APPENDIX L

MODULAR HYBRID PIER PRELIMINARY CONSTRUCTION COSTS

Attached on the following pages is a cost estimate based on the current preliminary design of the Modular Hybrid Pier. The costs are presented for a baseline case, a low range case and a high range case. The low range is about 83 percent of the baseline cost and the high range is about 120 percent of the baseline cost.

In most cases any assumptions made in the estimates are given in the background material supporting the estimate. Outside estimators were involved in providing some of the cost estimates.

Concrete Technology Corporation estimated the floating modules FOB their yard in Tacoma, WA. Their estimate is the high range cost given for the Structural Concrete Module Costs. Concrete Technology Corporation has a graving dock and has experience of having constructed a number of projects of similar scale to the MHP.

Manson Construction provided estimates for module to module joining and for the construction of the on-site mooring structures. Their estimates are the high range costs for both the Module to Module Joining and the MHP Mooring Costs. Manson was the general contractor for the floating portion of the Ford Island bridge.

Ed Blessing, and marine cost estimating consultant, also estimated the mooring construction cost. His estimate is the low range cost for the MHP Mooring Cost.

Vansant and Gusler provided the mechanical and electrical utility estimates. They have significant cost estimating experience from the design of utilities for many Navy piers.

It should be noted that all of these cost estimates are based on concept level designs and that the material quantities involved are preliminary estimates.

When comparing costs with recent Navy pier construction it is important to adjust the costs for location, as construction cost factors differ significantly across the United States. A listing of Location Construction Cost Factors from Means 2000 is provided on the following page.

Location Construction Cost Factors from Means 2000

City	Cost factor	Construction cost vs Norfolk	Construction cost vs San Diego
San Diego	106.6	129.2%	100.0%
Norfolk	82.5	100.0%	77.4%
San Francisco	123.8	150.1%	116.1%
Anchorage	125.2	151.8%	117.4%
Loa Angeles	109.6	132.8%	102.8%
Jacksonville	83.6	101.3%	78.4%
Savannah	82.3	99.8%	77.2%
Honolulu	122.3	148.2%	114.7%
Shreveport	80.9	98.1%	75.9%
Boston	116.6	141.3%	109.4%
New York	133.8	162.2%	125.5%
Charleston	94.3	114.3%	88.5%
Seattle	105.0	127.3%	98.5%

Concept Design Cost Estimate- MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Low Range Cost	Baseline Cost	High Range Cost	Comments
Costs are for a 1300 ft MHP berthing facility with 2 mooring elements.					
Structural Concrete Module Costs		$14,604,800	$18,256,000	$21,580,648	
Corrosion Resistant Reinforcing		$1,800,000	$2,960,000	$4,440,000	material cost only - labor incl in module costs
Ancillary items		$2,934,400	$2,934,400	$2,934,400	See attached listing
Module to Module Joining Cost		$750,000	$1,089,000	$1,404,000	
MHP Mooring Cost		$1,844,400	$2,004,896	$3,970,000	2 moorings
MHP Operations Deck Ramp Cost		$385,209	$428,010	$470,811	98 ft long ramp steel construciton
MHP Service Deck Ramp Cost		$245,879	$258,820	$284,702	98 ft long ramp steel construction
MHP Electrical Utilities		$7,023,830	$7,804,255	$8,194,468	
MHP Mechanical Utilities		$2,192,366	$2,435,962	$2,557,760	
Assumed 500 mile tow for module delivery		$318,240	$374,400	$411,840	
Subtotal		$32,099,123	$38,545,743	$46,248,629	
10% for miscellaneous undesigned details		$3,209,912	$3,854,574	$4,624,863	
Total concept level construction cost estimate		**$35,309,036**	**$42,400,317**	**$50,873,492**	

Structural Concrete Module Cost - MHP Berthing Facility - Baseline Cost

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Graving dock rental				$1,000,000	Assumption
Module CIP keel slab	CY	$450	940	$423,000	
Service deck including crossover	CY	$550	770	$423,500	
Service deck (auxillary support area)	SF				Auxillary space not included
Operations deck	CY	$400	1790	$716,000	
Exterior longitudinal walls	CY	$1,000	610	$610,000	
Interior longitudinal walls	CY	$950	730	$693,500	
Interior transverse walls	CY	$1,000	310	$310,000	
End walls	CY	$1,100	210	$231,000	
Concrete stairs	CY	$800	50	$40,000	
Concrete in mooring area	CY	$900	130	$117,000	
	Cost of bare concrete module			**$4,564,000**	
		Total quantity	5540		
Average $/yard of concrete			$823.83		
Average $/SF of operations deck			$159.58		88ft X 1300ft = 114,400
Average $/SF for operations deck + service deck			$104.80		114,400+ (46 X 1300) = 174,200
		Total for 4 modules		**$18,256,000**	Includes reinforcing and prestress
Module to module joining, mooring, and utilities are in addition to this bare concrete cost.					

CONCRETE TECHNOLOGY CORPORATION

Innovation and Quality Since 1951

August 10, 2001

Mr. Michael W. LaNier
Vice President
BERGER/ABAM Engineers, Inc.
33301 Ninth Avenue South
Federal Way, WA 98003-6395

Re: Modular Hybrid Pier Concrete Module Costs

Dear Mike:

I looked through the package you sent last month to Millard's attention and applied our previous cost experience to the quantities in the package. The following table contains the cost items and prices that I came up with.

I reformatted some items to match more closely the way we account for costs at CTC. Specifically, the graving dock rental is spread throughout all elements. Also, I added the pilaster concrete as a separate line item. CIP keel and deck concrete items contain all the costs for assembling the walls in the graving dock, plus the post-tensioning costs and the cost of materials for joining the modules together (but not the labor and equipment). I added precast decks as a separate line item and assumed that the pontoon decks would contain equal quantities of CIP and precast concrete.

The prices include the cost of 130 pcf lightweight concrete. There is no cost included for mild reinforcing, but placement cost is included. My understanding is you will obtain the cost for stainless steel reinforcement and include it in the total.

Item	CY	MHP Unit Price	Total
Graving Dock			0
CIP Keel	940	$1,451.30	$1,364,222
CIP Deck	1280	$1,451.30	$1,857,664
PC Decks	1280	$465.30	$595,584
Ext Walls	549	$551.30	$302,664
Int long walls	657	$525.30	$345,122
Int trans walls	279	$525.30	$146,559
End Walls	210	$1,116.30	$234,423
Pilasters	165	$2,375.30	$391,925
Conc Stairs	50	$800.00	$40,000
Conc @ mooring	130	$900.00	$117,000
	5540	$974	$5,395,162

X 4 = $21,580,648

I looked at the towing costs included in the package and I think they may be a little higher than necessary. I do not have a good first hand grasp on sizing of tugboats, but a 4,000 hp tug is $325/hr ($7,800/day) rather than $10,000/day. Also, I am not aware of a large mobilization cost for tugboats, other than standby time and "deadhead" time if a round trip included with no backhaul.

Mike, I hope this information helps your efforts for now. If you have any questions, please give me a call.

Sincerely,
CONCRETE TECHNOLOGY CORPORATION

Gary

Gary R. Wilson
Sales Manager, Marine and Heavy Const

cc: Millard Barney, Larry Norton

Utility Costs for 1300 ft long (4 module) MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units		Unit price	Quantity	Total	Comments
Structural - Per Module						
Keel Slab	940	CY				
Service Deck (include Crossover)	770	CY				
Service Deck (composite deck)	1	LS				
Operation Deck	1790	CY				
Exterior. Long. Walls	610	CY				
Interior Long. Walls	730	CY				
Trans. Walls	310	CY				
End Walls	210	CY				
Mooring	130	CY				
Stair	50	CY				
Removal FRP Curb	660	LF	[See Dwg S-4 & S-6]			
End Wall Barrier	40	LF	[			
High Mast Light Poles	2	POLES	[See Dwg S-3]			
Bollards (Only Primary)	18	EA	[See Dwg S-1]			
Form Filled Fenders (8 DIA X 14 feet)	26	EA	[See Dwg A-1]			
Preventer Fenders	26	EA	[See Dwg S-6]			
Cleats	48	EA	[See Dwg S-5 & S-6]			
Misc. Pier Parts ??						
construction???						

Concrete Weight & Reinforcement

Reference dwg: S-4,S-6,S-8 [SLABS, WALLS - CONCRETE]
S-8, S-9, S-10 [MOORING AREA]
S-19,S-21,S-22,S-24 [P/T for SLABS & WALLS]

Note: 1) Concrete (CY) and Reinforcement (T) are roundup to 10s.
2) Concrete Quantities are based on the Draft Calculations
3) S.S Reinf. Quantities are based on the preliminary Design
(Reinforcements are not specified in the dwg.)

Keel Slab			
	concrete (CY)	25202 CF	940 CY
	s.s Steel (Ton)	50 kips	30 T
	P/T (Ton)	155 kips	80 T
Service Deck (include Crossover)			
	concrete (CY)	20542 CF	770 CY
	s.s Steel (Ton)	38 kips	20 T
	P/T (Ton)	97.5 kips	50 T
Service Deck (composite deck)			
Operation Deck			
	concrete (CY)	48250 CF	1790 CY
	s.s Steel (Ton)	85 kips	50 T
	P/T (Ton)	273 kips	140 T
Exterior Long. Walls			
	concrete (CY)	16333 CF	610 CY
	s.s Steel (Ton)	163 kips	90 T
	P/T (Ton)	29 kips	20 T
Interior Long. Walls			
	concrete (CY)	19624 CF	730 CY
	s.s Steel (Ton)	192 kips	100 T
	P/T (Ton)	0 kips	0 T
Trans. Walls			
	concrete (CY)	8104 CF	310 CY
	s.s Steel (Ton)	52 kips	30 T
	P/T (Ton)	20 kips	10 T
End Walls			
	concrete (CY)	5615 CF	210 CY
	s.s Steel (Ton)	40 kips	20 T
	P/T (Ton)	13 kips	10 T
Mooring			
	concrete (CY)	3460 CF	130 CY
	s.s Steel (Ton)	35 kips	20 T
Stairs			
	concrete (CY)	1276 CF	50 CY
	s.s Steel (Ton)	13 kips	10 T

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Project: MHP PH II
Sheet ___ of ___
Job Number: A01047
Subject: COST ESTIMATE Quantity
Designer: KAP
Date: 6/22/01

KEEL SLAB, CIP (SEE DWG S-6)

☐ CONCRETE QUANTITY (PER MODULE)

(W/ 232'-0 PIER)

BASED ON DRAFT CALCULATION

CIP KEEL SLAB	= 22,266 CF
ANCHORAGE	= 664 CF
	22,930 CF
tolerance (FORM)	592 CF
conc. density (18%)	1357 CF
	24,879 CF
(Adjust to 325'-0)	× 1.013
	25,202 CF
	(933 CY ≅ 940 Y)

☐ S.S. STEEL (BASED on Preliminary DESIGN)

TOP $A_s = \frac{0.156}{144}$ in²/ft EW × 325' × 88' = 31 CF
× 88' × 325' = 31 CF

BOT $A_s = \frac{0.096}{144}$ in²/ft EW × 325' × 88' = 19 CF
× 88' × 325' = 19 CF

TOTAL = 100 CF
× ρ = 490 lb/CF

W = 49 kips
(≅ 25T)

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Project MHP PH II
Sheet ____ of ____
Job Number A01047
Subject
Designer KAP
Date 6/22/01

con't KEEL SLAB (see DWG S-20)

□ P/T 0.6ϕ $A_s = 0.217\ in^2$

LONG.	17-12 strands	× 330 ft =	101 CF
	17-12 strands	× 330' =	101 CF
TRANSV	1-12 strands	× 88' =	1.6 CF
	166-4 strands	× 88' =	88 CF
	14-4 strands	× 68' =	5.7 CF
	30-4 strands	× 88' =	16 CF
	1-12 strands	× 88' =	1.6 CF

TOTAL = 316 CF
× $\rho = 490\ ^{lb}/_{CF}$

WT = 155 kips
(≃ 80T)

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Project: MHP PH II
Sheet ____ of ____
Job Number: A01047
Subject: COST ESTIMATE QUANTITY
Designer: KAP
Date: 6/22/01

SERVICE DECK (SEE DWG S-4 & S-6)

(323'-0 PONTOON)

☐ CONCRETE QUANTITY

BASED ON DRAFT CALC'S

SLAB	= 15,558 CF
END THICKENING (CROSSOVER)	= 2,598 CF
ANCHORAGE AREA (CROSSOVER)	= 671 CF
	18,827 CF
tolerance	320 CF
conc. density (15%)	1131 CF
	20,278 CF
(Adjust to 325'-0)	× 1.013
	20,542 CF
	(761 CY ≅ 770 CY)

☐. S.S. STEEL (BASED ON Preliminary Design)

TOP $A_s \sim \frac{0.12\ in^2/ft}{144}$ ~24'×2=48' × 325' ≅ 13 CF

325' × 48' ≅ 13 CF

BOT $A_s = 0.24\ in^2/ft$ 48' × 325' = 26 CF

325' × 48' ≅ 26 CF

78 CF

× ρ = 490 lb/CF

WT = 38.^{k}

($T \cong 20^T$)

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Project

Subject

Sheet of

Job Number A01047

Designer KAP

Date 6/22/01

con't Service Deck (see DWG S-19)

□ P/T 0.6φ $A_s = 0.217\ in^2$

LONG'l	11-12 strands	× 325'	≅	65CF
	11-12	× 325'	≅	65CF
TRANSV.	18-4 strands	× 88'	≅	9.5CF
	174-4 strands	× 48'	≅	50 CF
	18-4 strands	× 88'	≅	9.5CF

199CF

× ρ = 490 lb/cf

W - 97.5 kip

≅ (50T)

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Project ______ Sheet ______ of ______

Job Number A01047

Subject ______ Designer KAP

Date 6/22/01

OPERATION DECK (see DWG S-4 & S-6)

□ CONCRETE QUANTITY

DECK	= 38,973 CF
SLAB THICKENING	= 394 CF
END THICKENING	= 3,534 CF
ANCHORAGE	= 1,499 CF
	44,400 CF
- tolerance	592 CF
- conc. tolerance (35%)	2639 CF
	47,631 CF
(Adjust to 325'-0)	× 1.013
	48,250 CF
	(1787 CY ≅ 1790 CY)

□. S.S STEEL (BASED ON Preliminary Design)

		#	L	
TOP $As = \frac{0.252}{144}$ in²/ft	×	325'	× 88'	= 50 CF
	×	88'	× 325'	= 50 CF
BOT $As = \frac{0.18}{144}$ in²/ft	×	325'	× 88'	= 36 CF
	×	88'	× 325'	= 36 CF

TOTAL = 172 CF

$\rho = 490$ lb/CF

Wt ≅ 85 kips

(say 50T)

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Project: MHP PH II
Sheet ____ of ____
Job Number: A 01047
Subject: COST ESTIMATE
Designer: KAP
Date: 6/22/01

cont OPERATION DECK (SEE DWG S-19)

□ PT

0.6ϕ $A_s = 0.217 in^2 = 1.507E-3$ ft²

TRANSV.	1-12 STRANDS	x 88'	= 1.59 CF
	20-7 strands	x 88'	= 18.6 CF
	40-4 strands	x 68'	= 16.4 CF
	220-4 strands	x 88'	= 116.7 CF
	36-4 strands	x 88'	= 19.1 CF
	1-12 strands	x 88'	= 1.59 CF
Long	32-12 strands	x 330'	= 191 CF
	32-12 strands	x 330'	= 191 CF

to account for diagonal part

TOTAL = 556 CF

x ρ_{STEEL} = 490 lb/CF

WT = 272.4 kips

= 136.2 TON

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Project

Sheet of

Job Number A01047

Subject

Designer KAP

Date 6/22/01

LONG. WALLS (See DWG S-4 & S-6)

EXTERIOR

- Concrete

8075 + 8,102 + 430 + 397 − 2021 =	14,983 CF
Anchorage C11 + 11 = 22	22 CF
CORNER B/W T & L WALL	49 CF
	15 054 CF
Tolerance ($747^{CF}/2$) =	373.5 CF
conc. density = (12%)	905 CF
	16,333 CF
	(605 CY ≈ 610 CY)

- S.S. STEEL

- $A_s = 0.12\ in^2/ft$ EW

$28' \times 2 = 56' \times 325' = 15CF$

$325' \times 2 = 650' \times 28' = 15CF$

TOTAL = 30CF

× 490 lb/CF

WT = 15 kips

- $1\frac{3}{8}$"φ ROD @ 18" $1\frac{3}{8}$" $A_s = 1.5 in^2$

$325'/1.5' \approx 217$ bars

$(217\text{bars})\left(\frac{28'+17'}{2}\right)\left(\frac{1.5in^2}{144}\right) = 51CF$

× 490 lb/CF

WT ≈ 25K

40K

(20T)

(Equiv. 2.4 pcf conc)

SEEMS SMALL

LET'S Assume same as Int Long. WALL

say Equiv 10pcf conc = REINF

$\therefore (16,333 CF)\frac{(10pcf)}{1000} = 163.3^{Kips}$

≈ (say 90T)

(EXTERIOR Long. WALL con't)

(See S-24 & S-27)

□ P/T 0.6 ϕ $A_s = 0.217 in^2$

4-Strands @ 18" spA

½ FULL L

½ HALF L

$325'/1.5' = 217$ sets $\times 2 = 434$ sets

$(434 \text{sets})(4 \text{strands})\left(\frac{0.217 in^2}{144}\right)\left(\frac{23'+17'}{2}\right) = 59 CF$

$\times \rho = 490 pcf$

$WT = 29^k$

(≅ 20T)

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Project ______ Sheet ____ of ____

Job Number A01047

Subject ______ Designer KAP

Date 6/22/01

Long. WALL (see DWG S-4 & S-6)

INTERIOR

☐ Concrete

6,377 + 4,638 + 5547 + 287 + 576 = 17,425 CF

ENDTHICKENING (MID WALL) 703 CF

Anchorage 67 CF

18195 CF

Tolerance ($747^{CF}/2$) 373.5 CF

conc. density (14%) 1055 CF

19,624 CF

(727 CY ≈ 730 CY)

☐ S.S. STEEL

$0.5^{in^2}/ft$ EW × (29' × 6) × 325' = 19.6 CF

× (325' × 6) × 29' = 19.6 CF

TOTAL = 39.3 CF

× $\rho = 490^{lb}/_{CF}$

WT = 19.2 kips

(10 T)

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Project ______ Sheet ______ of ______

Job Number A01047

Subject ______ Designer KAP

Date 6/22/01

TRANSV. WALLS (See DWG S-4)

□ CONCRETE QUANTITY

WALLS	= 5,269 CF
ADDITIONAL WALLS	= 2,166 CF
	7,435 CF
Tolerance	217 CF
conc. density (6%)	452 CF
	8,104 CF
	(300 CY)

□ S.S. STEEL

Assume 7pcf = Δ_{STEEL}

(7435 CF) (7pcf) / 1000 ≟ 52 kips ≈ 26T

≟ 30T

(Similar to DWG S-21)

□ P/T $A_s = 0.6\phi = 0.217 \text{ in}^2$

VERT. ONLY

(ACCORDING TO Marcus W.)

EXT: 9 × 15-4 strands × 17' = 14CF

MID: 3 × 28-4 strands × 28' = 14CF

EXT: 9 × 15-4 strands × 17' = 14CF

TOTAL = 42CF

× ρ = 490 lb/CF

(~3pcf) WT = 21 kips

(~10T)

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Project ____ Sheet ____ of ____

Job Number ____

Subject ____ Designer ____

Date ____

END WALLS (See S-8, S-21)

☐ CONCRETE QUANTITY

ANCHORAGE AREA = 5,615 CF

(208 CY ≐ 210 CY)

☐ SS STEEL

Assume 7 pcf = Δ STEEL

(5615 CF)(7 pcf) / 1000 = 39 kip ≐ 40 k

= 20 T

☐ P/T 0.6 φ As = 0.217 in² (see DWG S-21)

VERT. 2x 15-4 strands × 17' = 3.0 CF

2x 28-4 × 29' = 10 CF

2x 15-4 × 17' = 3.0 CF

HORIZ 2x 6-6 strands × 88' = 10 CF

2 sides

TOTAL = 26 CF

× ρ = 490 lb/CF

WT = 13 kips

(≐ 10 T)

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Project ______ Sheet ______ of ______

Job Number A01047

Subject ______ Designer KAP

Date 6/22/01

MOORING AREA (see S-8, S-9)

□ CONCRETE QUANTITY

REMOVAL + ADDITION Mooring AREA = 3,145 CF

Adjustment for changing Mooring DIM = 1.10

3460 CF

(128 CY ≅ 130 CY)

□ SS STEEL

Assume 10pcf = A·Δ

3460 (10pcf) / 1000 = 35^K ≅ 20T

□ STEEL COVER PL

26' x 26' − 11.5' x 11.5' = 544 sf

□ FENDERS

TRANSV. FENDER (MV 1450 x 1500) 2 TRELLEX

Long FENDER (MV1450x1000) 2 TRELLEX

2 surface PL

□ SHIMS

1" - PL 9

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Project

Subject

Sheet of

Job Number A01047

Designer KAP

Date 6/22/01

STAIR (see DWG S-8)

□ CONCRETE QUANTITY

REMOVAL + ADDITION = 1,215 CF

Adjusting change of Stair DIM = x 1.05

1276 CF

(47 CY ≅ 50 CY)

□ S.S.

Assume 10pcf = Δ_{ss}

(1276 CF)(10 pcf)/1000 = 13 kips

(say 10T)

Eng-002-061095

PROJECT: NFESC FRP Concrete Composite Pier
SUBJECT: Weight and Center of Gravity Calculation
DESIGNER: KAP
DATE: 9-Nov-94
REVISED: 03-Jul-01

THIN WALLS AND SLABS III
LTWT CONCRETE (120 pcf)+ REINF

PONTOON 1 - DELIVERY VOYAGE - TRANSPORT 1
Without Building and Equipment

GROSS PARAMETERS:

SUMMARY

Water Density:	64	pcf
LTWT Concrete Density :	120	pcf
Keel Slab Concrete Density:	130	pcf
Top Slab Concrete Density:	130	pcf
Intermediate Slab Concrete Density:	130	pcf
Interior Walls Concrete Density:	130	pcf
Exterior Walls Concrete Density:	130	pcf
Haunch (Slab and Wall) Density:	130	pcf
Avg Reinforced Concrete Density - A:	64.5	pcf
Volume Concrete:	11,178	cyd
Weight Steel Reinf:	(8,070)	tons

Length:	323	ft (y)
Width:	88	ft (x)
Pontoon Depth:	28.88	ft (z) - depth at centre of pier
Pontoon Depth:	28	ft (z) - depth at edge of pier
Sevice Deck Height:	16.88	ft (z) - depth at centre of pier
Service Deck Height:	16	ft (z) - depth at edge of pier
Ext Cell Width:	23.75	ft (x) from the edge
Interior Cell Width:	20.25	ft (x)
Slope:	0.02	

WEIGHT AND CG - PONTOON

	ELEMENT	# UNITS	THICK	LENGTH	WIDTH	VOLUME	UNIT WT	WEIGHT	INCR DRAFT	X	Y	Z	Wx	Wy	Wz
			(in)	(ft)	(ft)	(ft^3)	(pcf)	(kips)	(ft)	(ft)	(ft)	(ft)	(kip-ft)	(kip-ft)	(kip-ft)
	PONTOON KEEL SLAB														
y	CIP	1	8.00	323.00	86.330	18,590	130	2,417	1.328	44.00	161.50	0.33	106,333	390,291	806
y	Exter Trans. Haunch	4	12.00	317.67	1.551	1,971	130	256	0.141	44.00	161.50	0.81	11,272	41,373	206
y	Inter Transv. Haunch Longit	4	12.00	319.00	1.337	1,706	130	222	0.122	44.00	161.50	0.81	9,757	35,813	179
						22,266			1.591						
	PONTOON SERVICE SLAB														
y	service slab	2	12.00	323.00	24.083	15,558	130	2,022	1.112	44.00	161.50	15.74	88,990	326,632	31,836
y	curb	2	8.00	323.00	1.000	431	130	56	0.031	44.00	161.50	16.74	2,463	9,042	937
						15,988			1.143						
	PONTOON DECK SLAB														
y	Precast Panels (top deck)	1	15.00	323.00	88.000	35,530	130	4,619	2.539	44.00	161.50	27.82	203,232	745,952	128,475
y	Ext. Haunch1	2	12.00	254.66	1.758	895	130	116	0.064	44.00	161.50	26.63	5120	18793	3099
y	Ext. Haunch2	2	12.00	254.66	1.778	906	130	118	0.065	44.00	161.50	27.00	5179	19010	3178
y	Int. Haunch	4	12.00	256.00	1.604	1,643	130	214	0.117	44.00	161.50	27.26	9,397	34,490	5,822
						38,973			2.780						
	LONG PONTOON WALLS														
y	Ext. Long Wall Bottom	2	10.00	323.00	15.000	8,076	130	1,050	0.577	44.00	161.50	7.50	46,189	169,535	7,873
y	Ext. Long Wall Top	2	14.00	323.00	10.750	8,102	130	1,053	0.579	44.00	161.50	21.38	46,343	170,100	22,513
y	Int Long Wall Bottom	2	8.00	323.00	14.808	6,377	130	829	0.456	44.00	161.50	8.07	36,478	133,892	6,691
y	Int. Long Wall Full ht	1	8.00	258.00	26.963	4,638	130	603	0.331	44.00	161.50	14.15	26,527	97,367	8,530
y	Int. Long Wall Top	2	12.00	258.00	10.750	5,547	130	721	0.396	44.00	161.50	21.85	31,729	116,459	15,756
y	Ext. Long Haunch Bottom	2	12.00	317.67	0.677	430	130	56	0.031	44.00	161.50	2.47	2,461	9,032	138
y	Ext. Long Haunch Top	2	12.00	317.67	0.625	397	130	52	0.028	44.00	161.50	13.33	2,271	8,337	688
y	EXT/Int Long Wall Haunch	2	12.00	317.67	0.451	287	130	37	0.020	44.00	161.50	2.47	1,641	6,021	92
y	Int Long Wall Haunch (bottom)	4	12.00	319.000	0.451	576	130	75	0.041	44.00	161.50	2.47	3,296	12,093	185
y	Windows to subtract	-24	14.00	72.180	1.000	(2,021)	130	(263)	-0.144	44.00	161.50	22.75	(11,560)	(42,432)	(5,977)
						22,409			2.316						
	TRANSV. PONTOON WALLS														
y	Ext. Tansv. Wall 1	10	8.00	22.583	14.333	2,158	130	281	0.154	44.00	161.50	7.83	12,343	45,306	2,197
y	Ext. Tansv. Wall 2	10	12.00	22.583	0.151	34	130	4	0.002	44.00	161.50	16.15	195	714	67
y	Int. Tranv. Wall 1	6	8.00	19.583	26.065	2,042	130	265	0.146	44.00	161.50	13.70	11,679	42,867	3,636
y	Int. Tranv. Wall 2	6	12.00	19.583	0.131	15	130	2	0.001	44.00	161.50	26.86	88	322	54
y	Ext. Haunch @ slab 1	24	12.00	7.778	1.076	201	130	26	0.014	44.00	161.50	0.81	1,149	4,219	21
y	Ext Haunch @ slab 2	48	12.00	7.280	0.718	251	130	33	0.018	44.00	161.50	0.94	1,434	5,265	31
y	Int Haunch @ slab 1	16	12.00	6.750	1.076	116	130	15	0.008	44.00	161.50	0.81	665	2,441	12
y	Int Haunch @ slab 2	32	12.00	6.250	0.718	144	130	19	0.010	44.00	161.50	0.94	821	3,013	18
y	Int Haunch @ wall 1	12	12.00	19.250	0.452	104	130	14	0.007	44.00	161.50	2.47	597	2,191	34
y	Int Haunch @ wall 2	24	12.00	0.167	0.301	1	130	0	0.000	44.00	161.50	2.47	7	25	0
y	Ext. Haunch @ wall 1	20	12.00	22.167	0.451	200	130	26	0.014	44.00	161.50	2.47	1,145	4,202	64
y	Ext. Haunch @ wall 2	40	12.00	0.167	0.376	3	130	0	0.000	44.00	161.50	2.47	14	53	1
						5,262			0.377						
	Corner BTW T&L walls														
y	Main Corner Piece_A	16	12.00	21.000	0.125	42	130	5	0.003	44.00	131.20	16.63	240	716	91
y	Bottom Corner Piece_B	16	12.00	5.000	0.083	7	130	1	0.000	44.00	131.20	4.42	38	114	4
									0.003						

	SLAB THICKENING														
y	24" TO 21" EXT (A end)	2	12.00	21.920	0.486	21	130	3	0.002	44.00	288.54	26.41	122	800	73
y	24"to 21" EXT (B end)	2	12.00	21.920	0.486	21	130	3	0.002	44.00	34.46	26.41	122	96	73
y	24"to21" INT (A end)	2	12.00	19.583	0.423	17	130	2	0.001	44.00	288.71	26.84	95	621	58
y	24"to21" INT (B end)	2	12.00	19.583	0.423	17	130	2	0.001	44.00	34.29	26.64	95	74	57
y	21" to16" EXT_middle (A end)	2	12.00	7.780	1.945	30	130	4	0.002	44.00	283.35	26.82	173	1,116	106
y	21" to16" EXT_middle (B end)	2	12.00	7.780	1.945	30	130	4	0.002	44.00	39.65	26.82	173	156	106
y	21" to16" EXT_ends (A end)	4	12.00	7.780	1.945	61	130	8	0.004	44.00	283.35	26.66	346	2,230	210
y	21" to16" EXT_ends (B end)	4	12.00	7.780	1.945	61	130	8	0.004	44.00	39.65	26.66	346	312	210
y	21" to16" int_middle (A end)	2	12.00	6.750	1.688	23	130	3	0.002	44.00	284.20	27.26	130	842	81
y	21" to16" int_middle (B end)	2	12.00	6.750	1.688	23	130	3	0.002	44.00	38.80	27.26	130	115	81
y	21" to16" int_ends (A end)	4	12.00	6.750	1.688	46	130	6	0.003	44.00	284.20	27.09	261	1,683	160
y	21" to15" int_middle (B end)	4	12.00	6.750	1.688	46	130	6	0.003	44.00	38.80	27.09	261	230	160
						394			0.026						
	END THICKENING														
y	Top Deck	2	9.00	27.500	65.667	3,534	130	459	0.253	44.00	161.50	26.82	20,213	74,191	12,319
y	Middle Long Wall	2	8.00	32.500	16.213	703	130	91	0.050	44.00	161.50	8.77	4,019	14,750	801
y	Service Slab @ Cross Over	2	12.00	32.500	39.833	2,589	130	337	0.185	44.00	161.50	16.18	14,810	54,359	5,446
						6,825			0.488						
	ANCHORAGE AREA (Last 5ft)														
y	keel slab	2	12.00	4.000	83.000	664	130	86	0.047	44.00	161.50	1.30	3,798	13,941	112
y	service slab	2	12.00	4.000	83.900	671	130	87	0.048	44.00	161.50	14.94	3,839	14,092	1,304
y	Top Deck	2	21.00	5.000	85.667	1,499	130	195	0.107	44.00	161.50	26.32	8,576	31,475	5,129
y	Boss @ Bottom	4	12.00	4.000	11.916	191	130	25	0.014	44.00	161.50	8.00	1,091	4,003	198
y	Boss @ top	4	12.00	5.000	9.000	180	130	23	0.013	44.00	161.50	20.50	1,030	3,779	480
y	End Wall @ top	2	24.00	41.833	9.000	1,506	130	196	0.108	44.00	161.50	21.17	8,614	31,618	4,145
y	Ext. Tansv. Wall 1	4	12.00	22.583	14.333	1,295	130	168	0.093	44.00	161.50	7.83	7,406	27,183	1,318
y	Ext. Tansv. Wall 2	4	12.00	22.583	0.226	20	130	3	0.001	44.00	161.50	15.15	117	429	40
y	Int. Tranv. Wall 1	4	12.00	19.583	26.065	2,042	130	265	0.146	44.00	161.50	13.70	11,679	42,867	3,636
y	Int. Tranv. Wall 2	4	12.00	19.583	0.196	15	130	2	0.001	44.00	161.50	26.86	88	322	54
y	Haunch for End Wall @ top	2	12.00	41.833	0.500	42	130	5	0.003	44.00	161.50	25.34	239	878	138
y	Haunch for End Ext Wall @ top	4	12.00	21.250	1.000	85	130	11	0.006	44.00	161.50	13.57	486	1,785	150
y	Haunch for End Ext Wall @ bot	4	12.00	21.250	1.000	85	130	11	0.006	44.00	161.50	2.58	486	1,785	29
y	Haunch for End Int Wall @ top	4	12.00	19.280	1.000	77	130	10	0.006	44.00	161.50	14.01	441	1,619	140
y	Haunch for End Int Wall @ bot	4	12.00	19.280	1.000	77	130	10	0.006	44.00	161.50	2.58	441	1,619	26
y	Haunch to Boss & Long Wall (middle)	16	12.00	8.356	0.500	67	130	9	0.005	44.00	161.50	6.26	382	1,403	54
y	Haunch to Boss & Long Wall (end_top)	16	12.00	2.000	0.333	11	130	1	0.001	44.00	161.50	13.11	61	224	18
y	Haunch to Boss & Long Wall (end_bot)	16	12.00	2.000	0.333	11	130	1	0.001	44.00	161.50	3.42	61	224	5
						8,536			0.610						
	ADDITIONAL CONCRETE (Stair)														
y	Operation Deck Removal sect 1	-1	16.32	10.000	4.660	(63)	130	(8)	-0.005	46.50	38.50	28.15	(383)	(317)	(232)
y	Operation Deck Removal sect 2	-1	15.00	10.000	9.000	(113)	130	(15)	-0.008	39.50	38.60	28.17	(578)	(563)	(412)
y	Operation Deck Removal sect 3	-1	12.00	10.000	0.976	(10)	130	(1)	-0.001	45.67	38.50	27.36	(58)	(49)	(35)
y	Operation Deck Removal sect 4	-1	12.00	10.000	1.606	(16)	130	(2)	-0.001	41.86	38.50	27.42	(87)	(80)	(57)
y	Mid Long Wall Removal	-1	8.00	10.000	13.000	(87)	130	(11)	-0.006	44.00	38.60	22.36	(496)	(434)	(252)
y	Side Long Wall Removal	-1	12.00	10.000	10.250	(103)	130	(13)	-0.007	54.42	38.50	22.41	(858)	(513)	(299)
y	Long Wall Added (Serv to Opera)	1	12.00	11.330	10.750	122	130	16	0.009	44.00	38.50	22.07	697	610	349
y	Long Wall Added (Bottom)	2	12.00	11.330	15.020	340	130	44	0.024	44.00	38.50	8.16	1,947	1,703	362
y	Mid Long Wall Added (Bottom)	1	4.00	11.330	14.130	53	130	7	0.004	44.00	38.50	8.15	305	267	57
y	Transv Wall Added	1	12.00	28.917	10.560	305	130	40	0.022	48.46	44.00	22.07	1,924	1,747	876
y	Transv. Wall Added 2	1	4.00	28.917	10.560	102	130	13	0.007	48.46	31.33	22.07	641	415	292
y	Stair added	2	12.00	11.660	5.000	117	130	15	0.008	44.00	38.60	22.88	667	584	347
y	Stair Landing Slab added	1	8.00	10.000	4.000	27	130	3	0.002	37.00	38.50	22.55	128	133	78
y	Stair Tower Long Wall	2	12.00	10.000	7.000	140	130	18	0.010	44.00	38.50	32.18	801	701	586
y	Stair Tower Trans Wall	2	12.00	20.000	7.000	280	130	36	0.020	44.00	38.50	32.18	1,602	1,401	1,171
y	Stair Tower Ceiling	1	6.00	20.000	12.000	120	130	16	0.009	44.00	38.50	35.93	686	601	561
						1,215			0.087						
y	*ADDITIONAL CONCRETE (Mooring)*														
y	Operatiaon Deck removal A	-1	15.00	18.000	18.000	(405)	130	(53)	-0.029	44.00	59.50	28.17	(2,317)	(3,133)	(1,483)
y	Operation Deck Removal B	-2	12.00	18.000	1.604	(58)	130	(8)	-0.004	44.00	59.50	27.46	(330)	(447)	(206)
y	Keel Slab Removal A	-1	8.00	13.000	13.000	(113)	130	(15)	-0.008	44.00	59.50	0.33	(644)	(871)	(5)
y	Keel Slab Removal B	-2	12.00	13.000	1.337	(35)	130	(5)	-0.002	44.00	59.50	0.81	(199)	(269)	(4)
y	Long wall Removal_Upper	-1	8.00	25.000	26.963	(449)	130	(58)	-0.032	44.00	67.00	14.15	(2,570)	(3,330)	(827)
y	Long Wall Removal_Haunch	-2	12.00	25.000	0.451	(23)	130	(3)	-0.002	44.00	67.00	2.47	(129)	(167)	(7)
y	Long Wall Added_Upper	2	12.00	25.000	26.770	1,339	130	174	0.096	44.00	67.00	14.15	7,656	9,918	2,462
y	Long Wall Added_Seal	2	24.00	18.000	2.500	180	130	23	0.013	44.00	59.50	11.50	1,030	1,392	269
y	Transv. Wall _Upper	2	12.00	18.000	26.870	967	130	126	0.069	44.00	59.50	14.10	5,533	7,482	1,773
y	Tranv. Wall_Seal	2	24.00	13.000	2.500	130	130	17	0.009	44.00	59.50	11.50	744	1,006	194
y	Service deck addition	1	12.00	42.333	39.833	1,686	130	219	0.121	44.00	54.33	16.18	9,645	11,910	3,546
y	Remove Serv. Deck for opening	-1	12.00	18.000	18.000	(324)	130	(42)	-0.023	44.00	59.50	16.29	(1,853)	(2,506)	(686)
y	Short Log Wall Btw Mooring/Stair	1	12.00	5.000	26.963	135	130	18	0.010	44.00	47.00	14.15	771	824	248
y	Local Thickening For Fenders (T)	2	6.00	4.330	9.500	41	130	5	0.003	44.00	59.50	16.38	235	318	88
y	Local Thickening For Fenders (L)	2	6.00	7.667	9.500	73	130	9	0.005	44.00	59.50	16.18	417	563	153
						3,145			0.225						

WEIGHT AND CG - PONTOON

ELEMENT	# UNITS	THICK	LENGTH	WIDTH	VOLUME	UNIT WT	WEIGHT	INCR DRAFT	X	Y	Z	Wx	Wy	Wz
		(in)	(ft)	(ft)	(ft^3)	(pcf)	(kips)	(ft)	(ft)	(ft)	(ft)	(kip-ft)	(kip-ft)	(kip-ft)
Additional Transverse Walls														
Remove Ext Long Haunch	-2	12.00	2.67	0.68	(4)	130	(0)	0.000	44.00	161.50	2.47	(21)	(76)	(1)
Remove Ext Long Haunch top	-2	12.00	2.67	0.63	(3)	130	(0)	0.000	44.00	161.50	13.33	(19)	(70)	(6)
Remove Ext/Int Long Haunch	-2	12.00	2.67	0.45	(2)	130	(0)	0.000	44.00	161.50	2.47	(14)	(51)	(1)
Add Ext T. Wall Part 1	8	8.00	22.58	14.33	1,726	130	224	0.123	44.00	161.50	7.83	9,874	36,244	1,758
Add Ext. T. Wall Part 2	8	12.00	22.58	0.15	27	130	4	0.002	44.00	161.50	15.15	156	571	54
Add Ext Haunch @ Slab 1	16	12.00	6.75	1.08	116	130	15	0.008	44.00	161.50	0.94	665	2,441	14
Add Ext Haunch @ Slab 2	32	12.00	6.25	0.72	144	130	19	0.010	44.00	161.50	0.81	821	3,013	15
Add Exit Huanch @ Wall 1	16	12.00	22.17	0.45	160	130	21	0.011	44.00	161.50	2.47	916	3,361	51
Add Exit Huanch @ Wall 2	32	12.00	0.17	0.38	2	130	0	0.000	44.00	161.50	2.47	11	42	1
					2,185			0.158						
Potential Office Area														
Comp. Slab	1	12.00	214.333	40.500	8,680	40	347	0.191	44.00	183.00	16.68	15,278	63,541	5,791
	0						0	0.000	44.00	161.50	0.00	0	0	0
	0						0	0.000	44.00	161.50	0.00	0	0	0
	0						0	0.000	44.00	161.50	0.00	0	0	0
	0						0	0.000						
					8680			0.191						
MISC ATTACHMENTS AT FLOAT OUT														
Typical Bollards	18					3.57	64	0.035	44.00	161.50	26.50	2,827	10,376	1,703
Optional Amphibs Bollards	6					3.57	21	0.012	44.00	161.50	26.50	942	3,459	568
Bow Spoon	0						0	0.000				0	0	0
Skeg	0							0.000	44.00	161.50	0.00	0	0	0
								0.047						
PONTOON / FOUNDATION INTERFACE														
Keel Thickening	0				0	120	0		44.00	161.50	0.00	0	0	0
Wall Thickening	0				0	120	0		44.00	161.50	0.00	0	0	0
								0.050						
					VOLUME (ft^3)		WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
BARE PONTOON SUBTOTAL					291,784		18274					804,024	2,895,814	293,025
BARE PONTOON CENTER OF GRAVITY								10.0452	44.00	158.47	16.04			
CONTINGENCIES														
% Wt Inc-Conc Toler	5				7,539	120	905	0.497	44.00	158.47	16.04	39,804	143,361	14,507
Inc Top'g Toler top slab (in)	1	0.25	323.000	88.000	592	120	71	0.039	44.00	158.47	16.04	3,127	11,261	615
Inc Top'g Toler base slab (in)	1	0.25	323.000	88.000	592	120	71	0.039	44.00	158.47	16.04	3,127	11,261	1,139
Inc Top'g Toler intermediate sla (in)	1	0.25	323.000	47.500	320	120	38	0.021	44.00	158.47	16.04	1,688	6,078	615
Inc Top'g Toler long walls Full HT (in)	1	0.25	323.000	79.000	532	120	64	0.035	44.00	158.47	16.04	2,807	10,109	1,023
Inc Top'g Toler long walls HALF HT (in)	1	0.25	323.000	32.000	215	120	26	0.014	44.00	158.47	16.04	1,137	4,095	414
Inc Top'g Toler Transv walls (in)	1	0.25	528.000	16.500	182	120	22	0.012	44.00	158.47	16.04	959	3,451	349
Inc Top'g Toler Transv walls (in)	1	0.25	220.000	12.000	55	120	7	0.004	44.00	158.47	16.04	290	1,046	106
								0.6674						
					VOLUME (ft^3)		WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
BARE PONTOON + CONTINGENCIES -- TOTALS					301,810		19,477					856,961	3,086,477	311,794
BARE PONTOON CENTER OF GRAVITY								10.707	44.00	158.47	16.01			

MISCELLANEOUS STRUCTURES & EQUIPMENT ALLOWANCE

**** BY OTHERS ****

WEIGHT AND CG - MISCELLANEOUS STRUCTURES AND EQUIPMENT

ELEMENT	# UNITS	THICK (in)	LGTH (ft)	WIDTH (ft)	VOLUME (ft^3)	UNIT WT (pcf)	WEIGHT (kips)	INCR DRAFT (ft)	X (ft)	Y (ft)	Z (ft)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
EQUIPMENT - DRY WEIGHT														
SERVICES												0	0	0
GROSS AMOUNT FOR SERVICES (ALLOWANCE)							500	0.275	44.00	161.50	17.00	22,000	80,750	8,500
PRINCIPAL UTILITIES MECHANICAL							0					0	0	0
Hose cabinets and reels							0					0	0	0
Oily waste/waste oil (OWWO)							0					0	0	0
Pipe and Hoses							0					0	0	0
Lift station/Oil Water separator							0					0	0	0
Valves and risers							0					0	0	0
Potable water (PW)							0					0	0	0
Pipe and Hoses							0					0	0	0
Sectionalizing valves							0					0	0	0
Back flow preventers							0					0	0	0
Hydrants							0					0	0	0
Metering							0					0	0	0
Sanitary Sewer (CHT)							0					0	0	0
Pipe and Hoses							0					0	0	0
Sanitary lift station							0					0	0	0
Valves and risers							0					0	0	0
Steam (STM)							0					0	0	0
Pipe and Hoses							0					0	0	0
Valves							0					0	0	0
Expansion loops							0					0	0	0
Condensate return line							0					0	0	0
Compressed Air							0					0	0	0
Rigid pipes and flexible hoses							0					0	0	0
Valves and risers							0					0	0	0
JP-5 - Aviation fuel							0					0	0	0
Rigid pipe and flexible hoses							0					0	0	0
Valves and risers							0					0	0	0
Diesel or light fuel (DFM)							0					0	0	0
Rigid pipe and flexible hoses							0					0	0	0
Valves and risers							0					0	0	0
OTHER UTILITIES MECHANICAL							0					0	0	0
high pressure compressed air							0					0	0	0
Oxygen							0					0	0	0
Fire Protection							0					0	0	0
Salt water							0					0	0	0
Chilled Water							0					0	0	0
Pure Water							0					0	0	0
Feedwater							0					0	0	0
Ventilation							0					0	0	0
PRINCIPAL UTILITIES ELECTRICAL							0					0	0	0
Shore power							0					0	0	0
Conduit and receptacle housing							0					0	0	0
Metering							0					0	0	0
Flexible cabling							0					0	0	0
Cable lockers/reels							0					0	0	0
Substation transformers							0					0	0	0
Industrial power							0					0	0	0
Conduit, lighting							0					0	0	0
Metering							0					0	0	0
Substation transformers							0					0	0	0
Ventilation							0					0	0	0
Switchgear							0					0	0	0

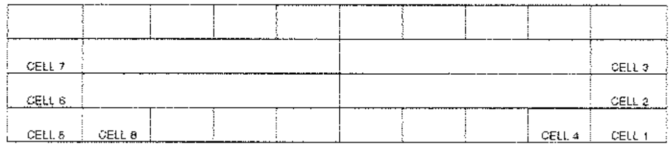
WEIGHT AND CG - MISCELLANEOUS STRUCYURES AND EQUIPMENT

ELEMENT	# UNITS	THICK	LGTH	WIDTH	VOLUME	UNIT WT	WEIGHT	INCR DRAFT	X	Y	Z	Wx	Wy	Wz
		(in)	(ft)	(ft)	(ft^3)	(pcf)	(kips)	(ft)	(ft)	(ft)	(ft)	(kip-ft)	(kip-ft)	(kip-ft)
Cable trays							0					0	0	0
Lighting fixtures							0					0	0	0
Communications							0					0	0	0
Utilities separation							0					0	0	0
Spill containment and control							0					0	0	0
MISCELLANEOUS														
Ramps							0					0	0	0
Bollards							0					0	0	0
Stairways							0					0	0	0
Fendering							0					0	0	0
Possible Int. deck	0	0.00	0.00	0.000	0	121	0	0.000	0.00	0.00	0.00	0	0	0
Allowance	0						0							
							WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
EQUIPMENT SUBTOTAL							500					22,000	80,750	8,500
EQUIPMENT CENTER OF GRAVITY								0.276	44.00	161.50	17.00			

WEIGHT AND CG -MISCELLANEOUS STRUCTURES AND EQUIPMENT

ELEMENT	# UNITS	THICK	LGTH	WIDTH	VOLUME	UNIT WT	WEIGHT	INCR DRAFT	X	Y	Z	Wx	Wy	Wz
		(in)	(ft)	(ft)	(ft^3)	(pcf)	(kips)	(ft)	(ft)	(ft)	(ft)	(kip-ft)	(kip-ft)	(kip-ft)
EQUIPMENT - DRY WEIGHT - cont'd														
CONTINGENCIES														
% Equipment Weight	20						100	0.055	44.00	161.50	16.44	4,400	16,150	1,644
								0.055						
							WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
EQUIPMENT + CONTINGENCIES -- TOTALS							600					26,400	96,900	10,144
EQUIPMENT CENTER OF GRAVITY								0.330	44.00	161.50	16.91			
BALLAST														
Ballast - Cell 1	0	0.00	32.417	23.000	0	62.4	0	0.000	12.333	17.208	0.667	0	0	0
Ballast - Cell 2	0	0.00	32.417	19.583	0	62.4	0	0.000	33.542	17.209	0.667	0	0	0
Ballast - Cell 3	0	0.00	32.417	19.583	0	62.4	0	0.000	54.458	17.209	0.667	0	0	0
Ballast - Cell 4	0	0.00	63.633	23.000	0	62.4	0	0.000	12.333	65.316	0.667	0	0	0
Ballast - Cell 5	0	0.00	32.417	23.000	0	62.4	0	0.000	12.333	305.792	0.667	0	0	0
Ballast - Cell 6	1	62.00	32.417	19.583	3,280	62.4	205	0.113	33.542	305.792	3.250	6,865	62,586	666
Ballast - Cell 7	1	62.00	32.417	19.583	3,280	62.4	205	0.113	54.458	305.792	3.250	11,146	62,586	665
Ballast - Cell 8	0	0.00	32.417	23.000	0	62.4	0	0.000	12.333	257.684	0.667	0	0	0
								0.225						
					VOLUME (ft^3)/gals		WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
BALLAST SUBTOTAL					6,560		409					18,011	125,172	1,330
BALLAST CENTER OF GRAVITY					49,068			0.225	44.00	305.79	3.25			
							WEIGHT (kips)		Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
MISCELLANEOUS STRUCTURES, EQUIPMENT AND BALLAST WEIGHT AND MOMENTS							1,009					44,411	222,072	11,474
MISCELLANEOUS STRUCTURES, EQUIPMENT AND BALLAST CENTER OF GRAVITY								0.555	44.00	220.02	11.37			

NORTH



Plan - Pontoon Ballast Cells

PONTOON - DELIVERY VOYAGE - TRANSPORT 2

TOTAL WEIGHT AND CENTER OF GRAVITY	WEIGHT (kips)	DRAFT (ft)	Xo (feet)	Yo (feet)	Zo (feet)	Wx (kip-ft)	Wy (kip-ft)	Wz (kip-ft)
Weights and Moments (pg 2 & pg 4)	20,486					901,372	3,308,548	323,268
Center of Gravity		11.231	44.00	161.50	15.78			

HYDROSTATIC PROPERTIES

Pontoon Weight =	19,477 kips	Ave. Draft due to Pontoon Wt. =	10.71 ft	Displacement =	304,323 cu ft
Misc Structures and Equipment Weight =	600 kips	Ave. Draft from Misc St. & Equ Wt.=	0.33 ft	Displacement =	9,375 cu ft
Ballast =	409 kips	Ave. Draft due to Ballast =	0.23 ft	Displacement =	6,396 cu ft
Total Weight =	20,486 kips	**Average Total Draft =**	**11.26 ft**	Displacement =	320,094 cu ft

Load To Sink Pontoon 1" = 161.59 kips per inch

Freeboard at Delivery Voyage = 17.62 ft

METACENTRIC HEIGHT CALCULATION - UNBALLASTED

X-AXIS (Weak Dir)

KB = 5.52 ft (Center of Buoyancy to Keel)
BM = 58.47 ft (Center of Buoyancy to Metacenter)
KM = 63.99 ft (Keel to Metacenter)
KG = 16.04 ft (Keel to Center of Gravity)

GM = 47.96 ft (METACENTRIC HEIGHT)

Moment to Heel 1" = 912 kip-ft

Mx = (14) kip-ft
Trim X = -0.01 in
Theta X = 0.00 degrees

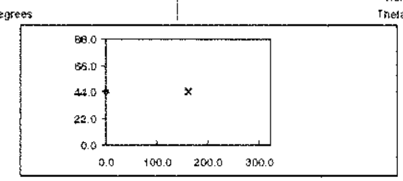
Y-AXIS (Strong Dir)

KB = 5.52 ft (Center of Buoyancy to Keel)
BM = 787.76 ft (Center of Buoyancy to Metacenter)
KM = 793.28 ft (Keel to Metacenter)
KG = 16.04 ft (Keel to Center of Gravity)

GM = 777.25 ft (METACENTRIC HEIGHT)

Moment to Trim 1" = 4,026 kip-ft

My = 63 kip-ft
Trim Y = 0.01 in
Theta Y = 0.00 degrees



STATICS CHECK

SSS Reinforcing Cost - Material only Installation Included in Module Cost

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
High Range Cost	Tons	$3,000	1480	$4,440,000	at $1.50 per pound
Baseline Cost	Tons	$2,000	1480	$2,960,000	at $1.00 per pound
Low Range Cost	Tons	$1,500	1200	$1,800,000	at $0.75 per pound and 80% of baseline quantity

Ancillary Items Cost - MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Fendering system	LF	$540	650	$351,000	Allowance
Bollards	EA	$8,700	18	$156,600	
Cleats	EA	$1,500	24	$36,000	
Pier lighting and controls	LS	$150,000	1	$150,000	Allowance
On-shore mechanical manhole	LS	$20,000	1	$20,000	
On-shore electrical vault		$20,000	1	$20,000	
		Cost of ancillary items		**$733,600**	
		Total for 4 modules		**$2,934,400**	

Joining Cost for 1300 ft long (3 joints) MHP Berthing Facility - BERGER/ABAM Baseline Estimate

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Labor and Equipment Costs for 1 joint					
Clean joint for joining	shifts	$7,500	1	$7,500	
Rental of winch barge	LS	$33,000	1	$33,000	Allocate cost of $100,000 rental over 3 joints
Harbor tug assist -	days	$6,000	10	$60,000	per 24 hour day
Workboat and operator assist	days	$2,500	10	$25,000	
Position Modules, Attach tension tie, Ballast, and Dewater	Shifts	$7,500	3	$22,500	Crew of 1 Supv and 8 Iron workers
Remove plugs, install 435 joint bars, snug bars.	Shifts	$7,500	6	$45,000	3 shifts for 2 days @ 1 staff hour per bar
Grout joint	Shifts	$7,500	4	$30,000	1 day with 2 shifts
Stress bars	Shifts	$7,500	6	$45,000	2 shifts for 3 days (1 hr per bar)
Finish joint	Shifts	$7,500	6	$45,000	1 shift for 3 days (.5 hr / bar)
Rent Misc equipment	LS	$50,000	1	$50,000	Grout pump, stressing jacks,
	Costs for completing 1 joint			$363,000	
	Costs for completing 3 joints			**$1,089,000**	

MANSON CONSTRUCTION CO.
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WA CONTRACTOR'S LICENSE #MANSOCC032M1 • FAX (206) 764-8595

Memorandum

To: Michael Lanier, Berger / ABAM Engineers

From: Bill Shorey, Manson Construction

Ref: Modular Hybrid Pier, U.S. Navy

Per your request Manson Construction has completed a preliminary cost estimate for the module integration and the mooring dolphin elements. The documents used for this estimate are the text and drawings included in the Phase 2 Preliminary Design Report for the Modular Hybrid Pier.

Due to the preliminary nature of the drawings some interpretation was done to develop the cost of the two elements of work. The breakdown of these costs is as follows:

Module Integration:

SAY 50% OF MATL INCL IN CTC MODULE $

Materials (Per Joint):	X3	$180,000	270,000 FOR 3 JOINTS.
Labor, Equipment, Supplies & Subs (1st Joint):		$486,000	486 000
Labor, Equipment, Supplies & Subs (2nd or 3rd Joint):	X2	$324,000	324 000
			324 000

Total Cost to Integrate Modules = $1,674,000 $ 1,404,000 USE.

The lower cost to integrate the 2nd and 3rd joints is due to the reuse of provisions and supplies on the following joint integrations.

Mooring Piers:

Materials (Per Pier):	$585,000
Labor, Equipment, Supplies & Subs (1st Pier):	$1,650,000
Labor, Equipment, Supplies & Subs (2nd Pier):	$1,150,000

Total Cost for Two Mooring Piers = $3,970,000

The lower cost for the second pier is due to the reuse of provisions and supplies.

The mooring piers will be very difficult to construct. Dewatering the cofferdam is not practical with the procedure as shown on the plans. The weights that would have to be added to resist the uplift load are very large. Possibly some depth can be added to the pile cap to allow a first stage concrete tremie pour that can engage the piles to the pile cap and resist the uplift.

MANSON

Alternatively it might be better to revise the design and use a large mono-pile cantilevered out of an excavated caisson to serve as the mooring mast. A large diameter caisson can be driven into the ground and the mooring shaft anchored inside of it. This will allow adjustment to get the accurate positioning of the mooring shaft.

The costs shown above include markup for overhead and profit. However mobilization costs are not included. It is recommended that some contingency be added to the above prices due to the preliminary nature of the design.

If you have any questions or need additional information please call.

Sincerely,

William Shorey

William Shorey, P.E.

Mooring Costs for 1300 ft long (4 module) MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item		Units	Unit price	Quantity	Total	Comments
MHP MOORING COST						
Mooring Area						
Sliding Steel Cover PL	544	SF	$15.30	1	$8,323	
				TOTAL	**$8,323**	
Fendering						
T. Trellex Fenders (MV1450x2000)	4	EA	$3,500.00	1	$14,000	
L. Trellex Fenders (MV1450x1000)	4	EA	$1,750.00	1	$7,000	
Surface PL (MV1450x2000 A)	2	EA	$11,400.00	1	$22,800	
Surface PL (MV1450x1000 B)	2	EA	$4,000.00	1	$8,000	
9-Shims (MV1450x2000)	2	SIDES	$20,700.00	1	$41,400	
9-Shims (MV1450x1000)	2	SIDES	$10,800.00	1	$21,600	
				TOTAL	**$93,200**	
Guided Shaft						
Steel shafts (including Int. PL and End PL)	74000	lb	$1.80	1	$133,200	
INT. PL	70000	lb	$1.80	1	$126,000	
END PI	14000	lb	$1.80	1	$25,200	
1.5" dia Vertical Bars (4)	41	LF	$30.00	4	$4,920	
				TOTAL	**$289,320**	
Pile Cap						
Precast	80	CY	$366.00	1	$29,280	not installed
Cast-in-place	150	CY	$373.00	1	$55,950	installed
Grout	10	CY	$373.00	1	$3,730	installed
				TOTAL	**$88,960**	
Precast Piles						
20"oct. pile- 22 strands	100	LF	$55.00	16	$88,000	installed (Ref: Prev. project)
				TOTAL	**$88,000**	

Mooring Costs for 1300 ft long (4 module) MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item		Units	Unit price	Quantity	Total	Comments
Leveling System						
Steel Leveling Cap	9000	lb	$1.50	1	$13,500	
Leveling Screws	8	EA	$15.00	1	$120	
1.5" High Strength Bars w/ embed anchor	6.5	LF	$30.00	8	$1,560	
Embed PL (Steel) - machine sregated	11760	lb	$5.00	1	$58,800	
Sliding PL (Steel) - machine sregated	11760	lb	$5.00	1	$58,800	
Extra Concrete to cover the plates	5	CY	$373.00	1	$1,865	installed
				TOTAL	**$134,645**	
Construction						
Sheet Pile						
Dewatering						
Temporary Shoring						
Temp Anchors						
Temp Bracing						
Pile Load Test?						
				TOTAL	**$300,000.00**	(Rough Estimate)
SUBTOTAL FOR MHP MOORING					**$ 1,002,448**	**PER MOORING**
			X 2 moorings		**$ 2,004,896**	**For 1300 Foot Pier**

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Sheet ____ of ____

Job Number A01047

Subject COST ESTIMATE MOORING

Designer KAP

Date 6/29/01

- MOORING AREA

    - PRECAST CONCRETE ⇨ PART of MHP MODULE

    - SLIDING STEEL COVER PL (DWG DETAIL 3 of S-5)

— 26'x26' OUTER − 11.5'x11.5' inner = 544 SF

say 3/8" PL

$$VOL = (544\,SF)\left(\frac{3/8''}{12}\right) = 17\,CF$$

$$WT = (17\,CF)(490\ lb/CF) = 8,326\ lb$$

— COST

Means p189 W27x114 ⇨ ~60¢/lb STEEL (SEE GUIDE SHAFT)

∴ say unit cost $1.00/lb

COST = $ 8,326

[unit cost (SF) = $8,326 / 544 SF = $15.30/SF]

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Subject COST ESTIMATE MOORING

Sheet ____ of ____

Job Number A01047

Designer KAP

Date 6/29/01

- FENDERING (DWG. 3/S-9)

- T. TRELLEX FENDER MV 1450 x 2000 — (4.76' x 6.56')

  L. TRELLEX FENDER MV 1450 x 1000 — (4.76' x 3.28')

— Per Mike

FOAM FILLED FENDER ≅ $540/FT

Let's assume

MV 1450 x 2000 ⇒ $540/ft x 6.56' = $3,542

≅ $3,500/EA

MV 1450 x 1000 ⇒ $3500/2 = $1750/EA

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Project: MHP PH II | Sheet ____ of ____
Job Number: A01047
Subject: COST ESTIMATE MOORING
Designer: KAP
Date: 6/29/01

- SLIDING PL (surface PL) — (see DWG. 3/S-9, 1/S-8)

SIZE ≅ 76" x 105"
↑
1.33 (2000 mm)

MV1250 — 1.33 (1250 mm)
PL WIDTH ≅ 1660 mm
≅ 66"

MV1000 — 1.33 (1000 mm)
WIDTH ≅ 1330 mm
≅ 52"

MV1450
W ≅ 1932 mm
≅ 76"

REF TRELLEX manual (attached)
P920 PANEL WT (w/o chane) assume

ORIENTATION = VERTICAL (Fig 3)

H = MV1450 = 1450 mm = 1.450 m

L = 2000 mm = 2.0 m

compound (A)

max WV = 2.0 x 1.78 x 1.45 = 5.1 Tonnes ≅ $\boxed{11,380\text{ lb}}$

LET'S assume W = 11,400 lb

unit cost $1.00/lb

MV1450 x 2000 $\boxed{\text{COST} = \$11,400/\text{PANEL}}$

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Sheet ____ of ____

Job Number A01047

Subject COST ESTIMATE MOORING

Designer KAP

Date 6/29/01

- MV1450×1000

max $W_v = 1.0^m \times 1.25 \times 1.45^m$ = 1.81 tonnes = 3995 ≅ 4000 lb

compound (B)

H = 1.45m

L = 1m

unit cost --> \$1/lb

$\boxed{\text{MV1450×1000 COST} = \$4000\ \text{/panel}}$

- Shims (DWG 1/S-8) (• Shims located base of MHP side of fenders • Assume 9 - 1" shim plate)

Let's assume size shims as follows. (Similar to panel size)

			1" PL
MV1450×2000 →	76"×106"	A = 56 SF	V = 4,664 WT = 22831
MV1450×1000 →	76" × 53"	A = 28 SF	V = 2,334 WT = 11411 lb

unit cost = \$1.00/lb.

∴ MV1450×2000 \$2,300/sht × 9 shims = \$20,70

MV1450×1000 \$1,200/sht × 9 = \$10,80

STEEL PANELS

The *Trellex Steel Panel* is a closed box design as standard and is developed for maximum strength at minimum weight. Plain and smooth outer surfaces guarantee the best treatment and control of the marine corrosion protection and minimize the exposed surface area. The grade of steel depends on requirement and is calculated for every customized case. Normally used grade of steel is stronger than 43 A (ASTM A 36 or JIS 3101), which is minimum grade used. Example of different types of panels, multiple fenders and special fenders, see pages 26-27.

Marine corrosion protection can be according to BSI, ASTM, SIS or other standards applicable.

Open-Grid-design for hot dip galvanizing can be made as an alternative, but will result in heavier panels.

As shown below there are great advantages in designing light panels and use of low friction facing. Weight chains and/or shear chains can in many cases be avoided.

FENDER PANELS WITHOUT WEIGHT CHAINS

A considerable amount of permanent weight can be supported by the MV elements.

Maximum allowed permanent weight W of panel to be supported by the MV elements only is dependent on element sizes (H and L) and compound of rubber (A or B).

H = size in m (example MV 750; H = 0.75 m)

Table below can be used for calculating allowed weight of panel without weight chains. It shows the weight which can be supported by a pair of MV elements 1 metre in length (L) orientated vertically (Wv, fig. 3) or horizontally (Wh, fig. 4).
Combining weight Wv and Wh can be applied.

Compound A		Compound B	
Wv	Wh	Wv	Wh
1.78 H	1.0 H	1.25 H	0.7 H
Weight in tonnes			

Example:
Two vertical orientated MV elements MV 750 x 1500 A and two horizontal MV 750 x 1000 B behind a panel.

Weight of panel to be supported by MV elements only may not exceed W total.

W total = 1.5 x 1.78 x 0.75 + 1.0 x 0.7 x 0.75 = 2.53 Tonnes

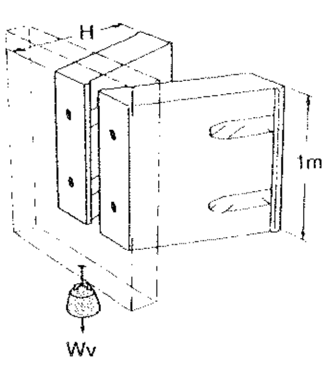


Fig. 3

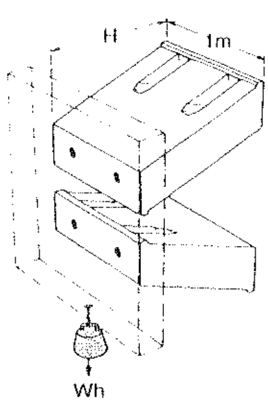


Fig. 4

FENDER PANELS WITHOUT SHEAR CHAINS

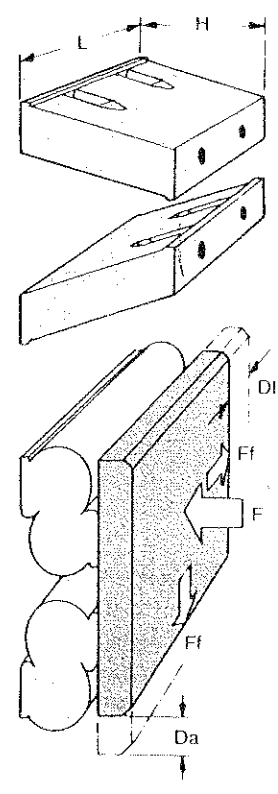
The fender elements are often able to transfer the momentary transversal forces to the structure. The friction along the panel will cause a sideways deflection.

SHEAR STIFFNESS of standard MV elements

Momentary transversal deflection caused by shear forces independent of compound (A or B) and length (L).

F = Rated reaction force at deflection min. 0.27 H
Cf = Coefficient of friction (formulas valid for Cf 0-0.4)
Ff = Shear force caused by friction Ff = F x Cf
Dl = Deflection longitudinal at shear force (mm)
Formula: Dl = 0.39 x H x Cf
Da = Deflection across at shear force (mm)
Formula: Da = 0.82 x H x Cf

Example: H = 1000 mm (MV 1000 x ____ A or B)
Cf = 0.2
Dl = 0.39 x 1000 x 0.2 = 78 mm 3.1"



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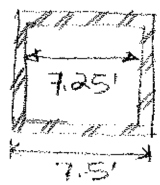
Project: MHP PH II | Sheet ___ of ___
Job Number: A01047
Subject: Cost Estimate
Designer: KAP
Date: 6/29/01

GUIDE SHAFT (DWG S-9, S-11)

- STEEL TUBE L = 41 ft

  - 7'-6" x 7'-6" x 1 1/2" ⇒ A = 3.69 SF



Vol = 151.2 CF

WT = 151.2 CF x 490 lb/CF

= 74,088 lb = 74 K

L = 41 ft

(ASSUME 10 PL)

- INT. PL = 7.5' x 7.5' x 1/4" = 14 CF → 7 K/ x 10 PL
- END PL = 7.5' x 7.5' x 1/2" = 28 CF → 14 K/

$\boxed{\text{TOTAL} = 158^K}$

(MEANS P189)

W 27x114   WT = 114 lb x 1 = 114 lb

= .57 T ⇒ $ 69/MATERIAL

material

$\boxed{\text{unit} = \$1.15/\text{TON}}$

material cost = ~ 60¢/lb.

unit cost: say $1.40 to $1.80 /lb

(W/ WELDING etc)

COST = (158,000 lb)($1.80/lb) = $284,400 /SHAFT

(unit $/LF = $6,937/LF)

001-061095

BERGER/ABAM ENGINEERS INC.

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Subject COST Estimate
Designer KAP
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- VERTICAL BARS (DWG 3/S-11 & 1/S-12)

1½"φ High Strength BARS

LF = 41'

QUANTITY = 4

COST : similar to P/S STRANDS

PER Mile : Lets use \$5/lb

1½"φ $A = \pi(0.75")^2 = 1.77 in^2 = 0.0123 ft^2$

VOL (ft) = 0.00123 CF

WT = 6.0 LB. (PER 1ft)

∴ unit cost/LF = \$5/LB × 6 LB = $\boxed{\$30/ft}$

COST = (41') (\$30) (4) = \$4,920

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Sheet ____ of ____

Job Number A01047

Subject COST ESTIMATE

Designer KAP

Date 6/29/01

PILECAP (DWG S-11)

▷ PRECAST

VOL ≅ 76CY ≅ 80CY

(means p161)

	Mat	Labor	EQ	TOTAL	TOTAL OH
24"x52" x40' BM	$4025	$111	$78	$4214	$4700
= 12.84 CY	$313/CY	$8.6/CY	$6.07	$328.	$366/CY

× 80CY

BGAR COST = $29,280

TO PLACE ??

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▷ CAST-IN-PLACE (DWG S-11)

VOL ≅ 148 CY ≅ 150 CY

(MEANS p161 2001) TOTAL · OH

CIP 6000 psi ⇒ $91.50/CY

(MEANS P158)
PLACING CONCRETE
W/CRANE BUCKET ⇒ $70/CY × 4 = $280.
24" thick water construct

$372/CY
× 150 CY

$55,800 INPLACE

$$\boxed{\text{CAST-IN-PLACE CONC} \cong \$56{,}000}$$

(unit price = $373/CY)

▷ GROUT

VOL = 10 CY

Assume unit price = CAST IN PLACE conc. unit price = $373/CY

$$\boxed{\therefore \text{COST} = \$3{,}730 \cong \$4{,}000}$$

BERGER/ABAM ENGINEERS INC

Project MHP PH II
Sheet ____ of ____
Job Number A01047
Subject COST ESTIMATE
Designer KAP
Date 6/29/01

S-9

▸ CONCRETE PILE (DWG S-11)

▹ 24" OCT. PILE

LENGTH = 20' (Top cap to sea bottom) + 50' (Embed L)

+ 20' (Top cap to water surf) + 5' (above water)

≅ 95' say 100'

▹ COST

REF: Lewis K.

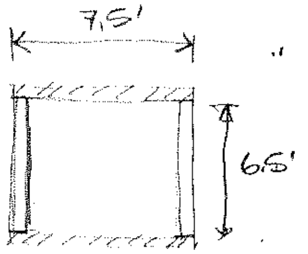
Handai (?) JOB. COST

24" oct pre-cast pile → $55/LF INSTALLED
(used 5% inflation)

Project	MHP PH II
Sheet	of
Job Number	A01047
Subject	COST Estimate
Designer	KAP
Date	6/29/01

LEVELING SYSTEM

▶ STEEL LEVELING CAP (DWG 1/S-12)



(AUTO-CAD)

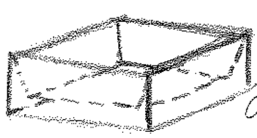
24'-0 × 7.5' = 180 SF

OUTER DIM of LEVELING CAP

ADDITIONAL piece

6' × 6.5' = 39 SF

180 SF + 39 SF = 219 SF



assume 1" thickness

$Vol = (219\,SF)(1/12) = 18.25\,CF$

$WT = 18.25\,CF \times 490\,lb/CF = 8{,}942\,lb$

$\approx 9{,}000\,lb$

COST

unitcost assume \$1.50

$\boxed{COST = \$13{,}500}$

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Subject COST Estimate

Sheet ____ of ____

Job Number A01047

Designer KAP

Date 6/29/01

▶ SERIGATE PL TOP & BOT (DWG b-12)

TOP 6' x 4' x 3" TICK = 6 CF x 490 lb/CF = 2940 lb x 4 PL

= 11,760 lb

BOT 6' x 4' x 3" TICK = 11,760 lb

TOTAL WT = 23,520 lb.

COST

GUESS $5.00/lb (MIKE)

(unit cost = $5/lb)

$\boxed{\text{COST = \$117,600}}$

BERGER/ABAM ENGINEERS INC.

Project MHP PH II

Subject COST Estimate

Sheet ____ of ____

Job Number A01047

Designer KAP

Date 6/29/01

▸ LEVELING SCREWS (DWG S-12)

QUATITY → 8 EA

(means p183)

LAG SCREWS

5/8" dia 3" — (MAT + LABOR + OHA) $ 3.72/EA

say 12" — $ 15.00/EA

× 8

COST = $120

$\boxed{\text{COST} = \$120 / \text{CAP}}$

▸ 1½" ϕ Highstrength Bars (DWG S-12)

unit cost = $30/LF (same as shaft bars)

LF = 6.5 ft

QUANTITY = 8

unit cost = $30/LF

$\boxed{\text{cost} = \$1,560}$

BERGER/ABAM
ENGINEERS INC.

PLANNING
ENGINEERING
ENVIRONMENTAL
PROGRAM MANAGEMENT

Transmittal Memorandum

To: Ed Blessing
7049 E Desert Spoon Ln.
Gold Canyon, AZ 85219

Date 3 July, 2001
Project Modular Hybrid Pier
Our Number A01047

Attention Ed
Phone: 480-983-7642
Regarding Cost Estimating Input
I am forwarding Modular Hybrid Pier Estimating Information

■ Prints ☐ Originals ☐ Reproducibles ☐ Photocopies ☐ Other

Quantity	ID Number	Date	Description
1 set		July 3, 2001	Estimating Information

Remarks Dear Ed:
Attached is the material we discussed. We would like you to concentrate on estimating the two mooring shaft support dolphins complete with mooring shaft installed. (see the installation drawing for this element) Then take a look at the floating concrete module estimate and see if you have an opinion about the cost. I am trying to get Manson to take a look at the cost of the floating concrete modules, but I would still like any input you have. I would also like your general input on how we might be able to improve the constructability of the mooring elements. There are some tolerance issues that will likely be difficult to deal with. There are differing opinions about how closely we can position the pile cap... using it as a template for driving. Give me a call at 206-431-2300 if you have any questions or want to discuss any of the features.

You mentioned that you could spare a couple of days for this. That amount of time would be about right. Please send your bill to my attention and note where you want the check sent. Thanks for your help.

Regards,

Michael W. LaNier
Vice President

CC: Kayoko Price

Mike Lanier

From: Edward Blessing [elb-mmb@worldnet.att.net]
Sent: Saturday, July 07, 2001 1:11 PM
To: Mike LaNier
Subject: MHP costs / comments

cost est detail.doc   A01047-001.PUB   A01047-002.PUB

Mike,

I have estimated the Mooring Dolphins and have attached my detailed cost estimate. This certainly is a difficult structure to construct but I came up with a scheme for the precast cap support structure and cofferdam that I feel will work. They have not been "engineered" and the material sizes and costs may increase when the designs are completed. The costs do not contain a contingency for design details. As you read the detailed costs, I did not include shaft fendering which if feel Kayoko covered in her estimate.

In reviewing the floating Module costs, in my opinion, the fabrication costs appear to be adequate at $4,500,000 ea. I think the joining costs are light and would expect a cost of at least $250,000 per joint. As an example, each joint will require a cofferdam around the girth and the area pumped before the bolt holes are punched through.

I suggest that you include a system of mating cones where pontoon "A" has two "male" projections and pontoon "B" has matching "female" receptacles. The pontoons are winched together and, when snug, the bolt holes will be in alignment. This may add some cost to the fabrication but will save time and money in aligning and bolting.

I am attaching my detailed cost estimate for the mooring dolphins and two crude drawing of cofferdam and support structure.
I will send hard copy of the estimate and more detailed concept of cofferdam and support str.

Thank you for the work I'll call Monday (7/9/01) in the early afternoon to see if you have any questions. I'll also e-mail my time sheet to Patty.

Thanks again!

Ed Blessing

MODULAR HYBRID PIER

MOORING DOLPHIN

COST ESTIMATE DETAIL

1. Support Structure

The support structure consists of 8 ea 24" dia. x ½" wall steel pipe pile 100 ft. long placed 5'+/- each way from the corners of the precast pile cap. The piles are cutoff and capped with a steel plate and jacks placed atop the plates. Doubled 14"HP102 sections are placed between piles at each corner and raises to the proper invert elevation of the PC cap and secured. PC cap is then lowered underwater whereupon it's corners rest on the HP beams.

- 8 ea. 24"x1/2"x100' pipe = 104,000 lb. @ $.20 = $20,800
- Dbl. 14HP102x12'x4ea = 10,00 lb @ $.35 = $3,500
- Plate and bracing = $10,700
- Jacks, 8 ea. @ $1,000 = $8,000

Subtotal = $44,000

Derrick & Crew

Equipment = $5,400 /shift
Operators = $1,000 / shift
Pile bucks = $ 2,600 / shift

+ $10,00 / shift

Divers, 2 crew of $2,00 = $4.00 / shift

- Drive pile, 2 shift @ $10,000 = $20,000
- Cut off, cap, & level, 2sh. @ $10,000 = $20,000
- Divers, 2 shift @ $4,000 = $8,000

Subtotal = $48,000

Item Total = $92,000

2. Precast Cap

- Fabricate pc cap, 80 cy @ $300 = $24,000
- Guides, sling, etc. = $6,000
- Place on support frame, 1 shift w/divers = $14,000

Item Total = $44,000

3. **Pile Driving**

16 ea. 24" octagonal x 100'

- Buy pile, 1,600' @ $50 = $80,000
- Drive pile, 4 shifts @ $10,000 = $40,000
- Cut off pile, 4 diver shifts @ $4,000 = $16,000

Item Total = <u>$136,000</u>

4. **Concrete Pile to PC Cap**

- Forms = $2,500
- Concrete = $1,000
- Install = 1 sh w/ divers & derrick = $14,000

Item Total = <u>$17,500</u>

5. **Cofferdam**

3/8" steel plate walls with 4"x4"x1/4" angle stiffeners at 2'-0" o/c in each direction (like a barge hull). Sheet pile interlocks at the corners. Walls to be snug fit to outside of PC cap walls with rubber strip.

- 3/8" pl, 4 ea 30'x30' + 900 ' angle + misc struts and braces = 110,00 lb @ $1 = $110,000
- Interlocks, 120' @ $20 = $2,400
- Install, I sh. W/ derrick & diver crews = $14,000
- Pump and seal = $7.000

Item Total = <u>$133,400</u>

6. **C.I.P. Concrete** 135 c.y.

- Concrete @ $92 = $12,420
- Ferry to site @ $18 = $2,430
- Reinforcing steel, 130#/c.y. @ $65 = $8,775
- Place @ $75 = $10 125

Item Total = <u>$33,750</u>

7. **Shaft**

7.5' square x 1 ½" plate x 41' long = 75,300 lb., + Stiffeners and top plate = 6,900 lb

- Buy steel, 83,000 lb @ $.40 = $33,200
- Fabricate Steel @ $1.60 = $132,800

Item Total = <u>$166,000</u>

8. Shaft Hardware

- Verticle hold down bars, 164' @ $30 = $5,000
- Leveling system, 9,000 lb @ $2 = $18,000
- Alignment Plates, 24,000 lb @ $4 = $92,000
- Bolts = $2,000

Item Total = $117,000

9. Fit-up Shaft

- Place, plumb & brace shaft, 1 shift @ $10,000
- Grout leveling Base = $1,000
- Temporary supports, allow $2,000

Item Total = $13,000

10. Remove Cofferdam & Support Structure

- Remove Cofferdam, I shift @ $14,000
- Remove support frame, I shift @ $14,000
- Pull pipe piles, 2 shift @ $14,000 = $28,000

Item Total = $56,000

11. Temporary pier Moorings

- Rent anchors, chain, buoys, etc. = $10,000
- Place, moor, remove, 3 shift @ 410,000 = $30,000

Item Total = $40,000

12. Install Shafts

- Place & grout underwater, 1 shift @ $14,000
- Dewater = $1,000
- Install hold down rods = $3,000
- Place concrete = $5,000

Item Total = $23,000

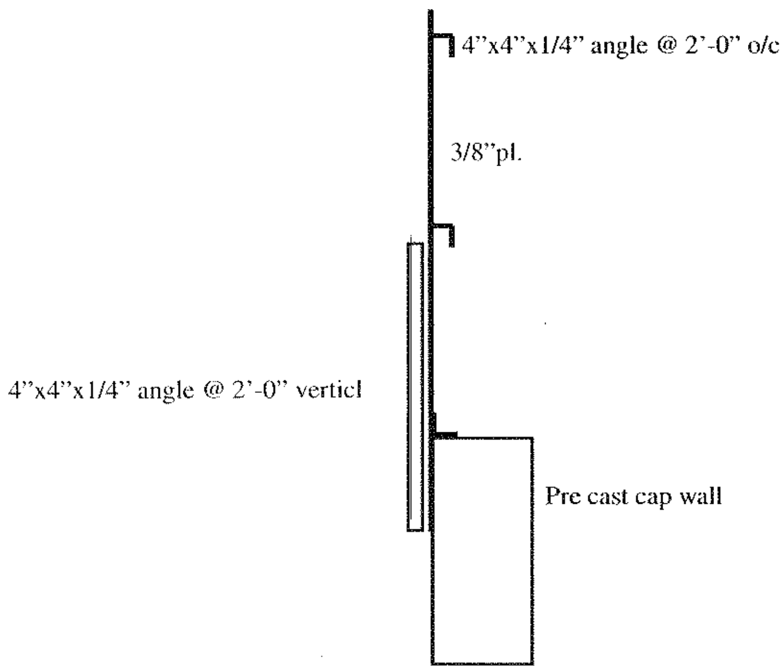
SUMMARY OF COSTS

1. Support System	**$ 92,000**
2. PC Pile Cap	**$ 44,000**
3. Pile Driving	**$136,000**
4. Concrete Piles to Cap	**$ 17,500**
5. Cofferdam	**$133.400**
6. C.I.P. Concrete	**$ 33,750**
7. Shaft	**$166,000**
8. Shaft Hardware	**$117,000**
9. Fit-up Shaft	**$ 13,000**
10. Remove Temp. Const.	**$ 56,000**
11. Temp Moorings	**$ 20,000**
12. Install Shafts	**$ 23,000**
Subtotal	**$851,650**
20% OH & Profit	**$170,350**
TOTAL	**$922,000 per dolphin**

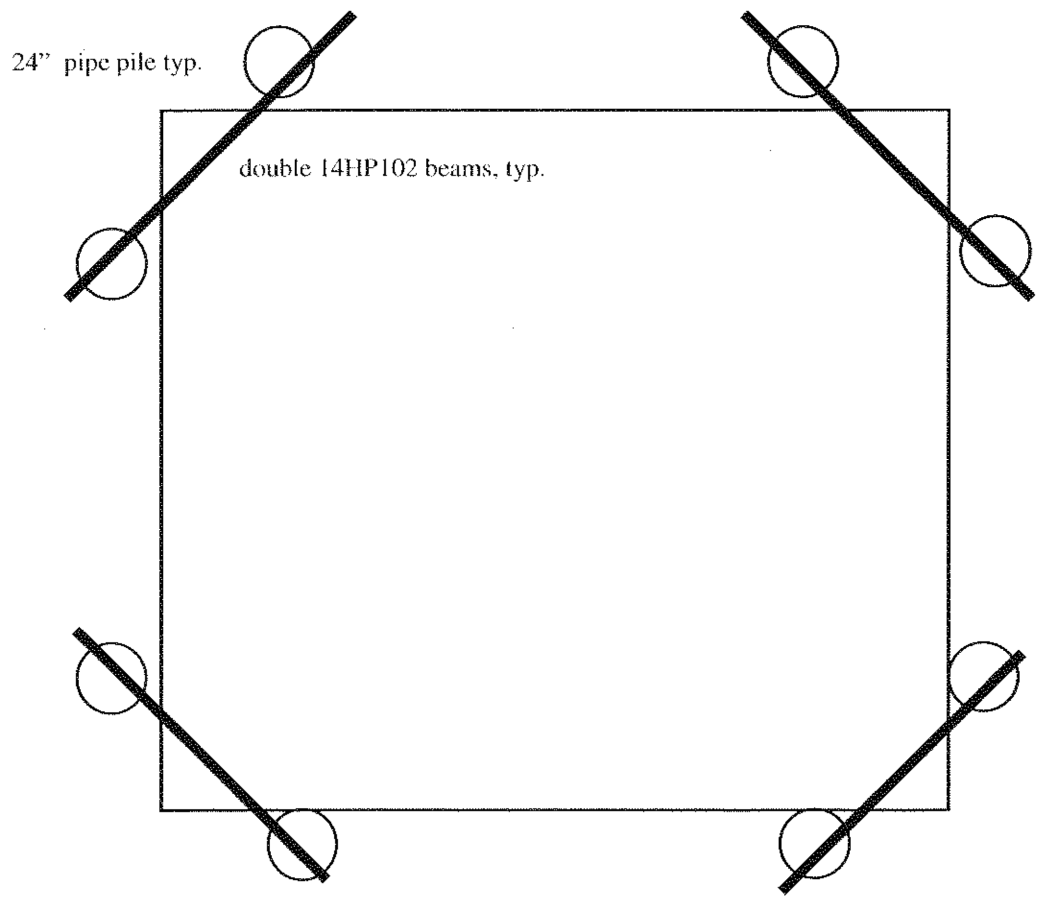
2 ea. Dolphins = $1,844,000

Note: This estimate does not include shaft fendering attached to the floating module. Towing, mobilization, demobilization and site tug / transportation are likewise excluded except as noted. Task specific equipment is included.

COFFERDAM WALL TYPICAL SECTION



PRECAST CAP SUPPORT STRUCTURE



MANSON CONSTRUCTION CO.
5209 EAST MARGINAL WAY S. • SEATTLE, WA 98134 • (206) 762-0850
MAILING ADDRESS, P. O. BOX 24067 • SEATTLE, WA 98124-0067
WA CONTRACTOR'S LICENSE #MANSOCC032M1 • FAX (206) 764-8595

Memorandum

To: Michael Lanier, Berger / ABAM Engineers

From: Bill Shorey, Manson Construction

Ref: Modular Hybrid Pier, U.S. Navy

Per your request Manson Construction has completed a preliminary cost estimate for the module integration and the mooring dolphin elements. The documents used for this estimate are the text and drawings included in the Phase 2 Preliminary Design Report for the Modular Hybrid Pier.

Due to the preliminary nature of the drawings some interpretation was done to develop the cost of the two elements of work. The breakdown of these costs is as follows:

Module Integration:

SAY 50% OF MATL INCL IN CTC MODULE $

Materials (Per Joint):	X3	$180,000	270,000 FOR 3 JOINTS.
Labor, Equipment, Supplies & Subs (1st Joint):		$486,000	486 000
Labor, Equipment, Supplies & Subs (2nd or 3rd Joint):	X2	$324,000	324 000
			324 000

Total Cost to Integrate Modules = $1,674,000 $ 1404,000 USE.

The lower cost to integrate the 2nd and 3rd joints is due to the reuse of provisions and supplies on the following joint integrations.

Mooring Piers:

Materials (Per Pier):	$585,000
Labor, Equipment, Supplies & Subs (1st Pier):	$1,650,000
Labor, Equipment, Supplies & Subs (2nd Pier):	$1,150,000

Total Cost for Two Mooring Piers = $3,970,000

The lower cost for the second pier is due to the reuse of provisions and supplies.

The mooring piers will be very difficult to construct. Dewatering the cofferdam is not practical with the procedure as shown on the plans. The weights that would have to be added to resist the uplift load are very large. Possibly some depth can be added to the pile cap to allow a first stage concrete tremie pour that can engage the piles to the pile cap and resist the uplift.

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Richmond, California 94804-2128
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Fax (510) 232-4528
California License # A-220319

MANSON

Alternatively it might be better to revise the design and use a large mono-pile cantilevered out of an excavated caisson to serve as the mooring mast. A large diameter caisson can be driven into the ground and the mooring shaft anchored inside of it. This will allow adjustment to get the accurate positioning of the mooring shaft.

The costs shown above include markup for overhead and profit. However mobilization costs are not included. It is recommended that some contingency be added to the above prices due to the preliminary nature of the design.

If you have any questions or need additional information please call.

Sincerely,

William Shorey

William Shorey, P.E.

Operations Deck Ramp Cost - MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Ramp basic structure - Installed	SF	$145	2058	$298,410	98 ft X 21 ft = 2058 sf
Ramp transition structure pier end	SF	$100	252	$25,200	12 ft X 21 ft = 252 sf
Ramp transition structure shore end	SF	$100	**252**	$25,200	12 ft X 21 ft = 252 sf
Pier end support wheel installation	LS	$7,000	1	$7,000	
Shore end support wheel installation	LS	$14,000	1	$14,000	
Pier end support corbel	LS	$11,200	1	$11,200	25 ft X 3 ft X 5 ft = 14 cubic yd @ $800/cubic yd
Shore end abutment	LS	$30,000	1	$30,000	50 cubic yards @ $600/ cubic yard
Utilities support structure	LF	$100	120	$12,000	
Guard house between ramps	LS	$5,000	1	$5,000	
Total Cost of Operations Deck Ramp				**$428,010**	Baseline Cost
				$385,209	Low range cost @ 90% of Baseline
				$470,811	High range cost @ 110% of Baseline

Service Deck Ramp Cost - MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Ramp basic structure - installed	SF	$145	1176	$170,520	98 ft X 12 ft = 1176 sf
Ramp transition structure pier end	SF	$100	36	$3,600	3 ft X 12 ft = 36 sf
Ramp transition structure shore end	SF	$100	252	$25,200	12 ft X 21 ft = 252 sf
Pier end support wheel installation	LS	$7,000	1	$7,000	
Shore end support wheel installation	LS	$14,000	1	$14,000	
Pier end support corbel	LS	$5,500	1	$5,500	25 ft X 3 ft X 5 ft = 14 cubic yd @ $800/cubic yd
Shore end abutment	LS	$30,000	1	$21,000	35 cubic yards @ $600 per cubic yard
Utilities support structure	LF	$100	120	$12,000	
Total Cost of Service Deck Ramp				**$258,820**	Baseline
				$245,879	Low range @ 95% of Baseline
				$284,702	High range @ 110% of Baseline

Utility Costs for 1300 ft long (4 module) MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Electrical					
High voltage electrical feed from on-shore electrical vault to MHP shore end	EA	$7,769	2	$15,538	
High voltage electrical feed from MHP shore end to substations	EA	$215,853	2	$431,705	
Electrical Substations	EA	$531,754	8	$4,254,031	
Fixed cable feeds from substations to turtlebacks	LF	$62	26400	$1,632,709	
Electrical Distribution Turtlebacks	EA	$37,694	12	$452,326	
15% for misc. undesigned details	LS	$1,017,946	1	$1,017,946	
Electrical Total				$7,804,255	
Mechanical					
MHP fixed potable water piping system	LF	$66	3096	$205,636	8" FRTP pipe
Potable water piping pressure test	HR	$96	64	$6,123	16 Hr per section + equipment rental
Potable water pipe hangers	EA	$144	347	$50,020	Vinylester hanger w SS all-threaded rod
Potable water sectionalizing valves	EA	$839	33	$27,671	8" butterfly valve
Potable water sectional flex connections	EA	$1,081	6	$6,486	8" braided SS connector, 2' length
Potable water backflow preventors	EA	$4,034	96	$387,288	Reduced pressure principle
Potable water hose connectors	EA	$142	96	$13,585	2-1/2" screwed hose coupling
Potable water outlet valves	EA	$1,326	96	$127,336	2-1/2" SS ball valve
Potable water MHP to ship hoses (per berth X no of berths)	EA	$186	192	$35,735	50' hose section w screwed fittings: (2) sections per manifold connection
Potable water line from MHP to on-shore manhole	LF	$66	400	$26,568	Based on connection within 100' of pier
Motion accommodations provisions MHP to shore	EA	$6,001	4	$24,003	8" braided SS connector, 8' long w floating flange + isolation valves
Potable water on-shore hook-up	LS	$7,365	1	$7,365	
MHP fixed compressed air piping system	LF	$55	2968	$163,869	6" FRTP pipe
Compressed air piping pressure test	HR	$96	64	$6,123	16 Hr per section + equipment rental
Compressed air pipe hangers	EA	$144	347	$50,020	Vinylester hanger w SS all-threaded rod
Compressed air sectionalizing valves	EA	$1,795	33	$59,219	6" ball valve
Compressed air sectional flex connections	EA	$554	6	$3,325	6" braided SS connector, 2' length

Utility Costs for 1300 ft long (4 module) MHP Berthing Facility

(all costs are installed costs - Navy construction - 2001 $)

Item	Units	Unit price	Quantity	Total	Comments
Compressed air hose connectors: 1-1/4"	EA	$102	48	$4,918	Quick-connect fitting
Compressed air hose connectors: 1/2"	EA	$76	48	$3,658	Quick-connect fitting
Compressed air outlet valves: 1-1/4"	EA	$185	48	$8,901	SS ball valve
Compressed air outlet valves: 1/2"	EA	$63	48	$3,001	SS ball valve
Compressed air MHP to ship hoses (per berth X no. of berths)	EA	$228	96	$21,928	50' hose section w quick-connect fittings: (2) sections per manifold connection
Compressed air line from MHP to on-shore manhole	LF	$66	400	$26,568	Based on connection within 100' of pier
Motion accommodations provisions MHP to shore	EA	$5,806	4	$23,223	6" braided SS connector, 8' long w floating flange + isolation valves
Compressed air on-shore hook-up	LS	$4,995	1	$4,995	
MHP fixed oily waste piping system	LF	$66	2619	$174,143	4"/ 6" double-wall FRTP pipe
Oily waste piping pressure test	HR	$96	64	$6,123	16 Hr per section + equipment rental
Oily waste pipe hangers	EA	$144	296	$42,668	Vinylester hanger w SS all-threaded rod
Oily waste sectionalizing valves	EA	$1,795	32	$57,424	4" ball valve
Oily waste sectional flex connections	EA	$345	6	$2,072	4" braided SS connector, 2' length
Oily waste hose connectors	EA	$186	16	$2,971	Cam-lok fitting
Oily waste outlet valves	EA	$867	16	$13,867	4" ball valve
Oily waste MHP to ship hoses (per berth X no. of berths)	EA	$687	32	$21,973	50' hose section w cam-lok fittings: (2) sections per utility connection
Oily waste mobile pumping unit	EA	$21,510	8	$172,083	
Oily waste line from MHP to on-shore manhole	LF	$90	800	$72,240	Based on connection within 300' of pier
Motion accommodations provisions MHP to shore	EA	$4,829	4	$19,317	4" braided SS connector, 8' long w floating flange + isolation valves
Oily waste on-shore hook-up	LS	$6,660	1	$6,660	
MHP fixed CHT waste piping system	LF	$55	2456	$135,601	6" FRTP pipe
CHT waste piping pressure test	HR	$96	64	$6,123	16 Hr per section + equipment rental
CHT pipe hangers	EA	$144	286	$41,227	Vinylester hanger w SS all-threaded rod
CHT waste sectionalizing valves	EA	$1,795	32	$57,424	6" ball valve
CHT waste sectional flex connections	EA	$554	6	$3,325	6" braided SS connector, 2' length

Utility Costs for 1300 ft long (4 module) MHP Berthing Facility					
(all costs are installed costs - Navy construction - 2001 $)					
Item	**Units**	**Unit price**	**Quantity**	**Total**	**Comments**
CHT waste hose connectors	EA	$186	12	$2,228	Cam-lok fitting
CHT waste outlet valves	EA	$857	12	$10,285	4" ball valve
CHT waste MHP to ship hoses (per berth X no. of berths)	EA	$426	24	$10,220	50' hose section w cam-lok fittings: (2) sections per utility connection
CHT waste mobile pumping unit	EA	$21,510	8	$172,083	
CHT waste line from MHP to on-shore manhole	LF	$79	800	$63,216	Based on connection within 300' of pier
CHT waste on-shore hook-up	LS	$6,660	1	$6,660	
Motion accommodations provisions MHP to shore	EA	$5,806	4	$23,223	6" braided SS connector, 8' long w floating flange + isolation valves
CHT/Oily Waste Manhole	EA	$7,620	2	$15,240	
Mechanical Total				$2,435,962	
Total for 1300 ft MHP Berthing Facility					

MHP Module Towing Costs			
	$/day	Mobilization	
7200 BHP - 250,000 lb bollard pull			For reference
Ocean Tug	$21,200	$575,000	Tows large concrete units at 3 kts
			in open ocean
A large ocean tug is not needed to tow the MHP modules.			
Estimated costs for a coastal tug (4000 HP)	$7,800		
Standby and deadhead return for 4 coastal tugs	4	$93,600	Return without load at 12 kts.
2 kts = 55 miles per 24 hour day			Tow MHP units at 2 kts
			in river and coastal waters
500 mile tow = 9 days	9	$280,800	
1000 mile tow = 18 days	18		
Total cost 500 mile tow		**$374,400**	Baseline cost
Total cost 1000 mile tow	$655,200		
		$318,240	Low range cost at 85% of baseline
		$411,840	High range cost at 110% of baseline