER SPECIFICATION FOR DESIGN**

The USS Missouri is regarded as such an icon of history that special consideration was given to ensure a completed installation that lives up to its legacy.

This required 3D Model and Concept Renderings

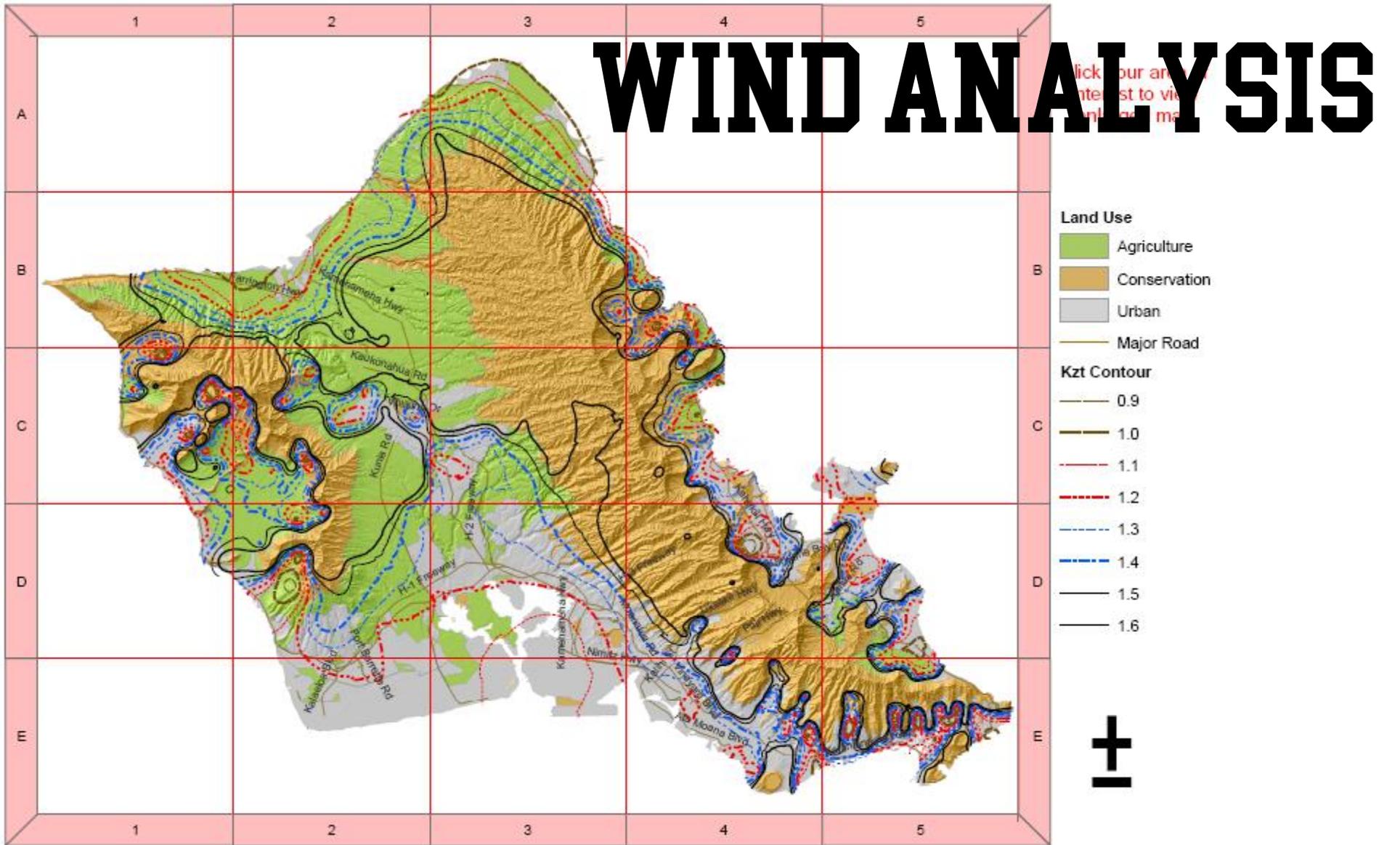
- **PLAN OF ATTACK TO DESIGN**

We were also requested to provide as much shade coverage as possible, which was quite the challenge wrapping a complex membrane around the turrets and super-structure.

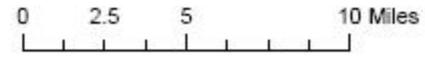
- **DESIGN CONTROL**

Special oversight by the Association's Curator was present at every step of design to approve the aesthetics of the project.

# WIND ANALYSIS



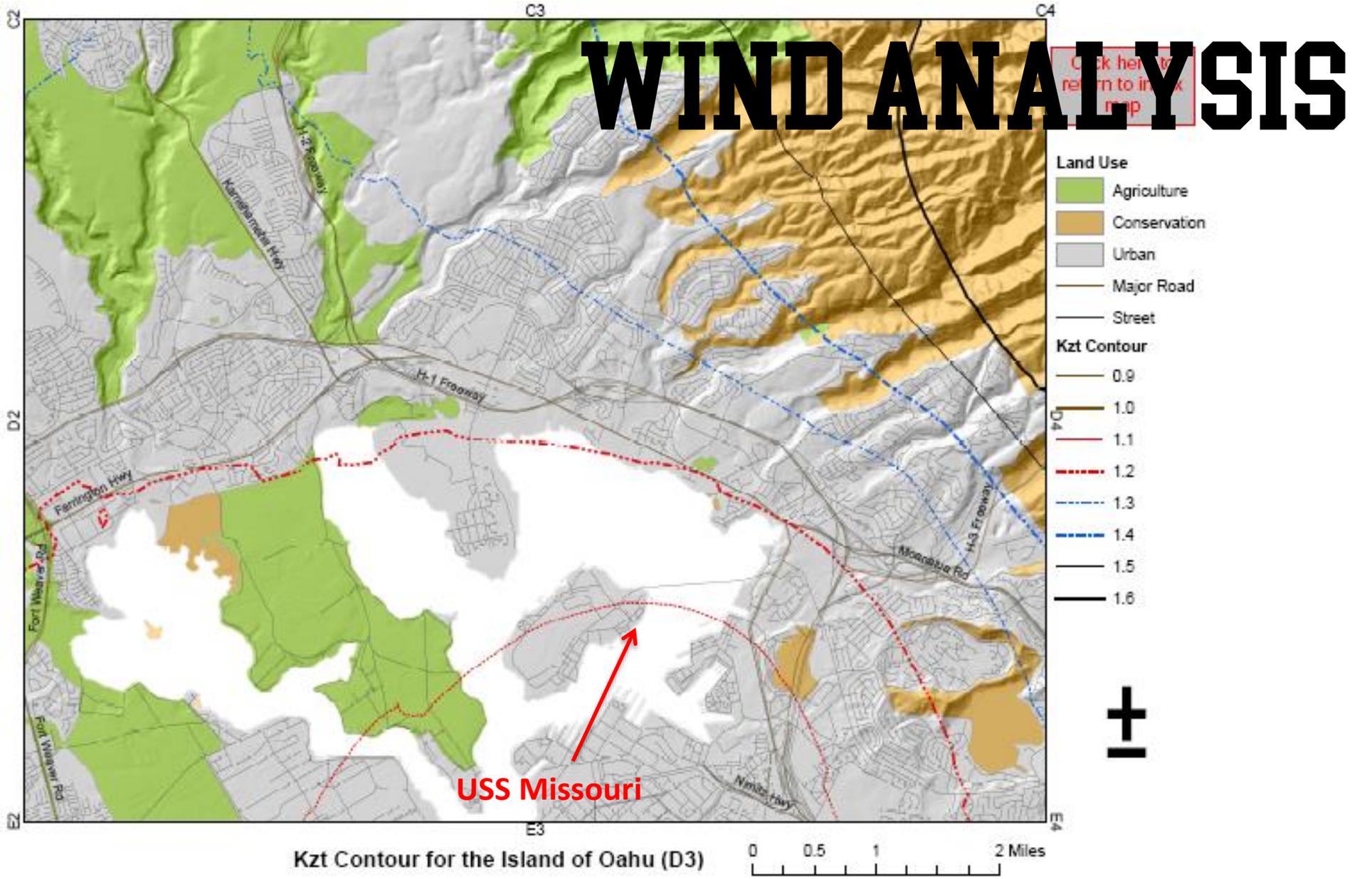
Kzt Contour for the Island of Oahu



Map for Hawai'i Topographic Wind Effects



# WIND ANALYSIS



Map for Hawaii Topographic Wind Effects

# ENGINEERING ANALYSIS

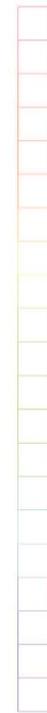
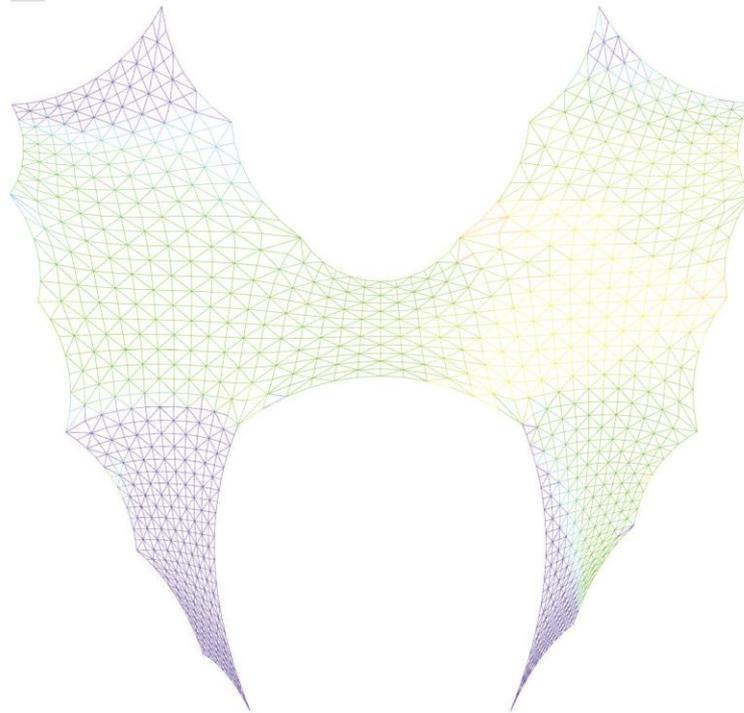
## Load Case 2

No Description

Membrane Elements, Pressure, Weight, Proj Weight, Factor

MList 1, 0.265, 0, 0, 1

MList 2, 0.124, 0, 0, 1



Reserve Factor =0.0

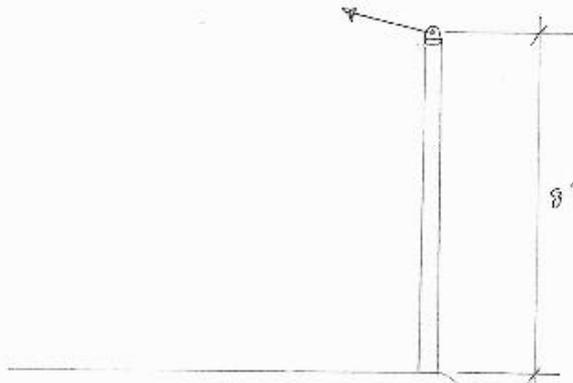
Reserve Factor =5.0

Reserve Factor =10.0

MISSOURI STANCHION

OPTION 1 - PIPE

# STANCHION CONCEPTS

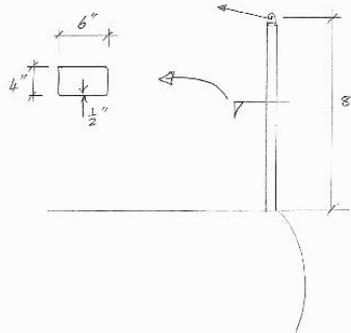


- OPTION 1a: 8" SCH 40 PIPE (STD)
- OPTION 1b: 6" SCH 80 PIPE (X-STRONG)
- OPTION 1c: 5" SCH 160 PIPE (ORXX STRONG)

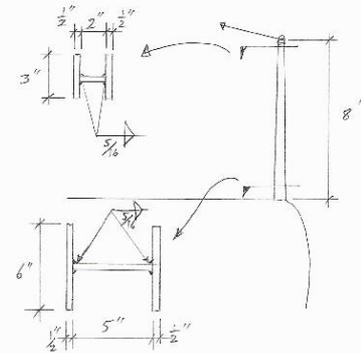
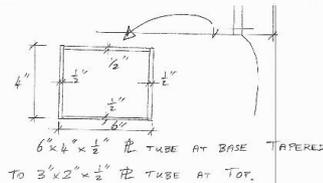
Maintain Original Stanchion geometry but design for significantly higher cable loads

MISSOURI STANCHION

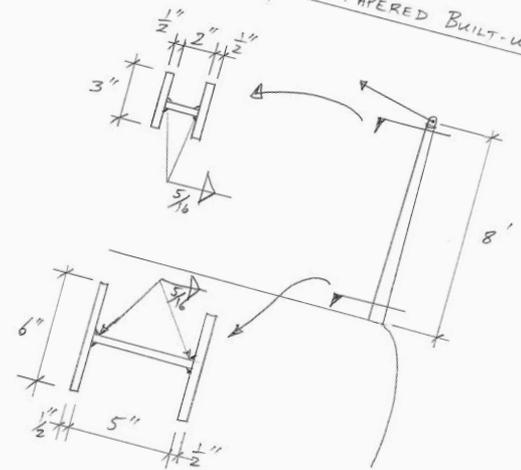
OPTION 2 - TUBE STEEL



6" x 4" x 1/2" HSS.



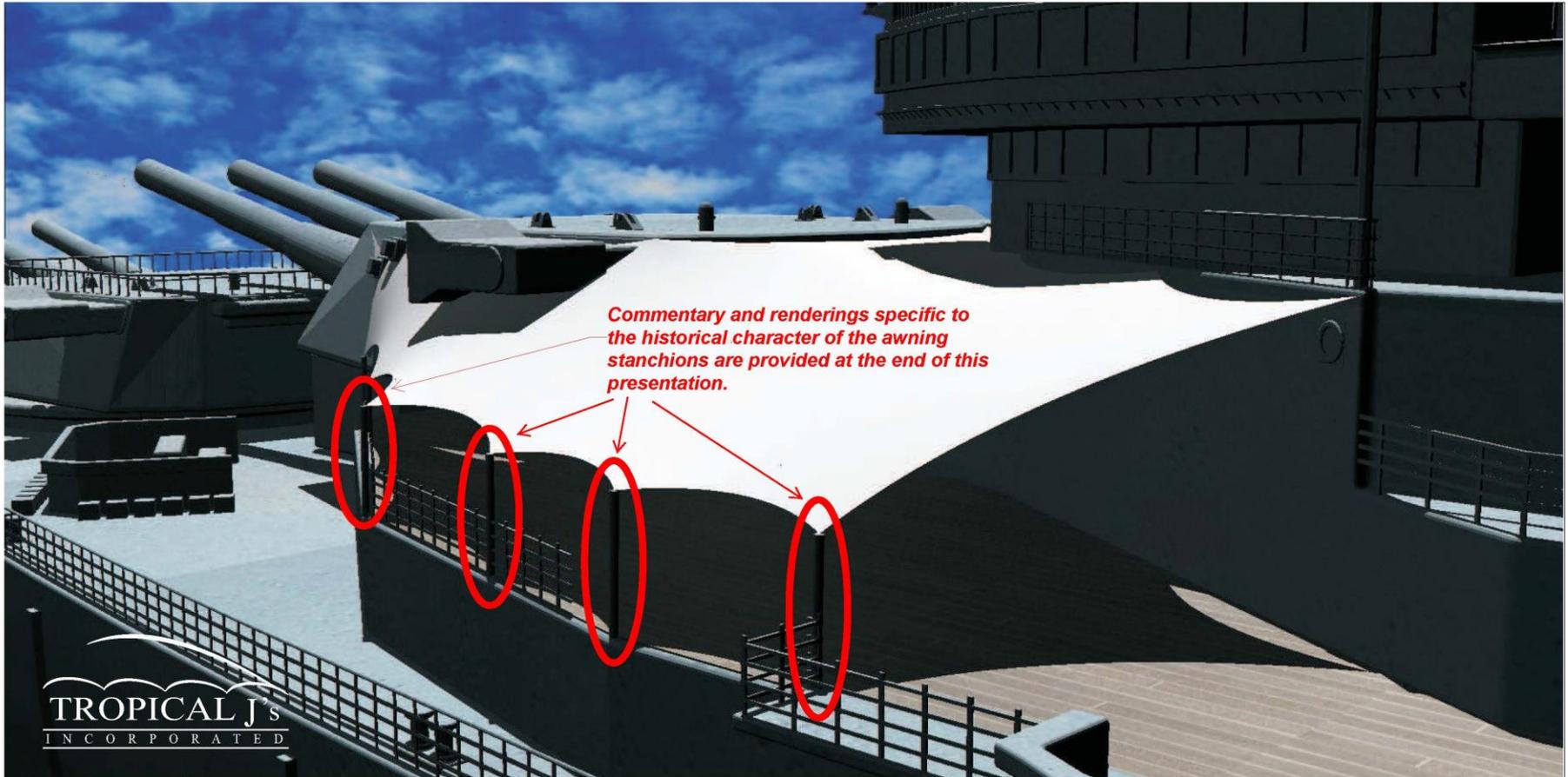
MISSOURI STANCHION  
OPTION 5 - TAPERED BUILT-UP I



6" x 6" x 1/2" FL  
 3" x 3" x 1/2" FL  
 I-section



# STANCHION APPROVAL



**USS Battleship MISSOURI BB 63 Memorial  
Surrender Deck Canopy Concept**

July 2016

Image 3 of 10

# MISSION: MANUFACTURING PART 1

PARAVANE SKEG OF THE U.S.S. MISSOURI.  
NAVY YARD, PHILA. OCT. 27, 1918.

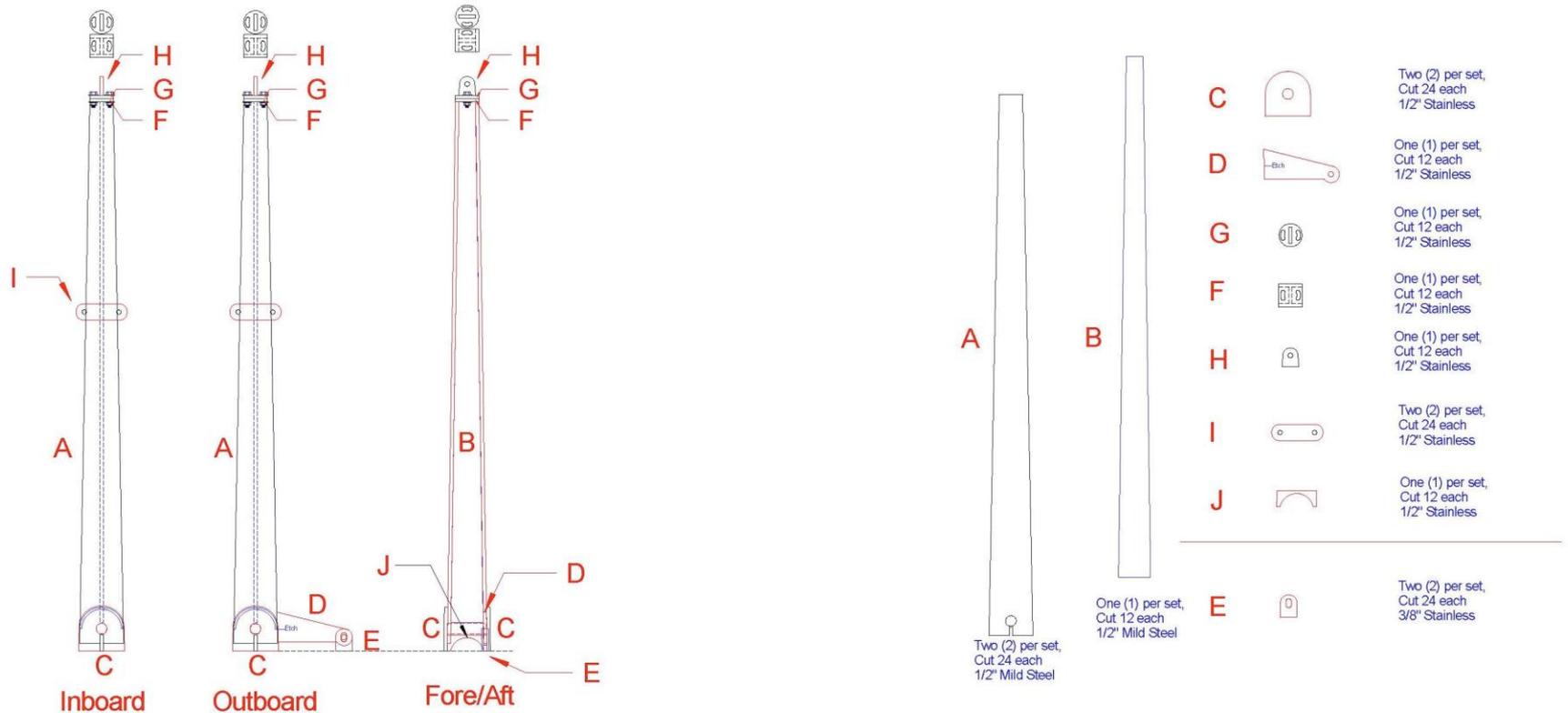
- **STEEL**

Utilizing our waterjet to cut components to manufacture tapered cantilevered stanchions from ½” steel, matching the original stanchions on deck.

- **PAINT**

Heavy duty Paint Specs  
3 Coats (Amercoat 240)  
Each coat 4-8 Mils

# STANCHION DESIGN



# STANCHION LAYOUT

S6

S5

S4

S3

S2

S1

P6

P5

P4

P3

P2

P1



# WATERJET MFG.

  
NO TOUCH  
LI'DAT!!!!

  
MAKIEM  
WATERJET

 EXPO

# WATERJET MFG.



# WATERJET MFG.



# WATERJET MFG.



# STANCHION MFG.



# STANCHION MFG.



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# STANCHION MFG.



# STANCHION MFG



# STANCHION MFG.



EXPO

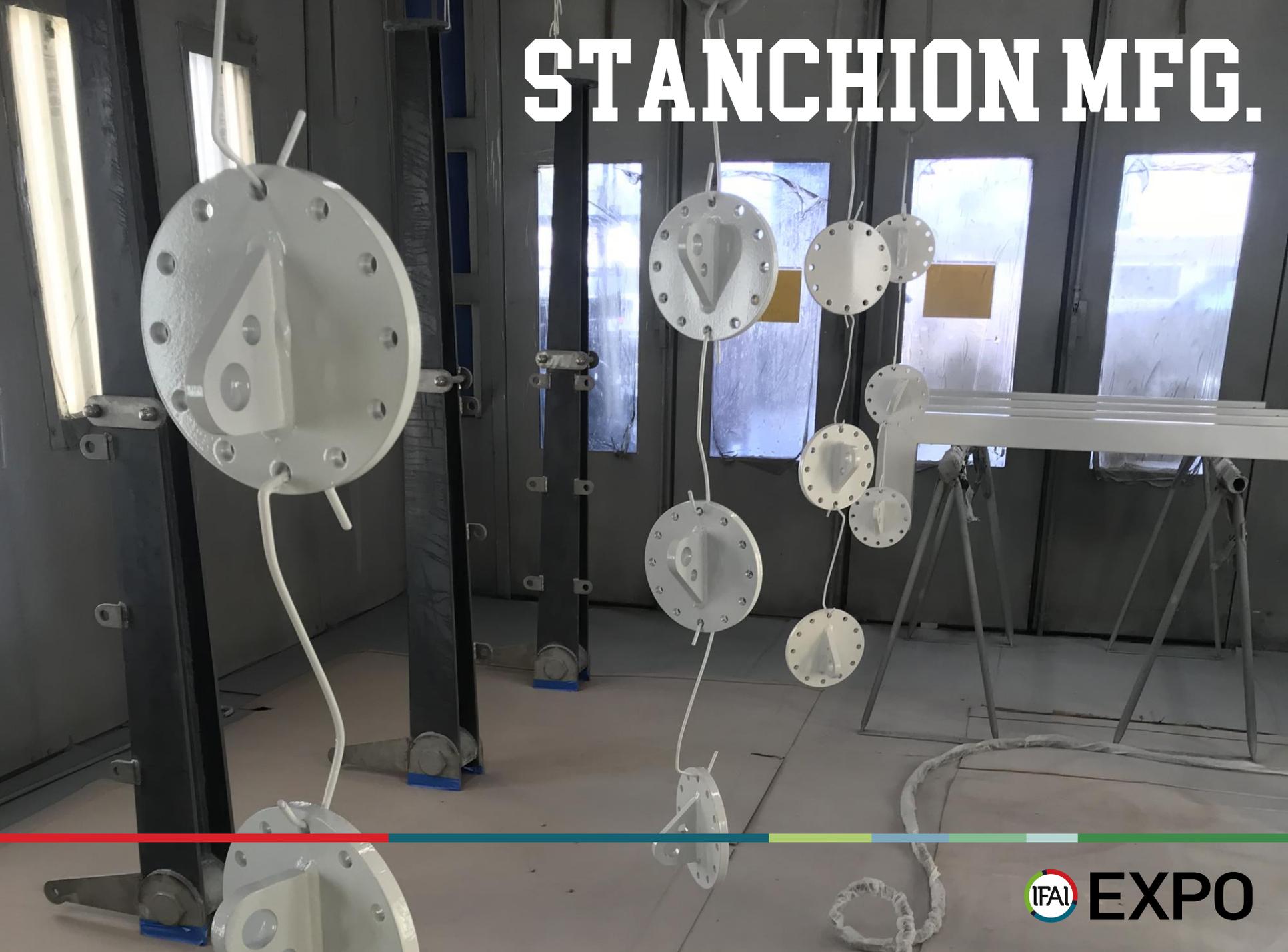
# STANCHION MFG.



# STANCHION MFG.



# STANCHION MFG.



# STANCHION INSTALL

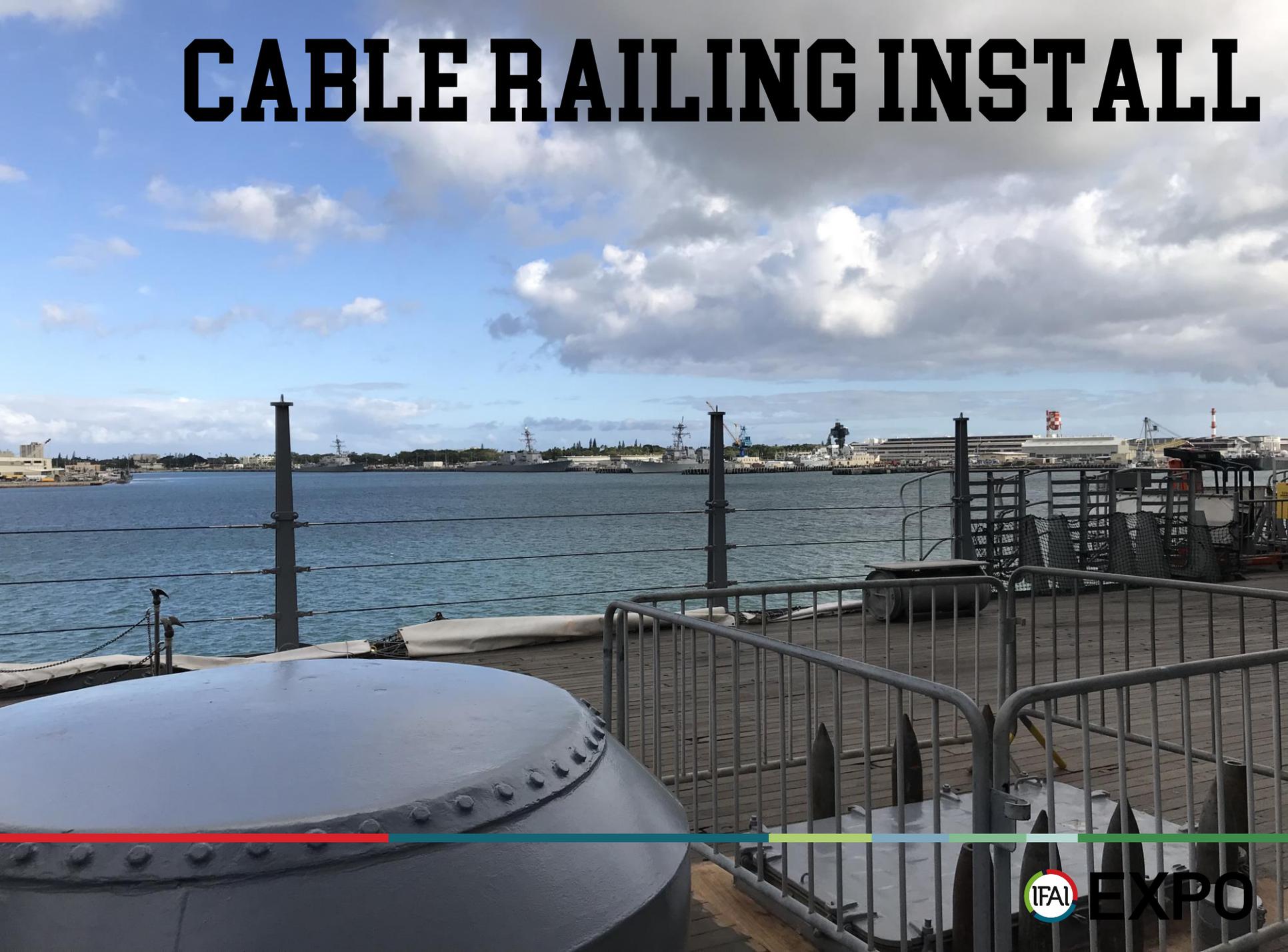


TROPICAL J's  
INCORPORATED  
AWNINGS - SHADE SCREENS - UMBRELLAS - FURNITURE  
LIC-2241 (80) 848-0888  
www.tropicajs.com

# STANCHION INSTALL



# CABLE RAILING INSTALL



# TABS INSTALL



# TABS INSTALL



EXPO



# **MISSION: SOFTWARE & DESIGN PROTOCOL**

- **USE OF LASER MEASURING**

No real as-built drawings due to age and continuing modifications over the years. Once we welded on attachment points, we proceeded to shoot and capture their true locations, orientation and relation to the structure.

Utilized a Leica 3D Disto Laser, which offers accuracy within  $\frac{1}{8}$ " over 135'. Laser afforded us the ability to shoot each side of the Ship in one single take

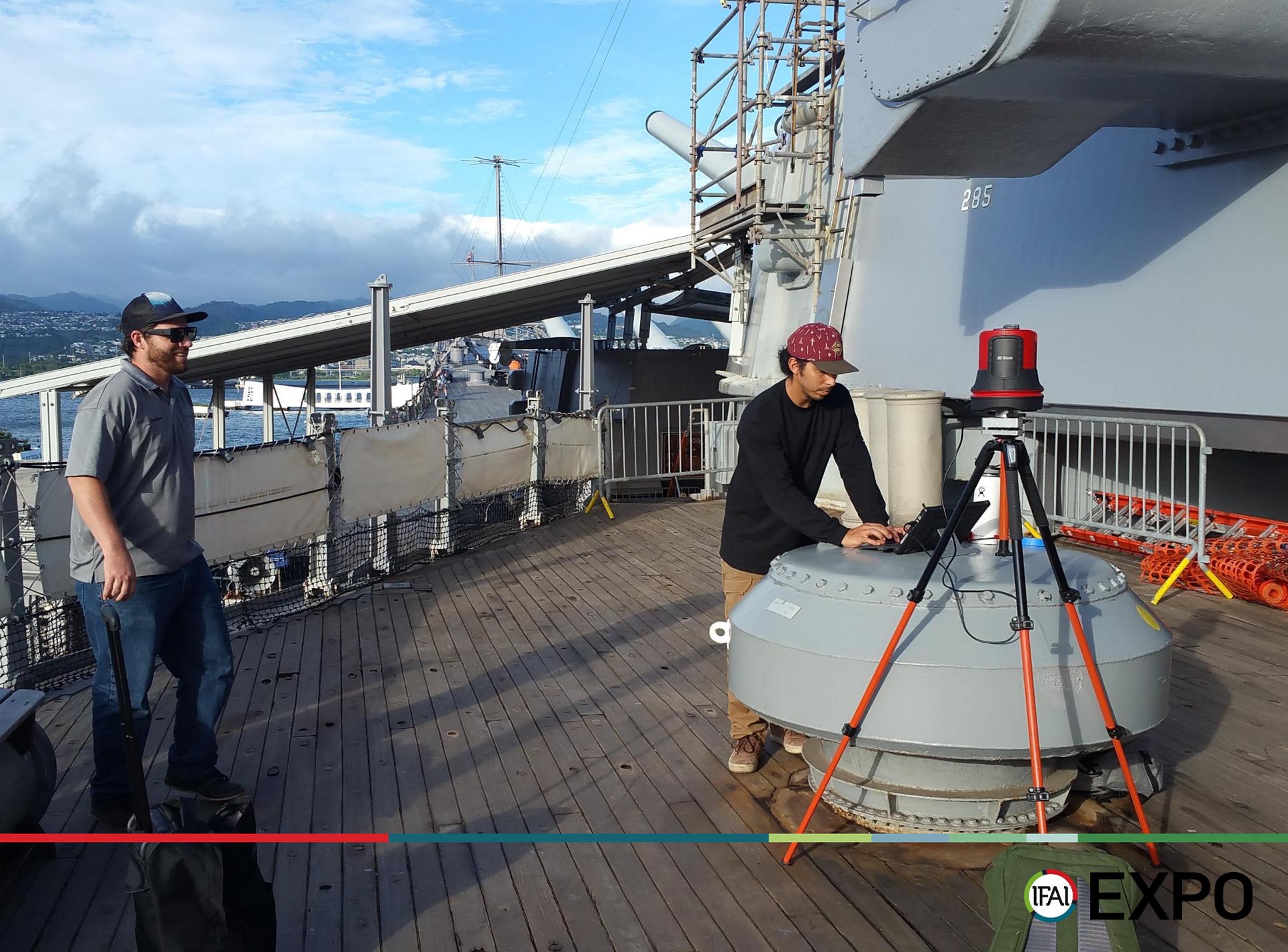
- **DESIGNING AROUND ENVIRONMENT**

Tight tolerance around bump out (ladders, sights, et cetera) and irregular contours.

Captured the curves of the turret and slope of the super structure to replicate in the curvature of our catenaries.



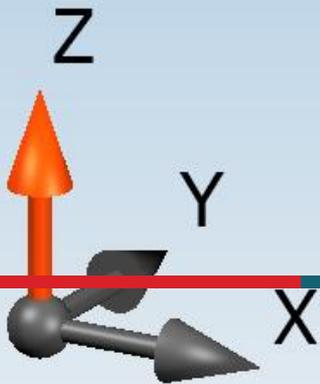
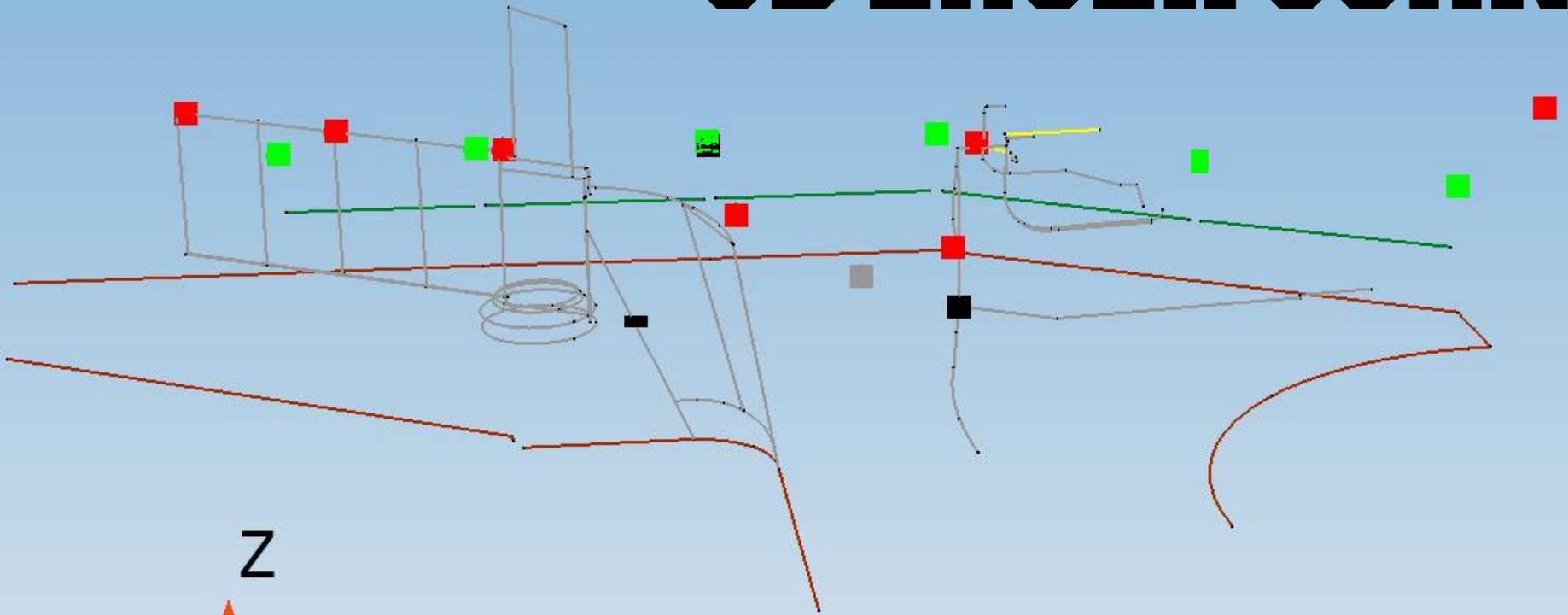




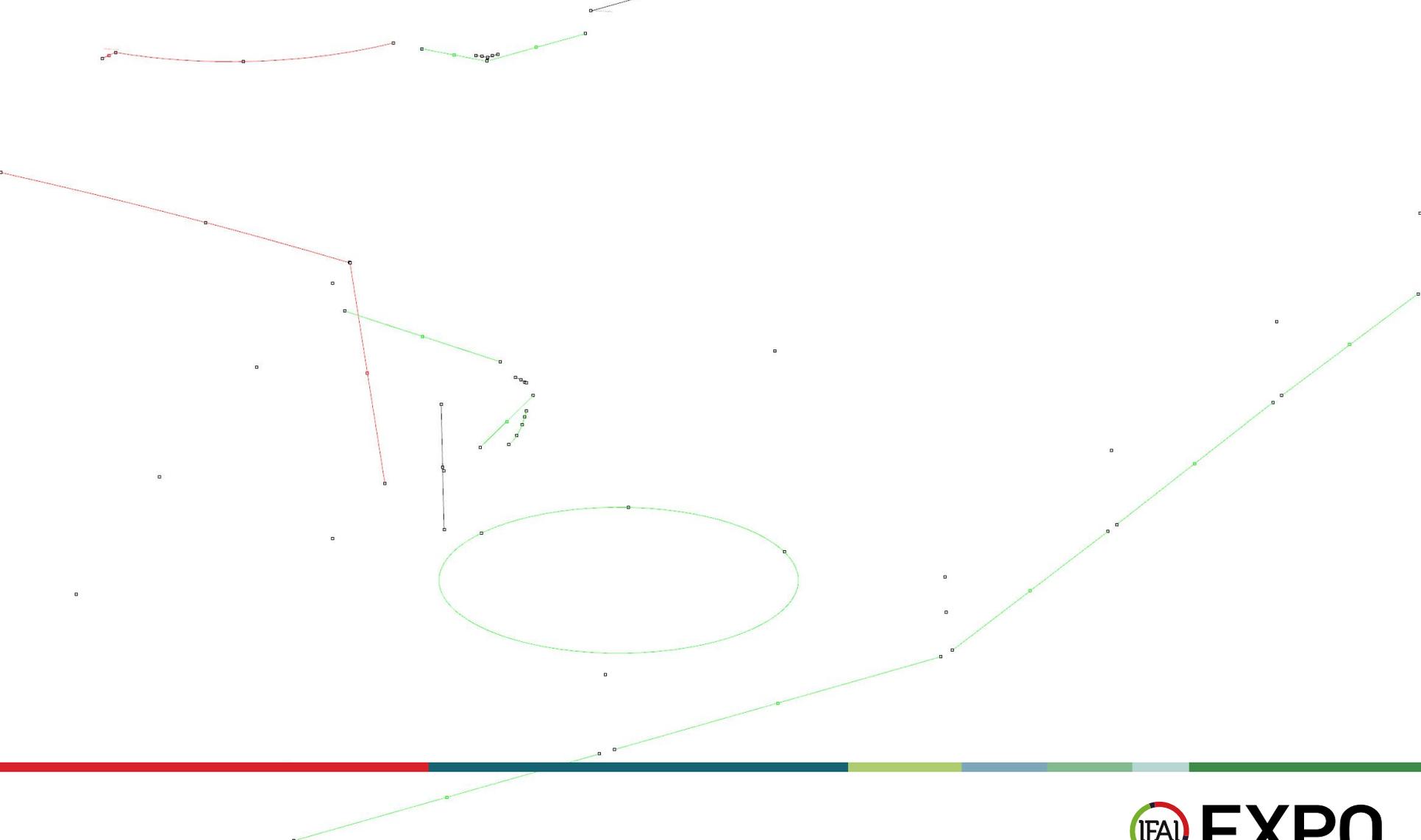


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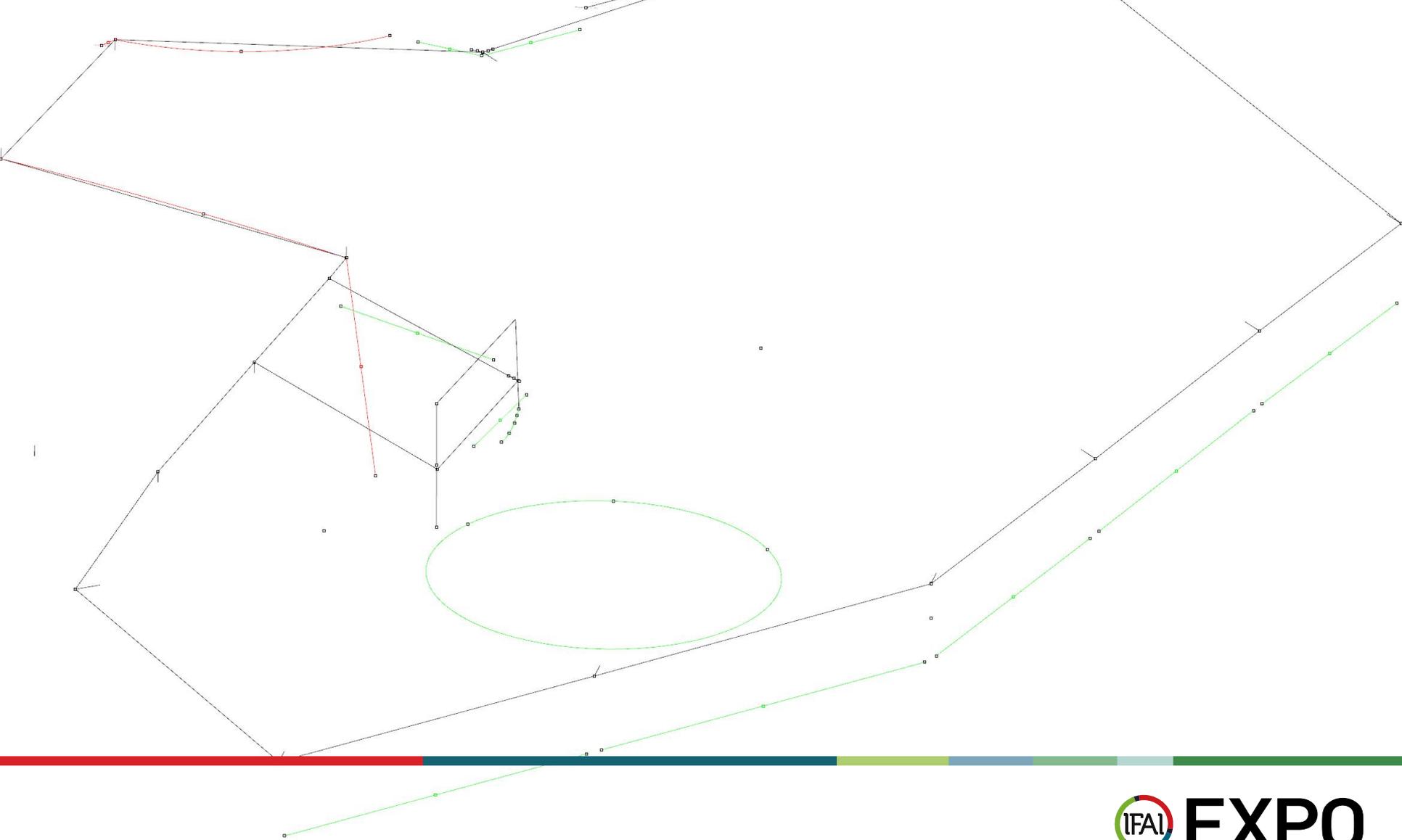
# POINTS FROM 3D LASER SCAN



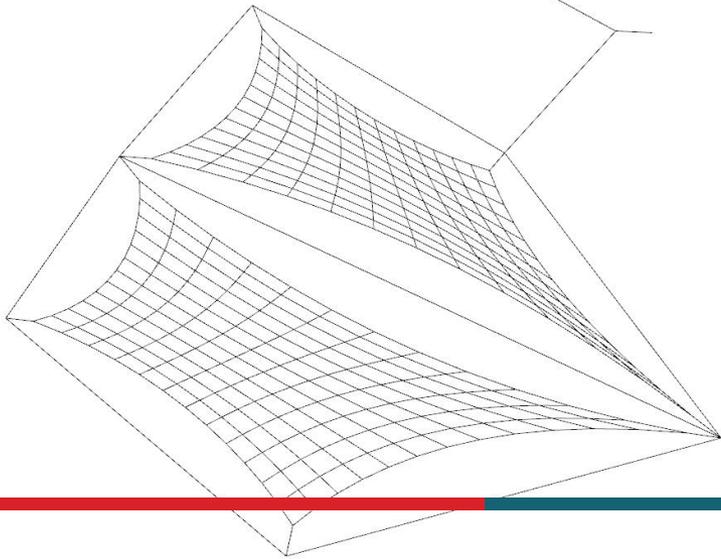
# CAD DESIGN



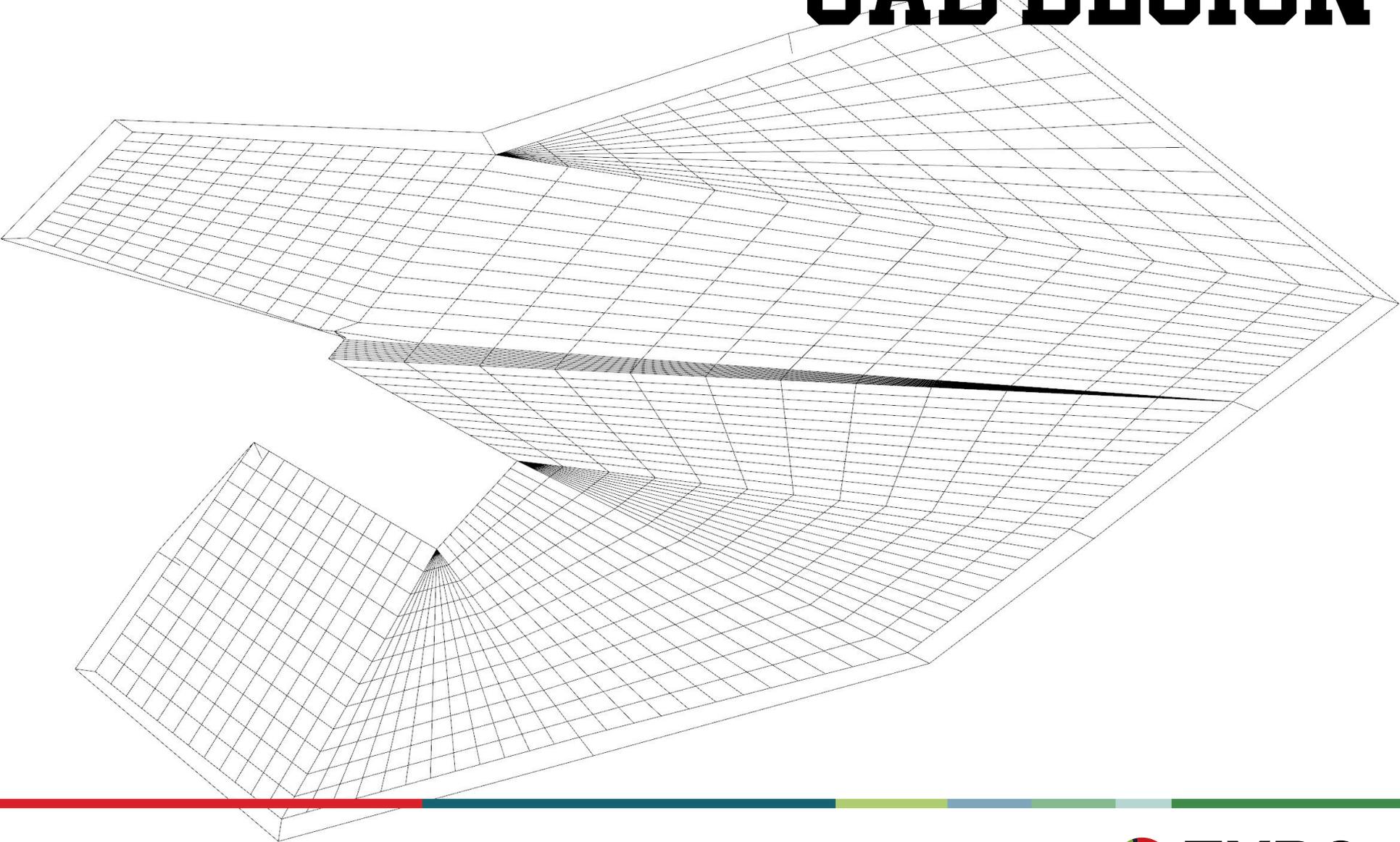
# CAD DESIGN



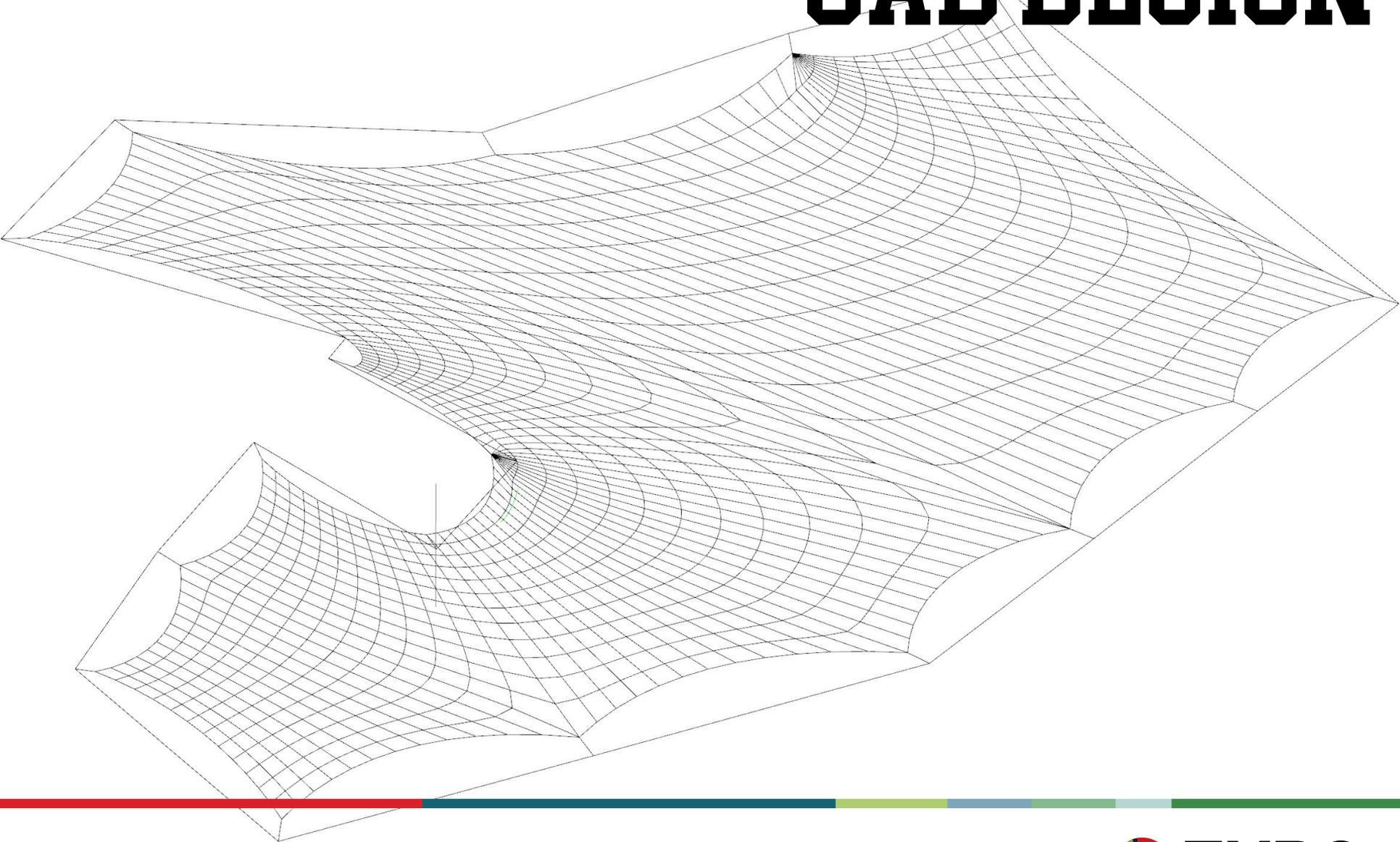
# CAD DESIGN



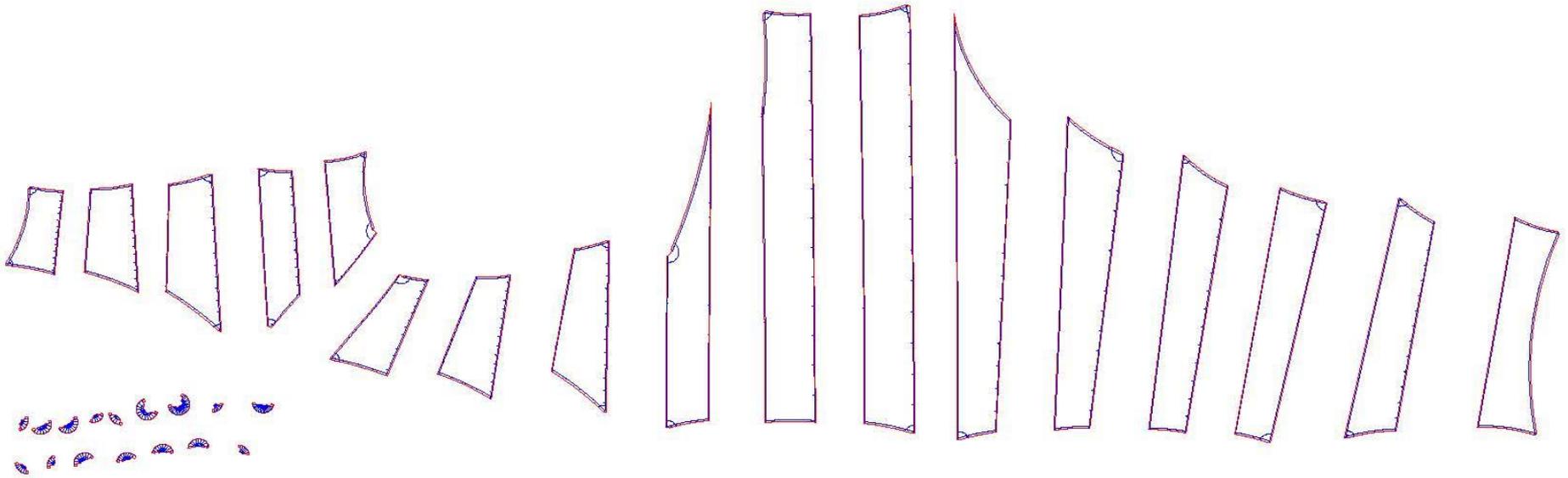
# CAD DESIGN



# CAD DESIGN



# CUT PLOTS



# MISSION: MANUFACTURING PART 2



- **FABRIC (SERGE FERRARI PRECONSTRAINT TX30)**

Seams needed to be sanded for welding.

Build out of a whole new Sew Shop table to accommodate the XL Port and Starboard side fabrics.

- **1/2" STAINLESS FABRIC PLATES**

Custom designed fabric clamping plates

A wide-angle shot of a busy workshop. In the foreground, a large roll of white fabric lies on a wooden board. The floor is cluttered with green and orange cables. To the right, a metal rack is filled with various rolls of fabric and materials. In the background, a green sewing machine is visible, and several workers are engaged in their tasks. The scene is well-lit, with overhead lights visible.

# SEW SHOP TABLE BUILD



# SEW SHOP TABLE BUILD



# SEW SHOP TABLE BUILD



# FABRIC MFG.

# FABRIC MFG.





# FABRIC MFG.

# FABRIC PLATES



# FABRIC PLATES



# FABRIC PLATES



# MISSION: INSTALLATION

- **PRE-INSTALLATION**

Decades worth of lead paint was carefully abated to facilitate the welding of fabric attachment plates to the armored turrets of the ships 16-inch guns

Cable Manufacturing

- **NIGHT-TIME INSTALL**

After hours

One-Shot

Utilizing Ship Attachment Pts to Set Fabric Using Chain falls

Complete by Morning

# CRANE PICK



# INSTALLATION



# INSTALLATION



# INSTALLATION



# INSTALLATION



# INSTALLATION



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# INSTALLATION





285





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# CONCLUSION

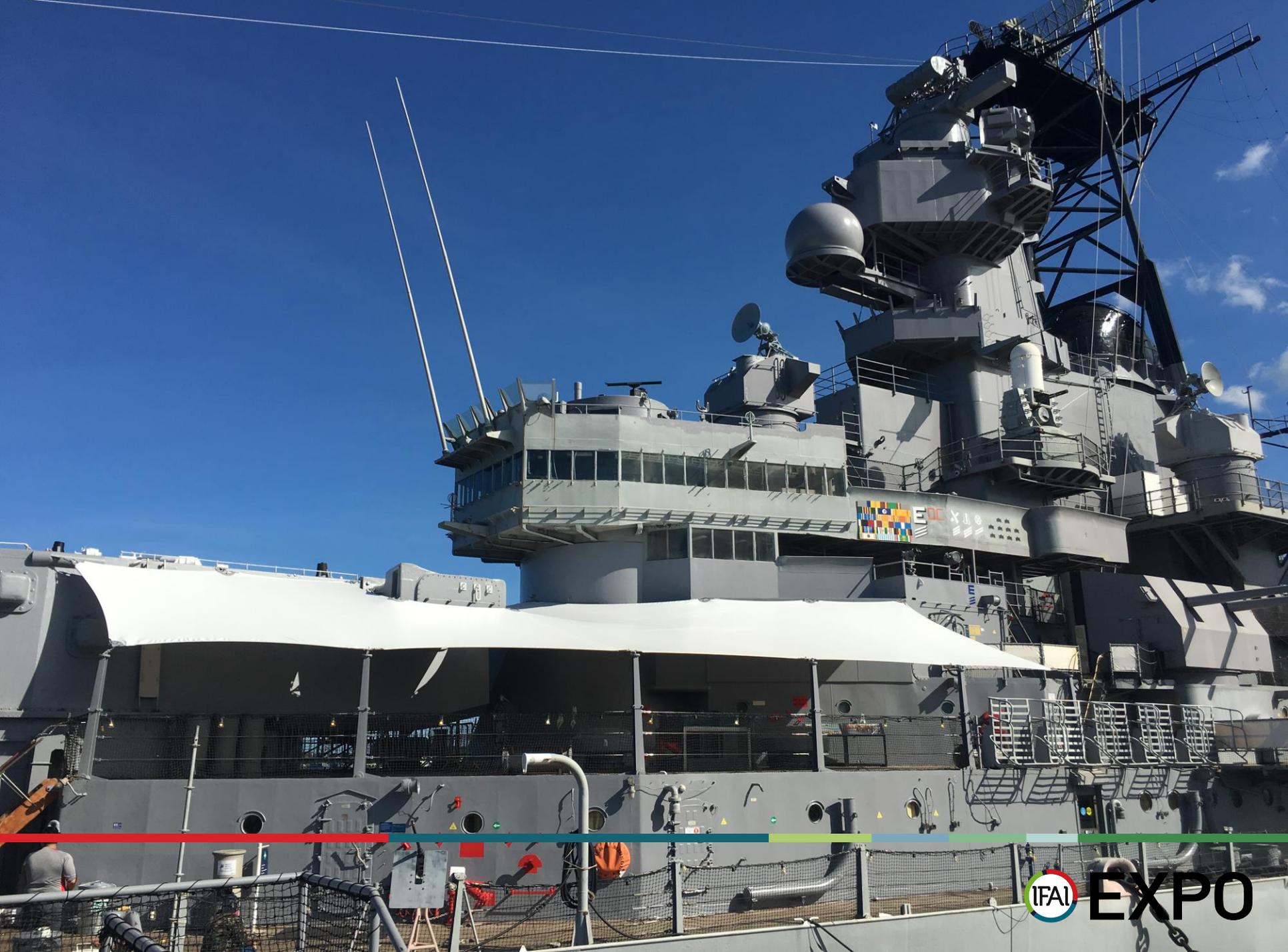


- **CONCLUSION**

What we achieved was a beautiful and utilitarian cover over a hallowed military icon of WWII that maintained the original aesthetics of the Ship. The collective preservation efforts will undoubtedly ensure the legacy of the USS Missouri and will continue to inspire and educate future generations for many years to come.

- **PROTECTING HISTORY**

Since opening in January 1999, the Battleship Missouri Memorial has attracted more than 8-million visitors from around the world with a fascinating tour experience showcasing the USS Missouri's unique place in history. We are honored to help protect the history of the Mighty Mo!



NAVY



EXPO









25 25



285











The background of the image is a stylized, wavy American flag. The top portion shows the blue canton with white stars, while the rest of the image is filled with red and white stripes that curve and flow across the frame. In the bottom left corner, there is a dark grey curved area containing the IFAL logo and the word 'EXPO'.

**MAHALO!**



**EXPO**