HEGER DRY DOCK, INC

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16-87L December 7, 2016

Attention:
Eddie Goldman, Senior Dockmaster (eddie.goldman@baesystems.com)
Justin Gleaton, Dockmaster (justin.gleatonr@baesystems.com)

Re: Request for HEGER Certification of Dry Dock No. 2 located in BAE San Francisco, CA

References:
(1) HEGER Structural and Mechanical/Electrical Control Inspection Report for FDD No. 2, Aug 2016
(2) INTERNATIONAL INSPECTION Ultrasonic Gauging Survey Report for FDD No. 2, Jan 2016
(3) DRYDOCK #2 Facility Certification Report, December 1987
(4) BRUCE S. ROSENBLATT & ASSOCIATES DD No. 2 Finite Element Analysis, August 2016

Enclosures:
(1) HEGER Drawing Package
(2) TRITON Mooring Limitations

Gentlemen:

HEGER DRY DOCK, INC. has been asked to commercially certify Dry Dock No. 2 at BAE SYSTEMS's San Francisco Shipyard in accordance with USGC SFLC STD SPEC 8634.

The certification of the floating dry dock will be based on the material and operational inspection performed by Waleed Sayed and Michael Naylor, both engineers at Heger Dry Dock, on August 8th through the 12th, 2016. See Reference 1 for more information on survey results.

In order to issue a commercial capacity certification for Dry Dock No. 2, Heger Dry Dock conducted a design review to establish operational limitations based on the dock's current condition.

The objective of this letter is to present the results of HEGER's design review. The review outlines the dry dock's limitations and notable structural deficiencies of the dock's current condition. The design review includes:

- Transverse bending analysis / FEA review
- Longitudinal bending analysis
- Local strength calculations based on hydrostatic head pressure
- Intact stability calculations
- Review of BAE's mooring calculations and limitations

HEGER has compiled a history of the dock's drawings for the purpose of evaluating and performing the design review. Refer to the following drawings of Enclosure 1 for more information:

A-001 GENERAL ARRANGEMENT
S-301 SECTION - TYPICAL TRANSVERSE
S-302 SECTION - TRANSVERSE NWT BULKHEAD
S-303 SECTION - TRANSVERSE WT/NWT BULKHEAD

Description of Dock

Dry Dock No. 2 is a one piece type steel floating dry dock. The dry dock was constructed by the Bethlehem Steel Corporation at their San Francisco Yard in 1970. The design of the drydock was done by Earl and Wright, Consulting Engineers of San Francisco.

The dock's pontoon is divided into forty (40) ballast tanks; twenty(20) port tanks and twenty(20) starboard tanks. Each ballast tank is 40'-0" long x 84'-0" wide. Each ballast tank is flooded via a 20" diameter butterfly valve operated by an electric actuator located on the safety deck. Each ballast tank is dewatered by a single-stage mixed flow vertical shaft pump with an approximate capacity of 6,000 GPM. The pumps and valves are operated remotely by push buttons in the control house. There is an 18'-0" wide buoyancy chamber located along the dock's centerline. The buoyancy chamber is divided into five(5) compartments of varying lengths longitudinally.

PRINCIPAL CHARACTERISTICS OF THE DOCK

Age of Dock	46 years
Length Overall	900'-0"
Length of Pontoon	800'-0"
Breadth Overall	186'-0"
Breadth between Wingwalls	150'-0"
Height of Wingwall Above Keel	66'-0"
Pontoon Depth	20'-0"
Design Capacity (18" Freeboard)	59,600 LT
Design Keel Load Line Rating	84 LT/ft

Refer to Enclosure 1 for a General Arrangement drawing of the dry dock.

Buoyant Capacity

HEGER has reviewed the dry dock's buoyant lift calculations shown in the FCR (see Reference 3). The dock had an original design buoyant lift capacity of 59,600 LT. The dock's Facility Certification Report assumed the following dock light weight properties:

Dock Lightweight (No Ballast)	15,500 LT
Vertical Center of Gravity	25.00 ft above baseline

Freeboard measurements taken on January 3, 1986 showed the dock was capable of achieving a light draft of 4.48 feet. This represents a dock light weight of 17,400 LT (dock weight & residual ballast of 1,900 LT).

The dock has an operating freeboard of 18 inches (equivalent to a dock draft of 18.50 feet). At this operating freeboard the dock has a displacement of 77,170 LT. Based on the 1986 freeboard measurements, the dock would have about 59,670 LT of buoyant capacity available to lift a vessel and trimming water.

During HEGER's inspection of the dock (August 2016), a significant amount of mud deposit was observed in the ballast tanks. Some areas had mud deposits of approximately two feet. There has also been extensive structural modification to the dock such as the addition of 1/2 " doubler plates to the pontoon deck, new wingwall cranes, and six(6) stability sponsons. The concern is that the mud deposits and structural modifications over the years have increased the dock's light weight and the 1986 buoyant capacity is no longer achievable at the 18" operating freeboard.

More recent FEA report (see Reference 4) indicates the dock's current light weight has increased by 3,750 LT to:

Dock Lightweight (No Ballast) .... 19,250 LT
Vertical Center of Gravity .... 26.22 ft above baseline

In order to gain additional lift capacity that has been compensated by the above-mentioned added weight, HEGER suggests certification of the dock's lift capacity at a lower 12" of pontoon deck freeboard. The reduced operating freeboard would gain 2,159 LT of lift capacity.

Based on the most current dock lightweight information, the dock would have a buoyant capacity of 58,000 LT at 12" of operating freeboard and 55,800 LT at 18" of operating freeboard.

If additional lift capacity is desired, ballast tanks would have to be mucked.

It is important to note that although 12" of operating freeboard is permitted by ABS rules, MIL-STD rules mandate an 18" operating freeboard for this capacity dock.

HEGER will need to field verify Dry Dock No. 2's current dock weight and lift capacity with field measurements at the next survey prior to issuing a commercial certification.

Intact Stability of the Dry Dock

Dry Dock No. 2 was renovated in 2008 by adding six (6) 40'x12' sponsons in order to increase its transverse intact stability for docking phases 3 and 4. HEGER has developed an allowable KG versus vessel weight curve for the floating dry dock for a minimum GM of 3.28 feet as required by ABS. The stability curve is shown Figure 1 below. Plotted points that fall on or below this line are acceptable, points above are unacceptable.

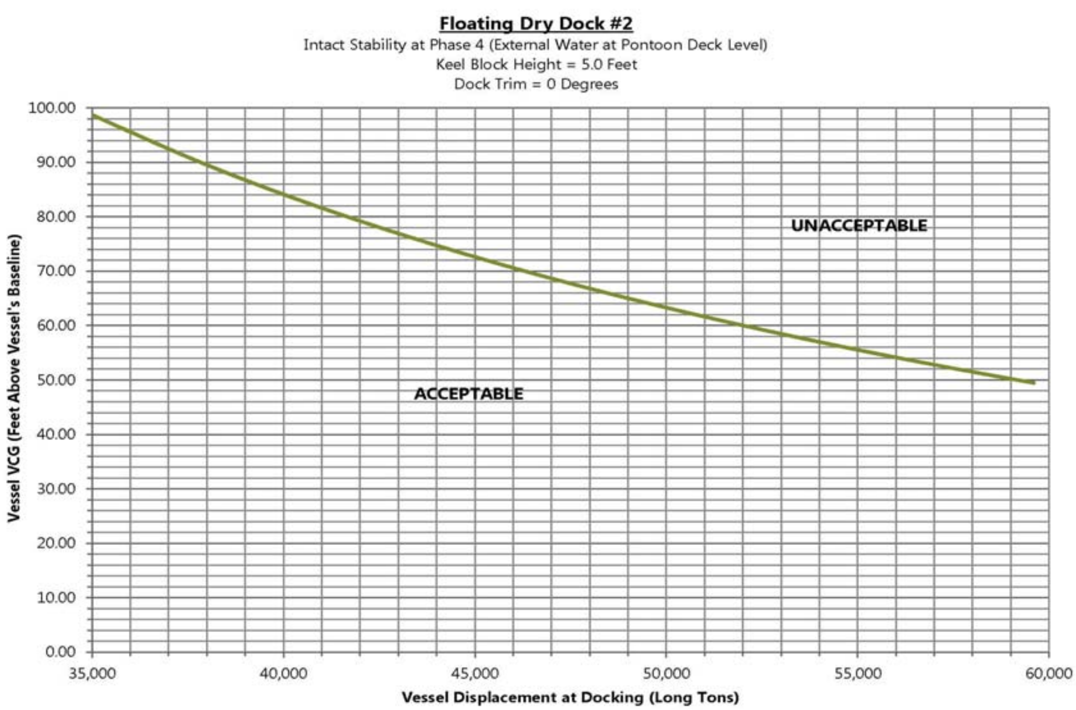


FIGURE 1 – Intact Stability Curve

Maximum Submergence Drafts

Dry Dock No. 2's current submergence berth limits the dock's maximum possible submergence to 59'-6", with a 6-ft tide (according to BAE).

Allowable Head Pressures

Based on the maximum achievable draft and the corresponding internal ballast tank water levels, HEGER has calculated the maximum allowable head pressure to be about 28-ft, during a docking evolution of a capacity vessel, provided an engineered pumping plan is followed.

An empty dock or unloaded tank experiences a hydrostatic head pressure of about 10-ft, during a submergence evolution provided an engineered pumping plan is followed.

External Shell

The design of the dock's external shell thickness requirement is typically governed by the strength required to resist hydrostatic head pressures experienced during a docking evolution.

HEGER has calculated the allowable hydrostatic head pressure the external shell can safely resist for a given corroded plate thickness using the dock's designed stiffener spacing (typically 25"). The original design thickness of the wing wall side shell plating was 7/16" or 0.44 inches. The allowable head pressure is based on based on ABS Rules for Building & Classing Steel Floating Dry Docks 2009.

The results are as follows and are shown in Figure 2:

Plate Thickness	Corrosion	Allowable Head Pressure
0.35 inches	20%	28.2 feet
0.30 inches	31%	18.4 feet
0.25 inches	43%	10.7 feet

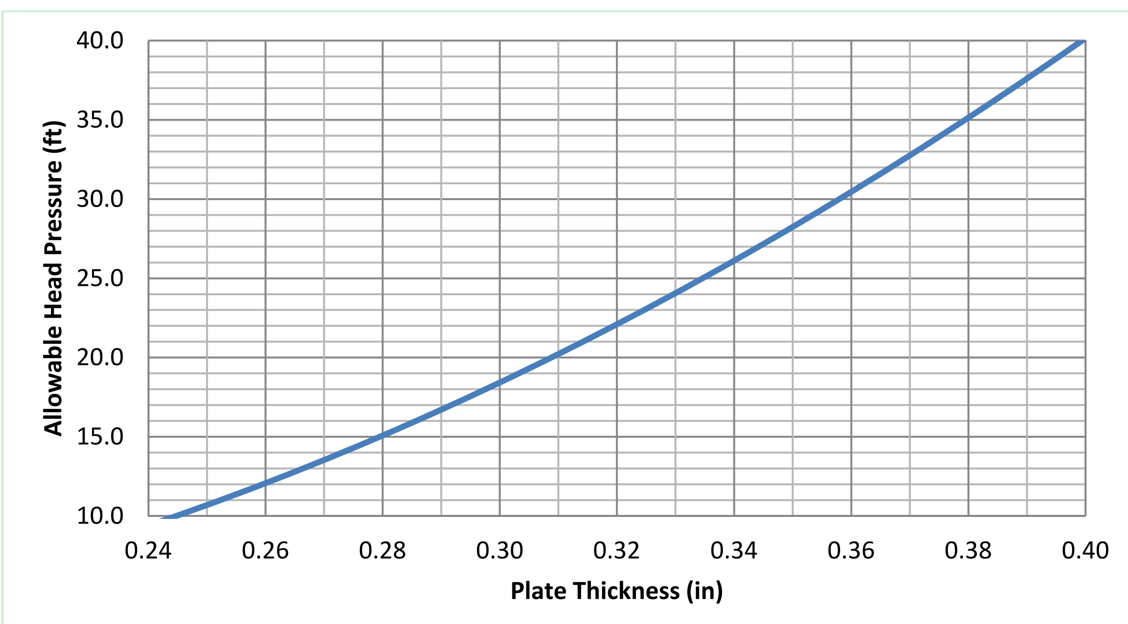


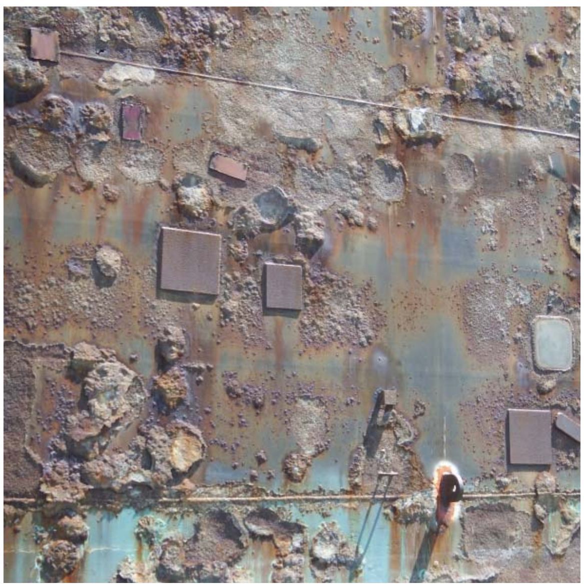
FIGURE 2 – Allowable Head Pressure vs. Plate Thickness Curve

To create the chart in Figure 2, the assumption is that the angle stiffeners welded to the shell plate have 15% corrosion or less.

HEGER has reviewed the dock's most recent UT survey conducted by International Inspection in January 2016 in order to evaluate the dock's current condition, after 45 years of service, with the intent of determining an allowable head pressure on a tank by tank basis. Allowable head pressure is based on remaining material thickness of the shell plate.

The UT survey results of the dock's external shell plating indicate areas of significant metal thickness loss. Areas of extensive corrosion were confirmed by HEGER's August 2016 visual inspection with numerous observed holes in the plating.

The most notable areas of corrosion are:



Outboard Shell Plating, specifically in way of the splash zone (2-ft below the pontoon deck to 10-ft above the pontoon deck)

Connection of the inboard wingwalls and the pontoon deck

There have been ongoing repair efforts to the dock's original external plating to fix areas of extensive corrosion and holed-through plating. Some locations have been repaired by installing doubler plates over localized holes. Other areas of the external shell have been repaired by cropping and replacing 40-ft x 10-ft stiffened plate panels. The thickness of the new plate panels has been increased to 1/2" from the original 7/16".

The majority of the external shell repairs have been made to the East and West outboard shells with about 20% of the dock's original plate panels being replaced.

NOTE: The amount of vessel load placed over a tank group will directly correlate to the amount of head pressure that tank group experiences in a docking evolution. Therefore, the amount of vessel load that can be positioned over a specific tank group will be limited by the minimum measured Ultrasonic Thickness (UT) measurement surveyed in that tank group.

Pontoon Deck & Transverse Bending Strength

The dock's original pontoon deck is severely corroded as reflected in the most recent ultrasonic thickness (UT) measurements surveyed by International Inspection in January 2016 (see Reference 2). UT measurements were taken internally and measured the thickness of the original deck plate only.

Doubler plates have been installed on the topside of the dry dock's original pontoon deck plate over about 65% of the surface with a concentration towards the dock's centerline. The doubler plates are 1/2" in thickness and are connected to the dock's original pontoon deck plate via 2" x 6" slot welds located along transverse and longitudinal structure. These slots welds are considered essential as they provide the doubler plates with required buckling capacity. The half-inch doubler plates were installed to fortify the original deck plate as an alternative to removing and replacing the corroded plating and stiffeners.

HEGER has analyzed the dry dock's pontoon deck for both local hydrostatic pressure and transverse strength requirements when lifting a keel line loading at the dock's centerline.

Hydrostatic pressure thickness requirements are similar to those outlined in the external shell section of this letter as the stiffener spacing is similar. An allowable head pressure rating of 28 feet is recommended at a minimum.

The transverse bending calculations were analyzed using a loading of 68 LT/ft to verify the local structural capacity suggested by the dock's most recent FEA report (see Reference 4). In the FEA report, the dock's transverse capacity is governed by a conservative remaining thickness assumption of the pontoon bottom plating. The latest 2016 UT measurements show 20% corrosion in the most suspect places; the FEA analysis modeled portions of the bottom at 50% to allow for future corrosion.

Below is the pontoon deck thickness requirements to support 68 LT/FT based on location off of dock centerline from the analysis.

Location off Dock Centerline (ft)	**Plate Thickness Required (in)**
0 - 1.5	0.43
1.5 - 3.5	0.38
3.5 - 9	0.36
9 - 27	0.40
27 - 32	0.35*
32 - 44	0.35*
44 - 50	0.35*
50 - 54	0.35*
54 - 67	0.35*

*Controlled by hydrostatic head pressure of 28 feet.

A review of allowable pontoon deck vehicular traffic limitations was not conducted as part of this design review as it does not influence the safety of the vessel in dry dock.

Mooring

In order to meet HEGER certification requirements, a drydock needs to be adequately moored to the pier.

In May of 2016, Troy Gillum, PE of Triton Engineering, Inc. conducted an engineering analysis of Dry Dock No. 2's mooring to determine the operational wind speed restrictions, based on a few different vessel types on dry dock and the direction of the wind. See Enclosure 2 for more information.

To obtain and maintain HEGER certification, BAE will be required to adhere to these wind speed restrictions to maintain a safe operation of the dry dock. This may preclude docking larger vessels until the mooring is strengthened.

In addition, if a vessel's sail area limits the allowable wind speed from any direction to below 65 knots, based on mooring strength, it should <u>not</u> be docked. If wind events are forecasted that may exceed the allowed wind speed for a particular vessel's sail area, procedures need to be in place to undock that vessel before the predicted event occurs. The 65 knot limitation is based on a 10 year mean rate of occurrence for the San Francisco location according to the Applied Technology Council.

HEGER recommends that BAE begin exploring methods of strengthening their mooring dolphins in order to increase the maximum allowable wind speeds to meet current ASCE criterion.

Longitudinal Strength

HEGER has reviewed the dry dock's longitudinal bending calculations shown in the FCR (see Reference 3). The dock's original deflection limit was +/- 3 inches.

HEGER has performed corresponding longitudinal strength calculation to verify the dock has adequate longitudinal strength. Based on UT reports, we have assumed all dock structure is corroded 15% of original thickness with the exception of the pontoon deck which we have assumed to be 50% corroded.

HEGER has concluded the dock has adequate longitudinal strength for the current +/- 3 inches deflection limit. The dock's longitudinal deflection should be monitored during all dock operations to ensure the limitations are not exceeded. An engineered pumping plan should be developed for docking and undocking evolutions to minimize longitudinal stress and deflection.

Conclusion and Required Repairs for HEGER Certification

HEGER's primary concern with the dock's current structural condition is the severely corroded shell plating, with number of holed-through areas. The holes, located throughout the dock, impede the watertight integrity of numerous ballast tanks and raise the following concerns:

1. The dock cannot hold draft without operating pumps to offset the leaking of ballast tanks. This was confirmed and observed in HEGER's submergence test conducted in the 2016 control inspection.

2. The holed-through plating creates local hydrostatic strength deficiencies which put corroded areas of the dock at risk of failure. Due to lack of material strength, there is the potential for these holes to enlarge significantly during a docking evolution, to a point where the amount of external leakage cannot be offset by the dock's pumps. It should also be noted that the dock does not have emergency cross-connect values in the event

an individual tank's pump is lost, thus losing the ability to offset external leakage.

In order for HEGER to certify this dock, BAE will be required to repair the structurally deficient areas of the external shell and make repairs to holes in the external shell to re-establish the dock's watertight integrity and ensure safe dock operations.

Based on HEGER's knowledge of the dock's design review, visual condition survey, and most recent UT survey, areas of the dock's structural deficiencies have been mapped out on the inboard and outboard wing shells and the pontoon deck in the drawings listed below. HEGER has assigned a Priority 1 or 2 to the areas of most structural concern.

Priority 1 areas will need to be repaired prior to HEGER certification. These areas are either heavily corroded as indicated by the dock's UT survey or contain holes or other deficiencies noted in the 2016 control inspection.

The square footage of Priority 1 areas is approximately 21,600 sq ft.

Priority 2 areas will need to be repaired before the subsequent HEGER re-certification. These areas also show signs of significant corrosion. Until the priority 2 areas are repaired, there will need to be operational restrictions regarding allowed head pressure in these areas.

The square footage of Priority 2 areas is approximately 41,400 sq ft.

In the drawings listed below, all areas are generally mapped out on a tank by tank basis. It is recommended the external shell in these areas be cropped out and replaced with a fabricated insert plate to properly repair the area. In the event of small isolated holes, a doubler plate may be installed as a temporary fix.

See the following drawings in Enclosure 1 for more information on UT measurements and Priority 1 or 2 repair areas:

A-002 PONTOON DECK - 1 OF 2
A-003 PONTOON DECK - 2 OF 2
A-004 WEST OUTBOARD WINGWALL
A-005 EAST OUTBOARD WINGWALL
A-006 WEST INBOARD WINGWALL
A-007 EAST INBOARD WINGWALL
A-008 PONTOON BOTTOM - 1 OF 2
A-009 PONTOON BOTTOM - 2 OF 2

The majority of the pontoon deck has been covered with a 1/2" doubler plate. This is not a viable long term solution for the dock. HEGER recommends a maintenance plan be developed to properly replace the corroded deck panels with insert plates. Note that the dock was originally designed with 1/2" high strength steel (yield point of 50 ksi). HEGER recommends any pontoon deck replacements be 3/4" high strength steel. Note that this may correspond to a small reduction in the lift capacity of the dock due to an increase in dock weight, but will build in additional corrosion allowance.

See Section 4.1 of Heger Dry Dock's 2016 control inspection report (Reference 3) for a tank by tank list of noted deficiencies. All repairs recommended to be accomplished as soon as possible in section 6 of the report should be considered Priority 1 and addressed prior to HEGER certification.

Once Priority 1 repairs have been accomplished, HEGER will field verify the condition of the dock and take light dock freeboards in order to certify the dock in accordance with USGC SFLC STD SPEC 8634 if the condition so warrants.

Based on the results of this design review the dock is expected to have the following operational limitations:

Lift Capacity (18” Freeboard)	55,800 LT
Lift Capacity (12” Freeboard)	58,000 LT
Max Keel Line Load	68 LT/ft
External Water Differential	varies, max 28 feet
Internal Water Differential	20 ft
Max Submergence Draft (on 6’ tide)	59’-6”
Longitudinal Deflection	+/- 3 inches
Max Trim	2 ft per 100 ft
Max List	2 degrees
Allowed Wind Speed	varies by ship, 65 knots min. required

Due to the extent of the external shell plate corrosion, the dock will have maximum external head pressure restriction on a tank by tank basis. The maximum head pressure that can be applied to a tank will be governed by the least material thickness measurement of that tank. The external head pressure limitations will directly affect the amount of vessel load that can be applied to the tank. An empty dock sees approximately 10-ft of head pressure. As more vessel load is applied to the tank, the head pressure increases. Each docking will have to be carefully looked at to ensure that a tank’s operational restriction is not exceeded.

Due to the various operational restrictions presented in this review, the certification issued by HEGER will include a clause that docking plans and calculations for any vessel exceeding 60% of the dock’s rated lift capacity will need to be reviewed and approved by a HEGER engineer prior to its docking (until Priority 2 repairs are complete).

Please contact me if you have any questions or comments regarding this letter.

Sincerely,
HEGER DRY DOCK, Inc.

Mike Naylor

Michael Naylor
Engineer

ENCLOSURE 1

HEGER Drawing Package

BAE SYSTEMS SHIP REPAIR

SAN FRANCISCO, CA.

COMMERCIAL CERTIFICATION OF FLOATING DRY DOCK #2

GENERAL DRAWING INDEX

ITEM	NO.	DRAWING TITLE
1	G-001	COVER, DESIGN CHARACTERISTICS AND DRAWING INDEX SHEET

DRAWING INDEX

ITEM	NO.	DRAWING TITLE
2	A-001	GENERAL ARRANGEMENT
3	A-002	REPAIRS – PONTOON DECK – 1 OF 2
4	A-003	REPAIRS – PONTOON DECK – 2 OF 2
5	A-004	REPAIRS – WEST OUTBOARD WINGWALL
6	A-005	REPAIRS – EAST OUTBOARD WINGWALL
7	A-006	REPAIRS – WEST INBOARD WINGWALL
8	A-007	REPAIRS – EAST INBOARD WINGWALL
9	A-008	PONTOON BOTTOM – 1 OF 2
10	A-009	PONTOON BOTTOM – 2 OF 2
11	S-301	SECTION – TYPICAL TRANSVERSE
12	S-302	SECTION – TRANSVERSE NWT BULKHEAD
13	S-303	SECTION – TRANSVERSE WT/NWT BULKHEAD

DRYDOCK #2 OPERATIONAL LIMITS

1)	LIFT CAPACITY (18" FREEBOARD)	–	55,800 LT
2)	LIFT CAPACITY (12" FREEBOARD)	–	58,000 LT
3)	MAX KEEL LINE LOAD	–	VARIES, MAX 68 LT/FT
4)	EXTERNAL WATER DIFFERENTIAL	–	VARIES, MAX 28'
5)	INTERNAL WATER DIFFERENTIAL	–	20'
6)	MAX SUBMERGENCE DRAFT (ON 6' TIDE)	–	59'-6"
7)	LONGITUDINAL DEFLECTION	–	± 3"
8)	MAX TRIM	–	2' PER 100'
9)	MAX LIST	–	2'
10)	WIND SPEED	–	VARIES BY SHIP, 35 KNOTS REQUIRED

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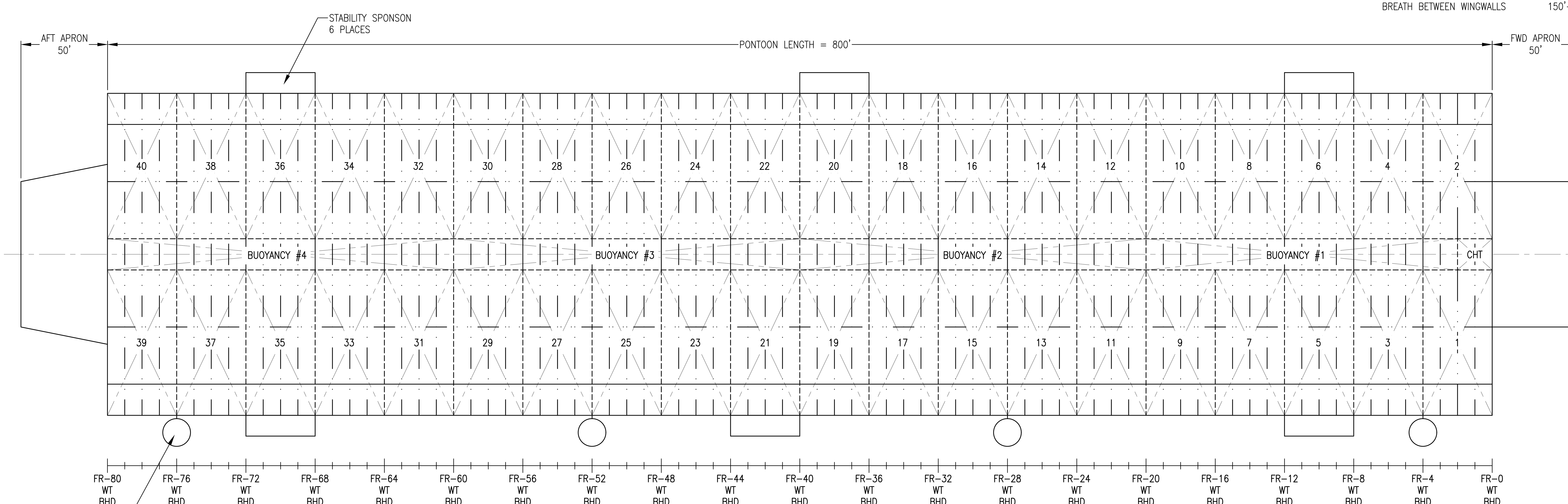
DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

CLIENT NAME AND ADDRESS: BAE SYSTEMS
SAN FRANCISCO, CA
PROJECT TITLE: COMMERCIAL CERTIFICATION OF FDD #2
DRAWING TITLE: COVER, DESIGN CHARACTERISTICS AND DRAWING INDEX SHEET

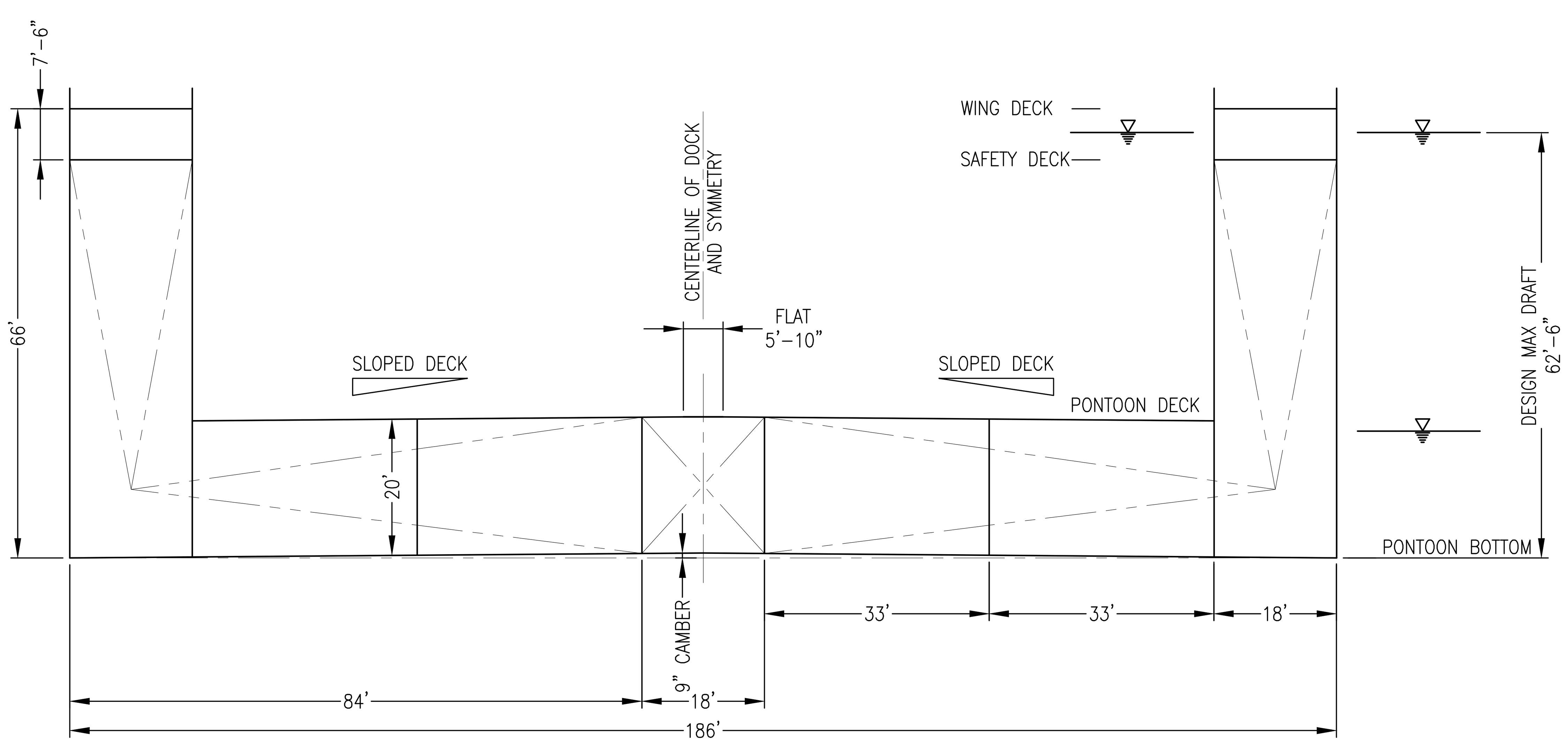
SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 1 OF 13
G-001

DOCK CHARACTERISTICS

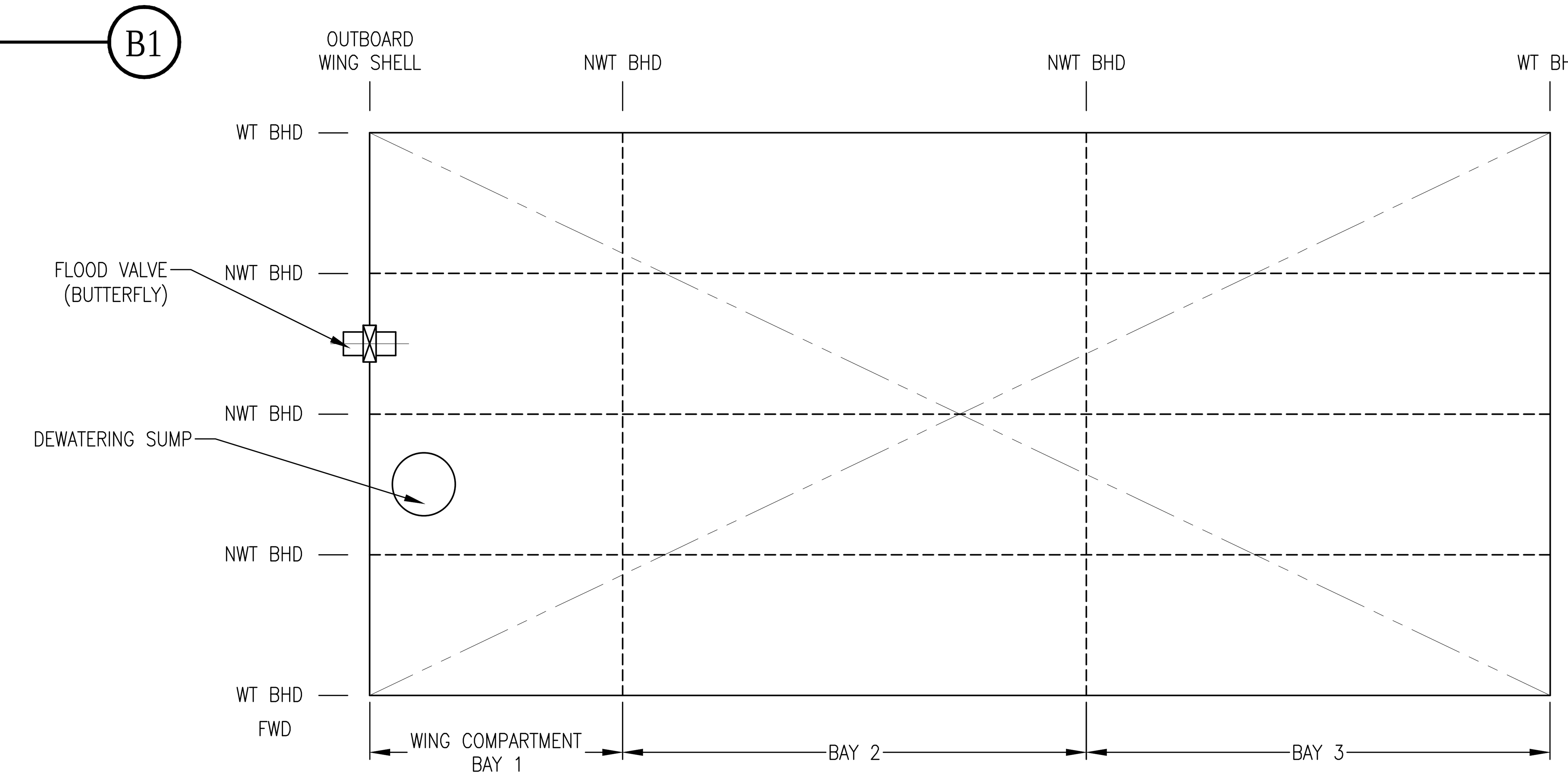
YEAR BUILT	1970
LENGTH OVERALL	900'-0"
LENGTH OF PONTOON	800'-0"
BREATH OVERALL	186'-0"
BREATH BETWEEN WINGWALLS	150'-0"



PLAN VIEW
SCALE 1/32" = 1'- 0"
B1



MIDSHIP SECTION
SCALE 1/16" = 1'- 0"
A1



PLAN - TYPICAL BALLAST TANK CONFIGURATION
SCALE 1/8" = 1'- 0"
A4

1/8" = 1'-0" 0 2 4 8 16 FT
1/16" = 1'-0" 0 4 8 16 32 FT
1/32" = 1'-0" 0 8 16 32 64 FT

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SYM | DESCRIPTION | DATE | APPR

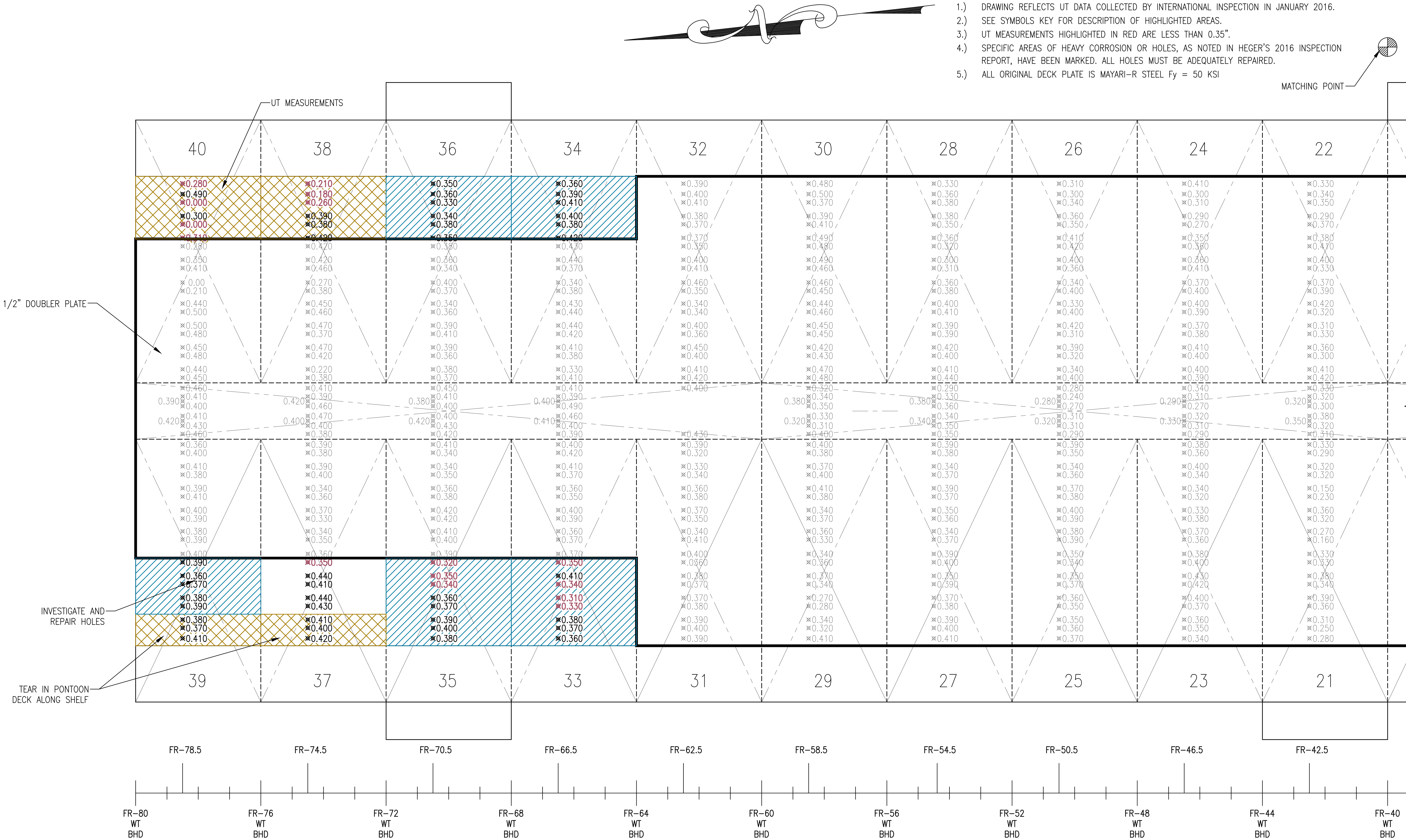
DES MDN | DRW JAH | CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

CLIENT NAME AND ADDRESS: BAE SYSTEMS
SAN FRANCISCO, CA
PROJECT TITLE: COMMERCIAL CERTIFICATION OF FDD #2
DRAWING TITLE: GENERAL ARRANGEMENT

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 2 OF 13
A-001

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".
4.) SPECIFIC AREAS OF HEAVY CORROSION OR HOLES, AS NOTED IN HEGER'S 2016 INSPECTION REPORT, HAVE BEEN MARKED. ALL HOLES MUST BE ADEQUATELY REPAIRED.
5.) ALL ORIGINAL DECK PLATE IS MAYARI-R STEEL Fy = 50 KSI



PLAN - PONTOON DECK - UT MEASUREMENTS (A1)
SCALE: 1/16"=1'-0"

1ST PRIORITY PLATE REPAIR
2ND PRIORITY PLATE REPAIR
PREVIOUS PLATE REPAIR

SYMBOLS KEY
N.T.S.

1/16" = 1'-0" 0 4 8 16 32 FT

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DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

BAE SYSTEMS
SAN FRANCISCO, CA
COMMERCIAL CERTIFICATION OF FDD #2
REPAIRS – PONTOON DECK – 1 OF 2

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 3 OF 13
A-002

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
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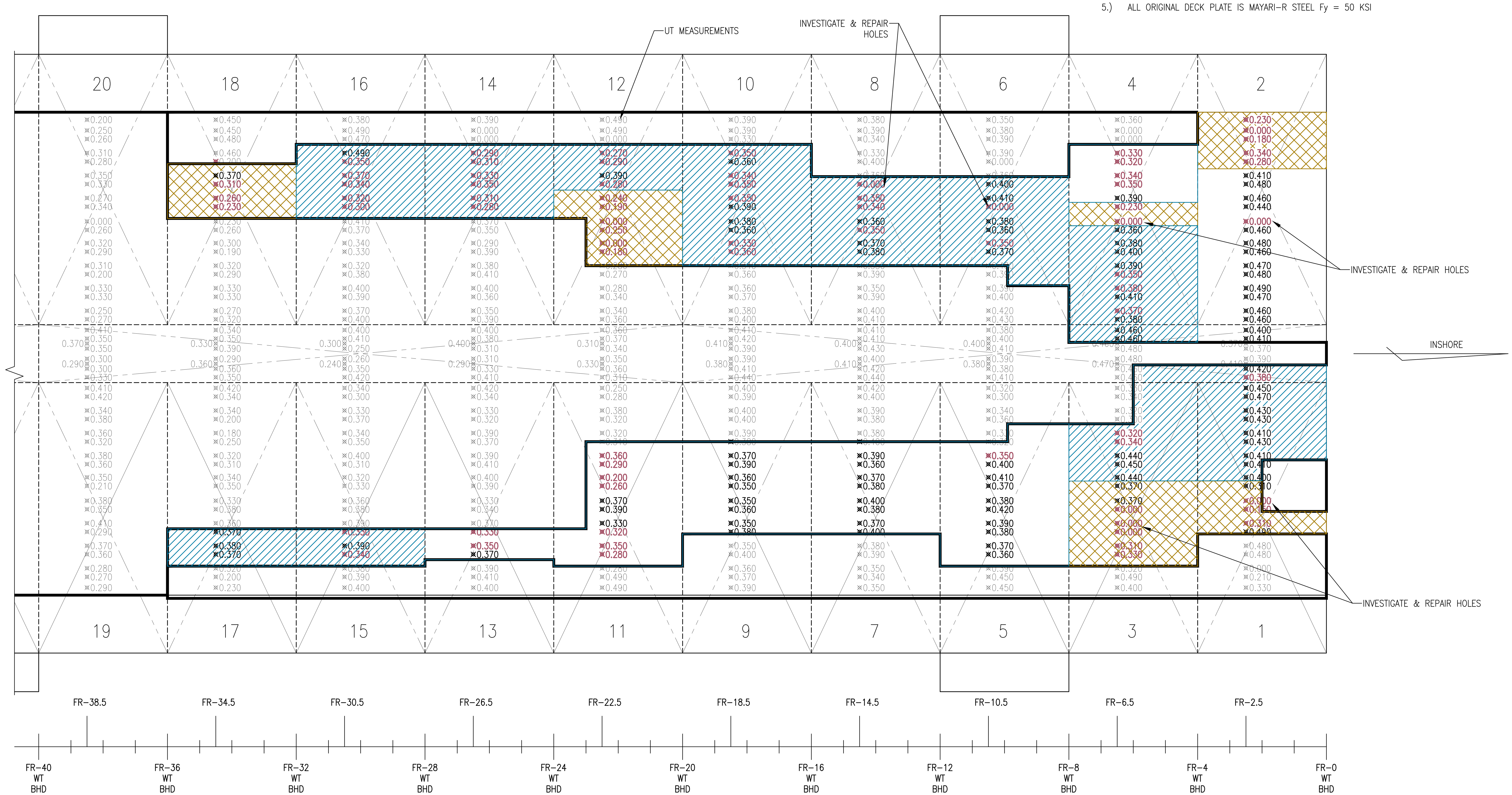

MATCHING POINT

PLAN - PONTOON DECK - UT MEASUREMENTS (A1)

SCALE: 1/16"=1'-0"

SYMBOLS KEY

N.T.S.

1ST PRIORITY PLATE REPAIR

2ND PRIORITY PLATE REPAIR

PREVIOUS PLATE REPAIR

1/16" = 1'-0" 0 4 8 16 32 FT

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DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

BAE SYSTEMS
SAN FRANCISCO, CA

COMMERCIAL CERTIFICATION OF FDD #2

REPAIRS – PONTOON DECK – 2 OF 2

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 4 OF 13
A-003

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
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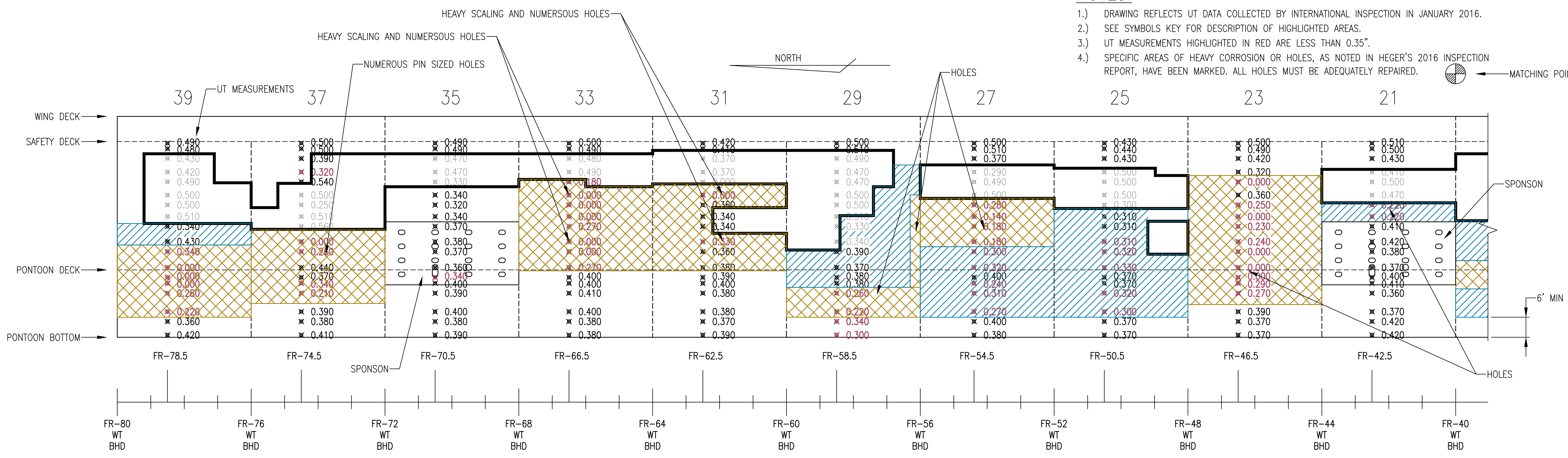
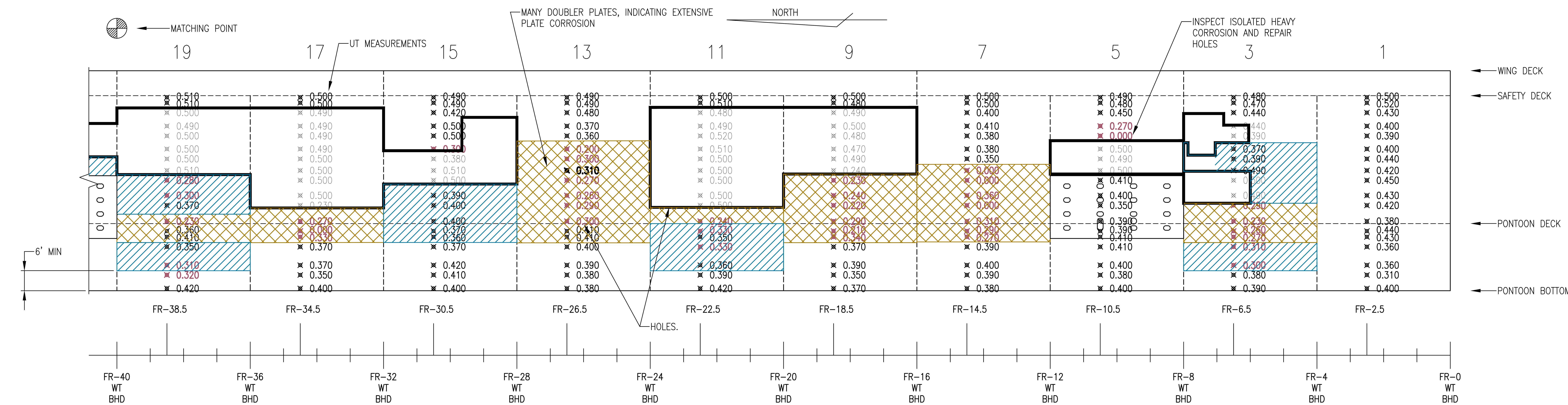


ELEVATION - WEST OUTBOARD WINGWALL - UT MEASUREMENTS (C1)
SCALE: 1/16"=1'-0"



ELEVATION - WEST OUTBOARD WINGWALL - UT MEASUREMENTS (A1)
SCALE: 1/16"=1'-0"

SYMBOLS KEY
N.T.S.

- 1ST PRIORITY PLATE REPAIR
- 2ND PRIORITY PLATE REPAIR
- PREVIOUS PLATE REPAIR

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

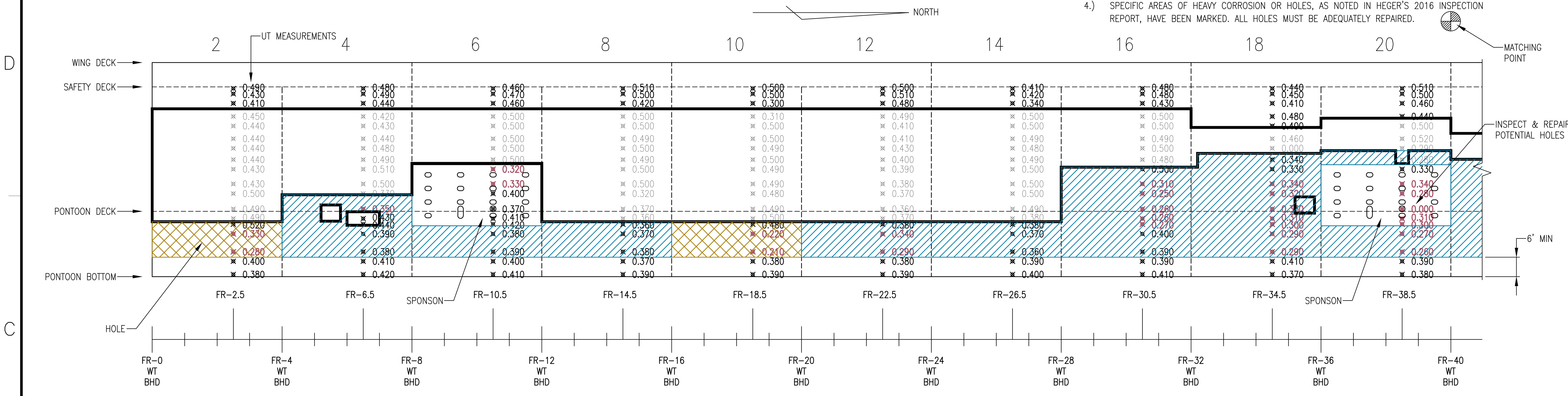
BAE SYSTEMS
SAN FRANCISCO, CA

COMMERCIAL CERTIFICATION OF FDD #2
REPAIRS - WEST OUTBOARD WINGWALL

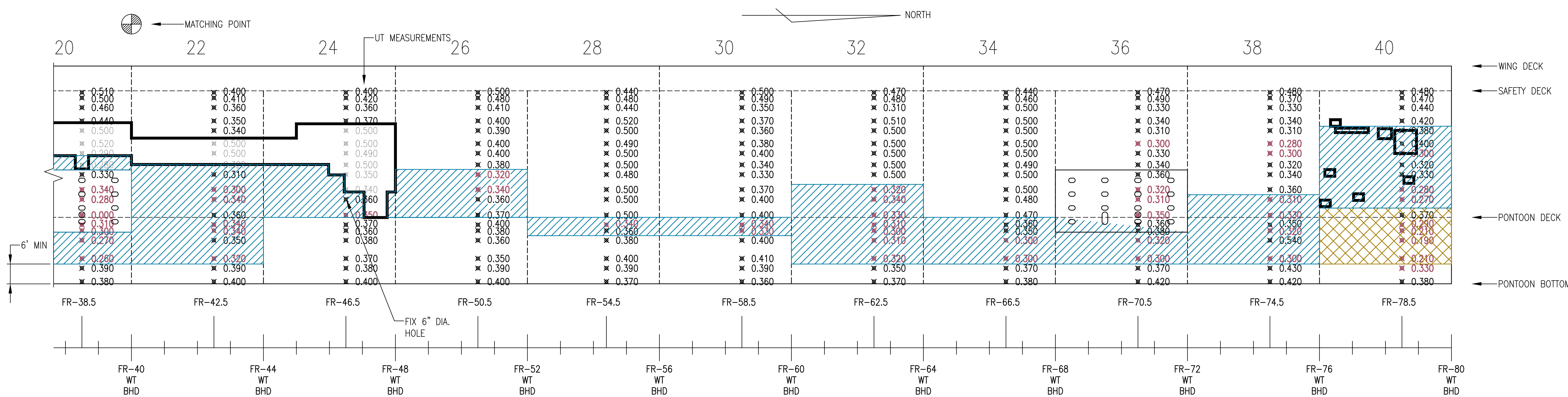
SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 5 OF 13
A-004

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".
4.) SPECIFIC AREAS OF HEAVY CORROSION OR HOLES, AS NOTED IN HEGER'S 2016 INSPECTION REPORT, HAVE BEEN MARKED. ALL HOLES MUST BE ADEQUATELY REPAIRED.



ELEVATION - EAST OUTBOARD WINGWALL - UT MEASUREMENTS (C1)
SCALE: 1/16"=1'-0"



ELEVATION - EAST OUTBOARD WINGWALL - UT MEASUREMENTS (A1)
SCALE: 1/16"=1'-0"

1ST PRIORITY PLATE REPAIR
2ND PRIORITY PLATE REPAIR
PREVIOUS PLATE REPAIR

SYMBOLS KEY
N.T.S.

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

BAE SYSTEMS
SAN FRANCISCO, CA

COMMERCIAL CERTIFICATION OF FDD #2

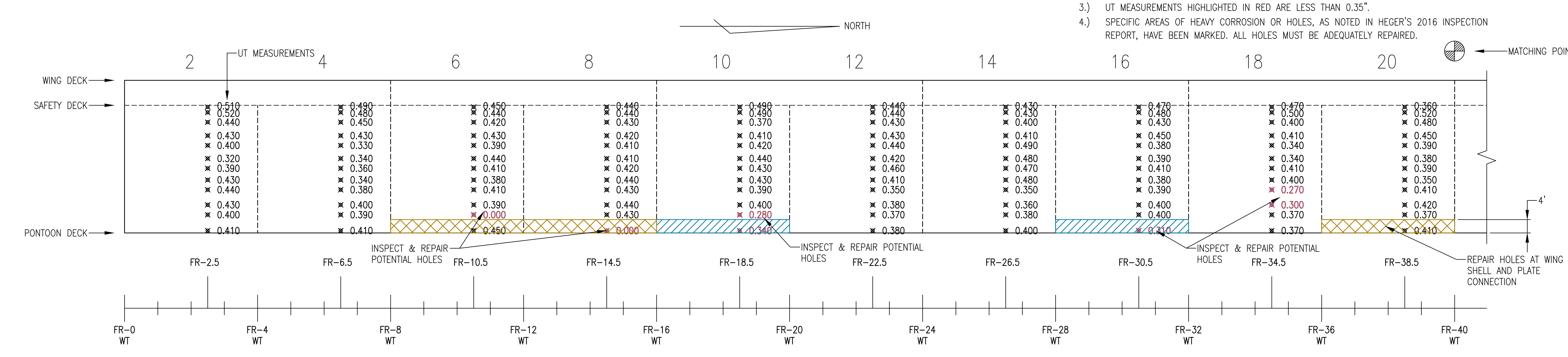
REPAIRS - EAST OUTBOARD WINGWALL

SCALE: AS NOTED
PROJECT NO.: 3973-D
SHEET 6 OF 13

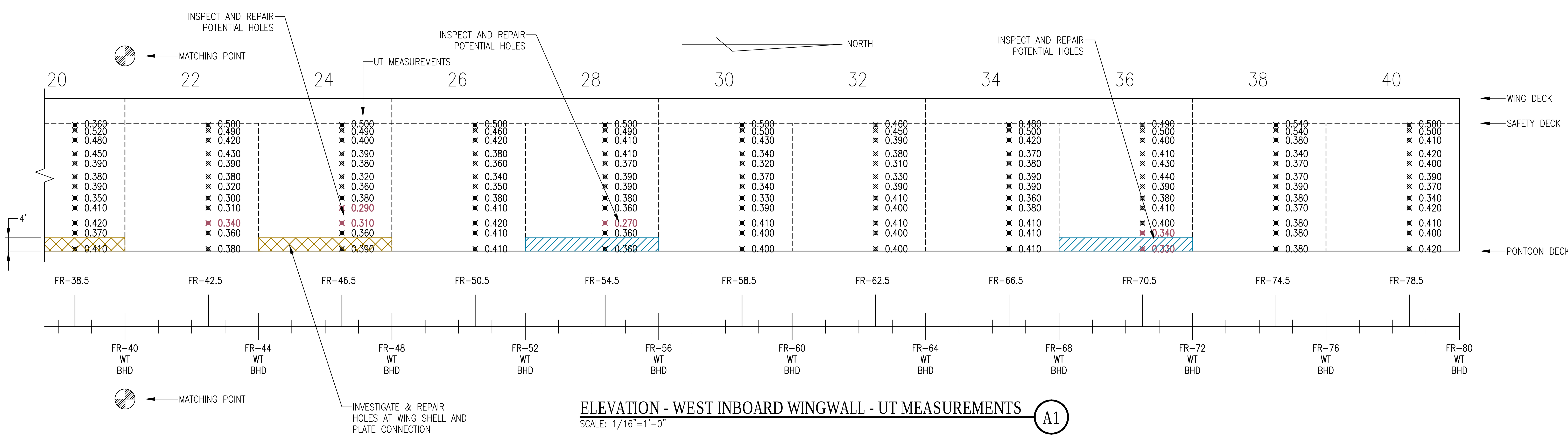
A-005

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".
4.) SPECIFIC AREAS OF HEAVY CORROSION OR HOLES, AS NOTED IN HEGER'S 2016 INSPECTION REPORT, HAVE BEEN MARKED. ALL HOLES MUST BE ADEQUATELY REPAIRED.



ELEVATION - WEST INBOARD WINGWALL - UT MEASUREMENTS (C1)
SCALE: 1/16"=1'-0"



ELEVATION - WEST INBOARD WINGWALL - UT MEASUREMENTS (A1)
SCALE: 1/16"=1'-0"

SYMBOLS KEY
N.T.S.

- 1ST PRIORITY PLATE REPAIR
- 2ND PRIORITY PLATE REPAIR
- PREVIOUS PLATE REPAIR

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

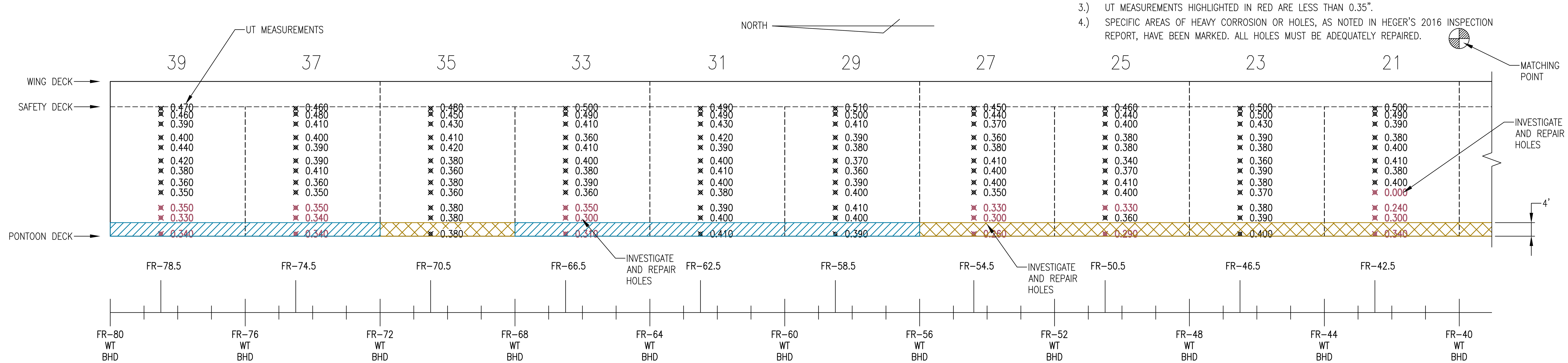
DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

BAE SYSTEMS
SAN FRANCISCO, CA
COMMERCIAL CERTIFICATION OF FDD #2
REPAIRS – WEST INBOARD WINGWALL

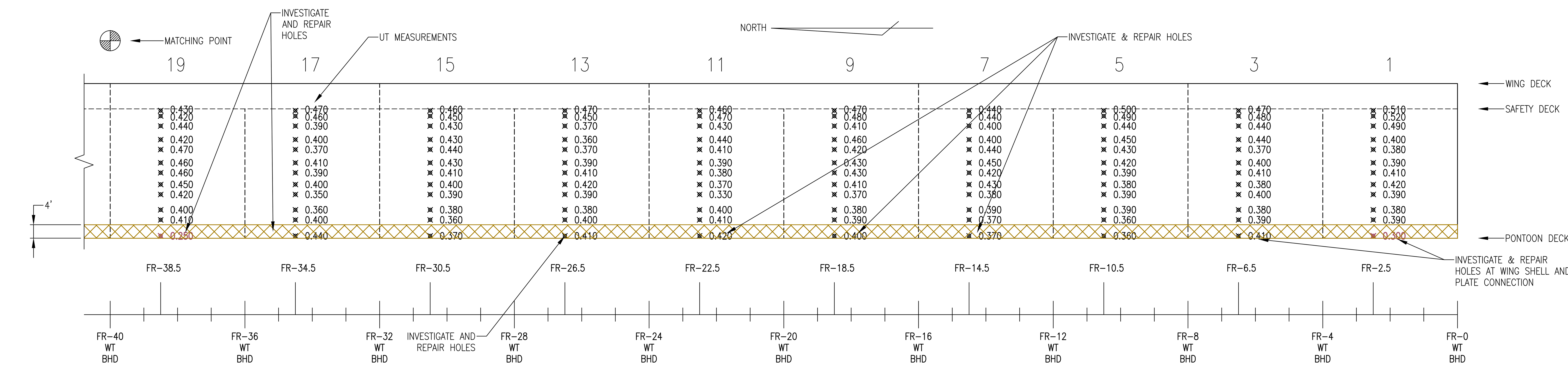
SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 7 OF 13
A-006

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".
4.) SPECIFIC AREAS OF HEAVY CORROSION OR HOLES, AS NOTED IN HEGER'S 2016 INSPECTION REPORT, HAVE BEEN MARKED. ALL HOLES MUST BE ADEQUATELY REPAIRED.



ELEVATION - EAST INBOARD WINGWALL - UT MEASUREMENTS (C1)
SCALE: 1/16"=1'-0"



ELEVATION - EAST INBOARD WINGWALL - UT MEASUREMENTS (A1)
SCALE: 1/16"=1'-0"

SYMBOLS KEY
N.T.S.

- 1ST PRIORITY PLATE REPAIR
- 2ND PRIORITY PLATE REPAIR
- PREVIOUS PLATE REPAIR

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES: MDN DRW: JAH CHK: MDN
CHIEF ENG.: PREMAL SHAH
DATE: 12/06/2016

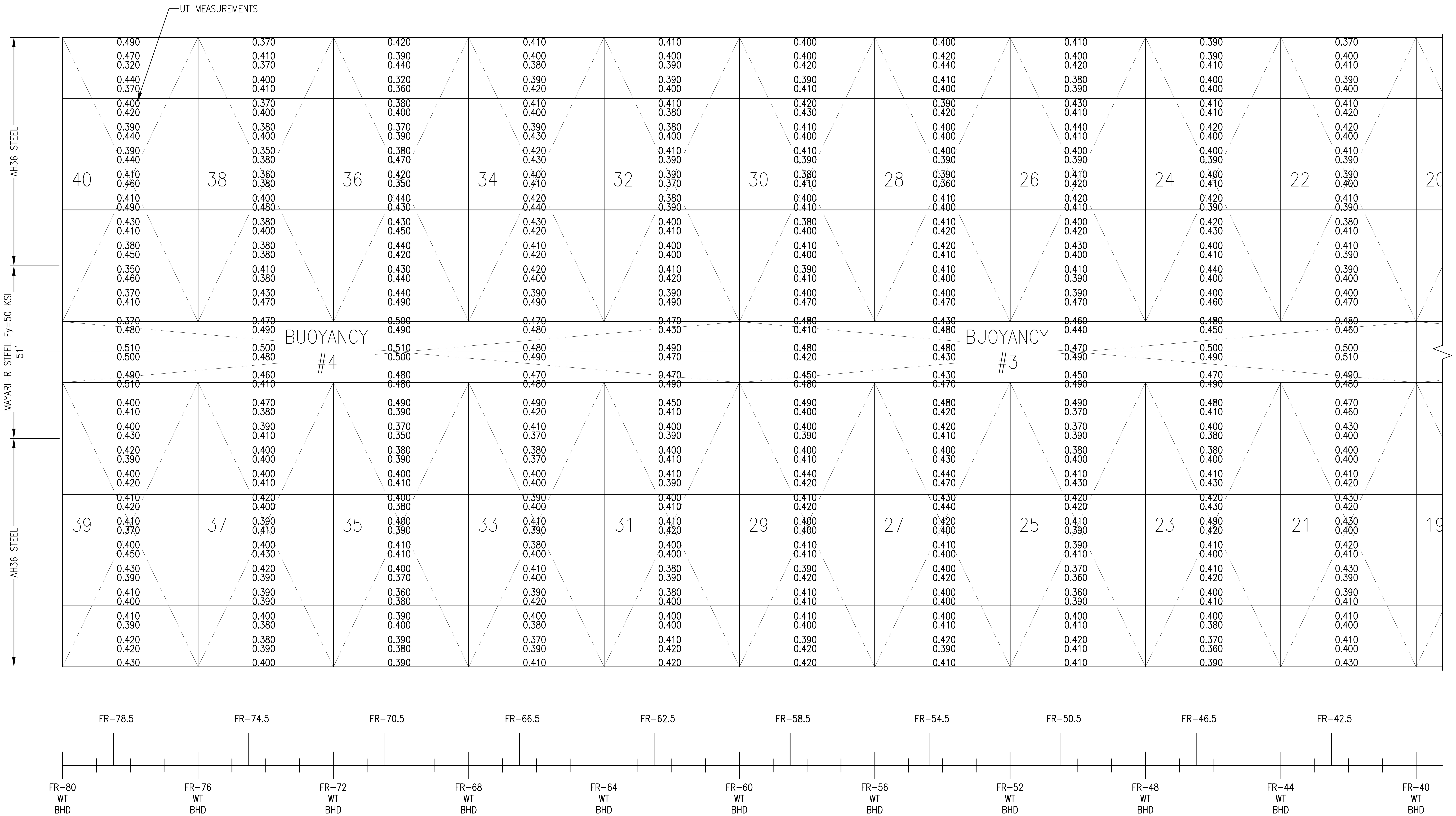
BAE SYSTEMS
SAN FRANCISCO, CA
COMMERCIAL CERTIFICATION OF FDD #2
REPAIRS – EAST INBOARD WINGWALL

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.:
SHEET 8 OF 13
A-007

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".

MATCHING POINT



MATCHING POINT

PLAN - PONTOON BOTTOM - UT MEASUREMENTS (A1)

SCALE: 1/16"=1'-0"

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

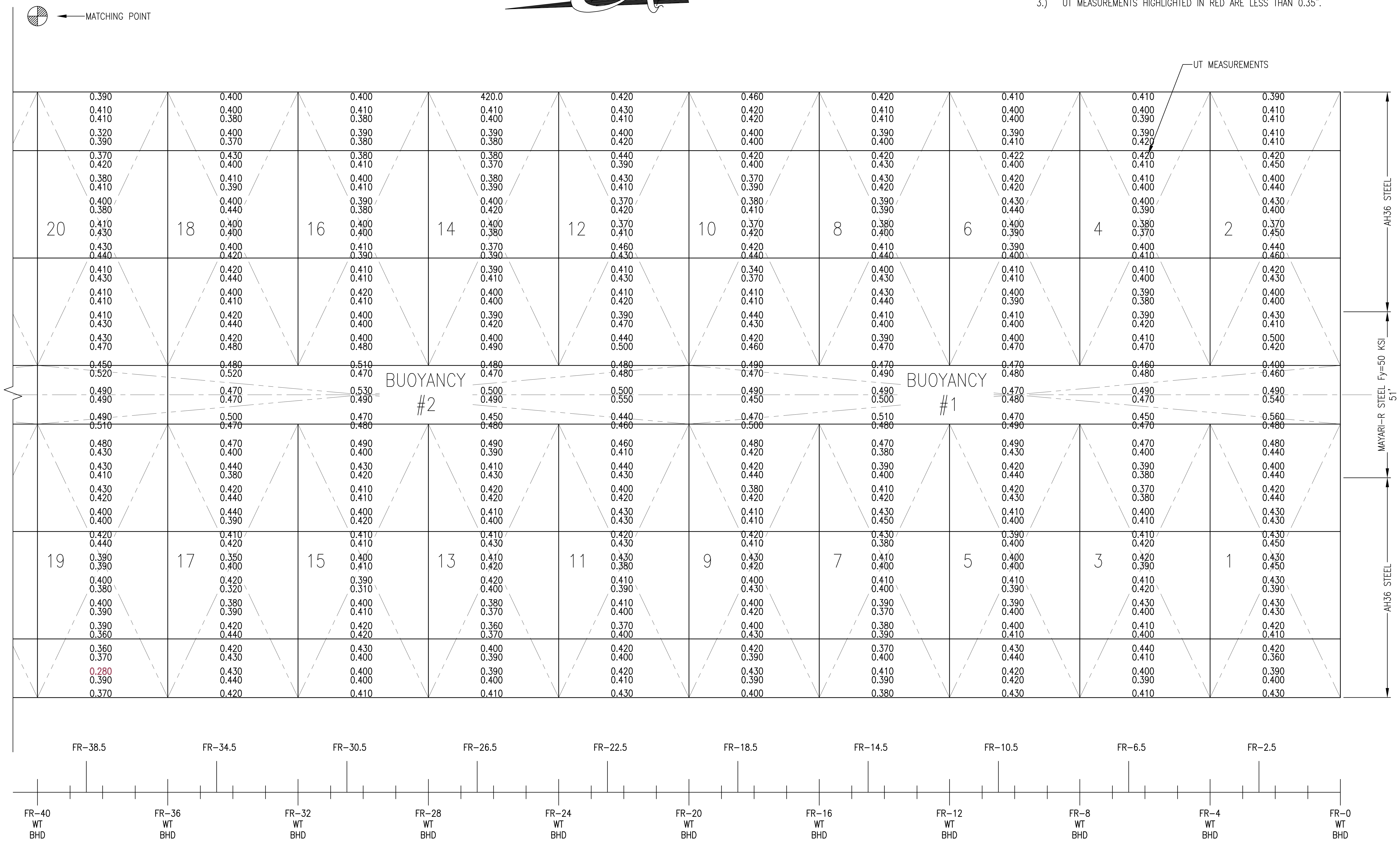
DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

CLIENT NAME AND ADDRESS: BAE SYSTEMS, SAN FRANCISCO, CA
PROJECT TITLE: COMMERCIAL CERTIFICATION OF FDD #2
DRAWING TITLE: PONTOON BOTTOM - 1 OF 2

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 9 OF 13
A-008

NOTES:

1.) DRAWING REFLECTS UT DATA COLLECTED BY INTERNATIONAL INSPECTION IN JANUARY 2016.
2.) SEE SYMBOLS KEY FOR DESCRIPTION OF HIGHLIGHTED AREAS.
3.) UT MEASUREMENTS HIGHLIGHTED IN RED ARE LESS THAN 0.35".



FR-38.5	FR-34.5	FR-30.5	FR-26.5	FR-22.5	FR-18.5	FR-14.5	FR-10.5	FR-6.5	FR-2.5
0.390	0.400	0.400	420.0	0.420	0.460	0.420	0.410	0.410	0.390
0.410	0.400	0.410	0.410	0.430	0.420	0.410	0.400	0.400	0.410
0.410	0.380	0.380	0.400	0.410	0.420	0.410	0.400	0.390	0.410
0.320	0.400	0.390	0.390	0.400	0.400	0.390	0.390	0.390	0.410
0.390	0.370	0.380	0.380	0.420	0.400	0.400	0.410	0.420	0.410
0.370	0.430	0.380	0.380	0.440	0.420	0.420	0.422	0.420	0.420
0.420	0.400	0.410	0.370	0.390	0.400	0.430	0.400	0.410	0.450
0.380	0.410	0.400	0.380	0.430	0.370	0.430	0.420	0.410	0.400
0.410	0.390	0.410	0.390	0.410	0.390	0.420	0.420	0.400	0.440
0.400	0.400	0.390	0.400	0.370	0.380	0.390	0.430	0.400	0.430
0.380	0.440	0.380	0.420	0.420	0.410	0.390	0.440	0.390	0.400
0.410	0.400	0.400	0.400	0.370	0.370	0.380	0.400	0.380	0.370
0.430	0.400	0.400	0.380	0.410	0.420	0.400	0.390	0.370	0.450
0.430	0.400	0.410	0.370	0.460	0.420	0.410	0.390	0.400	0.440
0.440	0.420	0.390	0.390	0.430	0.440	0.440	0.400	0.410	0.460
0.410	0.420	0.410	0.390	0.410	0.340	0.400	0.410	0.410	0.420
0.430	0.440	0.410	0.410	0.430	0.370	0.430	0.410	0.400	0.430
0.410	0.400	0.420	0.400	0.410	0.410	0.430	0.400	0.390	0.400
0.410	0.410	0.410	0.400	0.420	0.410	0.440	0.390	0.380	0.400
0.410	0.420	0.400	0.390	0.390	0.440	0.410	0.410	0.390	0.430
0.430	0.440	0.400	0.420	0.470	0.430	0.400	0.400	0.420	0.410
0.430	0.420	0.400	0.400	0.440	0.420	0.390	0.400	0.410	0.500
0.470	0.480	0.480	0.490	0.500	0.460	0.470	0.470	0.470	0.420
0.450	0.480	0.510	0.480	0.480	0.490	0.470	0.470	0.460	0.400
0.520	0.520	0.470	0.470	0.480	0.470	0.490	0.480	0.480	0.460
0.490	0.470	0.530	0.500	0.500	0.490	0.490	0.470	0.490	0.490
0.490	0.470	0.490	0.490	0.550	0.450	0.500	0.480	0.470	0.540
0.490	0.500	0.470	0.450	0.440	0.470	0.510	0.470	0.450	0.560
0.510	0.470	0.480	0.480	0.460	0.500	0.480	0.490	0.470	0.480
0.480	0.470	0.490	0.490	0.460	0.480	0.470	0.490	0.470	0.480
0.430	0.400	0.400	0.390	0.410	0.420	0.380	0.430	0.400	0.440
0.430	0.440	0.430	0.410	0.440	0.420	0.390	0.420	0.390	0.400
0.410	0.380	0.420	0.430	0.430	0.440	0.400	0.440	0.380	0.440
0.430	0.420	0.410	0.420	0.400	0.380	0.410	0.420	0.370	0.420
0.420	0.440	0.410	0.420	0.420	0.420	0.420	0.430	0.380	0.440
0.400	0.440	0.400	0.410	0.430	0.410	0.430	0.410	0.400	0.430
0.400	0.390	0.420	0.400	0.430	0.410	0.450	0.400	0.410	0.430
0.420	0.410	0.410	0.410	0.420	0.420	0.430	0.390	0.410	0.430
0.440	0.420	0.410	0.430	0.430	0.410	0.380	0.400	0.420	0.450
0.390	0.350	0.400	0.410	0.430	0.430	0.410	0.400	0.420	0.430
0.390	0.400	0.410	0.420	0.380	0.420	0.400	0.400	0.390	0.450
0.400	0.420	0.390	0.420	0.410	0.400	0.410	0.410	0.410	0.430
0.380	0.320	0.310	0.400	0.390	0.430	0.400	0.390	0.420	0.390
0.400	0.380	0.400	0.380	0.410	0.400	0.390	0.390	0.430	0.430
0.390	0.390	0.410	0.370	0.400	0.420	0.370	0.400	0.400	0.430
0.390	0.420	0.420	0.360	0.370	0.400	0.380	0.400	0.410	0.420
0.360	0.440	0.420	0.370	0.400	0.430	0.390	0.410	0.400	0.410
0.360	0.420	0.430	0.400	0.420	0.420	0.370	0.430	0.440	0.420
0.370	0.430	0.400	0.390	0.400	0.390	0.400	0.440	0.410	0.360
0.280	0.430	0.400	0.390	0.420	0.430	0.410	0.420	0.400	0.390
0.390	0.440	0.400	0.400	0.410	0.390	0.390	0.420	0.390	0.400
0.370	0.420	0.410	0.410	0.430	0.400	0.380	0.430	0.410	0.430

MATCHING POINT

PLAN - PONTOON BOTTOM - UT MEASUREMENTS

SCALE: 1/16"=1'-0"

A1

1/16" = 1'-0" 0 4 8 16 32 FT

HEGER
DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES MDN DRW JAH CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

BAE SYSTEMS
SAN FRANCISCO, CA

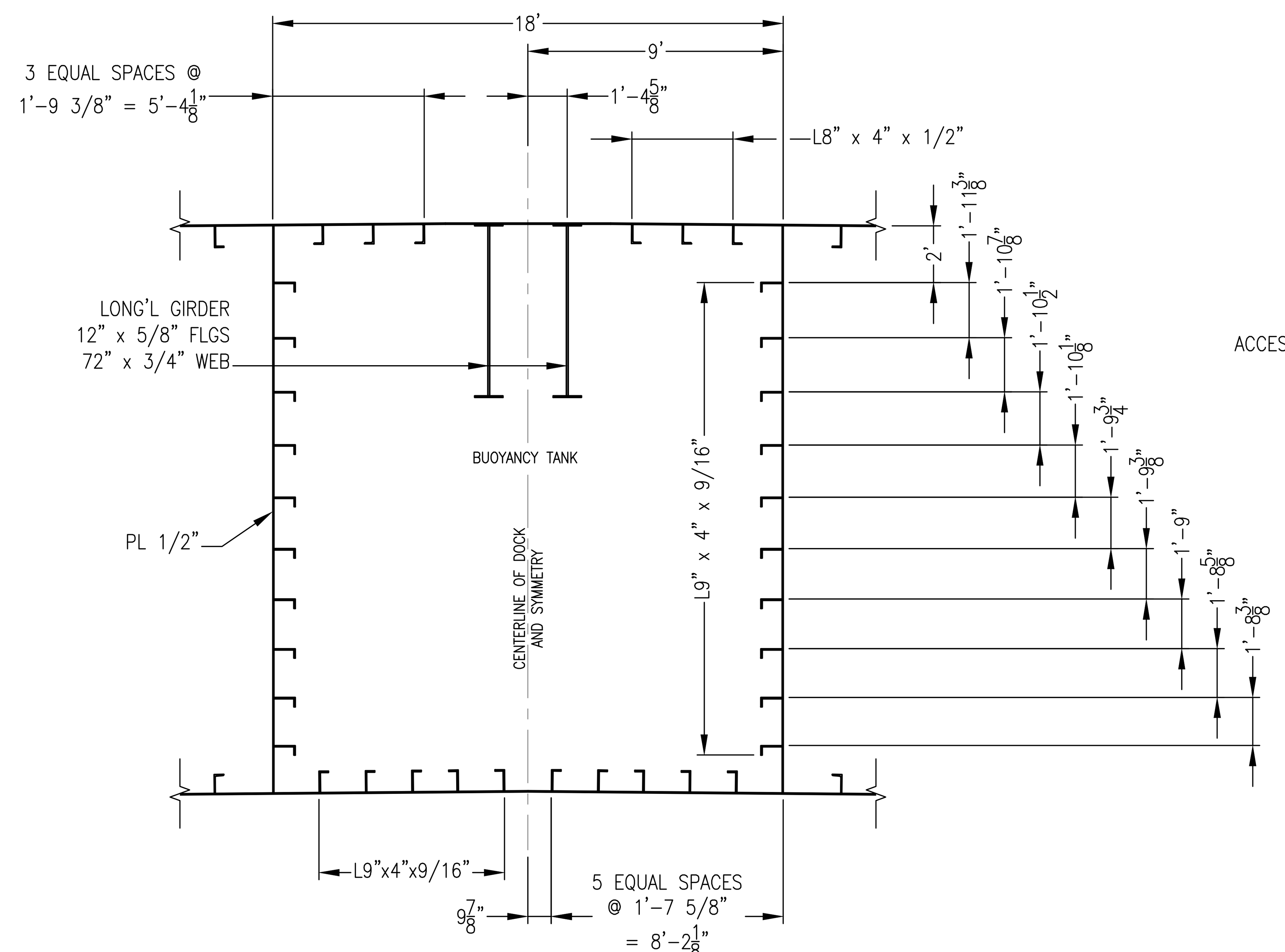
COMMERCIAL CERTIFICATION OF FDD #2

PONTOON BOTTOM - 2 OF 2

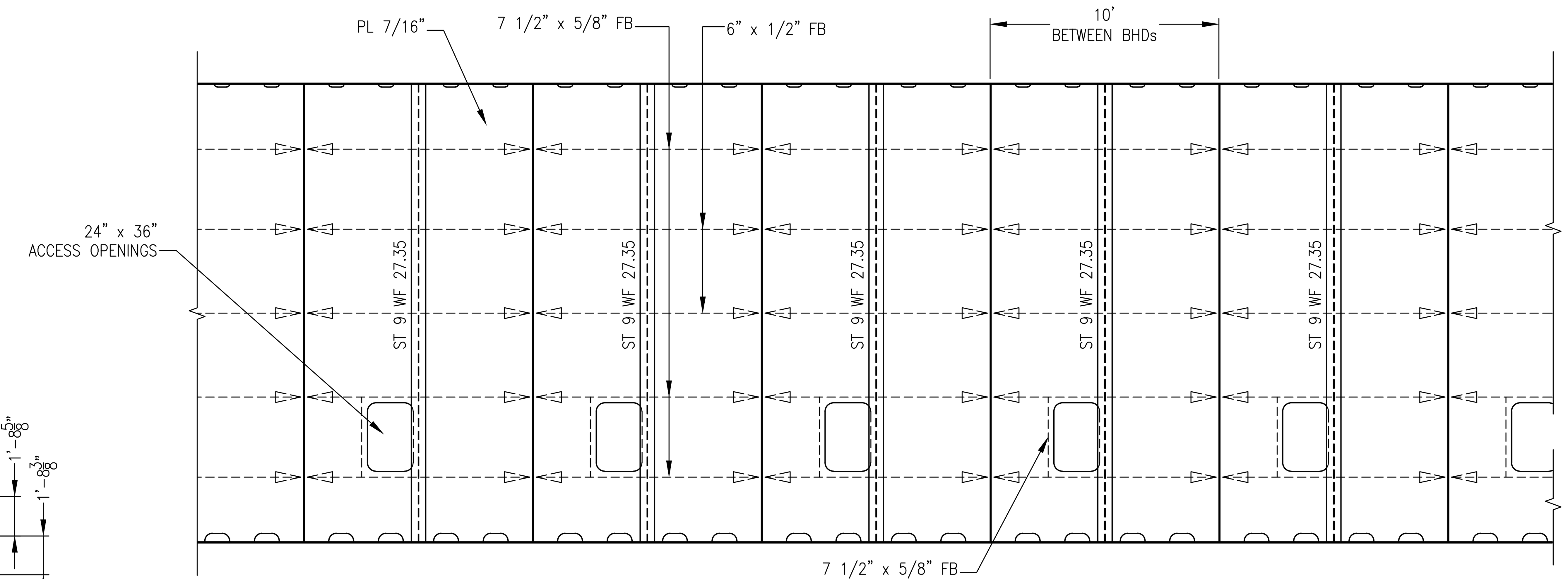
SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.

SHEET 10 OF 13

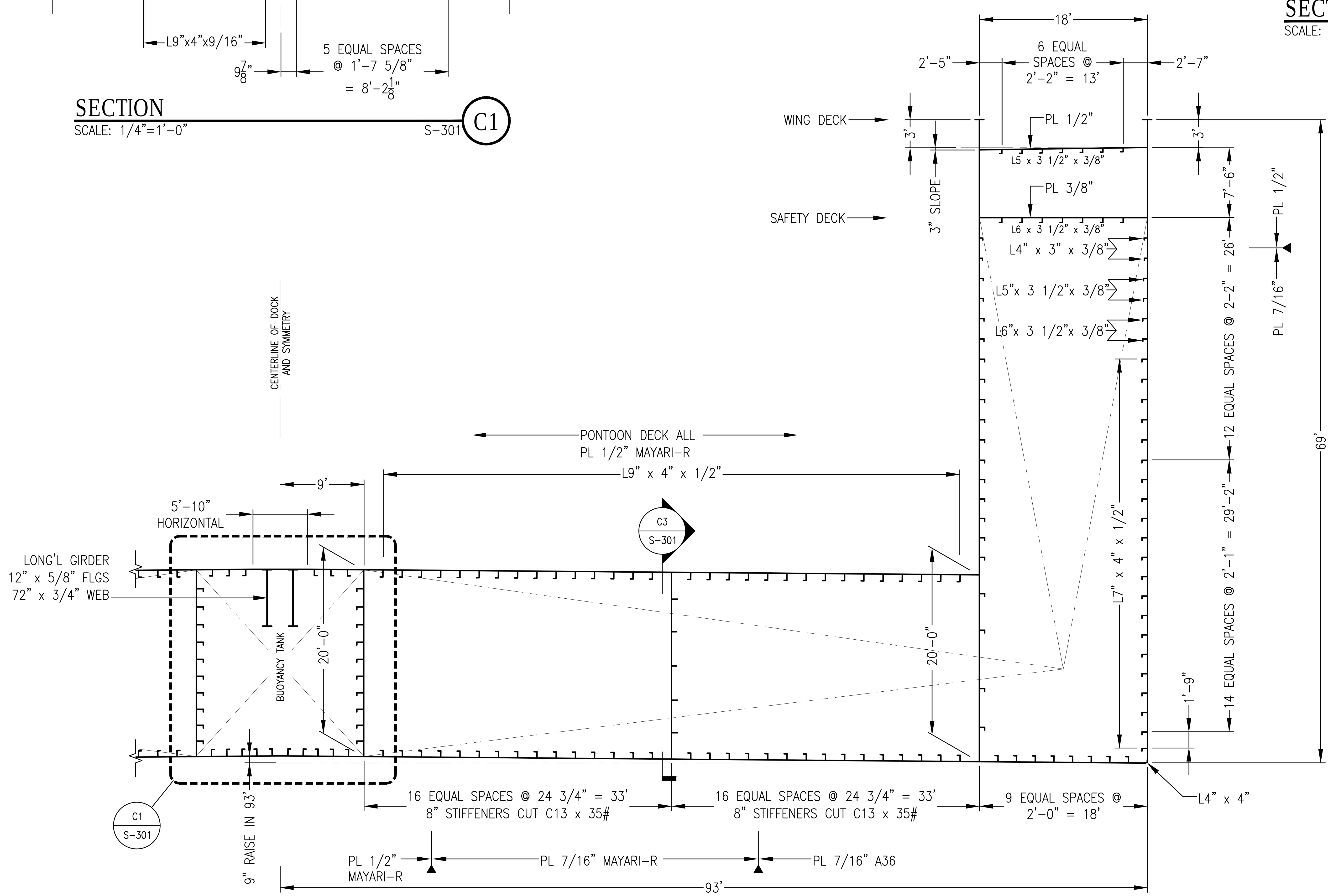
A-009



SECTION
SCALE: 1/4"=1'-0"
C1
S-301



SECTION
SCALE: 1/4"=1'-0"
C3
S-301



SECTION - TYP TRANSVERSE
SCALE: 1/8"=1'-0"
A1

1/4" = 1'-0" 0 1 2 4 8 FT

1/8" = 1'-0" 0 2 4 8 16 FT

HEGER
DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

SYM | DESCRIPTION | DATE | APPR

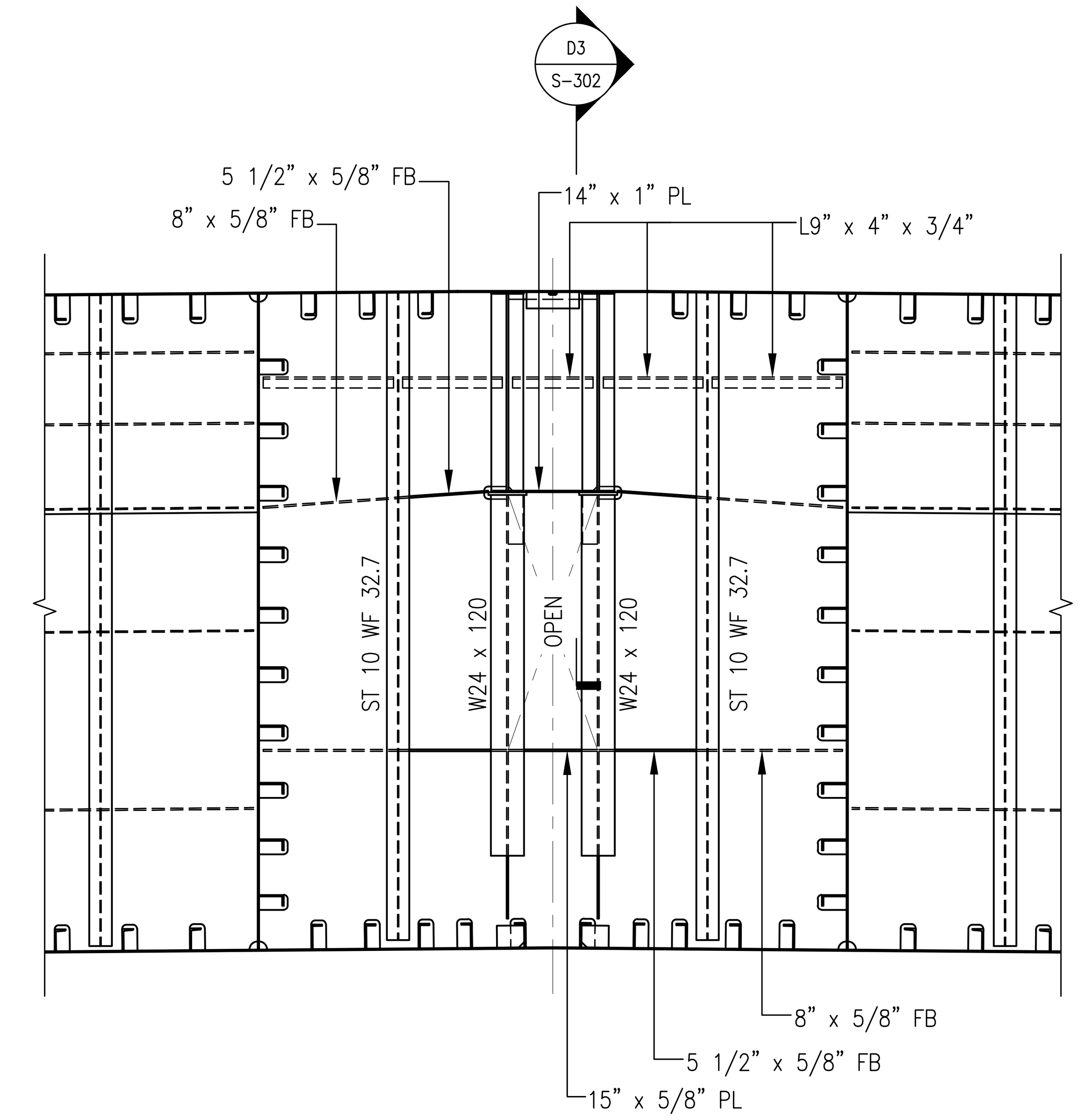
DES MDN DRW JJB CHK MDN
CHIEF ENG. PREMAL SHAH
DATE: 12/06/2016

CLIENT NAME AND ADDRESS: BAE SYSTEMS
SAN FRANCISCO, CA

PROJECT TITLE: COMMERCIAL CERTIFICATION OF FDD #2

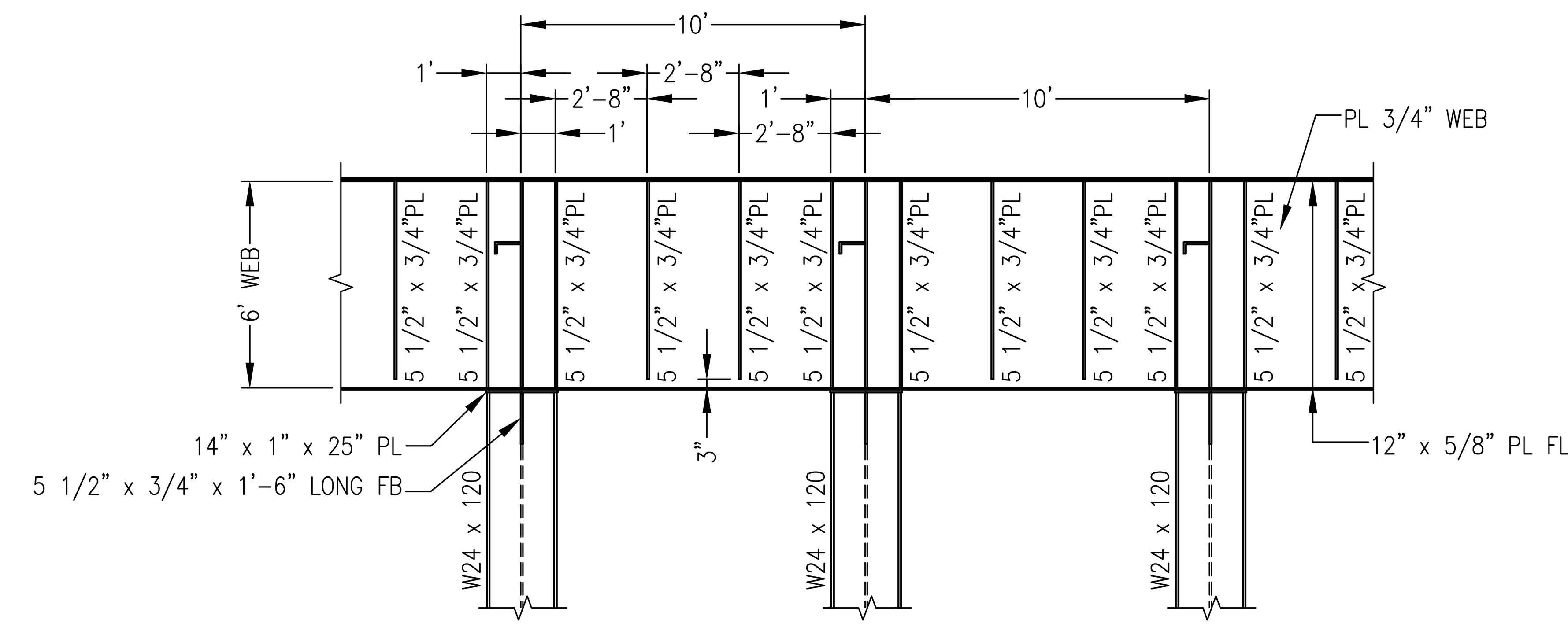
DRAWING TITLE: SECTION - TYPICAL TRANSVERSE

SCALE: AS NOTED
PROJECT NO.: 3973-D
CONSTR. CONTR. NO.
SHEET 11 OF 13
S-301

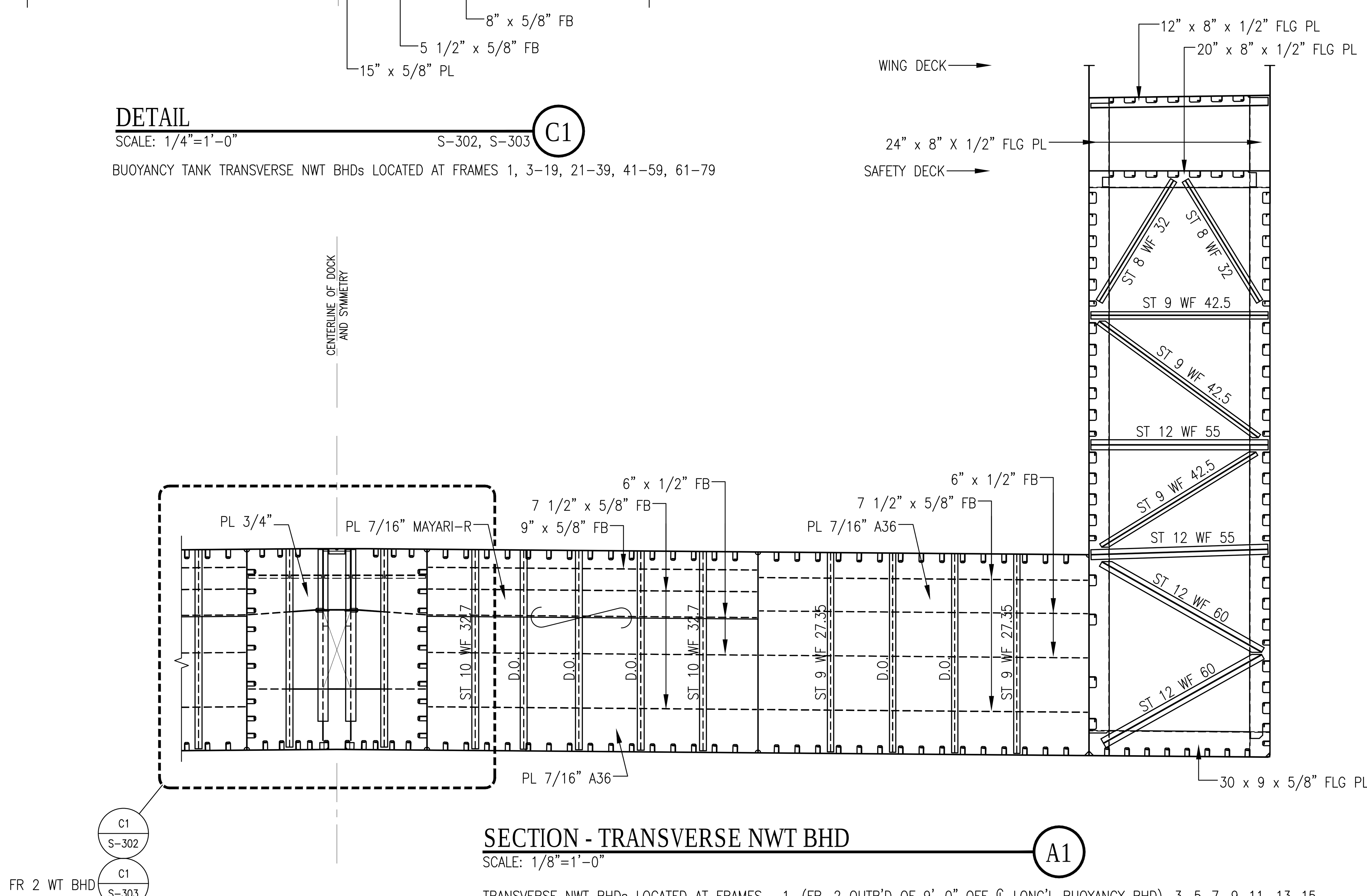


DETAIL
SCALE: 1/4"=1'-0" S-302, S-303 C1

BUOYANCY TANK TRANSVERSE NWT BHDs LOCATED AT FRAMES 1, 3-19, 21-39, 41-59, 61-79



DETAIL - KEEL GIRDER 1'-4 5/8" OFF CENTERLINE
SCALE: 1/4"=1'-0" S-302 D3



SECTION - TRANSVERSE NWT BHD
SCALE: 1/8"=1'-0" A1

TRANSVERSE NWT BHDs LOCATED AT FRAMES 1, (FR, 2 OUTB'D OF 9'-0" OFF ℄ LONG'L BUOYANCY BHD), 3, 5-7, 9-11, 13-15
17-19, 21-23, 25-27, 29-31, 33-35, 37-39, 41-43, 45-47, 49-51, 53-55,
57-59, 61-63, 65-67, 69-71, 73-75 AND 77-79

1/4" = 1'-0" 0 1 2 4 8 FT

1/8" = 1'-0" 0 2 4 8 16 FT

SYM DESCRIPTION DATE APPR

HEGER
DRY DOCK, Inc.

DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

SEAL

DES MDN	DRW JJB	CHK MDN
CHIEF ENG. PREMAL SHAH		
DATE: 12/06/2016		

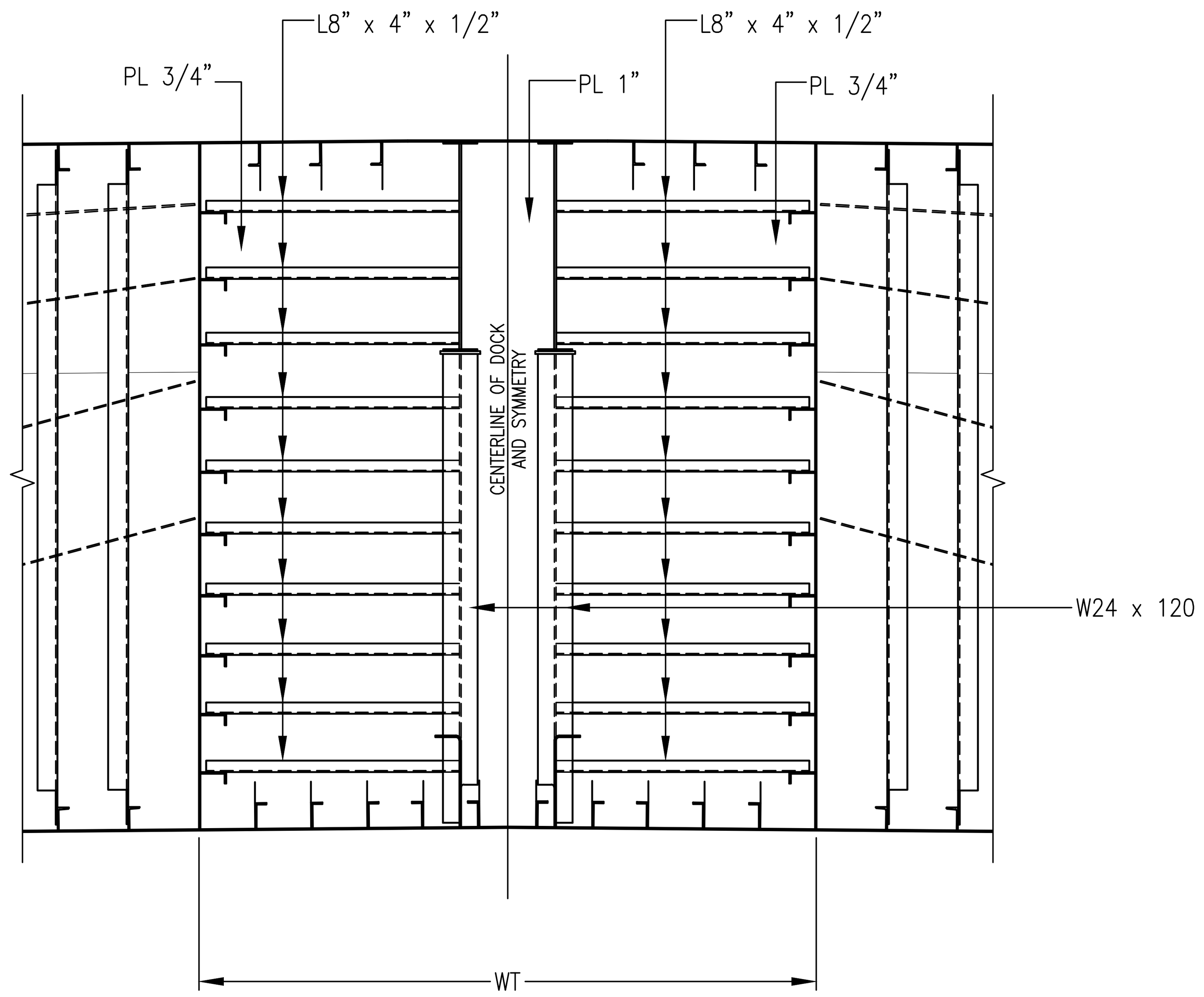
CLIENT NAME AND ADDRESS: BAE SYSTEMS
SAN FRANCISCO, CA

PROJECT TITLE: COMMERCIAL CERTIFICATION OF FDD #2

DRAWING TITLE: SECTION - TRANSVERSE NWT BHD

SCALE:	AS NOTED
PROJECT NO.:	3973-D
CONSTR. CONTR. NO.	
SHEET 12 OF 13	

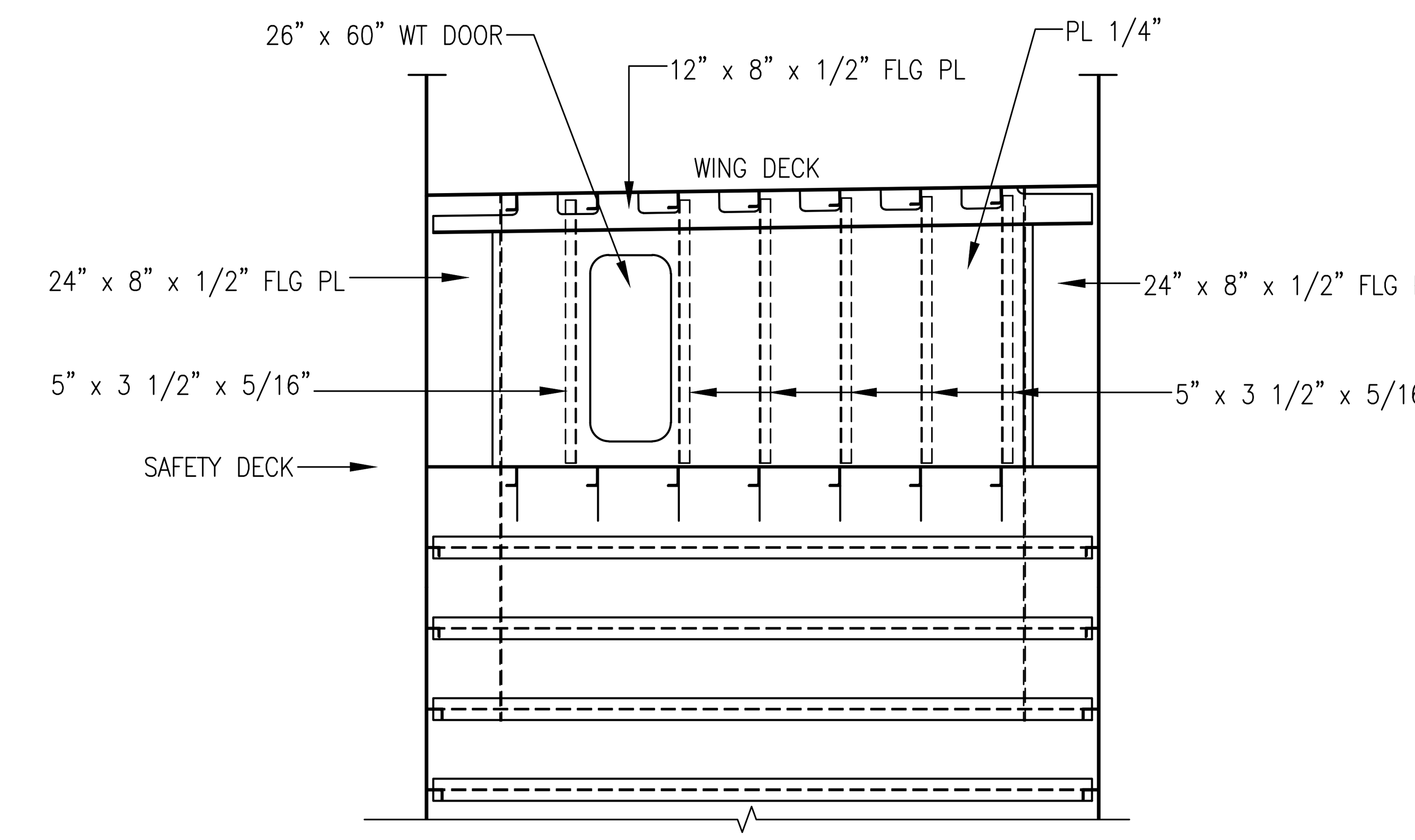
S-302



DETAIL

SCALE: 1/4"=1'-0" S-303 C1

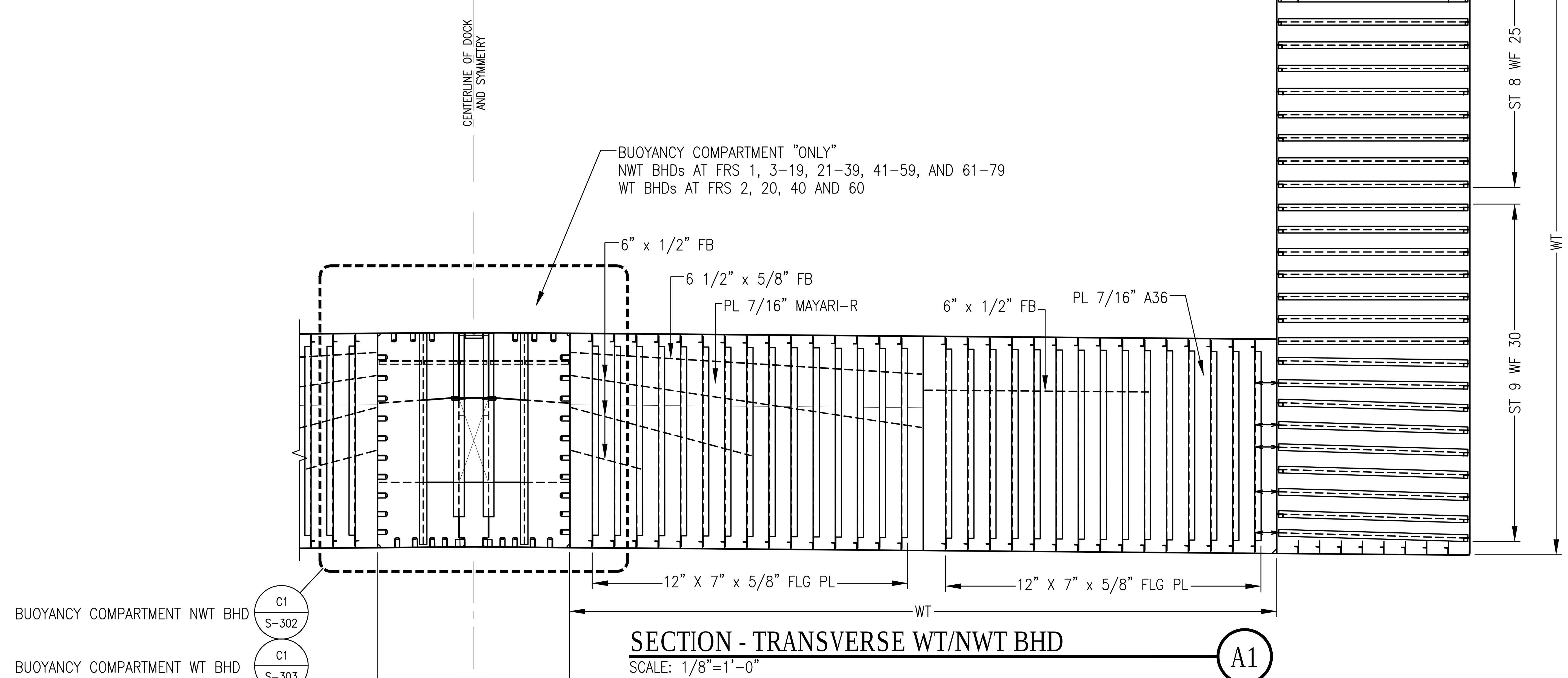
BUOYANCY TANK TRANSVERSE WT BHDs LOCATED AT FRAMES 2, 20, 40 AND 60



DETAIL

SCALE: 1/4"=1'-0" C4

WT BHDs AT FRAMES 20, 40 AND 60



SECTION - TRANSVERSE WT/NWT BHD

SCALE: 1/8"=1'-0" A1

TRANSVERSE WT BHDs LOCATED AT FRAMES 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72 AND 76

1/4" = 1'-0" 0 1 2 4 8 FT

1/8" = 1'-0" 0 2 4 8 16 FT

HEGER DRY DOCK, Inc.

DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES	MDN
DRW	JJB
CHK	MDN
CHIEF ENG.	PREMAL SHAH
DATE	12/06/2016
CLIENT NAME AND ADDRESS	BAE SYSTEMS, SAN FRANCISCO, CA
PROJECT TITLE	COMMERCIAL CERTIFICATION OF FDD #2
DRAWING TITLE	SECTION – TRANSVERSE WT/NWT BHD
SCALE	AS NOTED
PROJECT NO.	3973-D
CONSTR. CONTR. NO.	
SHEET	13 OF 13

S-303

ENCLOSURE 2
TRITON Mooring Limitations

TRITON ENGINEERS, INC.

2400 KETTNER BLVD, SUITE 237
SAN DIEGO, CALIFORNIA 92101 USA

MOORING CALCULATIONS

FOR:

PROJECT: DRY DOCK NO. 2 WIND STUDY

BAE Systems, Inc. San Francisco Ship Repair

CLIENT: *BAE SYSTEMS, INC.*

Contact: Justin Gleaton, Dockmaster

A	FINAL ISSUE	TEG	JVP	5/27/16	
Rev.	Amendment	By	Checked	Date	Approved

FINAL ISSUE		
Issued Only For Purpose Indicated	Date	Approved

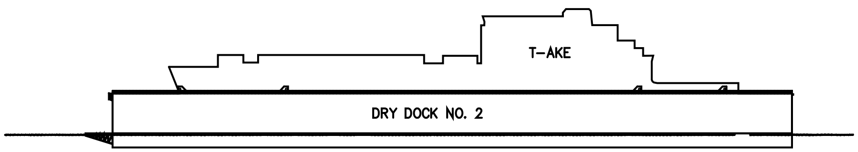
REGISTERED PROFESSIONAL ENGINEER
TROY E. GILLUM
No. C051514
Exp. 6-30-16
CIVIL
STATE OF CALIFORNIA

May 27, 2016
Troy E. Gillum, P.E.

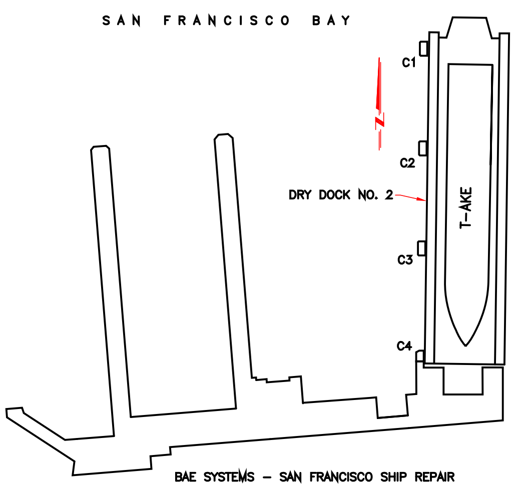
STATEMENT OF DRY DOCK OPERATING LIMITS
T-AKE AT DRY DOCK NO. 2

SIZE OF DOCKED VESSEL:

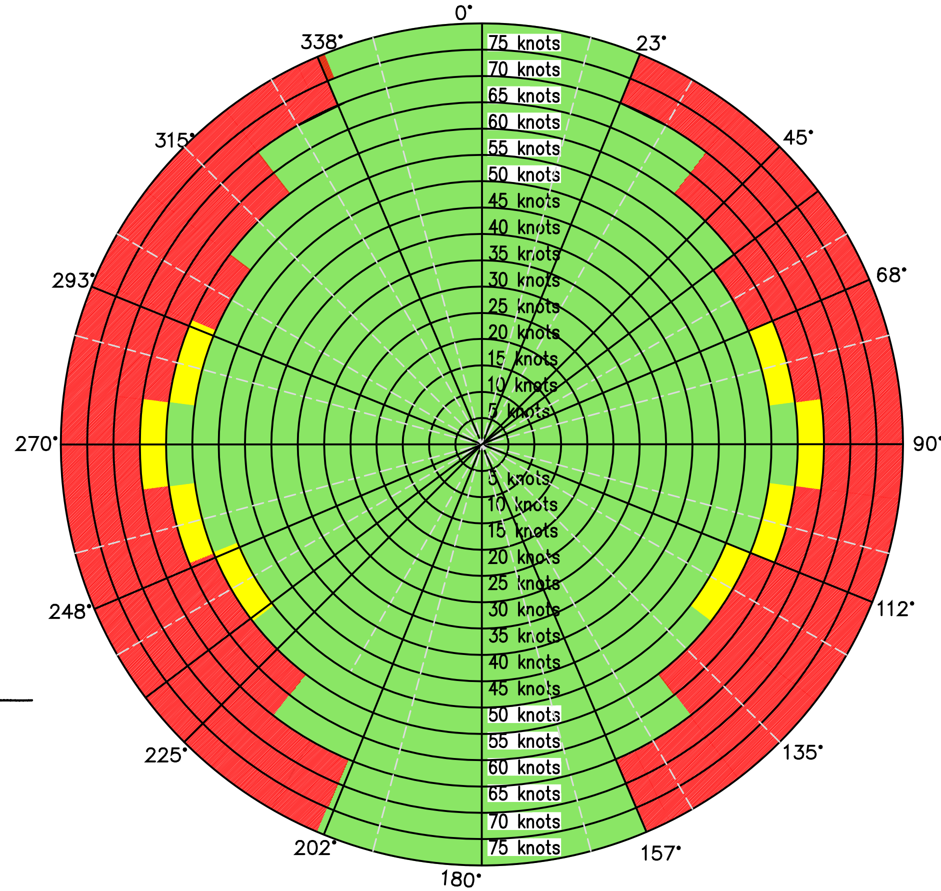
LOA	= 688'
LBP	=
BEAM	= 105'
DRY DOCK LOADED DRAFT	= 5'
BROADSIDE WIND AREA	= 74364 SF
END WIND AREA	= 18000 SF



DOCKED SHIP PROFILE



DRY DOCK MOORING ARRANGEMENT



WIND RESTRICTION DIAGRAM
(WIND DIRECTION FROM/30 SECOND AVERAGE)

LEGEND:

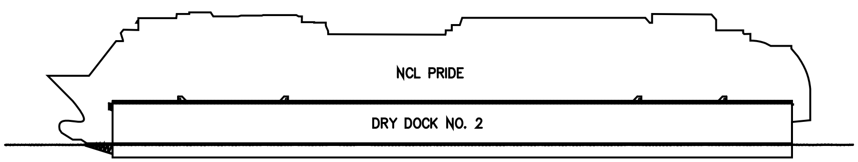
- CALL OUT SUPPORT TUGS (red)
- RESTRICTED OPERATIONS (yellow)
- NORMAL OPERATING CONDITIONS (green)

FIGURE SHOWS WIND ARRIVING IN AZIMUTH DEGREES FROM NORTH, AND INDICATES 30 SEC GUST WIND SPEED. ANALYSIS WAS NOT CARRIED OUT FOR WINDS GREATER THAN 80 KNOTS.

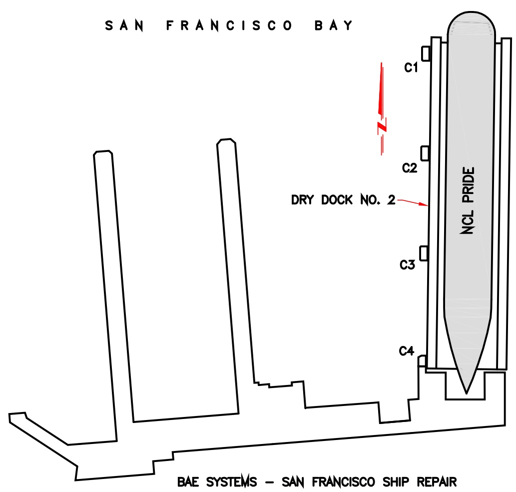
STATEMENT OF DRY DOCK OPERATING LIMITS
NCL PRIDE AT DRY DOCK NO. 2

SIZE OF DOCKED VESSEL:

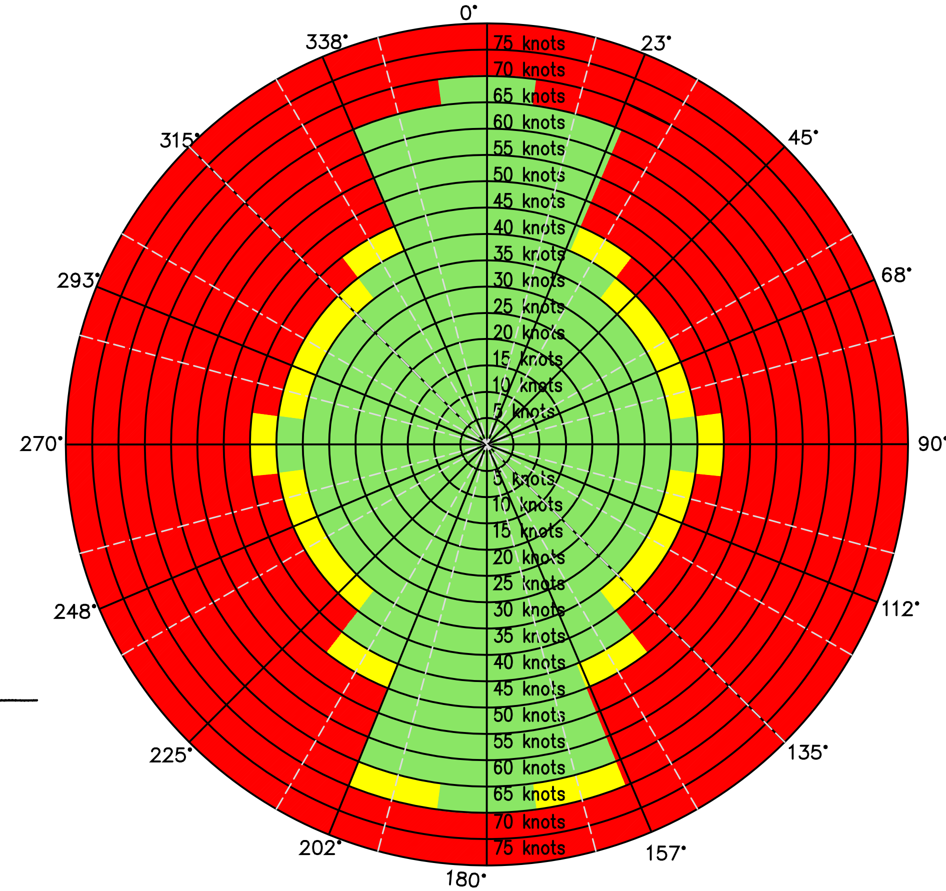
LOA	= 922'
LBP	=
BEAM	= 106'
DRY DOCK LOADED DRAFT	= 5'
BROADSIDE WIND AREA	= 125000 SF
END WIND AREA	= 18000 SF



DOCKED SHIP PROFILE



DRY DOCK MOORING ARRANGEMENT



WIND RESTRICTION DIAGRAM
(WIND DIRECTION FROM/30 SECOND AVERAGE)

LEGEND:

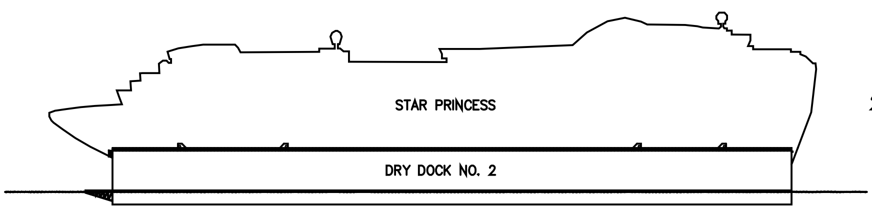
- CALL OUT SUPPORT TUGS (red)
- RESTRICTED OPERATIONS (yellow)
- NORMAL OPERATING CONDITIONS (green)

FIGURE SHOWS WIND ARRIVING IN AZIMUTH DEGREES FROM NORTH, AND INDICATES 30 SEC GUST WIND SPEED. ANALYSIS WAS NOT CARRIED OUT FOR WINDS GREATER THAN 80 KNOTS.

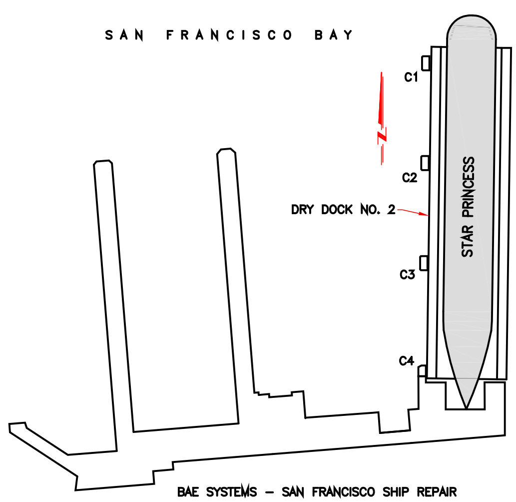
STATEMENT OF DRY DOCK OPERATING LIMITS
STAR PRINCESS AT DRY DOCK NO. 2

SIZE OF DOCKED VESSEL:

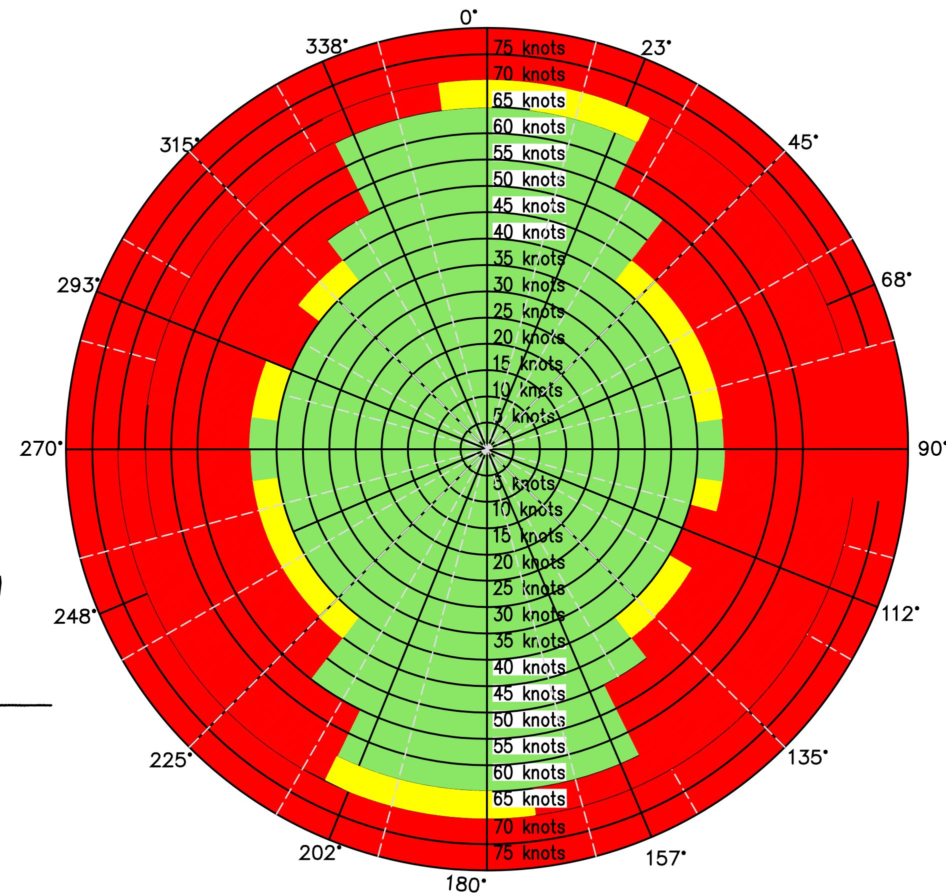
LOA	=	951'
LBP	=	
BEAM	=	118'
DRY DOCK LOADED DRAFT	=	5'
BROADSIDE WIND AREA	=	150000 SF
END WIND AREA	=	25000 SF



DOCKED SHIP PROFILE



DRY DOCK MOORING ARRANGEMENT



WIND RESTRICTION DIAGRAM
(WIND DIRECTION FROM/30 SECOND AVERAGE)

LEGEND:

- CALL OUT SUPPORT TUGS
- RESTRICTED OPERATIONS
- NORMAL OPERATING CONDITIONS

FIGURE SHOWS WIND ARRIVING IN AZIMUTH DEGREES FROM NORTH, AND INDICATES 30 SEC GUST WIND SPEED. ANALYSIS WAS NOT CARRIED OUT FOR WINDS GREATER THAN 80 KNOTS.