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 105,000 POUNDS INCLUDING BALLAST, WITHOUT WATER. CALCULATED DESIGN WEIGHT OF CAMEL WITHOUT BALLAST IS APPROXIMATELY 70,000 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 70,000 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. FLOODING/DRAINAGE AND AIR EQUALIZATION HOLES SHALL ONLY BE CAPPED ONCE FLOODING OF CAMEL HAS BEEN COMPLETED AFTER LOWERING CAMEL IN THE WATER.

6. TOW/MOVE CAMEL IN WATER USING AT LEAST BOTH CLEATS OR 2 OF THE 4 LIFTING BARS.

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

3. 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 SHALL BE THE THICKNESS OF EACH FACE PLUS 3.5 INCH THICKNESS OF CORE.

3. THICKNESS OF FRP FACES OF PANEL SHALL BE NOMINAL 0.3 INCHES EACH FACE.

4. 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.

5. COLOR OF THE PANELS AND EXTERIOR POLYMER COATING SHALL BE YELLOW, OR AS INDICATED BY THE GOVERNMENT. PANELS SHALL NOT BE PAINTED.

CONCRETE NOTES

1. PROVIDE CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.

2. DETAIL AND CONSTRUCT CONCRETE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE ACI 301, "SPECIFICATION FOR STRUCTURAL CONCRETE."

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 1,000 PSI.

3. BONDLINE SHALL HAVE MINIMUM THICKNESS OF 0.030 INCH AND MINIMUM COVERAGE AREA OF 75%.

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. PROVIDE ASTM A 36 STEEL PLATES AND BARS.

4. STEEL AND STAINLESS STEEL (SS) BOLTS, NUTS, AND WASHERS:

   4.1. PROVIDE ASTM A 307 STEEL FASTENERS.
   4.2. PROVIDE ASTM A 193 AND ASTM A 194 TYPE 316 SS FASTENERS.

5. PROVIDE ASTM A 36 STEEL RODS.

6. HOT DIP GALVANIZE IN ACCORDANCE WITH ASTM A 123.

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 ⅓ OF THE TOTAL LENGTH FROM THE BOTTOM OF THE FENDERS.

INITIAL INSTALLATION NOTES:

1. 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 SHALL BE REMOVED FROM THE WATER FOR ADJUSTMENT OF STEEL BALLAST PLATES. AFTER ADJUSTMENT OF STEEL PLATES, PLACE CAMEL BACK IN WATER FOR OBSERVATION. ASSUME THAT THIS PROCEDURE WILL BE REPEATED UP TO 3 TIMES FOR THE FIRST CAMEL.

4. LIVE LOAD CAPACITY SHALL BE TESTED AS FOLLOWS (WHILE CAMEL IS FLOATING): PROVIDE CONCENTRATED LOAD OF 500 LB AT EACH CORNER OF THE CAMEL AND MID-WAY OF EACH PERIMETER EDGE (8 LOCATIONS TOTAL, ONE LOCATION AT A TIME; CAMEL TRIM/LIST ANGLE IS REQUIRED TO REMAIN WITHIN 1 DEGREE OF HORIZONTAL.

5. STEEL BALLAST PLATES FOR THE REMAINING CAMEL SHALL BE INSTALLED TO MATCH THAT OF THE FIRST CAMEL.

6. INSTALL THE TOP PANEL AFTER THE FINAL STEEL BALLAST PLATE QUANTITY AND LOCATION HAS BEEN ESTABLISHED.

7. CAP ALL FLOODING/DRAINAGE HOLES AND AIR EQUALIZATION HOLES AFTER CAMEL IS PLACED IN WATER.

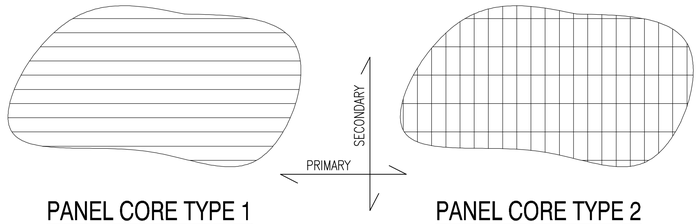
INSPECTION AND ACCEPTANCE

1. ADHESIVE BONDLINE CHECKED FOR MINIMUM THICKNESS AND AREA.

2. COATING CHECKED FOR FLAKING, BLISTERING, COLOR, AND MINIMUM THICKNESS.

3. SURFACES EXAMINED FOR SHARP EDGES AND BURRS.

4. SUB-ASSEMBLY CHECKED FOR DIMENSIONS.

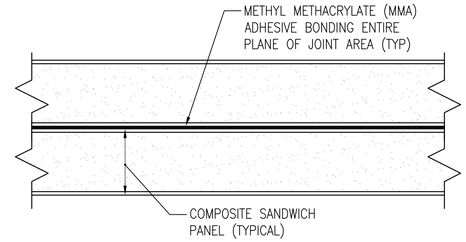


PANEL CORE TYPE 1

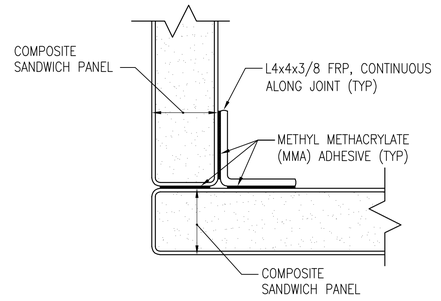
WEBS RUN IN 'PRIMARY' OR '0 DEGREE' DIRECTION. DIRECTION PERPENDICULAR TO WEBS IS 'SECONDARY' OR '90 DEGREE' DIRECTION.

PANEL CORE TYPE 2

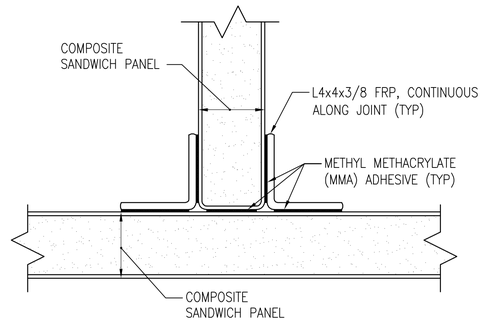
WEBS SPACED FARTHER APART RUN IN 'PRIMARY' OR '0 DEGREE' DIRECTION. WEBS SPACED CLOSER TOGETHER RUN IN 'SECONDARY' OR '90 DEGREE' DIRECTION.



TYPICAL COMPOSITE PANEL PARALLEL JOINTS



CORNER



MID-PANEL

TYPICAL COMPOSITE PANEL PERPENDICULAR JOINTS

NO.	DESCRIPTION	DATE	APPR

NAVFAC

SEAL

Composite Advantage

WR&A
801 South Caroline Street, Baltimore, MD 21231
WHITMAN, REQUARDT & ASSOCIATES, LLP
A/E INFO

APPROVED
FOR COMMANDER NAVFAC
ACTIVITY
SATISFACTORY TO DATE
DES. MHL DRW MHL CHK JBS
PM/DM
BRANCH MANAGER
CHIEF ENG/ARCH
FIRE PROTECTION

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVFAC LANT

COMPOSITE SUBMARINE CAMEL

NOTES AND TYPICAL DETAILS

SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
N66540-09-C-0029
NAVFAC DRAWING NO.
14019609
SHEET 3 OF 9

S-001

DRAWFORM REVISION: 10 MARCH 2009

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