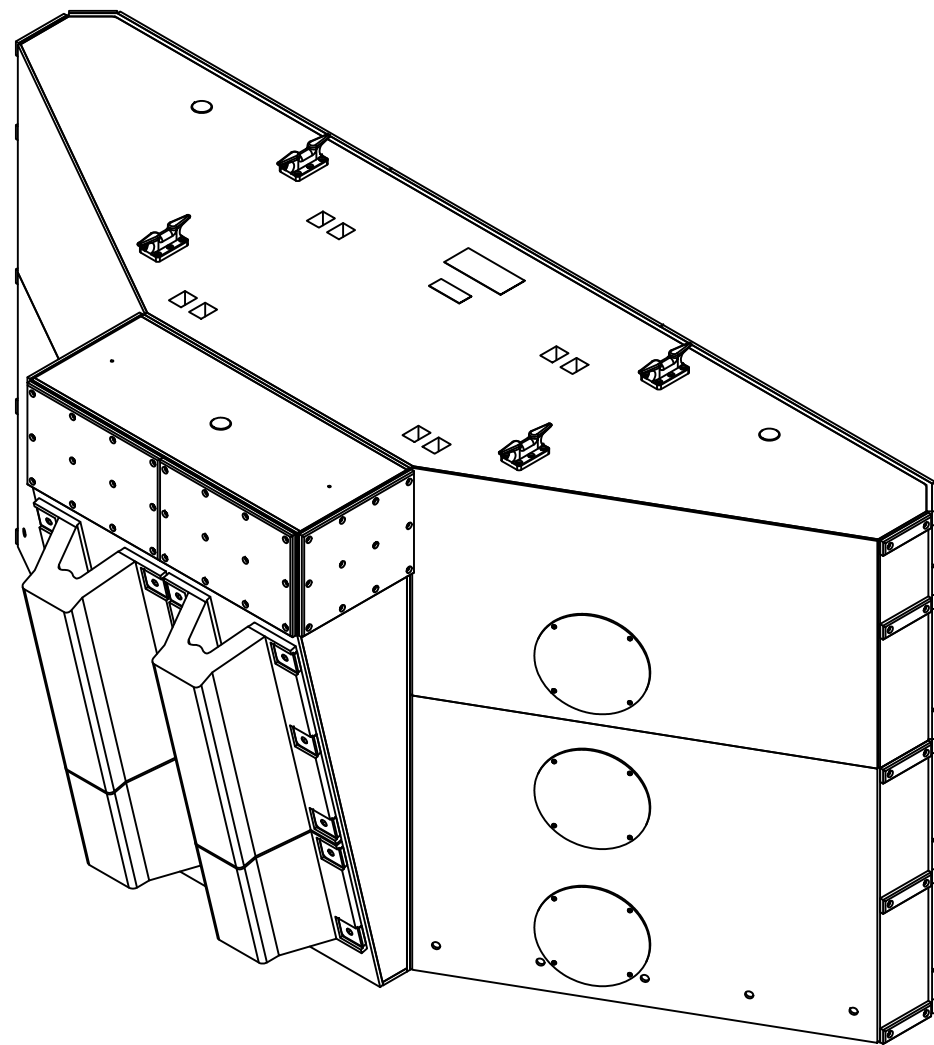


UNIVERSAL SUBMARINE CAMEL GEN. 2

NAVAL FACILITIES ENGINEERING COMMAND



INDEX OF DRAWINGS	
SHEET NUMBER	SHEET TITLE
GENERAL	
G-001	COVER SHEET
G-002	GENERAL ARRANGEMENT
STRUCTURAL	
S-001	STRUCTURAL NOTES
S-002	GENERAL ASSEMBLY
S-003	GENERAL ASSEMBLY SECTION VIEWS
S-004	LIFTING/LOWERING PROCEDURES
S-005	DESIGN DETAILS

GENERAL SYMBOLS	
<p>DETAIL NUMBER SHEET WHERE DETAIL IS DRAWN</p> <p>CALL-OUT INDICATOR</p>	<p>DIRECTION OF VIEW PHOTOGRAPH NUMBER SHEET WHERE PHOTOGRAPH IS SHOWN</p> <p>PHOTOGRAPH INDICATOR</p>
<p>SECTION NUMBER SHEET WHERE SECTION IS DRAWN</p> <p>SECTION CUT INDICATOR</p>	<p>INDICATES DIRECTION OF VIEW ELEVATION NUMBER SHEET WHERE ELEVATION IS DRAWN</p> <p>EXTERIOR ELEVATION INDICATOR</p>
<p>DETAIL TITLE SCALE: 3" = 1'-0"</p> <p>SHEET WHERE TAKEN</p>	<p>PLAN TITLE SCALE: 1/8" = 1'-0"</p> <p>TRUE NORTH DIRECTION</p>

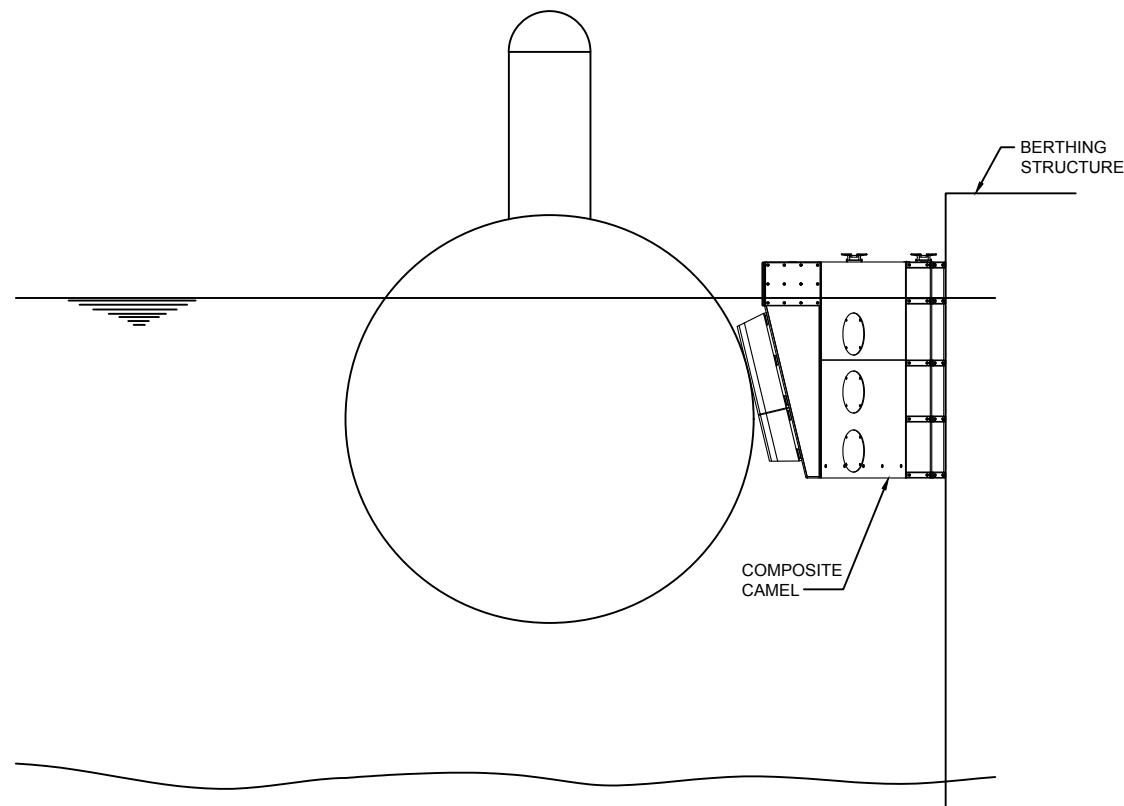
SYN	DESCRIPTION	DATE	APPR
C	TITLE BLOCK/UPDATED PAGE COUNT	04/26/18	AL
B	UNAW ADDED TO FRONT FINGER BOX	04/11/17	AL
A	INITIAL RELEASE	03/29/17	AL



APPROVED
FOR COMMANDER NAVFAC / BLTL
ACTIVITY
SATISFACTORY TO DATE
DES AL DRW LB CHK AL
PROJECT MANAGER
BRANCH MANAGER
ENGR DIRECTOR
CUSTOMER

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND	UNIVERSAL SUBMARINE CAMEL GEN. 2 COVER PAGE
SCALE: NTS	
PROJECT NO.: ---	
CONSTR. CONTR. NO. SPEBEG-14-D-0011	
NAVFAC DRAWING NO. 14064496	
SHEET 1 OF 7	
G-001	
DRAWFORM REVISION: 7 AUGUST 2009	

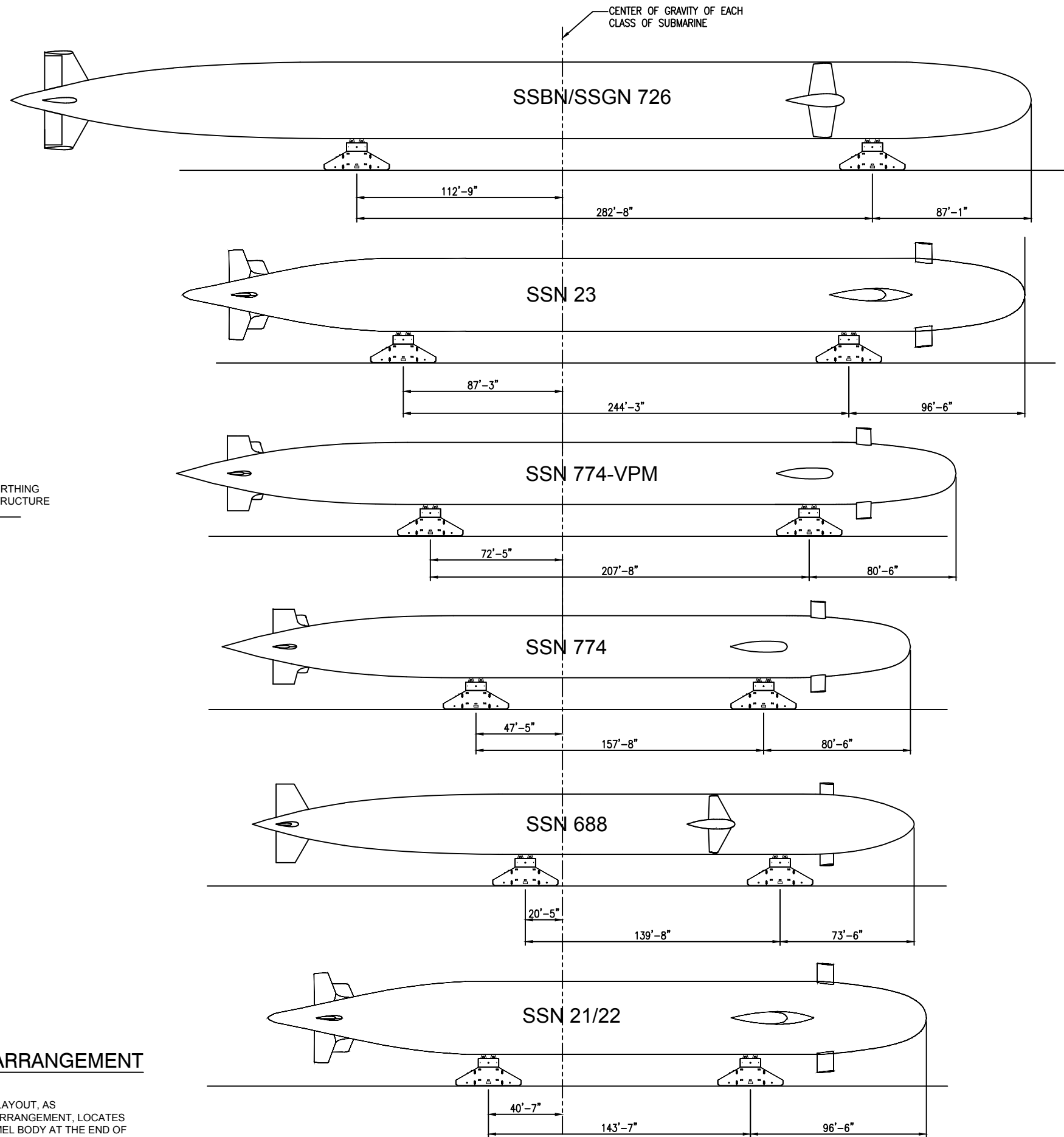
SUBMARINE	DISTANCE BOW TO FORWARD PARALLEL MID-BODY	DISTANCE BOW TO AFT PARALLEL MID-BODY	DISTANCE BOW TO CENTER OF GRAVITY
SSBN/SSGN 726	74' - 7"	382' - 3"	257' - 0"
SSN 23	57' - 6 1/2"	353' - 2 1/2"	253' - 5 1/2"
SSN 774-VPM			
SSN 774	68' - 0"	250' - 8"	190' - 9"
SSN 688	61' - 0"	225' - 8"	192' - 9 1/2"
SSN 21/22	57' - 6 1/2"	252' - 7"	199' - 6"



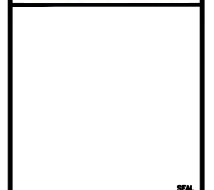
PLAN - CAMEL GENERAL ARRANGEMENT

SCALE: 1/32" = 1'-0"

NOTE: THE ASSUMED CAMEL BERTHING LAYOUT, AS DIMENSIONED IN THE CAMEL GENERAL ARRANGEMENT, LOCATES THE OUTSIDE CORNER OF THE MAIN CAMEL BODY AT THE END OF THE PARALLEL MIDBODY OF EACH SUBMARINE.



SYN	DESCRIPTION	DATE	APPR
C	TITLE BLOCK/UPDATED PAGE COUNT	04/26/18	AL
B	UNAW ADDED TO FRONT PENCER BOX	04/11/17	AL
A	INITIAL RELEASE	03/29/17	AL



APPROVED
FOR COMMANDER NAVFAC / BLTL
ACTIVITY

SATISFACTORY TO DATE
DES AL | DRW LB | CHK AL
PROJECT MANAGER
BRANCH MANAGER
ENGR DIRECTOR
CUSTOMER

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND
UNIVERSAL SUBMARINE CAMEL GEN. 2
COVER PAGE

SCALE: NTS
PROJECT NO.:
CONSTR. CONTR. NO.: SPEBEG-14-D-0011
NAVFAC DRAWING NO.: 14064497
SHEET 2 OF 7
G-002
DRAWING REVISION: 7 AUGUST 2009

GENERAL NOTES

1. THE CAMEL SUPPLIER IS RESPONSIBLE FOR PLACING AND ADJUSTING BALLAST PLATES AS INDICATED UNDER "INITIAL INSTALLATION NOTES."
2. CAMELS ARE DESIGNED FOR EXTREME LOADING CONDITIONS RESULTING FROM THE IMPACT OF A BERTHING SUBMARINE. THE SUBMARINE IS ASSUMED TO INITIALLY IMPACT ONLY ONE (1) CAMEL.
3. CALCULATED DESIGN WEIGHT OF ONE CAMEL IS APPROXIMATELY 87,000 POUNDS INCLUDING BALLAST, WITHOUT WATER. CALCULATED DESIGN WEIGHT OF CAMEL WITHOUT BALLAST IS APPROXIMATELY 86,000 POUNDS. BASED ON THE AS-BUILT WEIGHT OF THE CAMEL (WITHOUT BALLAST) THE AMOUNT AND DISTRIBUTION OF BALLAST MAY VARY. IF THE AS-BUILT WEIGHT OF THE CAMEL (WITHOUT BALLAST) IS DIFFERENT THAN 87,000 POUNDS, THE CAMEL SUPPLIER SHALL BE RESPONSIBLE FOR PROVIDING ADDITIONAL BALLAST AS REQUIRED SUCH THAT THE SPECIFIED FREEBOARD, TRIM, AND STABILITY ARE MAINTAINED.
4. ALL DESIGN DRAWINGS, SHOP DRAWINGS, CALCULATIONS, MATERIAL LISTS, AND ANY OTHER DOCUMENTS USED IN DESIGN, FABRICATION, OR INSTALLATION OF THE CAMELS SHALL BECOME THE PROPERTY OF THE GOVERNMENT.
5. CAMELS SHALL BE COMPLETELY FLOODED WHEN SUBMERGED.
6. TOW/MOVE CAMEL IN WATER USING AT LEAST TWO CLEATS OR 2 OF THE 4 LIFTING LOCATIONS.

DESIGN PARAMETERS

1. DESIGN PARAMETERS OF THE COMPOSITE SUBMARINE CAMELS HAVE BEEN ESTABLISHED BASED ON THE FOLLOWING CLASSES OF SUBMARINES:
 - 1.1. LOS ANGELES CLASS (SSN 688)
 - 1.2. VIRGINIA CLASS (SSN 774)
 - 1.3. SEAWOLF CLASS (SSN 21/22)
 - 1.4. USS JIMMY CARTER (SSN 23) (MODIFIED SEAWOLF CLASS)
 - 1.5. OHIO CLASS (SSBN 730)
 - 1.6. (CONVERTED) OHIO CLASS (SSGN 726)
2. VESSEL CHARACTERISTICS

SUBMARINE	SSN 688	SSN 774	SSN 21/22	SSN 23	SSBN/SSGN 726
LENGTH (FT)	360	377	353	453	560
BEAM (FT)	33	34	40	40	42
DISP. (LT)	6237	6958	8096	10460	16783

DESIGN LOADS -

- 3.1. SUBMARINE BERTHING:
 - 309 FT-KIP DESIGN ENERGY (INCLUDES 1.5 ACCIDENTAL FACTOR) FROM SSGN 726 AT 0.4 FT/SEC BERTHING VELOCITY NORMAL TO CAMEL. ENERGY IS ABSORBED BY ARCH RUBBER FENDERS.
- 3.2. MOORING LOAD ON CLEATS: 10 KIPS PER CLEAT (HORIZONTAL) (ASSUME 2 CLEATS USED TO MOOR CAMEL TO BERTH)
- 3.3. NON-VESSEL LOADING (SIMULTANEOUSLY APPLIED):
 - LIVE LOAD ON TOP OF CAMEL: 50 PSF
 - CONCENTRATED LOAD ALONG TOP PERIMETER OF CAMEL: 500 LB

CODES AND STANDARDS

1. UFC 4-151-10, "GENERAL CRITERIA FOR WATERFRONT CONSTRUCTION."
2. UFC 4-152-01, "DESIGN: PIERS AND WHARVES"
3. UFC 4-159-03, "DESIGN: MOORINGS"
4. TR-6064-OCN "BERTHING GUIDELINES FOR SUBMARINES"
5. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) "MANUAL OF STEEL CONSTRUCTION" 13TH EDITION.

COMPOSITE SANDWICH PANEL NOTES

1. COMPOSITE SANDWICH PANELS SHALL HAVE THE MINIMUM MATERIAL PROPERTIES AS SPECIFIED IN SPECIFICATION SECTION 06 90 00.
2. THE OVERALL THICKNESS OF THE COMPOSITE PANELS VARIES PER THIS DRAWING.
3. ALL EDGES AND OPENINGS IN PANELS SHALL BE WRAPPED WITH FACE LAMINATE MATERIAL TO CREATE A CONTINUOUS AND SMOOTH EDGE WITH NO CORE MATERIAL EXPOSED.
4. COLOR OF THE PANELS SHALL BE YELLOW, OR AS INDICATED BY THE GOVERNMENT.

ADHESIVE NOTES

1. METHYL METHACRYLATE (MMA) ADHESIVE SHALL BE USED TO CONNECT FRP SHAPES AND PVC PIPES AND FITTINGS TO THE COMPOSITE PANELS.
2. CURED MMA ADHESIVE SHALL HAVE A MINIMUM TENSILE STRENGTH OF 2,500 PSI; A MINIMUM SHEAR AND BONDING STRENGTH OF 1,700 PSI.

STEEL NOTES:

1. FABRICATE AND ERECT STEEL CONFORMING TO THE REQUIREMENTS OF AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), "MANUAL OF STEEL CONSTRUCTION" 13TH ED.
2. SUBMIT INSTALLATION PLANS AND SHOP DETAILS AND RECEIVE APPROVAL BEFORE PROCEEDING WITH FABRICATION.
3. STAINLESS STEEL (SS) PLATES:
 - 3.1. ASTM A 240 TYPE 316 SS PLATES
4. STAINLESS STEEL (SS) BOLTS, NUTS, AND WASHERS:
 - 4.1. PROVIDE ASTM A 193 AND ASTM A 194 TYPE 316 SS FASTENERS.
5. PROVIDE ASTM A 276 TYPE 316 STAINLESS STEEL RODS.

FRP ANGLE NOTES:

1. FABRICATE ANGLES USING VACUUM INFUSION PROCESS.
 - 1.1. FIBERGLASS CONTENT SHALL BE 370 TO 380 OZ/SQ.YD.
 - 1.2. FIBERS IN 0 DEGREE DIRECTION (LENGTH OF ANGLE) SHALL BE 16-20%.
 - 1.3. FIBERS IN +45 DEGREE DIRECTION SHALL BE 23-28%.
 - 1.4. FIBERS IN -45 DEGREE DIRECTION SHALL BE 23-28%.
 - 1.5. FIBERS IN 90 DEGREE DIRECTION SHALL BE 29-33%.

FLOTATION FOAM NOTES

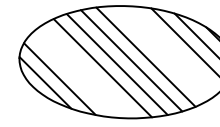
1. FLOTATION FOAM SHALL BE A RIGID, CLOSED CELL FOAM WHICH WILL RESIST THE ABSORPTION OF WATER.
2. DENSITY OF FOAM SHALL BE 2 PCF.
3. FOAM SHALL ENTIRELY FILL THE AREA OF THE CAMEL AS INDICATED ON THE DRAWINGS.

ARCH RUBBER FENDER NOTES

1. ARCH RUBBER FENDER SIZE SHALL BE AS SHOWN ON DRAWINGS.
2. ARCH RUBBER FENDERS SHALL HAVE THE CAPACITY TO ABSORB 35,000 FOOT-POUNDS OF ENERGY ±10% PER FOOT OF FENDER LENGTH WHEN 50% COMPRESSED, WITH A CORRESPONDING REACTION LOAD OF NOT MORE THAN 31,500 POUNDS ±10% PER FOOT OF FENDER LENGTH.
3. RUBBER SHALL BE IN ACCORDANCE WITH ASTM D 2000.
4. IF ARCH RUBBER FENDERS CANNOT BE PROCURED AT THE EXACT LENGTH AS SHOWN HEREIN, PROVIDE JOINT IN FENDERS AT A POINT APPROXIMATELY 1/3 OF THE TOTAL LENGTH FROM THE BOTTOM OF THE FENDERS.

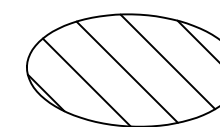
INITIAL INSTALLATION NOTES:

1. GALVANIZED STEEL BALLAST PLATES SHALL NOT BE INSTALLED UNTIL THE CAMELS ARE DELIVERED TO THE SITE.
2. AFTER INITIAL PLACEMENT IN WATER, THE FLOTATION OF THE CAMEL WILL BE OBSERVED BY THE CONTRACTING OFFICER TO DETERMINE THE PLACEMENT OF THE FINAL TRIM STEEL BALLAST PLATES FOR DESIRED FLOTATION POSITION (FREEBOARD AS INDICATED ON DRAWINGS AND LIST/TRIM NO GREATER THAN 1 DEGREE).
3. CAMEL TRIM SHALL BE ADJUSTED USING THE BALLAST ADJUSTMENT HOLES.
4. GALVANIZED STEEL BALLAST PLATES FOR THE REMAINING CAMEL SHALL BE INSTALLED TO MATCH THAT OF THE FIRST CAMEL.



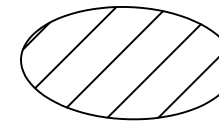
PRIMARY WEBS ARE CONTINUOUS. SECONDARY WEBS ARE TERMINATED AT THE PRIMARY WEBS.

BI-DIRECTIONAL PANEL CORE

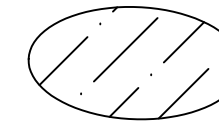


PRIMARY WEBS ARE CONTINUOUS.

UNI-DIRECTIONAL PANEL CORE

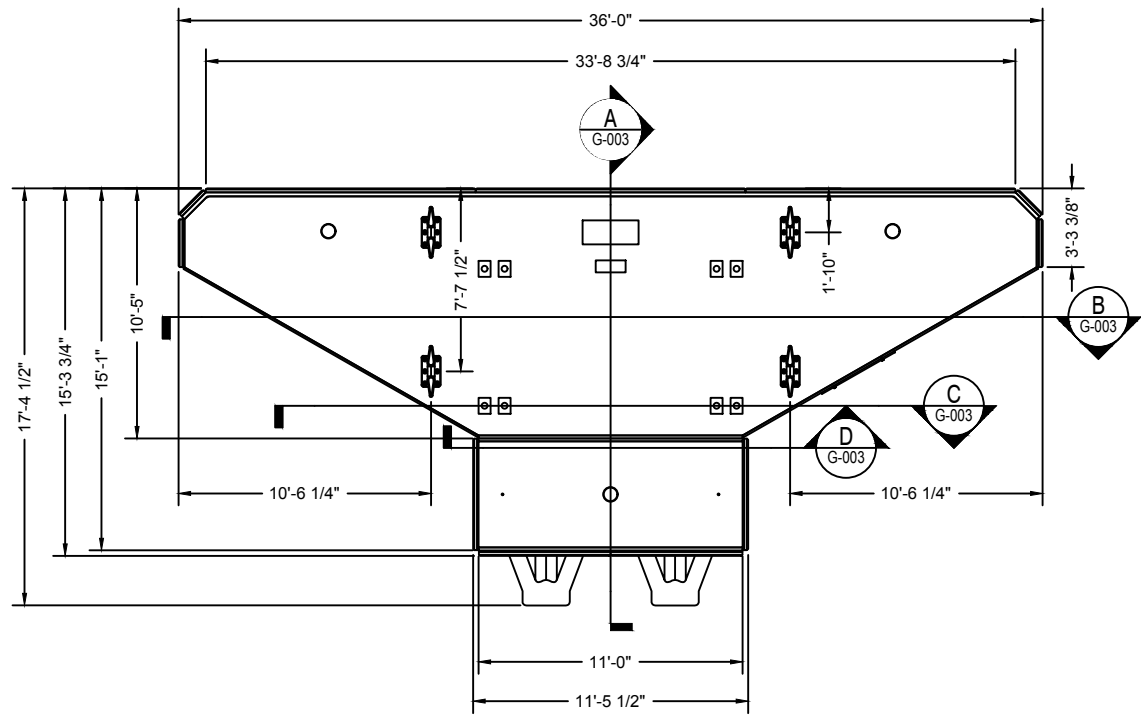


SOLID LAMINATE PANEL



FLOTATION FOAM

AL	AL	AL	APPR
04/26/18	04/11/17	03/29/17	DATE
C	B	A	SYN
TITLE BLOCK/UPDATED PAGE COUNT		DESCRIPTION	
DRAWN TO FRONT FENDER BOX		INITIAL RELEASE	
APPROVED			
FOR COMMANDER NAVFAC / BLTL			
ACTIVITY			
SATISFACTORY TO DATE			
DES	AL	DRW	LB
CHK	AL		
PROJECT NUMBER			
BRANCH NUMBER			
ENGR DIRECTOR			
CUSTOMER			
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND NAVAL FACILITIES ENGINEERING COMMAND UNIVERSAL SUBMARINE CAMEL GEN. 2 STRUCTURAL NOTES			
SCALE: AS NOTED			
PROJECT NO.:			
CONSTR. CONTR. NO. SPEBEG-14-D-0011			
NAVFAC DRAWING NO. 14064498			
SHEET 3 OF 7			
S-001			
DRAWING REVISION: 7 AUGUST 2009			

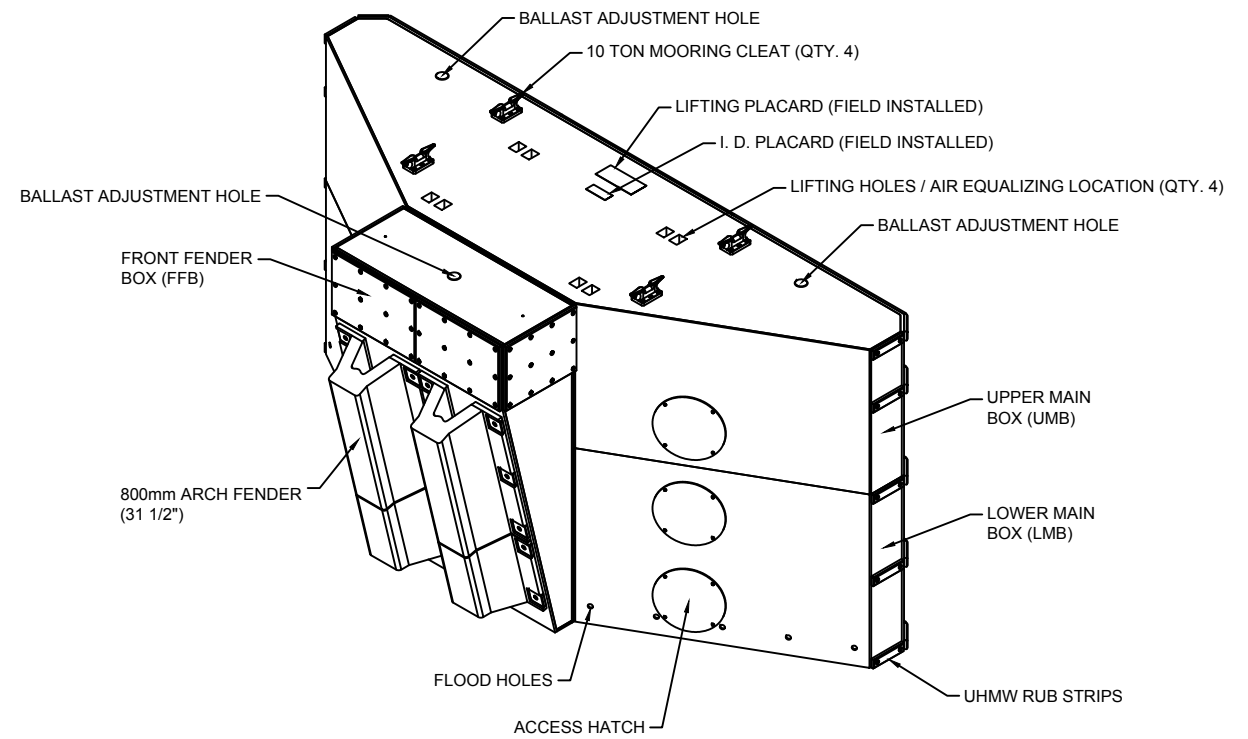


TOP VIEW - COMPOSITE WIDE BODY CAMEL

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

G-003

A1

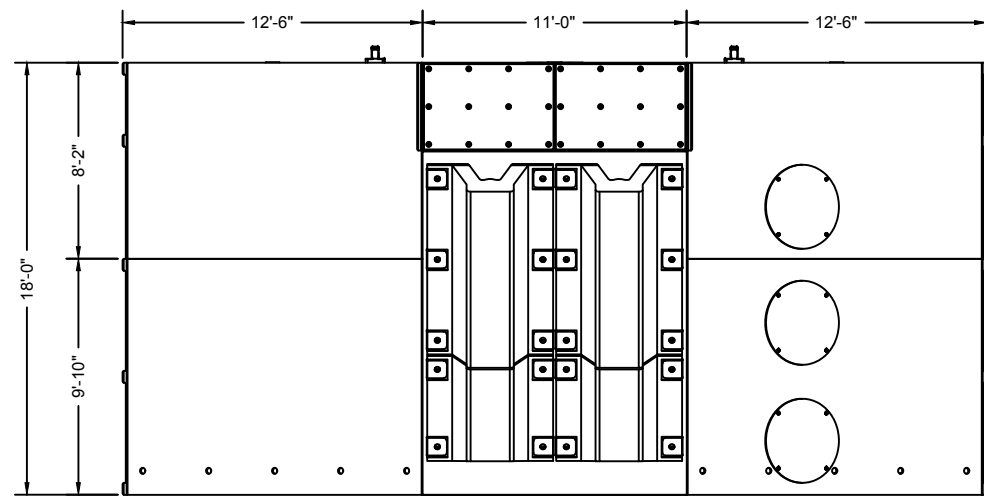


ISOMETRIC VIEW - COMPOSITE WIDE BODY CAMEL

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

G-003

A2

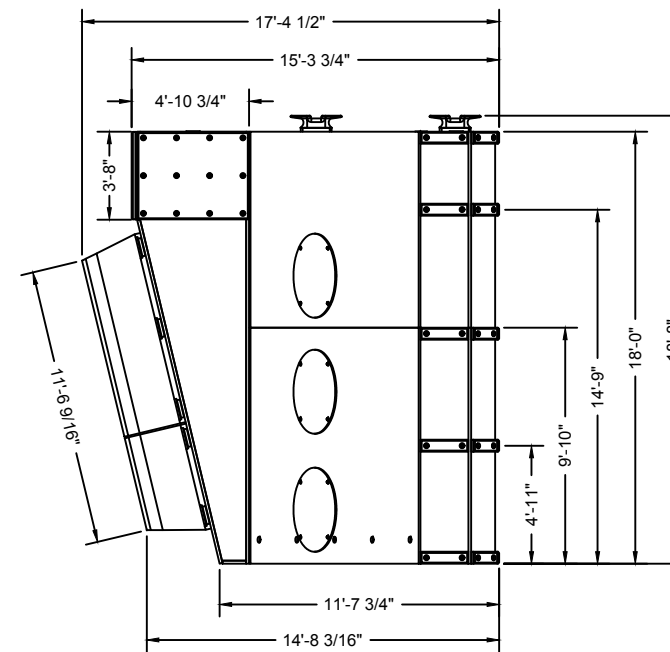


FRONT VIEW - COMPOSITE WIDE BODY CAMEL

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

G-003

A3



SIDE VIEW - COMPOSITE WIDE BODY CAMEL

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

G-003

A4

AL	04/26/18	DATE	APPR
AL	04/11/17	DATE	APPR
AL	03/29/17	DATE	APPR
SYN		DESCRIPTION	
A		INITIAL RELEASE	
B		UNAW ADDED TO FRONT FENDER BOX	
C		TITLE BLOCK/UPDATED PAGE COUNT	



APPROVED
FOR COMMANDER NAVFAC / BLTL
ACTIVITY
SATISFACTORY TO DATE
DES AL DRW LB CHK AL
PROJECT MANAGER
BRANCH MANAGER
ENGR DIRECTOR
CUSTOMER

DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 NAVAL FACILITIES ENGINEERING COMMAND
 UNIVERSAL SUBMARINE CAMEL GEN. 2
 GENERAL ASSEMBLY

SCALE	AS NOTED
PROJECT NO.	
CONSTR. CONTR. NO.	SPEBEG-14-D-0011
NAVFAC DRAWING NO.	14064499
SHEET	4 OF 7

S-002
 DRAWFORM REVISION: 7 AUGUST 2009

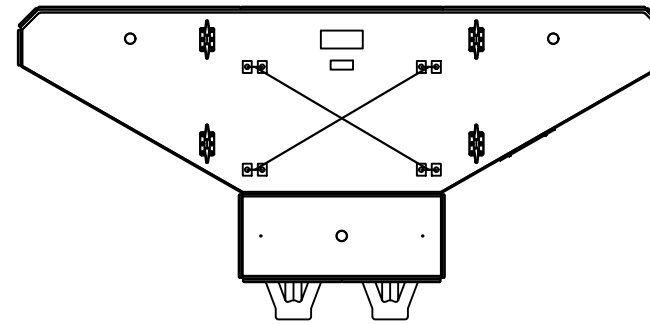
CAMEL LIFTING NOTES

LOADS:

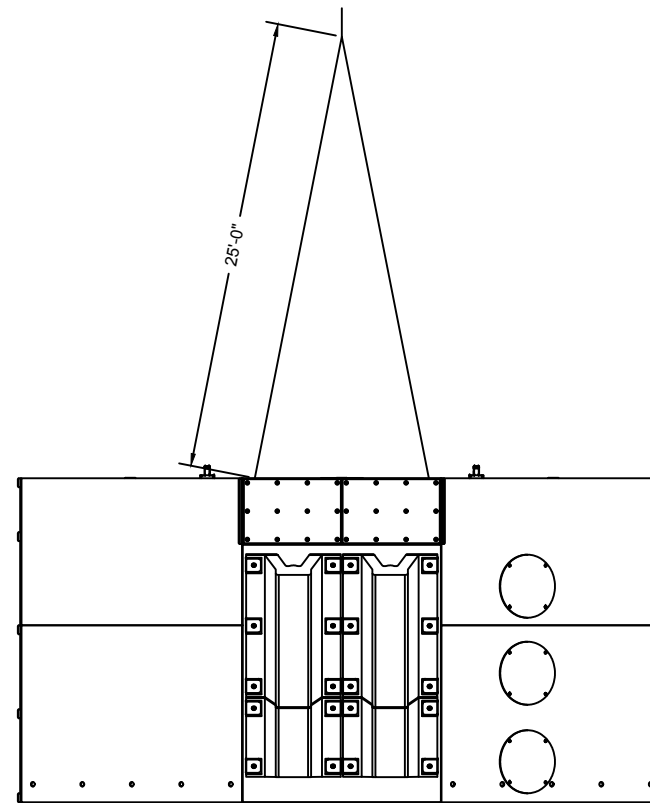
1. "DRY" WEIGHT OF CAMEL (WITHOUT ANY WATER INSIDE): 87,000 POUNDS.
2. "GROSS" WEIGHT OF CAMEL (FILLED WITH WATER): 400,000 POUNDS.
3. MAXIMUM LIFT IF PROPER PROCEDURES ARE FOLLOWED (SEE BELOW): 100,000 POUNDS.

PROCEDURES FOR LOWERING/LIFTING CAMEL INTO/OUT OF THE WATER:

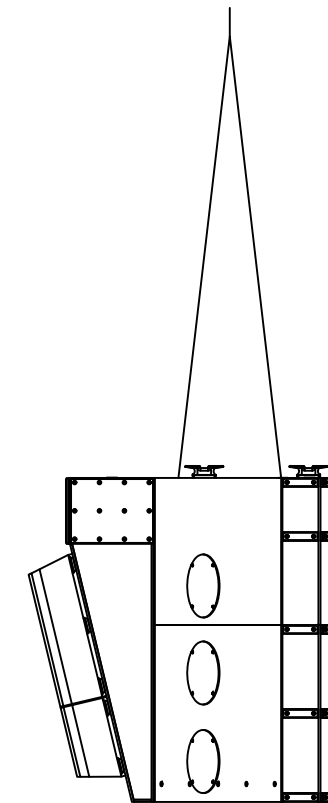
1. THESE NOTES APPLY TO LIFTING/LOWER THE CAMEL INTO THE WATER DURING INITIAL INSTALLATION AND AFTER INITIAL INSTALLATION HAS TAKEN PLACE.
2. LOWERING THE CAMEL INTO THE WATER:
 - 2.1. CAMEL MUST BE LIFTED USING ALL 4 BUILT IN LIFTING BARS.
 - 2.2. 4-25' LONG LIFTING SLINGS, ARRANGED DIAGONALLY, SHALL BE SECURED AND ATTACHED TO CRANE HOIST AT HEIGHT AS INDICATED.
 - 2.3. THE CAMEL SHALL BE LOWERED INTO THE WATER SLOWLY SUCH THAT THE GENERAL ORIENTATION OF THE CAMEL SHALL BE MAINTAINED WITH THE FLOTATION FOAM LOCATED "UP" AND THE BALLAST LOCATED "DOWN" FOR THE ENTIRE DURATION WHILE HOISTING THE CAMEL FROM THE BULKHEAD/PIER INTO THE WATER.
3. LIFTING THE CAMEL OUT OF THE WATER:
 - 3.1. CAMEL MUST BE LIFTED USING ALL 4 BUILT IN LIFTING BARS.
 - 3.2. 4-25' LONG LIFTING SLINGS, ARRANGED DIAGONALLY, SHALL BE SECURED AND ATTACHED TO CRANE HOIST AT HEIGHT AS INDICATED.
 - 3.3. THE CAMEL SHALL BE LIFTED OUT OF THE WATER SLOWLY TO MAINTAIN LESS THAN 100,000 POUNDS ON THE LMI. EXPECTED LIFT TIME IS 15 MINUTES.



UPPER PLAN



FRONT ELEVATION



SIDE ELEVATION

TOTAL LOAD - 55 TONS MAXIMUM
 4 LIFT POINTS REQUIRED
 MINIMUM SLING CAPACITY - 30 TONS
 LIFTING HOLES ACT AS AIR EXCHANGE HOLES ON TOP OF CAMEL
 5 DRAINAGE HOLES ON EACH END BELOW WATERLINE
 LIFT SLOWLY, PERIODICALLY PAUSING TO ALLOW FOR COMPLETE DRAINAGE (LMI NOT TO EXCEED 110 KIP)

LIFTING PROCEDURES AND DIAGRAM SIGN

I. D. PLATE

CAMEL LIFTING SCHEMATICS
 SCALE: 3/16" = 1'-0"

- NOTES: 1. SERIAL NO. SHALL BE "UCSC-###" W/NUMBERS PROVIDED BY CONTRACTING OFFICER.
 2. ATTACH SIGNS IN A PERMANENT AND WEATHERPROOF MANNER OR PAINT DIRECTLY ON CAMEL AND CLEAR COAT FOR WEATHER PROTECTION.

AL	DATE	APPR
AL	04/26/18	
AL	04/11/17	
AL	03/29/17	
SYN	DESCRIPTION	
A	INITIAL RELEASE	
B	UNAW ADDED TO FRONT FENDER BOX	
C	TITLE BLOCK/UPDATED PAGE COUNT	



APPROVED

FOR COMMANDER NAVFAC / BLTL

ACTIVITY

SATISFACTORY TO DATE

DES	AL	DRW	LB	CHK	AL
-----	----	-----	----	-----	----

PROJECT MANAGER

ENGR DIRECTOR

CUSTOMER

DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING COMMAND
 NAVAL FACILITIES ENGINEERING COMMAND

UNIVERSAL SUBMARINE CAMEL GEN. 2
 LIFTING/LOWER PROCEDURES

SCALE: AS NOTED

PROJECT NO.:

CONSTR. CONTR. NO. SPEBEG-14-D-0011

NAVFAC DRAWING NO. 14064501

SHEET 6 of 7

S-004

DRAWFORM REVISION: 7 AUGUST 2009

