

50 TO 200 LB. ARMOR STONE PLACED AND CHINKED. CHINKING STONES SHALL BE 10 LB. TO 50 LB. CHINKING SHALL BE CARRIED OUT AFTER PLACEMENT OF ARMOR STONE IS COMPLETED AND ONLY TO FILL THE VOIDS SMALLER THAN ARMOR STONE SIZE.

OVERSIZE STONES SHALL BE PLACED AT THE TOE OF THE REVETMENT. THE REMAINDER OF STONE TO BE PLACED IN A WELL GRADED DISTRIBUTION THROUGHOUT THE REVETMENT.

EXISTING BOTTOM

MEAN LOW WATER

FILTER CLOTH

EXCAVATE TOE 1' MIN. BELOW EXISTING BOTTOM OR BELOW MEAN LOW WATER.

MEAN HIGH WATER

MAXIMUM SLOPE

1  
2

2.0' MIN.

6" MIN. THICKNESS OF AASHTO M43, NO. 1 BEDDING STONE.

IN AREAS OF HIGH WAVE ENERGY, A STONE SPLASH APRON MAY BE INSTALLED AT THE DISCRETION OF DEPARTMENT. STONE APRON IS A LAYER OF 10 INCH TO 12 INCH STONE, 10 FEET WIDE, EXTENDING LANDWARD FROM TOP OF REVETMENT.

TOP ELEVATION TO BE MINIMUM 2.5' ABOVE MEAN HIGH WATER

EXTEND FILTER CLOTH UNDER STONE APRON

FILTER CLOTH (TO BE KEYED INTO SOIL AT TOP OF REVETMENT)

FILL VOIDS WITH SELECT FILL FREE OF LARGE STONES AND ORGANIC MATERIAL FIRMLY COMPACTED BEFORE REVETMENT CONSTRUCTION BEGINS.

TYPICAL SECTION  
SCALE: NONE

**NOTES:**

1. WHERE THE BANK HEIGHT IS LESS THAN THE MINIMUM TOP ELEVATION FOR THE REVETMENT THEN A 1' THICK LAYER OF ARMOR STONE SHALL EXTEND A MINIMUM OF 4' LANDWARD.
2. NO BUILDING RUBBLE CONCRETE OR SIMILIAR MATERIAL SHALL BE USED AS ARMOR STONE.
3. FILTER CLOTH SHALL BE POLY FILTER-X OR AN EQUIVALENT WOVEN PLASTIC.
4. THIS STANDARD DETAIL IS FOR USE IN SHELTERED COVES AND CREEKS. IT DOES NOT TAKE INTO ACCOUNT SEVERE WAVE ACTION, POOR SOIL CONDITIONS, SATURATED SOIL, SCOURING DUE TO CURRENTS OR STRUCTURAL SURCHARGE.
5. THE DETAILS OF THIS DRAWING ARE TO BE CONSIDERED AS MINIMUM STANDARDS FOR SPECIFIC CONDITIONS. IT SHALL BE UP TO THE APPLICANT TO DETERMINE IF REQUIRED DESIGN MODIFICATIONS ARE REQUIRED. WORCESTER COUNTY OR VISTA DESIGN, INC. ASSUME NO RESPONSIBILITY OR LIABILITY FOR ASCERTAINING APPLICANTS ON-SITE CONDITIONS OR THE RESULTANT FAILURE OF ANY STRUCTURE SHOWN ON THIS DRAWING.



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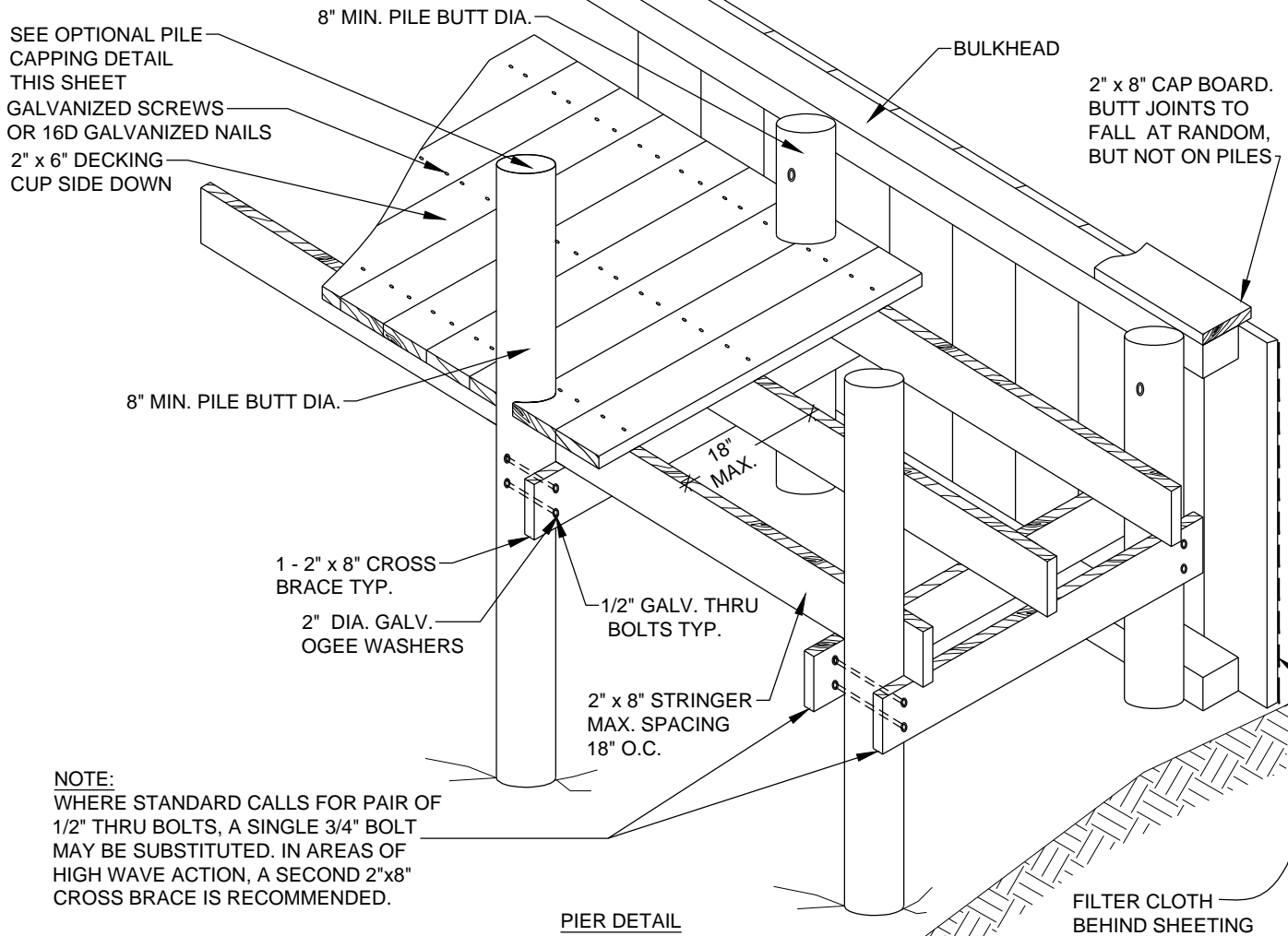
REVETMENT  
DESIGN  
STANDARDS

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DESIGN, INC.

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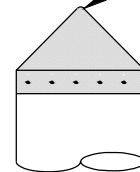
**GENERAL PIER NOTES:**

1. THESE MINIMUM PIER STANDARDS ARE BASED ON TYPICAL CONSTRUCTION ADJACENT TO BULKHEAD SYSTEMS WITH EXPOSED WALL FACE OF 0' TO 4' MAX. REFER TO SHEET 1 OF 4 FOR MIN STANDARDS FOR ADDITIONAL EXPOSED FACE CONDITIONS.
2. VARYING SITE CONDITIONS MAY REQUIRE ADDITIONAL BRACING AND/OR LARGER STRUCTURAL MEMBERS.
3. THE DETAILS OF THIS DRAWING ARE TO BE CONSIDERED AS MINIMUM STANDARDS FOR SPECIFIC CONDITIONS. IT SHALL BE UP TO THE APPLICANT TO DETERMINE IF REQUIRED DESIGN MODIFICATIONS ARE REQUIRED. WORCESTER COUNTY OR VISTA DESIGN, INC. ASSUME NO RESPONSIBILITY OR LIABILITY FOR ASCERTAINING APPLICANT'S ON-SITE CONDITIONS OR THE RESULTANT FAILURE OF ANY STRUCTURE.

**SPECIFICATIONS:**

1. WOOD SHALL BE TREATED NO. 2 SOUTHERN YELLOW PINE WITH A MINIMUM TENSILE STRENGTH OF 1200 PSI. PILES.
2. BRACING AND STRINGERS SHALL BE TREATED WITH CHROMATED COPPER ARSENATE (CCA) AT 1.5# PER CU.FT. AND PILINGS TREATED AT 2# PER CU.FT.
3. DECKING MATERIAL SHALL BE SALT PENTA TREATED MINIMUM 4% RETENTION OR EQUAL.
4. FASTENERS (SCREWS, BOLTS, WASHERS AND NAILS) SHALL BE NEW MARINE GRADE HOT DIPPED GALVANIZED AFTER WITHOUT DEFORMATION.
5. ALL HARDWARE FACING INTO ANY SLIP AREA SHALL BE COUNTERSUNK TO AVOID ANY DAMAGE TO MOORED VESSELS.

OPTIONAL PILE CAPPING WITH PLASTIC CONE SHAPE PILE CAPS FASTENED WITH GALVANIZED HARDWARE OR OPTIONAL COPPER CAP.



OPTIONAL PILE CAP DETAIL  
SCALE: NONE



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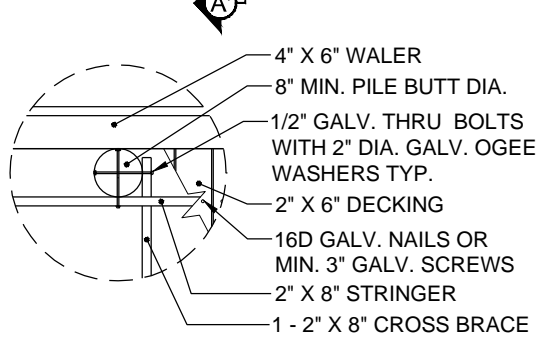
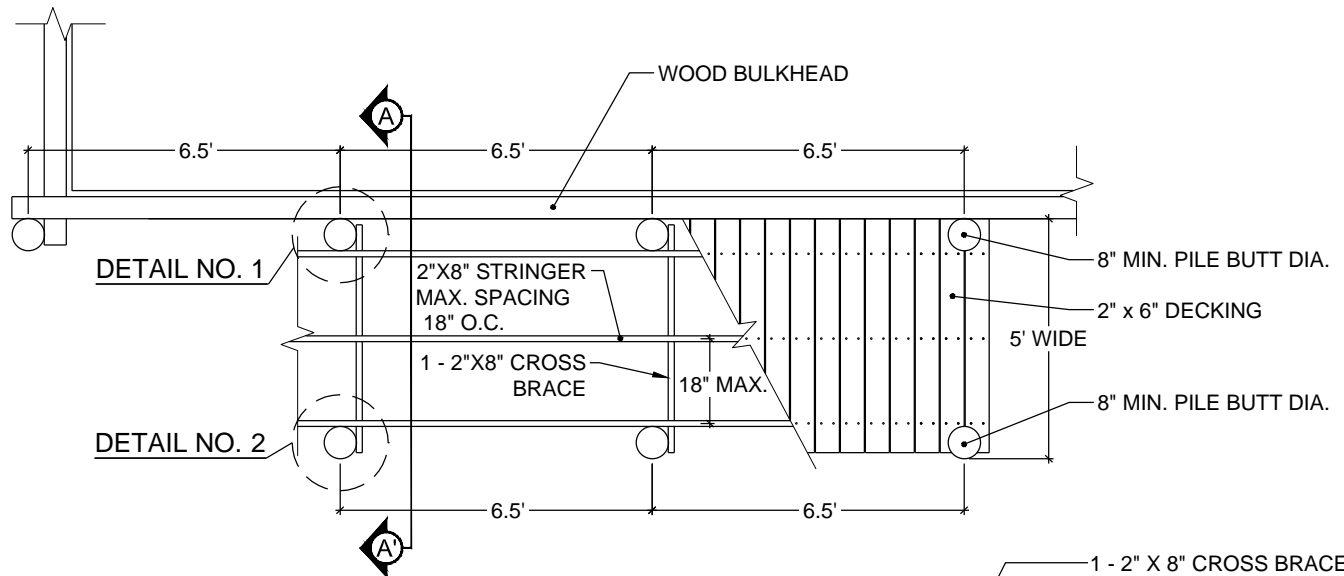
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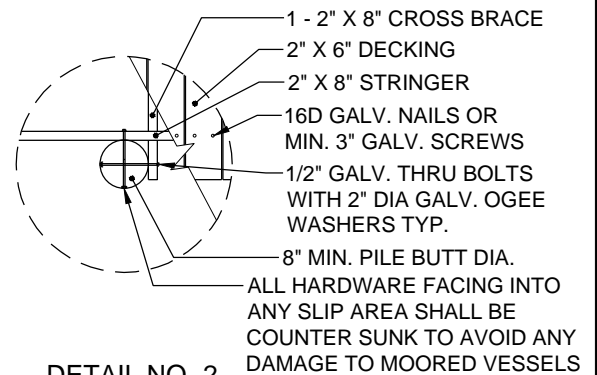
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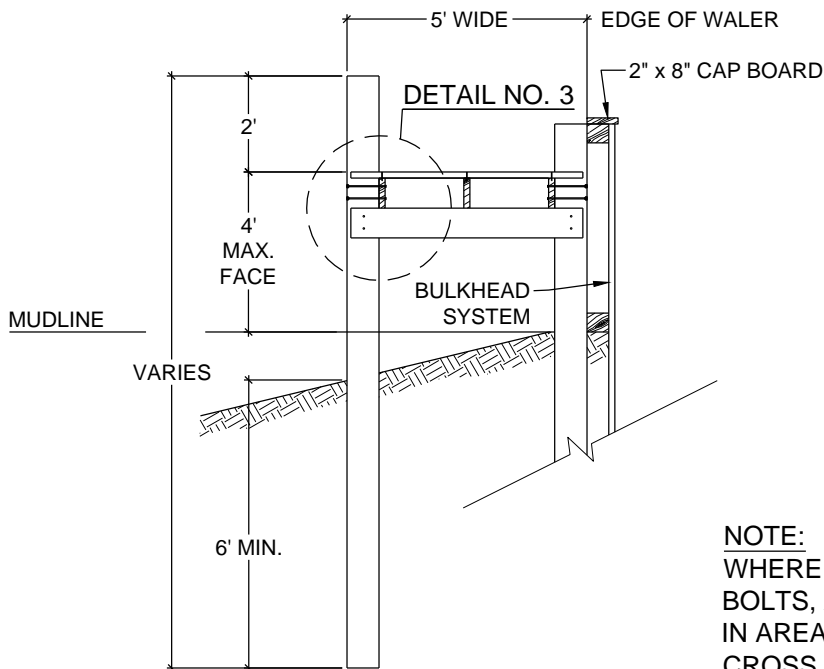
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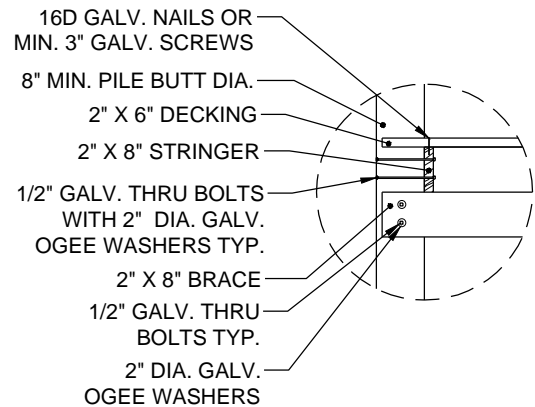
DETAIL NO. 1



DETAIL NO. 2



PIER SECTION A-A'



DETAIL NO. 3

**NOTE:**  
WHERE STANDARD CALLS FOR PAIR OF 1/2" THRU BOLTS, A SINGLE 3/4" BOLT MAY BE SUBSTITUTED. IN AREAS OF HIGH WAVE ACTION, A SECOND 2"x8" CROSS BRACE IS RECOMMENDED.



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MINIMUM BULKHEAD DESIGN STANDARDS WORCESTER COUNTY

- THESE MINIMUM BULKHEAD STANDARDS CALCULATED ON AN ESTIMATED ±15 YEAR LIFE EXPECTANCY ARE BASED ON EXPOSED WALL FACE, MUDLINE TO TOP WALER ASSUMING THE SITE HAS FIRM GRANULAR SOIL ON BOTH THE WATER AND SHORE SIDE OF BULKHEAD AND MINIMUM SOIL BEARING CAPACITY OF 1000 P.S.F.
- THESE STANDARDS ARE FOR TYPICAL CONDITIONS NOT ACCOUNTING FOR EXCESSIVE WATER DEPTH, POOR SOIL CONDITION, EXCESSIVE LONG SHORE CURRENT, EXCESSIVE WAVE ACTION OR STRUCTURAL SURCHARGE.
- IN THE EVENT THAT APPLICANT'S ON-SITE CONDITIONS VARY FROM TYPICAL CONDITIONS, PLANS AND SPECIFICATIONS SHALL BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MARYLAND.

WOOD BULKHEAD	0-4 FT.	4 FT. -6 FT.	6 FT & OVER
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A. PILING (SEE TYPICAL DRAWING)			
1. SIZE: ROUND	8 IN. BUTT DIA.	10 IN. BUTT DIA.	
LENGTH	14 FT. 0IN.	16 FT. 0 IN.	
2. SPACING:	----- 6 FT. 6IN. -----		
B. WALERS			
1. TOP-SIZE:	4 IN. X 6 IN.	6 IN. X 8 IN.	
PIECE LENGTH:	14 FT. 0 IN.	14 FT. 0 IN.	
2. BOTTOM-SIZE:	4 IN. X 6 IN.	6 IN. X 8 IN.	
PIECE LENGTH	*16 FT. 0 IN.	*16 FT. 0 IN. *REQUIRED FOR OVERLAP	
C. WOOD SHEETING - TONGUE & GROOVE			
1. OUTSIDE: SIZE	2 IN. X 10 IN. T & G	2 IN. X 10 IN. T & G	
LENGTH	12 FT. 0 IN.	14 FT. 0 IN.	
D. TIE BACKS			
1. RODS: SIZE DIAMETER	3/4 INCH	7/8 INCH	
LENGTH	14 FT. 0 IN.	20 FT. 0 IN.	
SPACING	----- 6 FT. 6IN. -----		
2. WOOD:			
A. ANCHOR PILE			
SIZE: ROUND	10 FT. 0 IN.	10 FT. 0 IN.	
SQUARE	10 IN. X 10 IN.	10 IN. X 10 IN.	
LENGTH	6 FT. 0 IN.	8 FT. 0 IN.	
DEPTH TO GRADE:	1 FT 0 IN.	2 FT. 6 IN.	
SETBACK:	13 FT. 6 IN.	19 FT. 0 IN.	
SPACING:	----- 6 FT. 6IN. -----		
B. DEADMAN			
SIZE: ROUND	10 IN. DIA.	10 IN. DIA.	
SQUARE	10 IN. X 10 IN.	10 IN. X 10 IN.	
LENGTH	16 FT. 0 IN.	16 FT. 0 IN.	
DEPTH TO GRADE	2 FT. 6 IN.	3 FT. 6 IN.	
3. CONCRETE ANCHORS			
SIZE:	2' x 3' x 10"	2' x 6' x 10"	
DEPTH TO GRADE:	2 FT. 0 IN.	3 FT. 0 IN.	
E. HARDWARE (NEW HOT DIPPED GALVANIZED MARINE GRADE)			
1. NAILS: 2 IN. T&G SHEETING	20D	20D	
2. BOLTS:	3/4 IN. DIA.	3/4 IN. DIA.	
3. WASHERS - OGEE:	2 IN. DIA.	2 IN. DIA.	
4. NUTS:	SQUARE	SQUARE	

MUST BE DESIGNED AND CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER, STATE OF MARYLAND

SPECIFICATIONS

- WOOD SHALL BE NO. 2 SOUTHERN YELLOW PINE WITH A MINIMUM 1200 PSI TENSILE STRENGTH TREATED WITH CHROMATED COPPER ARSENATE (CCA) WITH A 1.5# PER CUBIC FOOT RETENTION. \*
- VINYL BULKHEADS - SHALL BE ACCEPTABLE PROVIDING THE MANUFACTURER SUBMITS A VALID ENGINEERING CERTIFICATION THAT THE MATERIALS AND DESIGN MEET OR EXCEED THE WOODED BULKHEAD SPECIFICATIONS.
- ALL STEEL AND HARDWARE SHALL BE NEW MATERIALS HOT DIP GALVANIZED MARINE GRADE AFTER FABRICATION: 20,000 PSI AND INSTALLED FREE OF ANY DEFORMATION.
- CONCRETE DEADMAN SHALL BE POURED IN PLACE ON UNDISTURBED SOIL WITH A 3000 PSI MINIMUM COMPRESSIVE STRENGTH.
- UNPROTECTED BULKHEADS FRONTING ON MAJOR WATER BODIES SHALL BE DESIGNED TO A MINIMUM HEIGHT 3 FEET ABOVE THE MEAN HIGH WATER MARK REFERENCED TO SEA LEVEL DATUM.
- FILTER CLOTH SHALL EXTEND 1' BENEATH MUDLINE.
- METAL BULKHEADS - METAL MATERIAL SUCH AS ALCOA, KAISER OR EQUAL, SHALL BE ACCEPTABLE PROVIDING THE MANUFACTURER SUBMITS A VALID ENGINEERING CERTIFICATION THAT THE MATERIALS AND DESIGN MEET OR EXCEED THE WOODED BULKHEAD SPECIFICATIONS.

\* CHROMATED COPPER ARSENATE (CCA)1.5# MINIMUM PER CUBIC FOOT RETENTION SHALL BE THE MINIMUM FOR ALL APPLICATIONS, FRESHWATER, BRACKISH OR SALT WATER USE.



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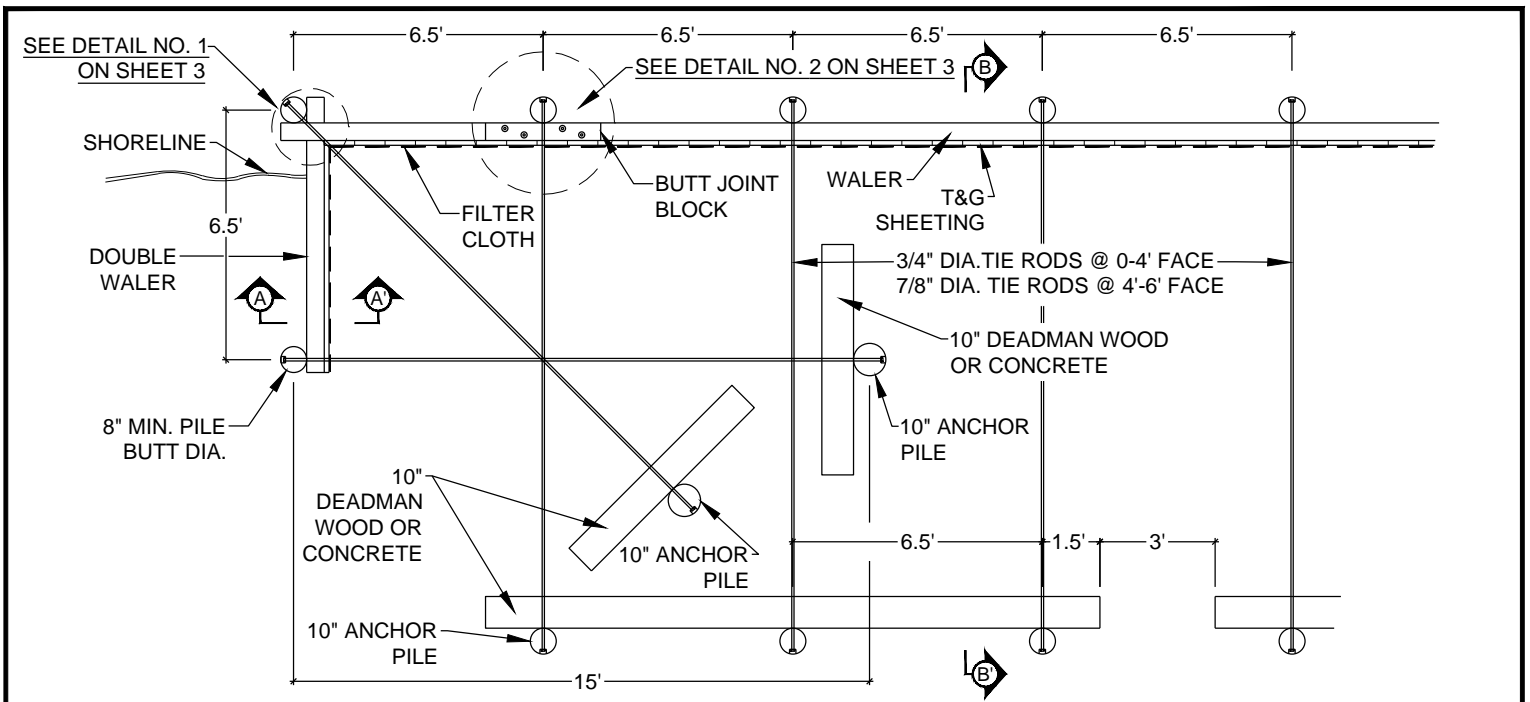
MINIMUM  
BULKHEAD  
DESIGN  
STANDARDS

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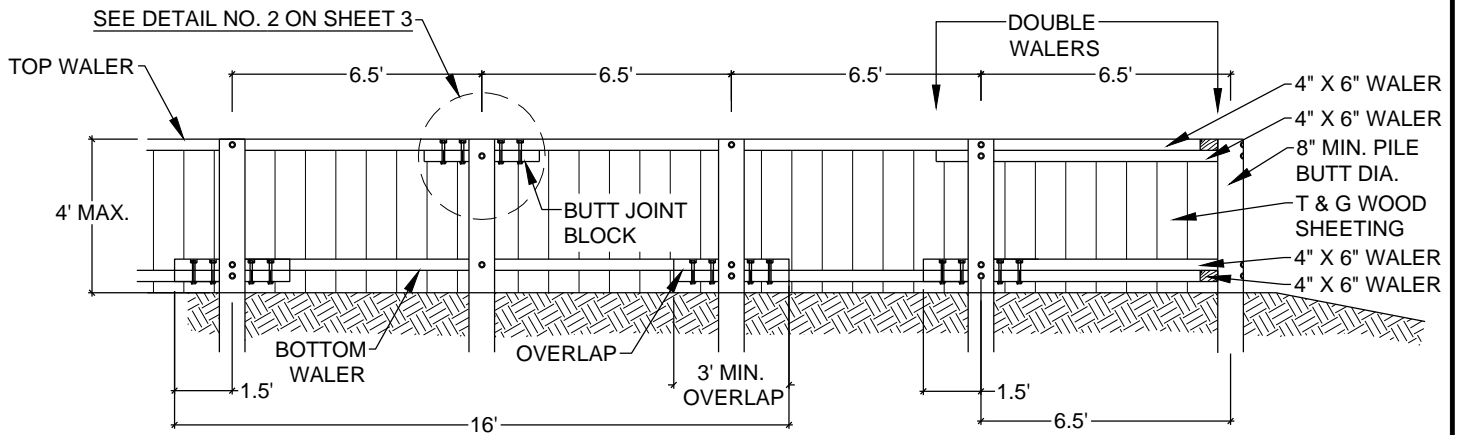
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**BULKHEAD PLAN**



**BULKHEAD ELEVATION**

NOTE: UPPER AND LOWER WALE JOINTS SHALL NOT OCCUR AT THE SAME PILE.

**BULKHEAD GENERAL NOTES**

- THIS SHEET SHOWS GRAPHICALLY THE TYPICAL MINIMUM BULKHEAD DESIGN STANDARDS FOR 0 - 4' EXPOSED WALL FACE. REFER TO SHEET 1 OF 4 FOR MINIMUM STANDARDS FOR ADDITIONAL EXPOSED FACE CONDITIONS.
- THESE MINIMUM STANDARDS CALCULATED ON AN ESTIMATED ±15 YEAR LIFE EXPECTANCY ARE BASED ON EXPOSED WALL FACE, MUDLINE TO TOP WALER WITH THE ASSUMPTION THAT APPLICANT HAS FIRM GRANULAR SOIL ON BOTH STREAM SIDE AND SHORE SIDE OF BULKHEAD AND MINIMUM SOIL BEARING CAPACITY OF 1000 PSF.
- THESE STANDARDS ARE FOR TYPICAL CONDITIONS THAT DO NOT TAKE INTO ACCOUNT EXCESSIVE WATER DEPTH, POOR SOIL CONDITIONS, EXCESSIVE LONG SHORE CURRENT, EXCESSIVE WAVE ACTION, OR STRUCTURAL SURCHARGE.
- IN THE EVENT THAT APPLICANTS ON-SITE CONDITIONS VARY FROM TYPICAL CONDITIONS, PLANS AND SPECIFICATIONS SHALL BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MARYLAND.
- WORCESTER COUNTY AND VISTA DESIGN, INC. ASSUME NO LIABILITY FOR ASCERTAINING APPLICANTS ON SITE CONDITIONS OR THE RESULTANT FAILURE OF ANY STRUCTURAL ELEMENTS.
- WHERE SPECIAL CASES EXIST, SUBMIT DATA TO THE WORCESTER COUNTY APPROVAL AUTHORITY FOR REVIEW AND APPROVAL.



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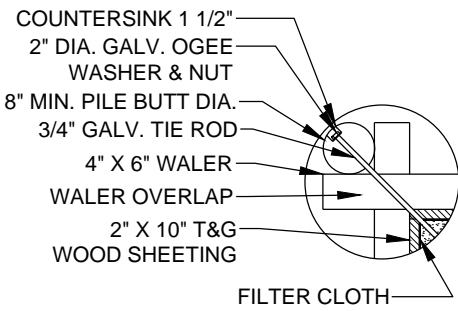
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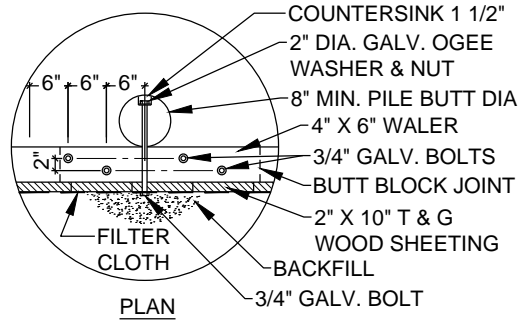
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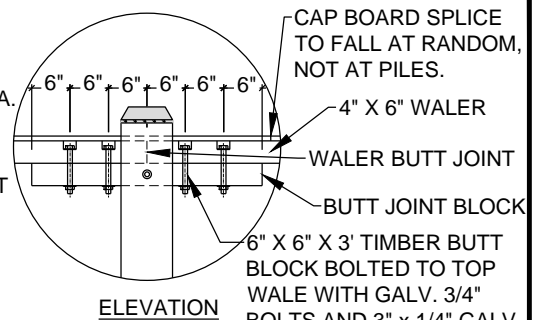




DETAIL NO. 1  
BULKHEAD CORNER

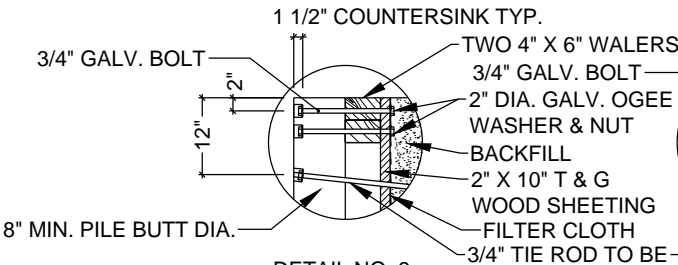


DETAIL NO. 2  
BUTT BLOCK JOINT

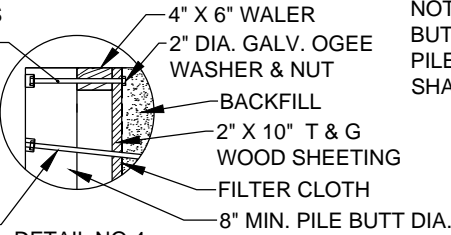


ELEVATION

CAP BOARD SPLICE TO FALL AT RANDOM, NOT AT PILES.  
4" X 6" WALER  
WALER BUTT JOINT  
BUTT JOINT BLOCK  
6" X 6" X 3" TIMBER BUTT BLOCK BOLTED TO TOP WALE WITH GALV. 3/4" BOLTS AND 3" X 1/4" GALV. OGEE WASHERS COUNTERSUNK IN WALE AND NUT WITH 3" X 1/4" GALV. OGEE WASHERS ON BOTTOM.



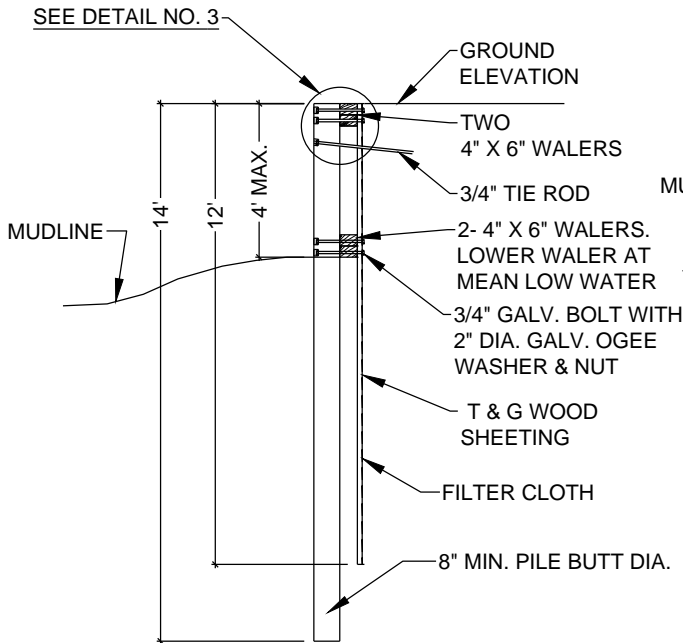
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DOUBLE WALER



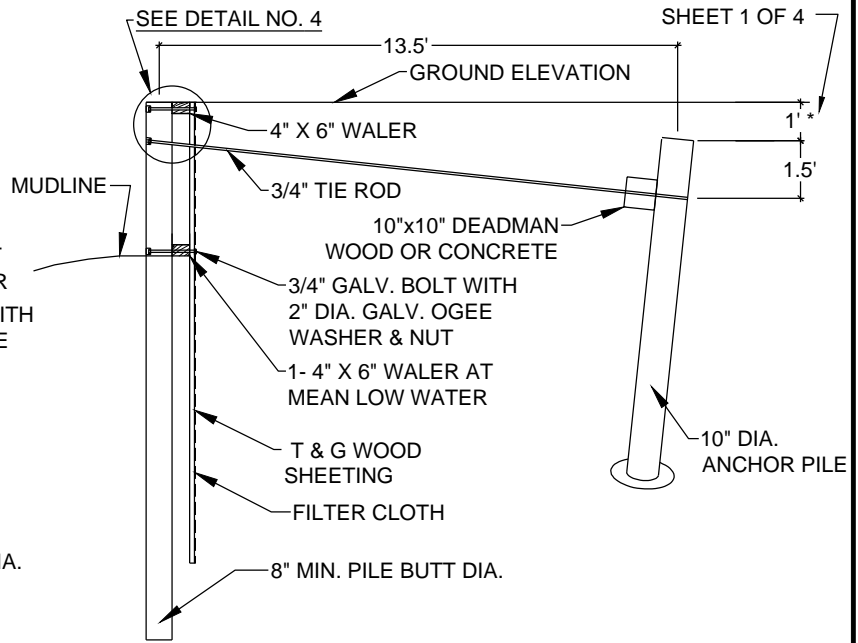
DETAIL NO. 4  
SINGLE WALER

NOTE: STAGGER UPPER AND LOWER BUTT JOINTS. JOINTS TO FALL ON PILES. UPPER AND LOWER BUTT JOINT SHALL NOT OCCUR ON SAME PILE.

\* VARIES PER EXPOSED FACE PER TABLE ON SHEET 1 OF 4



BULKHEAD SECTION A-A'



BULKHEAD SECTION B-B'

**DESIGN NOTES**

- WHERE NEW BULKHEAD MEETS EXISTING, IT'S THE APPLICANTS RESPONSIBILITY TO INSTALL A COMPATIBLE WATER TIGHT CONNECTION.
- WHERE NEW BULKHEAD MEETS UNPROTECTED PROPERTY, A CORNER BULKHEAD SHALL BE CONSTRUCTED A MINIMUM OF ONE SECTION (6'-6").
- UPPER AND LOWER WALERS JOINTS SHALL NOT OCCUR AT SAME PIER.
- BOTTOM WALERS SHALL BE INSTALLED DURING LOW TIDE SITUATION AND PLACED AT THE MUDLINE. MAXIMUM WALER SPACING SHALL BE 3'.
- FILTER CLOTH TO BE PLACED ON LAND SIDE OF SHEETING A MINIMUM 1 FOOT BELOW LOWER WALER.
- LANDWARD DECKS SHALL NOT CANTILEVER OVER BULKHEAD AND SHALL IN ANY EVENT BE INDEPENDENT OF BULKHEAD SUPPORT SYSTEM.



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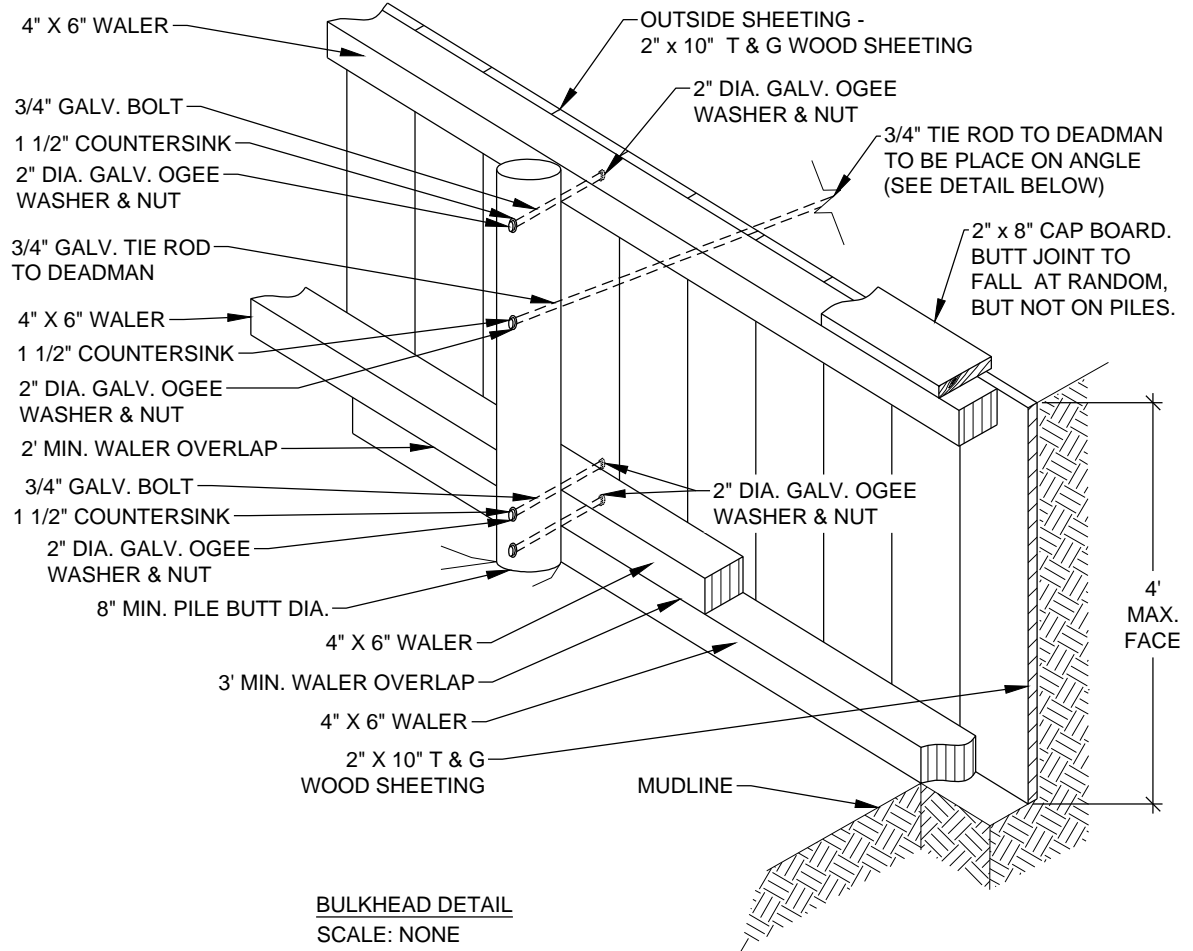
MINIMUM  
BULKHEAD  
DESIGN  
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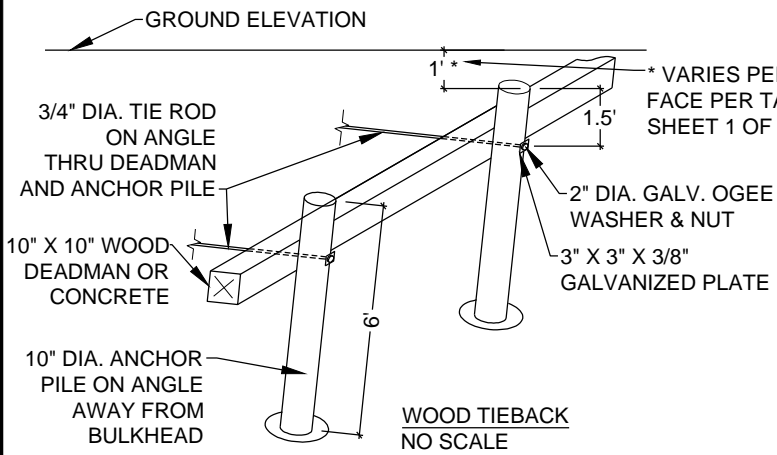
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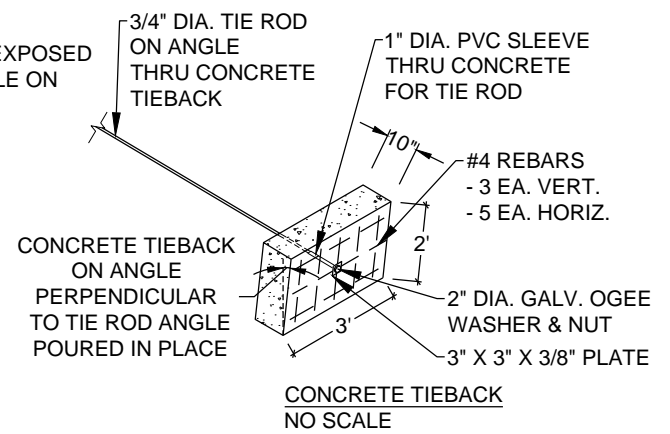
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**BULKHEAD DETAIL**  
SCALE: NONE



**WOOD TIEBACK**  
NO SCALE



**CONCRETE TIEBACK**  
NO SCALE

**SPECIFICATIONS:**

- WOOD SHALL BE TREATED NO. 2 SOUTHERN YELLOW PINE WITH A MINIMUM TENSILE STRENGTH OF 1200 PSI AND MINIMUM 1.5# CCA TREATMENT.
- ALL STEEL AND FASTENERS (BOLTS, WASHERS, NAILS AND SCREWS) SHALL BE NEW HOT DIPPED GALVANIZED MARINE GRADE.
- ALL STEEL MEMBERS SHALL BE NEW MATERIAL FREE OF DEFORMATIONS
- PILES AND SHEATHING CAN BE DRIVEN OR WASHED.
- CONCRETE SHALL BE POURED IN PLACE ON UNDISTURBED SOIL, MINIMUM COMPRESSIVE STRENGTH 3000 PSI.
- FILTER CLOTH SHALL BE CARTHAGE MILL, INC. "POLY-FILTER X" OR DUPONT "TYPAR" OR EQUAL.
- ALL TIE RODS SHALL BE CUT FLUSH OR COUNTERSUNK ON ALL STRUCTURAL MEMBERS.
- USE OF OAK MAY BE SUBSTITUTED FOR WOOD DEADMEN ONLY.



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GENERAL NOTES FOR BOAT LIFT INSTALLATION

1. IF PILINGS ARE TO BE INSTALLED, THEY SHALL BE 10" MIN. PILE BUTT DIAMETER, TREATED TO A MINIMUM 1.5#, AND LENGTH CONSISTENT WITH APPLICABLE BULKHEAD /OR PIER PILING STANDARDS.
2. BOAT LIFT SHALL INSTALLED IN STRICT ACCORDANCE WITH §NR 2-102 OF THE WORCESTER COUNTY CODE.
3. BOAT LIFTS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
4. ALL HARDWARE TO BE NEW HOT DIPPED GALVANIZED MARINE GRADE.
5. BOAT LIFTS REQUIRING ELECTRIC SERVICE ARE TO HAVE WORCESTER COUNTY ELECTRICAL PERMIT AND ASSOCIATED INSPECTIONS.
6. SIDE MOUNT LIFTS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S SPECS AND NOT NEGATIVELY AFFECT BULKHEAD OR PIER INTEGRITY.



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BOATLIFTS  
GENERAL  
STANDARDS

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