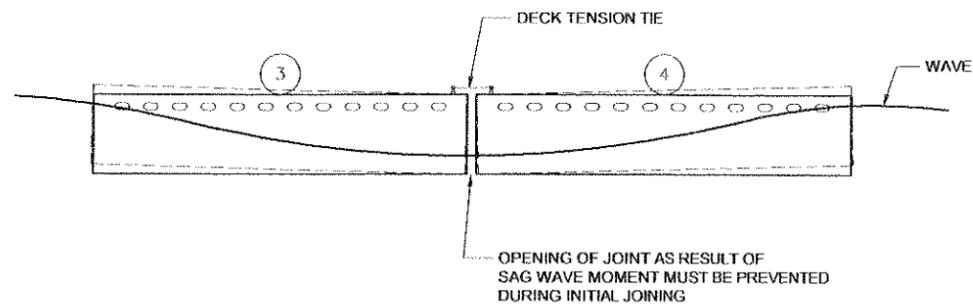


APPENDIX D

MODULE-TO-MODULE JOINING CONCEPT

This appendix supplements the discussion of the module-to-module joining process discussed in Section VIII and presents a schematic representation of steps in the module-to-module joining process on Drawings Appendix D-1, Appendix D-2, Appendix D-3, and Appendix D-4.

The construction tolerances that must be set and controlled to assure that modules are interchangeable and that any module can be joined to any other module are presented in Drawing Appendix D-5.

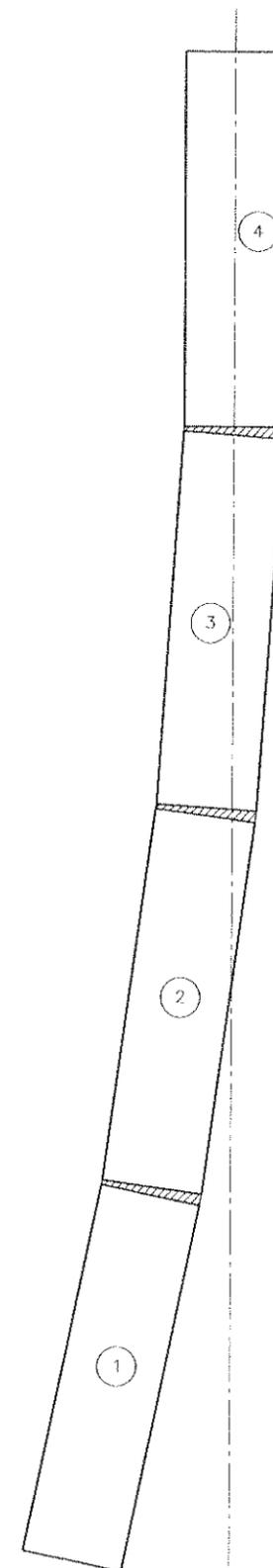


EFFECT OF SWELL ON JOINING ACTIVITY

MODULAR JOINING PROCESS

THE MODULE JOINING PROCESS IS DESIGNED TO ACCOMPLISH THE FOLLOWING THINGS:

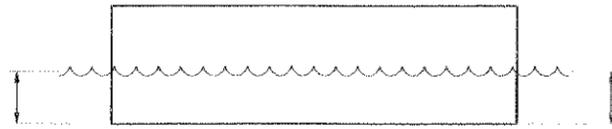
1. BALLAST THE MODULES AS REQUIRED TO ASSURE THAT THE MATING SURFACES ARE FLOATING IN THE WATER PARALLEL TO EACH OTHER (STEP 1).
2. PROVIDE A CONTROLLED MEANS TO BRING THE MODULES TOGETHER AND BRING THEM INTO INITIAL ALIGNMENT. (STEPS 2 AND 3).
3. PROVIDE A MEANS OF PROVIDING GREATER RELATIVE MOTION CONTROL AS THE MODULES MOVE WITHIN CONTACT RANGE OF EACH OTHER. (STEP 4).
4. DEVELOP A MEASURE OF INITIAL WAVE LOADING RESISTANCE BY BALLASTING AGAINST DECK TENSION TIE FORCE (STEP 5).
5. DEWATER THE JOINT AREA AND BRING THE MODULE MATING SURFACES INTO FULL CONTACT (STEP 6).
6. INCREASE WAVE LOADING RESISTANCE BY INSTALLING PRELIMINARY POST TENSIONING ACROSS JOINT THROUGH TENDONS THAT START AND END AT DECK LEVEL TO AVOID THE POSSIBILITY OF LEAKAGE INTO COMPARTMENTS (STEP 7).
7. INSTALL POST TENSIONING BARS ACROSS JOINT AND TENSION TO DEAD SNUG TO PROVIDE REACTION TO GROUTING FORCE (STEP 8).
8. AFTER GROUT HAS ATTAINED DESIGN STRENGTH, COMPLETE THE JOINT POST TENSIONING TO PROVIDE THE FULL REQUIRED CAPACITY OF THE JOINT (STEP 9).



ACCUMULATIVE JOINT TOLERANCE EFFECT TO BE AVOIDED

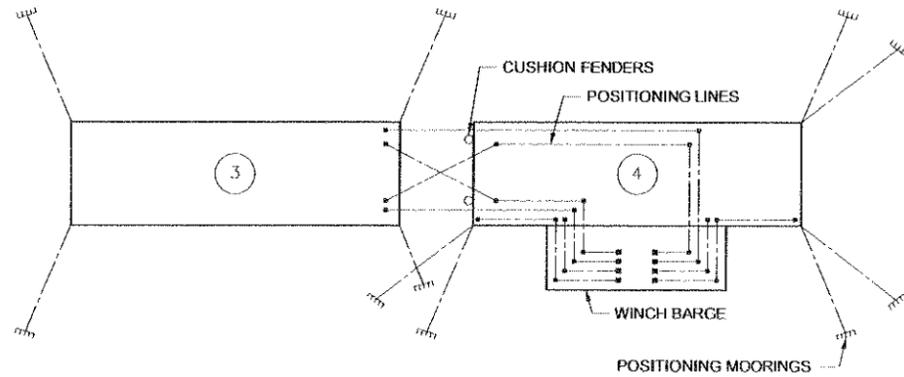
DEPARTMENT OF THE NAVY NFESC NAVAL FACILITIES ENGINEERING SERVICES CENTER		BERGER/ABAM ENGINEERS ARCHITECTS 1000 33RD ST AVE SUITE 300 BOCA RATON, FL 33431 (561) 365-1000 WWW.BERGER-ABAM.COM		APPROVED: _____ DATE: _____ ACTIVITY - SATISFACTORY TO DATE APPROVED: _____ FOR EST FOR COMMANDER NAFC	
A/E JMHZ N/LE	DESIGN DRAWN REVIEW	PROJECT MANAGER QUALITY CONTROL BRANCH MANAGER DESIGN DIRECTOR	DATE DATE DATE	REVISIONS	
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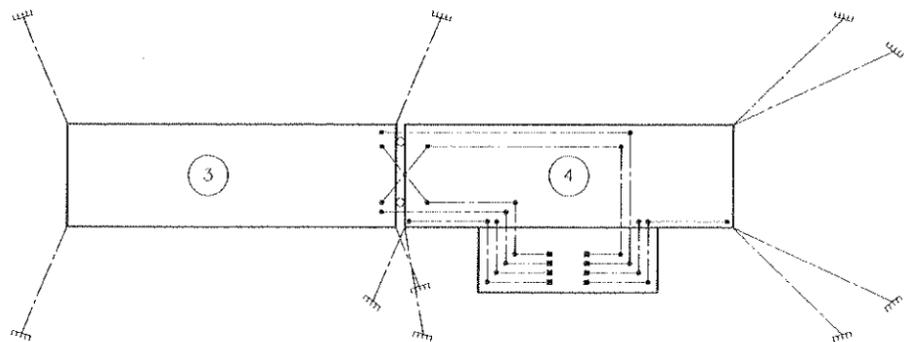
STEP 1

CHECK TRIM AND DRAFT OF MHP MODULE UNITS No.3 AND No.4 AND BALLAST TO LEVEL TRIM PLUS MINUS 25 mm AND THE SAME RELATIVE DRAFT PLUS/MINUS 25 mm.



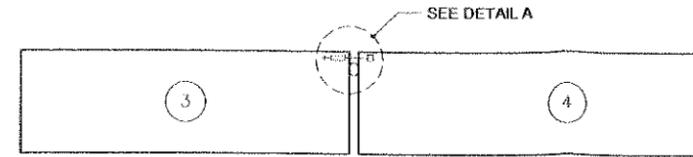
STEP 2

CHECK TRIM AND DRAFT OF MHP MODULE UNITS No.3 AND No.4 AND MOOR MHP MODULE No.3 IN POSITION FOR JOINING. INSTALL FULLY INFLATED PNEUMATIC CUSHION FENDERS IN FENDER RECESS ON MHP MODULE No.4 ATTACH WINCH BARGE TO MHP MODULE No.4 AND, USING TUGS, MOVE MHP MODULE No.4 INTO LOCATION FOR ATTACHMENT OF POSITIONING LINES. ATTACH MHP MODULE No.4 TO POSITIONING MOORINGS.



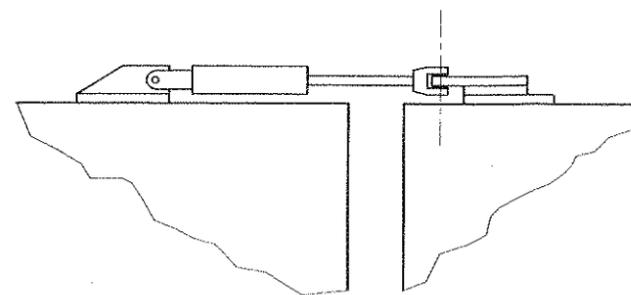
STEP 3

WINCH MHP MODULE No.4 TOWARD MHP MODULE No.3 USING OPTICAL INSTRUMENTS TO DIRECT OPERATION OF WINCHES. ASSURE PROPER ALIGNMENT OF UNITS JUST PRIOR TO CONTACT OF MHP MODULE No. 3 WITH PNEUMATIC FENDERS. GUIDE PINTEL ALIGNMENT ELEMENTS OF MHP MODULE No.4 INTO ALIGNMENT BOXES OF MHP MODULE No.3 USING POSITIONING LINES AND WINCHES, COMPRESS PNEUMATIC FENDERS.

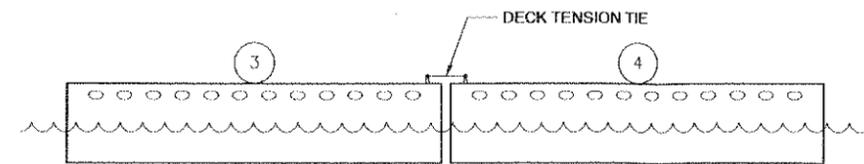


STEP 3.5

AFTER USING THE POSITIONING LINE WINCHES TO BRING THE BARGE UNITS TO WITHIN ONE METER OF CONTRACTING, ATTACH THE POSITIONING HYDRAULIC ACTUATORS AND PULL THE BARGES TOGETHER WHILE DEFLATING THE PNEUMATIC FENDERS. WHEN CONTACT IS MADE WITH THE TOP CONTACT PLATES APPLY THE DESIGN JOINING DECK FORCE WITH EQUAL LOADS AT EACH OF THE TWO ACTUATORS



DETAIL A

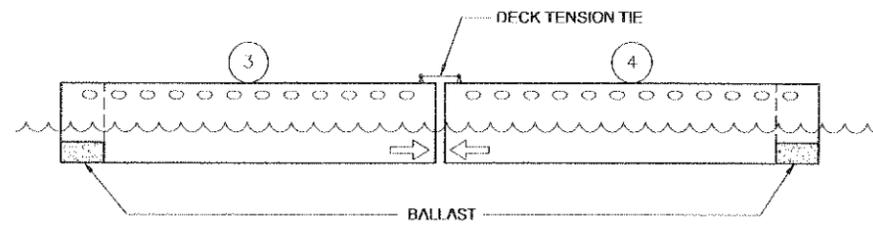


STEP 4

WITH LOAD STILL ON POSITIONING LINES ATTACH DECK LEVEL TENSION TIE HYDRAULIC ACTUATORS AT EITHER SIDE OF MHP MODULE No.3 TO TENSION THE HARDWARE ON MHP MODULE No. 4. JACK TENSION TIE ACTUATORS TO APPLY PREDETERMINED TOP TENSION FORCE AS PNEUMATIC FENDERS ARE DEFLATED. BRING MODULE TOP CONTACT PLATES IN FULL CONTACT AND PRESSURIZE FLAT JACKS AT TOP CONTACT PLATES.

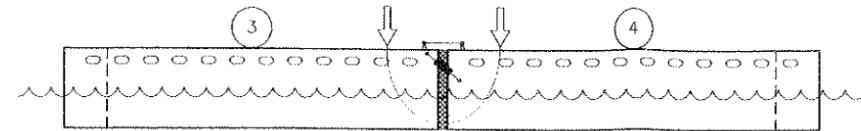
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MODULAR HYBRID PIER FLOATING PIER MODULAR JOINING PROCESS		ACTIVITY: SATISFACTORY TO APPROVED		DATE		FOR EDO FOR COMMANDER NAVAL APPROVED	
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APP D-2							

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STEP 5

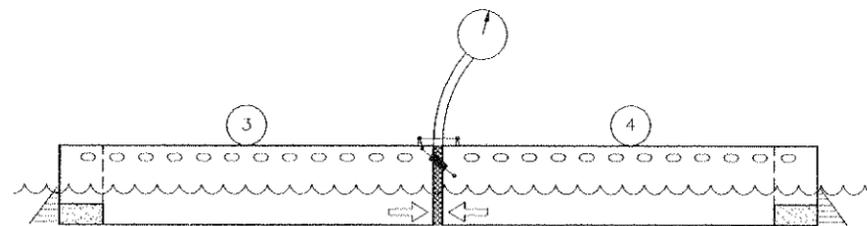
ADD BALLAST WATER IN BALLAST TANKS LOCATED AT MHP MODULE ENDS AWAY FROM JOINT LOCATION. QUANTITY OF BALLAST IS DESIGNED TO PRODUCE A COMPRESSIVE FORCE ACROSS THE BOTTOM OF THE JOINT SUFFICIENT TO REACT THE PRESSURE FROM THE INFLATABLE WATER JOINT AND STAY IN COMPRESSION WHEN EXPOSED TO THE "INITIAL MATING DESIGN WAVE" (0.30 m).



STEP 7

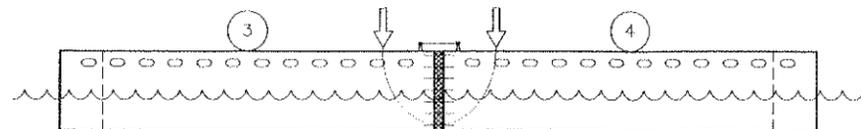
INSTALL PRELIMINARY STRAND JOINT POST TENSIONING FROM THE DECK ACROSS THE BOTTOM OF THE JOINT. (TWO LOCATIONS IN EXTERIOR WALLS) AND JACK PRELIMINARY POST TENSIONING TENDONS SNUG. CHECK AS TENSION IS BEING APPLIED TO ASSURE THAT THE MHP MODULES ARE ALIGNED TO SPECIFIED HORIZONTAL AND VERTICAL TOLERANCES. ADJUST FLAT JACK PRESSURE AT CONTACT PLATE LOCATIONS TO MEET SPECIFIED GLOBAL ANGULAR ALIGNMENT TOLERANCES.

CONTINUE JACKING PRELIMINARY JOINT POST TENSIONING TO FULL DESIGN LEVELS TO PROVIDE MOMENT CAPACITY AT JOINT FOR "FINAL JOINING DESIGN WAVE" (0.60m). UNCAP WATERTIGHT CAPS FROM JOINING BAR TENDON DUCTS IN DECK, EXTERIOR WALLS AND KEEL FROM INSIDE OF MODULE COMPARTMENTS ADJACENT TO JOINT AREA. CHECK ALIGNMENT OF JOINT POST TENSIONING DUCTS.



STEP 6

INFLATE PERIMETER JOINT WATERTIGHT SEAL AND DEWATER JOINT AREA. THIS WILL INCREASE THE COMPRESSION LOAD ACROSS THE JOINT AS RESULT OF HYDROSTATIC FORCES ACTING ON THE MODULE ENDS. CONNECT VERTICAL AND HORIZONTAL ADJUSTMENT ACTUATORS BETWEEN THE TOW MODULE UNITS ON THE DECK AND TOP OF THE CORNERS OF THE JOINT LOCATION.



STEP 8

EXTEND JOINING POST TENSIONING BARS FROM POSITIONS IN MHP MODULE No.3 INTO TENDON DUCTS IN MHP MODULE No.4. JACK JOINING BARS TO DEAD SNUG. FILL JOINT GROUT BAGS USING PRESSURE GROUTING FROM DECK INSTALLED GROUT TUBES. ALLOW GROUT TO CURE TO DESIGN STRENGTH FOR PRESTRESSING.

NO.	DATE	DESCRIPTION	BY	APPROVED

AVE	DESIGN	DATE
MHZ	DRAWN	
NLE	REVIEW	
	CHIEF ARCH/ENR	
	PROJECT MANAGER	
	FIRE PROTECTION	
	QUALITY CONTROL	
	BRANCH MANAGER	
	DESIGN	
	DIRECTOR	

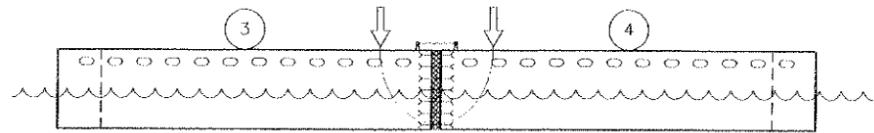
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DEPARTMENT OF THE NAVY
 NAVAL FACILITIES ENGINEERING SERVICES CENTER
NFESC
 MODULAR HYBRID PIER
 FLOATING PIER
 MODULE JOINING PROCESS

CODE NO. NO. 00001 SIZE D
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 SPEC. NO.
 CONSTR. CONTR. NO.
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APP D-3

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STEP 9

TENSION JOINING POST TENSIONING BARS IN DESIGN SEQUENCE TO 50 PERCENT OF FULL DESIGN VALUE. RELEASE PRESSURE IN FLAT JACKS AT CONTACT PLATES TO ASSURE TRANSFER OF LOADS TO WALL, KEEL, AND DECK LOCATIONS THROUGH JOINT GROUT. TENSION JOINING POST TENSIONING TO 100 PERCENT OF DESIGN TENSION AND FILL TENDON DUCTS WITH CORROSION PROTECTIVE MATERIAL. FILL INFLATABLE SEAL WITH GROUT. JOINING COMPLETE. MOVE TO NEXT JOINT AND REPEAT.

DEPARTMENT OF THE NAVY NFESC NAVAL FACILITIES ENGINEERING SERVICES CENTER MODULAR HYBRID PIER FLOATING PIER MODULE JOINING PROCESS		BERGER/ABAM ENGINEERS ARCHITECTS 1100 9th AVENUE EAST SUITE 200 DENVER, CO 80202-2244 PHONE: 303-733-1100 FAX: 303-733-1101 WWW: WWW.BERGER-ABAM.COM		DATE: _____ BY: _____ CHECKED BY: _____ PROJECT MANAGER: _____ FIRE PROTECTION: _____ QUALITY CONTROL: _____ BRANCH MANAGER: _____ DESIGN DIRECTOR: _____		REVISIONS NO. _____ DATE _____ DESCRIPTION _____	
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