APPENDIX A

Lutak Dock Ro Ro Ramp

Concept Drawings

LUTAK DOCK

BARGE RAMP RENOVATION AND REPLACEMENT CONCEPTS

HAINES, ALASKA

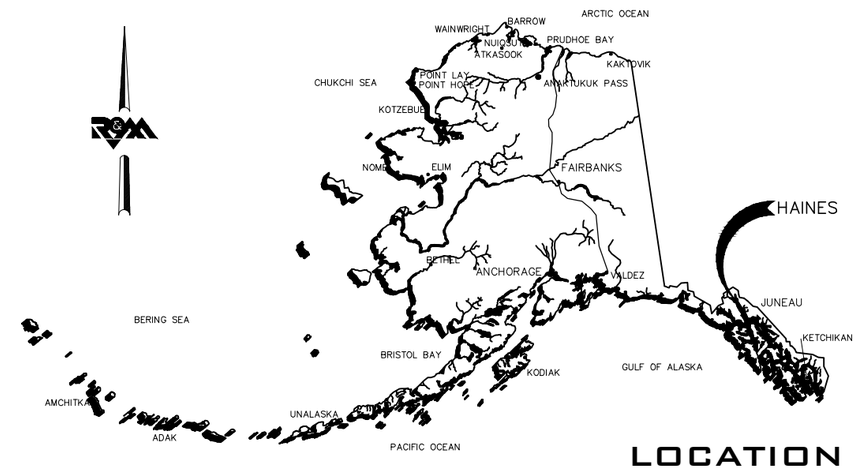
JANUARY 2018 FINAL SET

MAYOR
JANICE HILL

DIRECTOR OF PUBLIC FACILITIES
BRAD RYAN

HARBORMASTER
SHAWN BELL

Designed By:
R&M CONSULTANTS, INC.
9101 Vanguard Drive
Anchorage, Alaska 99507
rmconsult.com• email@rmconsult.com
phone: 907.522.1707 • fax: 907.522.3403
CORPORATE AUTHORIZATION NUMBER AECC111



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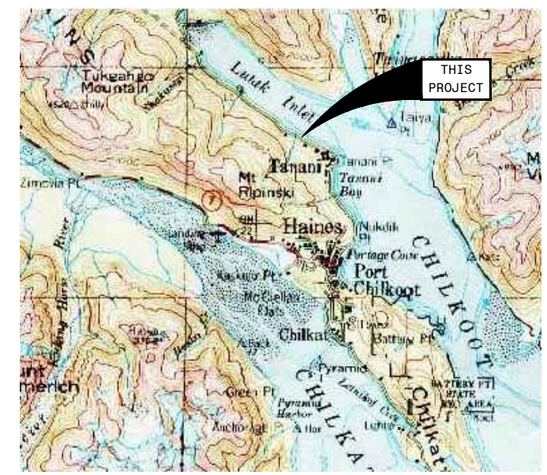

VICINITY

INDEX OF DRAWINGS

SHT	TITLE
G1.0	COVER
G2.0	EXISTING SITE PLAN
G3.0	EXISTING SITE PHOTOS
C1.1	BARGE RAMP SITE PLAN OPTION 1
C1.2	BARGE RAMP SITE PLAN OPTION 2
C1.3	BARGE RAMP SITE PLAN OPTION 3
C1.4	DECK TRUSS AND TRANSFER BRIDGE
C1.5	TRANSFER BRIDGE DETAILS
C1.6	3 PILE DOLPHIN
C1.7	4 PILE DOLPHIN

INDEX

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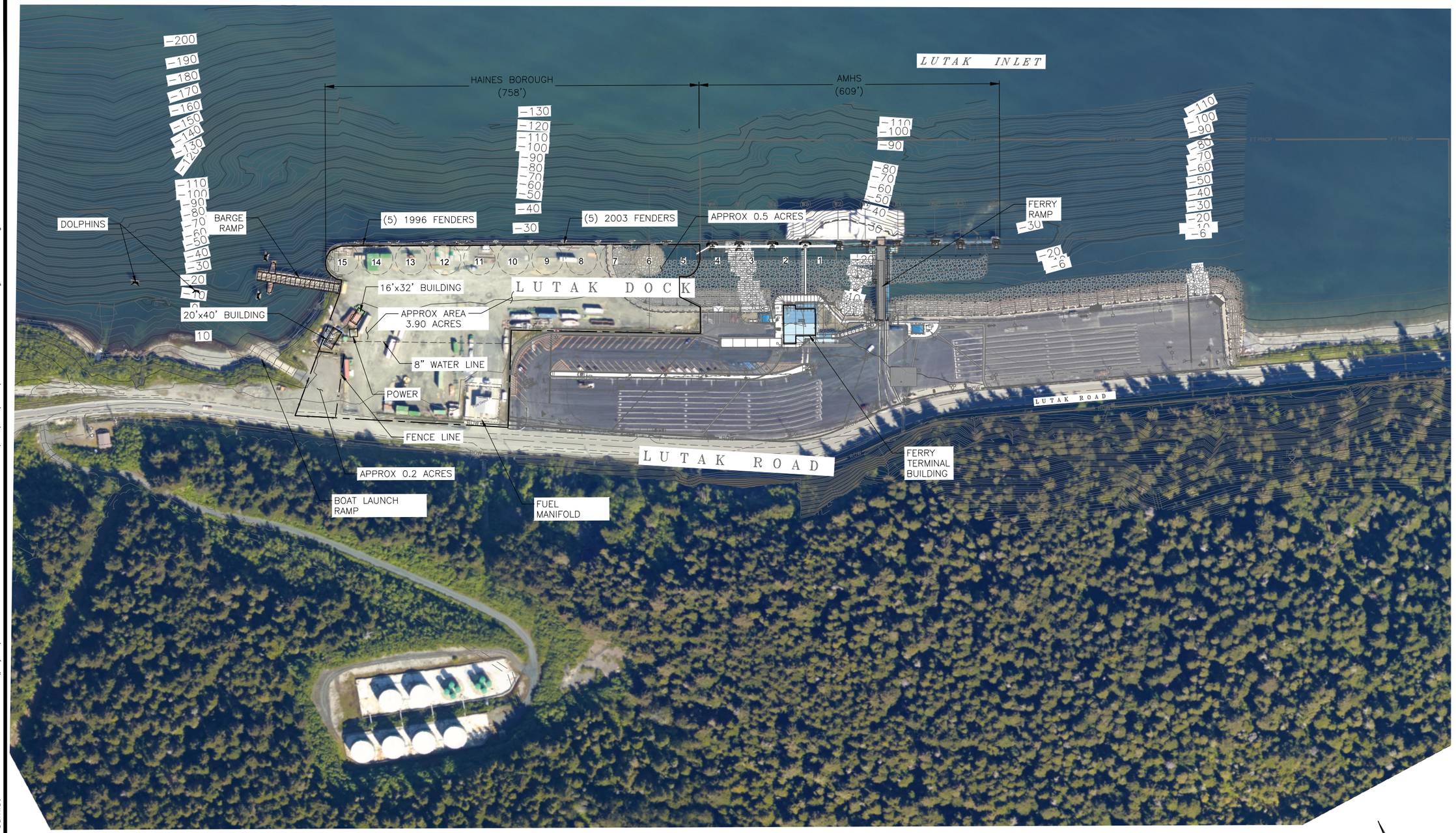

1 **EXISTING SITE PLAN**

Scale: 1" = 100'

0 100 200
FEET

PROGRESS SET
NOT FOR
CONSTRUCTION

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: EXISTING SITE PLAN

SHEET NO: 2 OF 10

G2.0

Z:\project\2573.01 HAINES B Lutak Dock RORO Condition Report\Civil\ACAD\2573.01 – G2.0 Existing Site Plan.dwg
Plotted 1/17/2018 3:44 PM by Jean Cumlat

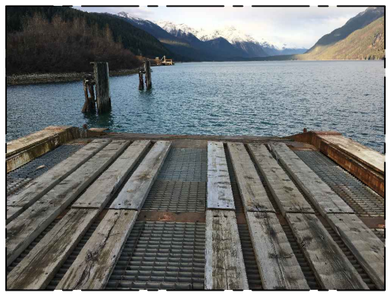
TRANSFER BRIDGE

UNDERSIDE TRANSFER BRIDGE

END OF TRANSFER BRIDGE

TRANSFER BRIDGE ABUTMENT

FLOAT DOLPHINS



TRANSFER BRIDGE DECKING

SIDE TIE DOLPHINS

FLOAT UNDERSIDE TRANSFER BRIDGE

LAUNCH RAMP

NORTH END BERTH DOLPHIN

SOUTH END BERTH DOLPHIN

WEST SIDE TIE DOLPHIN

MARINE GROWTH ON FENDER PANELS

TRANSFER BRIDGE BEARINGS

UPLANDS AT TRANSFER BRIDGE

1 EXISTING SITE PHOTOS

PROGRESS SET NOT FOR CONSTRUCTION

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Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: EXISTING SITE PHOTOS
SHEET NO: 3 OF 10
G3.0

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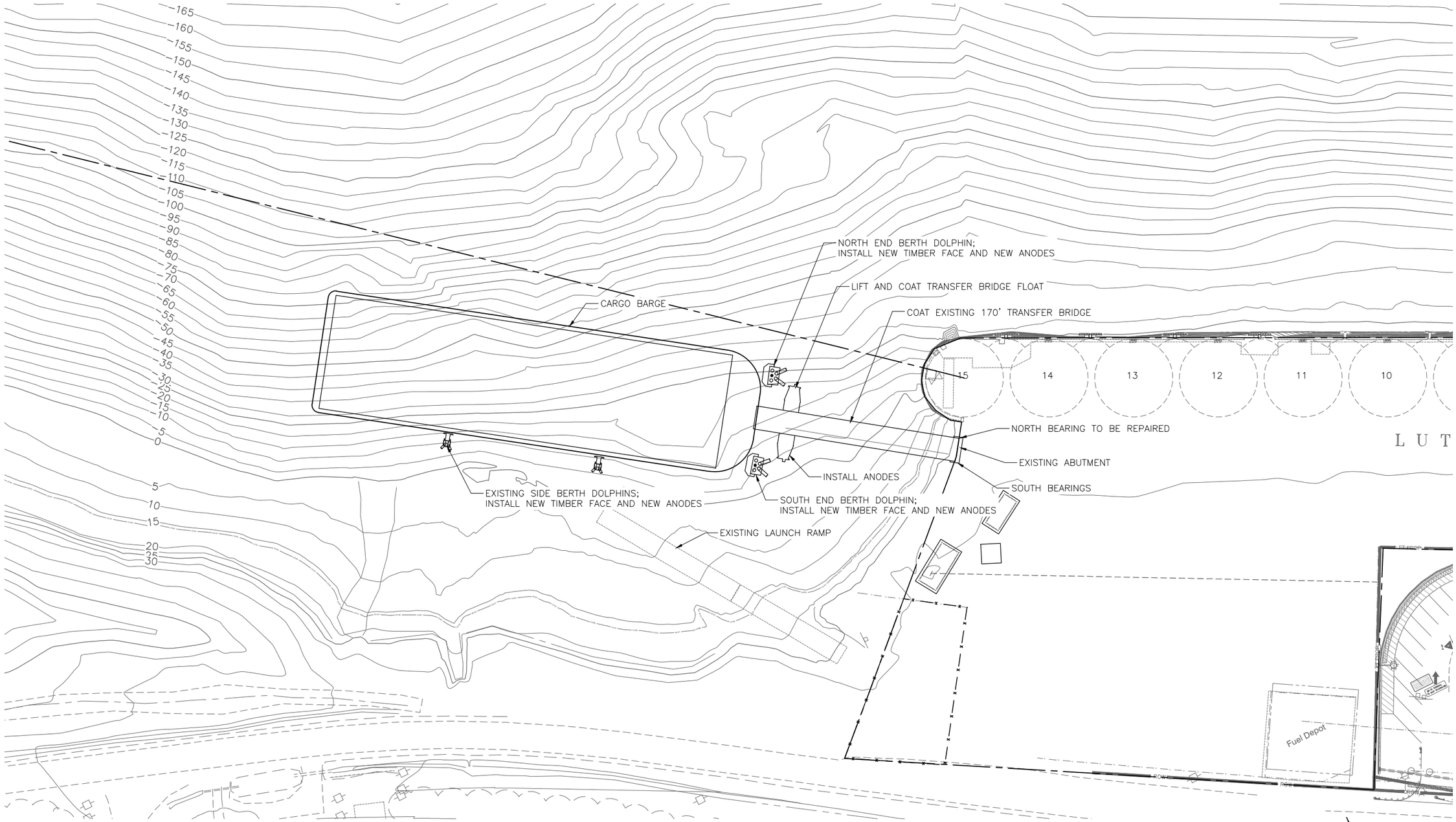

1 **BARGE RAMP SITE PLAN OPTION 1**
RENOVATE EXISITNG
Scale: 1" = 40'

PROGRESS SET
NOT FOR
CONSTRUCTION

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: BARGE RAMP SITE PLAN

SHEET NO: 4 OF 10
C1.1

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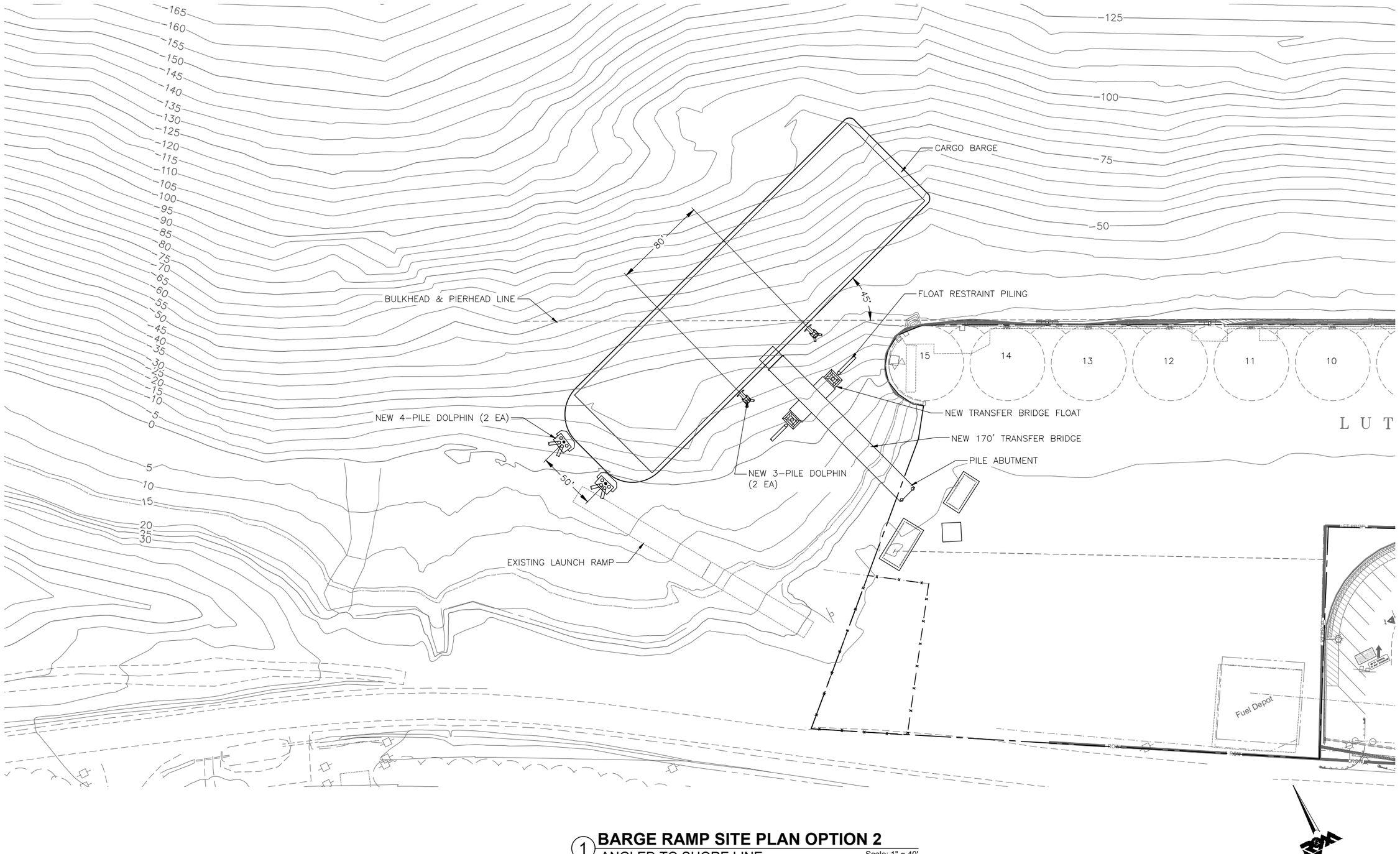

1 **BARGE RAMP SITE PLAN OPTION 2**
ANGLED TO SHORE LINE
Scale: 1" = 40'

PROGRESS SET NOT FOR CONSTRUCTION

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: BARGE RAMP SITE PLAN
SHEET NO: 5 OF 10
C1.2

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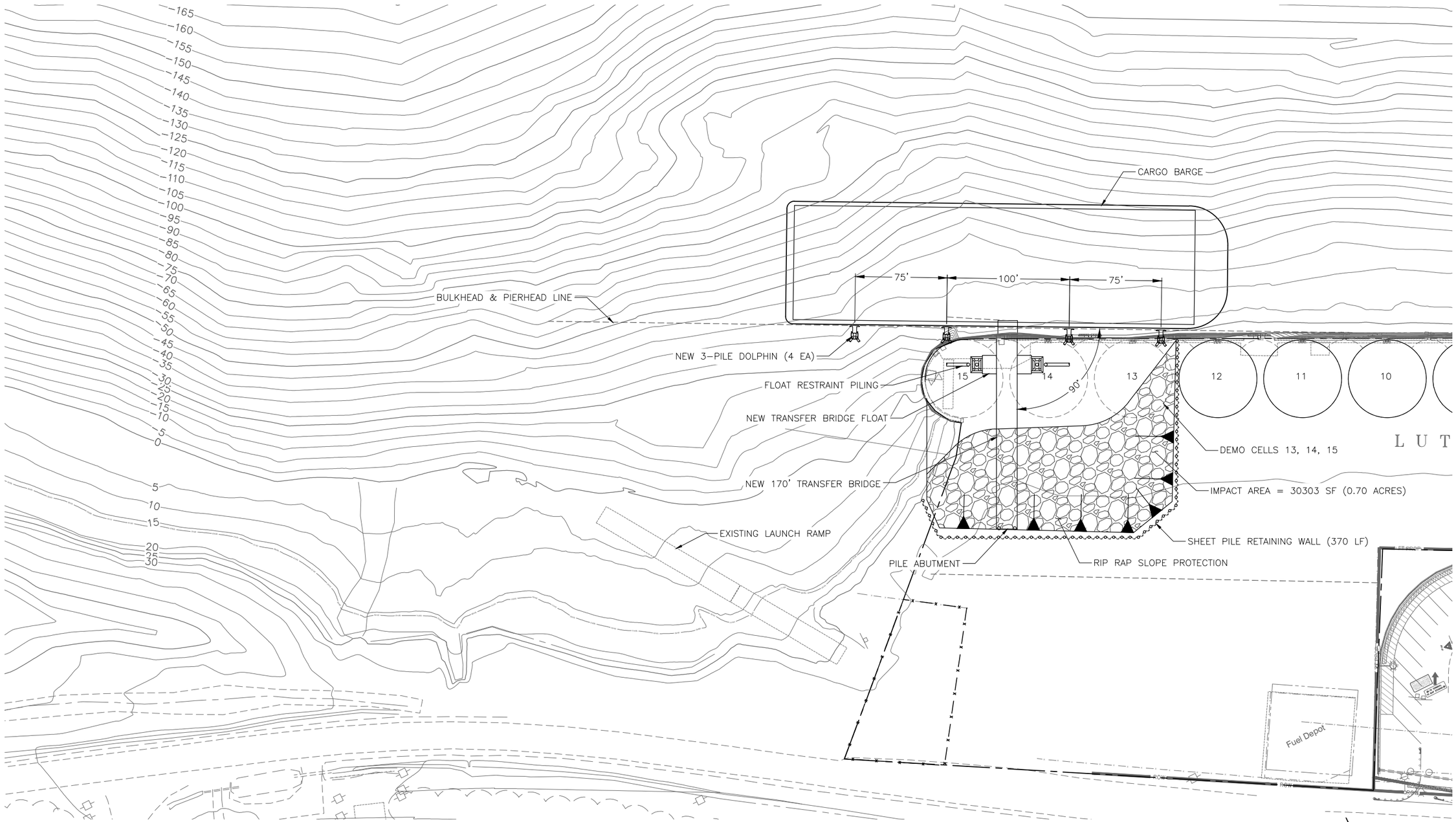

1 BARGE RAMP SITE PLAN OPTION 3

PARALLEL TO SHORE LINE

Scale: 1" = 40'

PROGRESS SET NOT FOR CONSTRUCTION

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough

LUTAK DOCK BARGE RAMP

HAINES BOROUGH ALASKA

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: BARGE RAMP SITE PLAN

SHEET NO: 6 OF 10

C1.3

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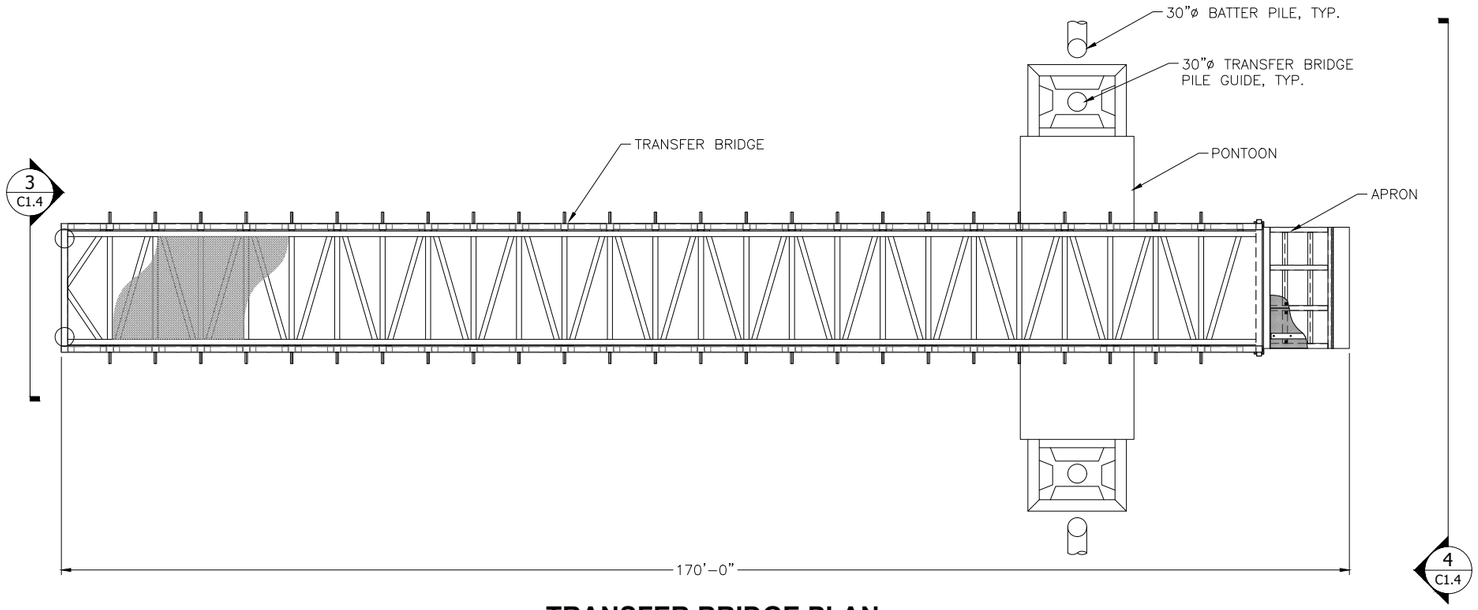
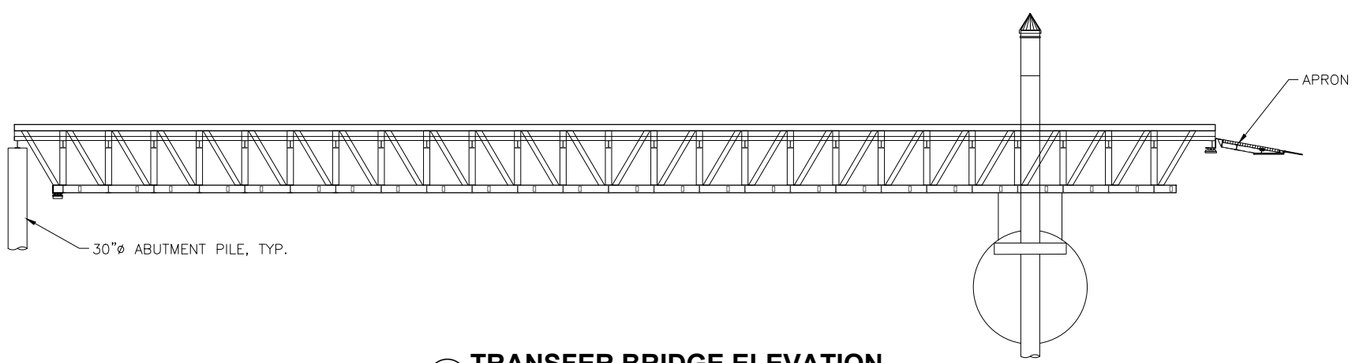
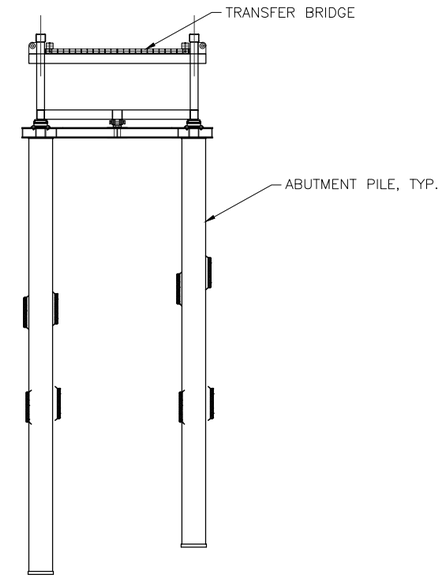


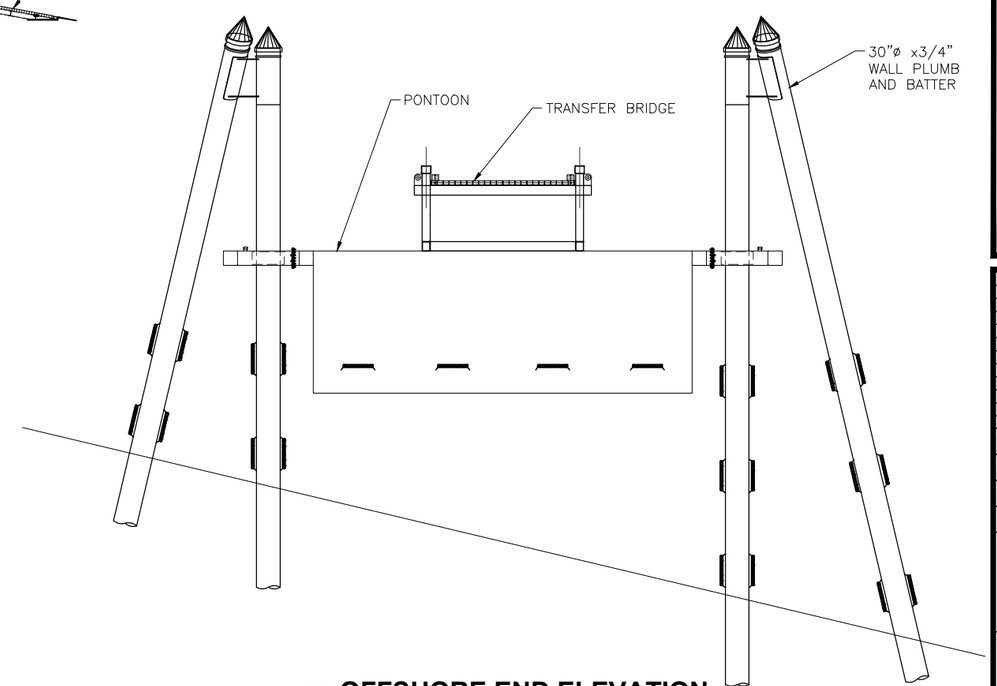
1 **TRANSFER BRIDGE PLAN**
Scale: 1" = 10'



2 **TRANSFER BRIDGE ELEVATION**
Scale: 1" = 10'



3 **ABUTMENT ELEVATION**
Scale: 1" = 8"



4 **OFFSHORE END ELEVATION**
Scale: 1" = 8'

PROGRESS SET NOT FOR CONSTRUCTION

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: BARGE RAMP, DECK TRUSS AND TRANSFER BRIDGE
SHEET NO: 7 OF 10
C1.4

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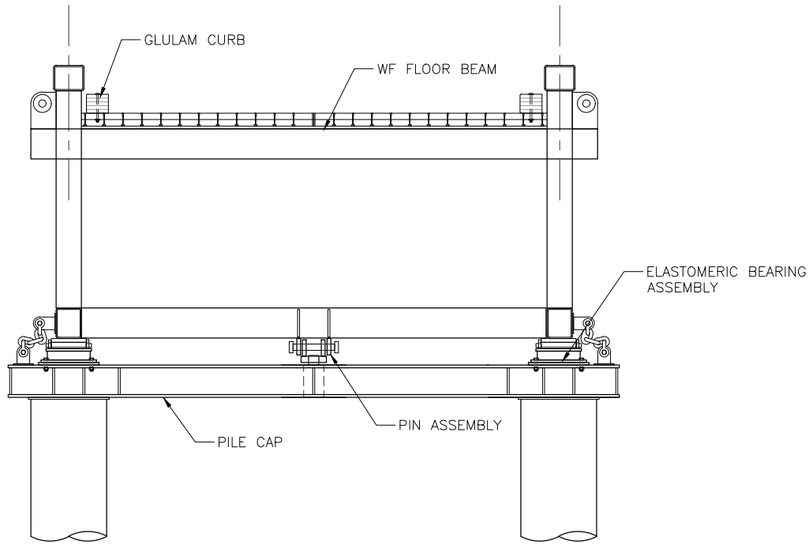

1 **BRIDGE SECTION AT APPROACH**
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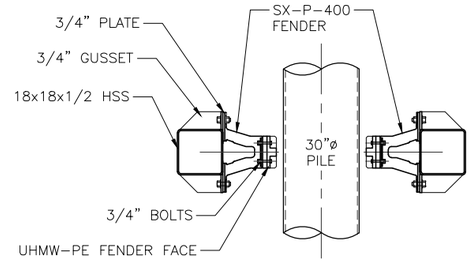
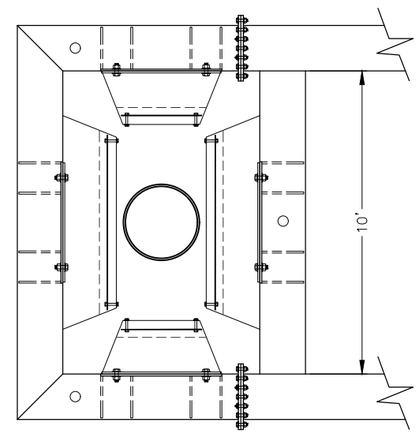
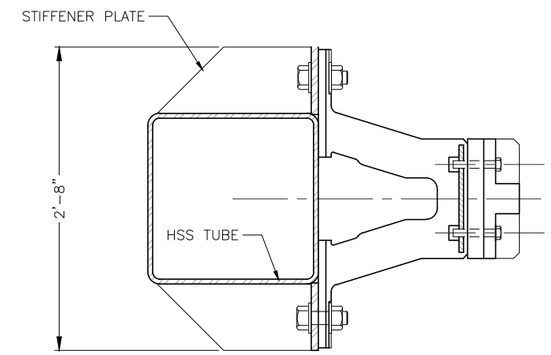


SECTION AT 30" PILE
Scale: 1:30



EXTERIOR PILE COLLAR
Scale: 1:30

2 **EXTERIOR PILE COLLAR DETAIL**
Scale: 1:30



3 **CONNECTION AT SX-P FENDER**
Scale: 1:8

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CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: BARGE RAMP - DETAILS
SHEET NO: 8 OF 10
C1.5

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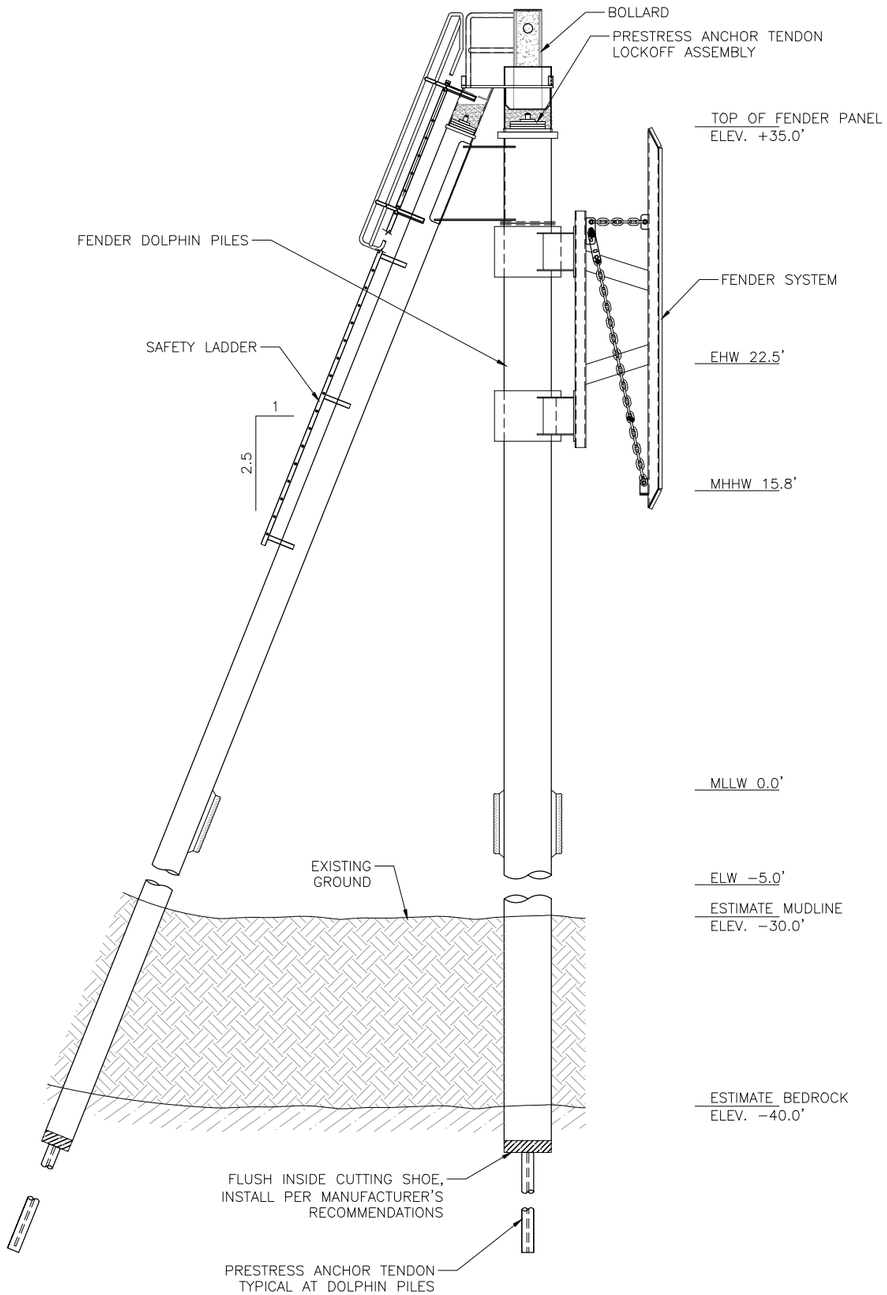
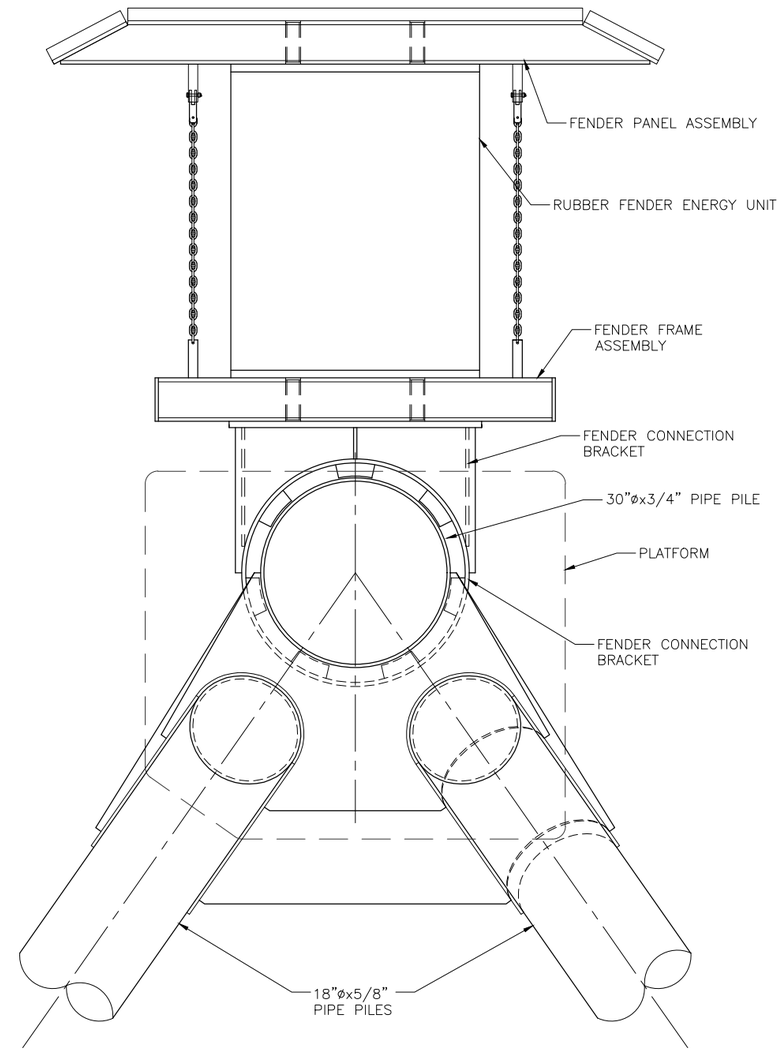


1 3 PILE DOLPHIN ELEVATION

Scale: NTS



2 3 PILE DOLPHIN PLAN

Scale: 1" = 1'-0"

PROGRESS SET NOT FOR CONSTRUCTION

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Anchorage, Alaska 99507
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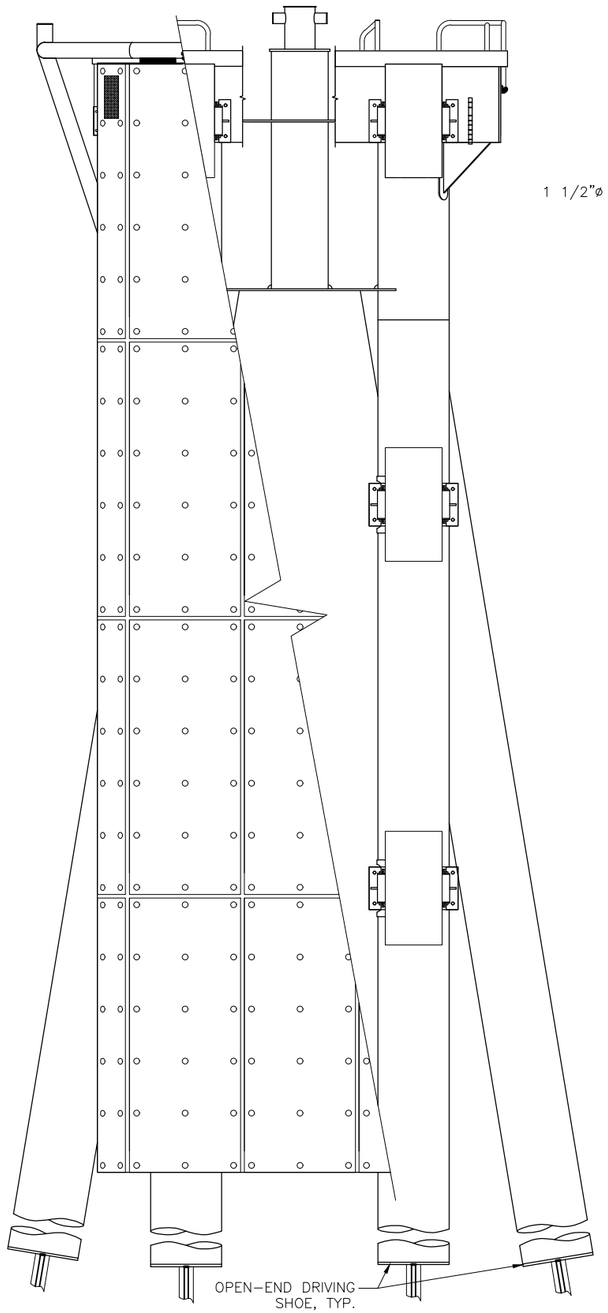
CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

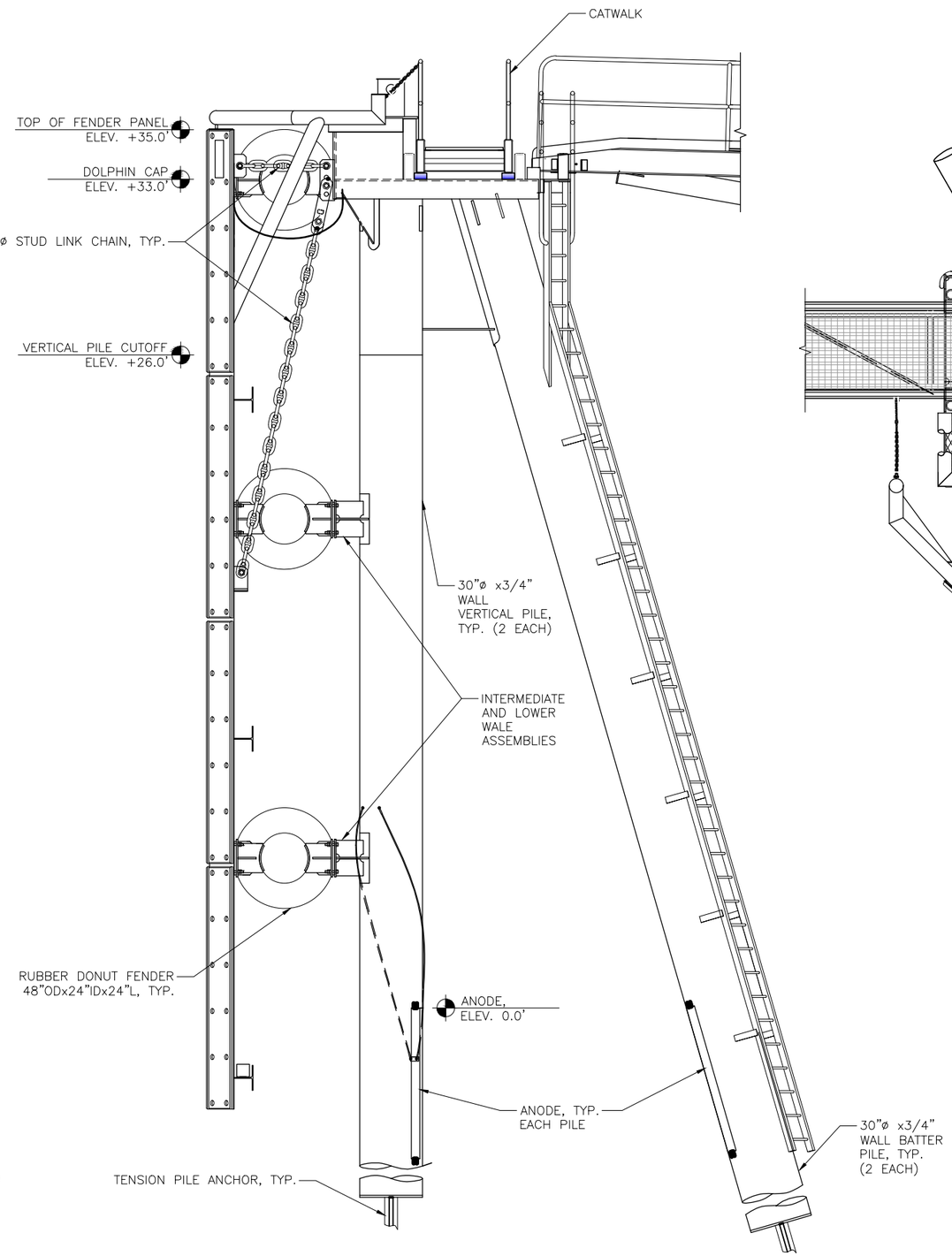
No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: 3 PILE DOLPHIN
SHEET NO: 9 OF 10
C1.6

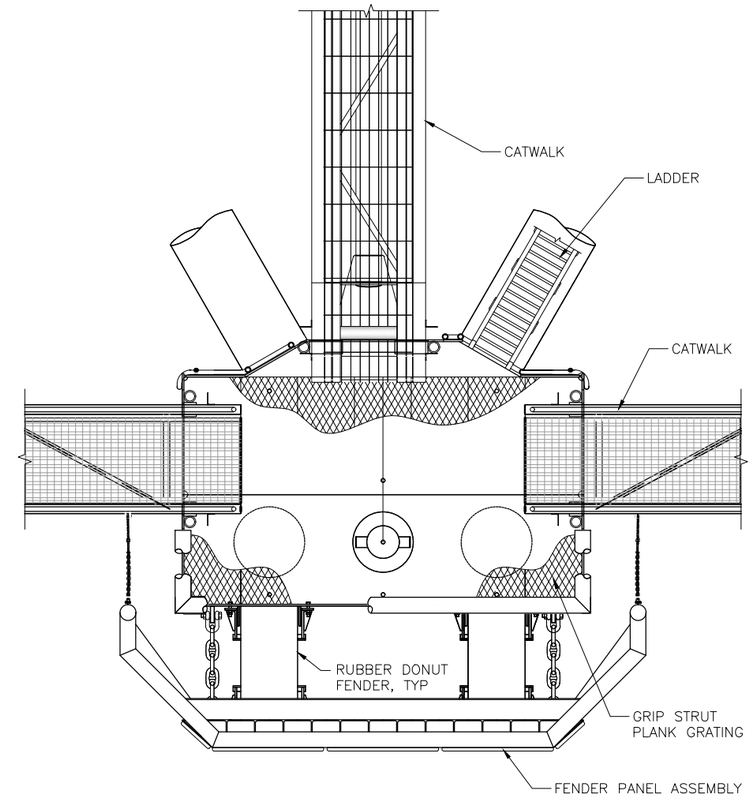
Z:\project\2573.01 HAINES B Lutak Dock RORO Condition Report\Civil\ACAD\2573.01 – C1.6 – 3 Pile Dolphin Plan & Elevation.dwg
Plotted 1/17/2018 3:51 PM by Jean Cumlat



1 **FRONT ELEVATION**
Scale: 3/8" = 1'-0"



2 **SIDE ELEVATION**
Scale: 3/8" = 1'-0"



3 **TOP PLAN VIEW**
Scale: 3/8" = 1'-0"

PROGRESS SET NOT FOR CONSTRUCTION

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Anchorage, Alaska 99507
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phone: 907.522.1707 • fax: 907.522.3403
CORPORATE AUTHORIZATION NUMBER AECC111

Haines Borough
LUTAK DOCK BARGE RAMP

No.	Description	Date

Drawn By: JVC
Checked By: JD/DA
Date: JANUARY 2018
Phase: PRELIMINARY
Project No: 2573.01
SHEET TITLE: 4 PILE DOLPHIN
SHEET NO: 10 OF 10
C1.7

Z:\project\2573.01 HAINES B Lutak Dock RORO Condition Report\Civil\ACAD\2573.01 – C1.7 – 4 Pile Dolphin Details.dwg
Plotted 1/17/2018 3:51 PM by Jean Cumlat

APPENDIX B

Cost Estimates

- **Renovation**
- **Replacement**

ESTIMATED CONSTRUCTION COST

HAINES LUTAK DOCK - RENOVATE EXISTING BARGE BERTH

NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	MOB AND DEMOB	LS	1	$500,000	$500,000
2	EROSION AND POLLUTION CONTROL	LS	1	$31,250	$31,250
3	SILT CURTAIN - BOOM	LS	1	$100,000	$100,000
	SUB TOTAL MOB AND DEMOB				**$631,250**
4	INSTALL SACRIFICAL ANODES	EA	71	$1,200	$85,200
5	COAT TRANSFER BRIDGE FLOAT	SF	4,000	$15	$60,000
6	MARINE CRANE TO LIFT FLOAT	LS	1	$50,000	$50,000
7	COAT TRANSFER BRIDGE	SF	29,000	$20	$580,000
8	REPLACE NORTH END BERTH DOLPHIN TIMBERS	EA	18	$2,000	$36,000
9	REPLACE SOUTH END BERTH DOLPHIN TIMBERS	EA	18	$2,000	$36,000
10	REPLACE SIDE TIE DOLPHIN TIMBERS	EA	36	$2,000	$72,000
11	REPAIR NORTH BEARING	LS	1	$25,000	$25,000
12	REPLACE TRANSFER BRIDGE DECKING	LS	1	$5,000	$5,000
	SUB TOTAL CONSTRUCTION				**$949,200**
A	DESIGN (10% OF CONSTRUCTION)	LS	1		$158,045
B	PERMITTING CLEAN WATER ACT SECTION 10 AND 404	LS	1	$20,000	$20,000
C	CONSTRUCTION ADMINISTRATION (6% OF CONSTRUCTION)	LS	1		$94,827
	SUB TOTAL ENGINEERING AND ADMIN				**$272,872**

TOTAL CONSTRUCTION & ENGINEERING COST: $1,853,322

25% CONTINGENCY: $463,331

TOTAL: $2,317,000

ESTIMATED CONSTRUCTION COST

HAINES LUTAK DOCK - NEW BARGE RAMP OPTION 2

NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	MOB AND DEMOB	LS	1	$2,500,000	$2,500,000
2	CONSTRUCTION SURVEY	LS	1	$150,000	$150,000
3	PROTECTED SPECIES OBSERVER	LS	1	$100,000	$100,000
4	EROSION AND POLLUTION CONTROL	LS	1	$25,000	$25,000
5	SILT CURTAIN - BOOM	LS	1	$100,000	$100,000
	SUB TOTAL MOB AND DEMOB				**$2,875,000**
6	DEMOLITION OF EXISITNG RO RO RAMP	LS	1	$35,000	$35,000
7	DEMOLITION OF BUILDINGS AND TOWER STRUCTURE	LS	1	$20,000	$20,000
	SUB TOTAL DEMOLITION				**$55,000**
8	FURNISH 30" DIAMETER PIPE PILES	LF	1,280	$258	$330,240
9	INSTALL 30" DIAMETER PILING IN ROCK SOCKET	EA	16	$25,000	$400,000
10	FURNISH 18" DIAMETER PIPE PILES	LF	320	$106	$33,920
11	INSTALL 18" DIAMETER PILING IN ROCK SOCKET	EA	4	$20,000	$80,000
12	FURNISH AND INSTALL TENSION ANCHOR	EA	14	$35,000	$490,000
13	FURNISH AND INSTALL 3 PILE DOLPHINS	EA	2	$140,000	$280,000
14	FURNISH AND INSTALL 4 PILE DOLPHINS	EA	2	$210,000	$420,000
15	FURNISH AND INSTALL ABUTMENT PILE CAP	LS	1	$30,000	$30,000
16	FURNISH AND INSTALL TRANSFER BRIDGE	LS	1	$1,120,000	$1,120,000
17	FURNISH AND INSTALL TRANSFER BRIDGE FLOAT	LS	1	$600,000	$600,000
18	FURNISH AND INSTALL LIFE RINGS	EA	4	$1,200	$4,800
19	FURNISH AND INSTALL FIRE EXTINGUISHERS	EA	4	$1,200	$4,800
20	FURNISH AND INSTALL 150# ANODES	EA	69	$1,200	$82,800
21	FURNISH AND INSTALL MECH BUILDING	LS	1	$60,000	$60,000
22	ELECTRICAL, MECHANICAL, AND LIGHTING	LS	1	$315,600	$315,600
	SUB TOTAL CONSTRUCTION				**$4,252,160**

ESTIMATED CONSTRUCTION COST

HAINES LUTAK DOCK - NEW BARGE RAMP OPTION 2

NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
	TOTAL CONSTRUCTION				**$7,182,160**
A	DESIGN UPLAND SURVEY	LS	1	$55,000	$55,000
B	DESIGN HYDROGRAPHIC SURVEY	LS	1	$20,000	$20,000
C	DESIGN GEOTECH PROGRAM	LS	1	$140,000	$140,000
D	DESIGN (10% OF CONSTRUCTION)	LS	1	$718,216	$718,216
E	PERMITTING CLEAN WATER ACT SECTION 10 AND 404	LS	1	$20,000	$20,000
F	PERMITTING NMFS IHA	LS	1	$80,000	$80,000
G	PERMITTING NEPA	LS	1	$100,000	$100,000
H	CONSTRUCTION ADMINISTRATION (6% OF CONSTRUCTION)	LS	1	$430,930	$430,930
	SUB TOTAL ENGINEERING AND ADMIN				**$1,564,146**

TOTAL CONSTRUCTION & ENGINEERING COST:	$8,746,306
25% CONTINGENCY:	$2,186,577
TOTAL:	$10,933,000

ESTIMATED CONSTRUCTION COST

HAINES LUTAK DOCK - NEW BARGE RAMP OPTION 3

NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	MOB AND DEMOB	LS	1	$2,500,000	$2,500,000
2	CONSTRUCTION SURVEY	LS	1	$150,000	$150,000
3	PROTECTED SPECIES OBSERVER	LS	1	$100,000	$100,000
4	EROSION AND POLLUTION CONTROL	LS	1	$25,000	$25,000
5	SILT CURTAIN - BOOM	LS	1	$100,000	$100,000
	SUB TOTAL MOB AND DEMOB				**$2,875,000**
6	DEMOLITION OF EXISTING RO RO RAMP	LS	1	$35,000	$35,000
7	DEMOLITION OF PILE CAPS AND MISC STRUCTURE	LF	200	$510	$102,000
8	DEMOLITION OF BUILDINGS AND TOWER STRUCTURE	LS	1	$20,000	$20,000
9	DEMOLITION OF SHEET PILE WALLS	SF	42,195	$3.50	$147,681
10	DEMOLITION OF EXISTING FENDERS	EA	2	$2,000	$4,000
11	DEMOLITION OF EXISTING FENDER PILES	EA	2	$2,500	$5,000
12	EXCAVATION AND DISPOSAL OF EXISTING FILL	CY	35,652	$15	$534,780
13	DREDGING AND DISPOSAL	CY	8,407	$24	$201,778
	SUB TOTAL DEMOLITION				**$1,050,239**
14	FURNISH AND INSTALL SELECT MATERIAL TYPE A	CY	3,487	$20	$69,740
15	FURNISH AND INSTALL SUBBASE GRADING TYPE B	CY	228	$25	$5,700
16	FURNISH AND INSTALL LEVELING COURSE D-1	CY	46	$40	$1,840
17	FURNISH AND INSTALL CLASS I RIP RAP SLOPE PROTECTION	CY	2,302	$102	$234,804
18	FURNISH AND INSTALL CLASS IV RIP RAP SLOPE PROTECTION	CY	2,915	$109	$317,735
19	FURNISH 30" DIAMETER PIPE PILES	LF	800	$258	$206,400
20	INSTALL 30" DIAMETER PILING IN ROCK SOCKET	EA	10	$25,000	$250,000
21	FURNISH 18" DIAMETER PIPE PILES	LF	640	$106	$67,840
22	INSTALL 18" DIAMETER PILING IN ROCK SOCKET	EA	8	$20,000	$160,000

ESTIMATED CONSTRUCTION COST

HAINES LUTAK DOCK - NEW BARGE RAMP OPTION 3

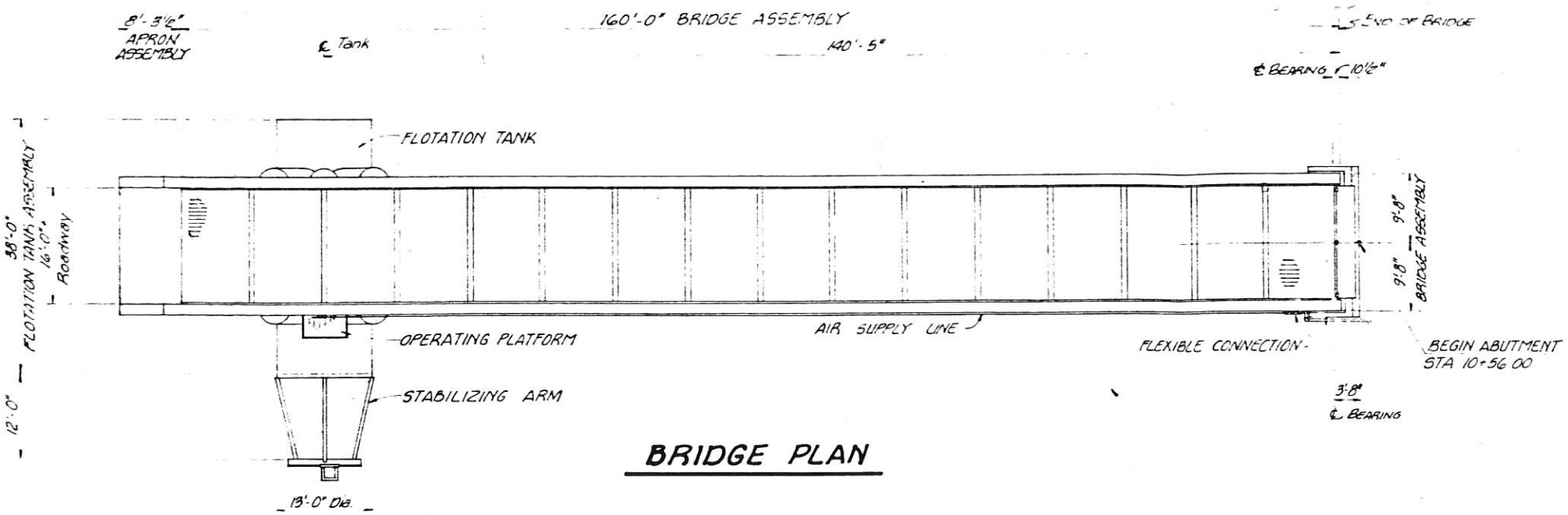
NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
23	FURNISH AND INSTALL TENSION ANCHOR	EA	12	$35,000	$420,000
24	FURNISH AND INSTALL 3 PILE DOLPHINS	EA	4	$140,000	$560,000
25	FURNISH AND INSTALL SHEETPILE COMBI WALL	LF	370	$2,500	$925,000
26	FURNISH AND INSTALL ABUTMENT PILE CAP	LS	1	$30,000	$30,000
27	FURNISH AND INSTALL TRANSFER BRIDGE	LS	1	$1,120,000	$1,120,000
28	FURNISH AND INSTALL TRANSFER BRIDGE FLOAT	LS	1	$600,000	$600,000
28	FURNISH AND INSTALL LIFE RINGS	EA	4	$1,200	$4,800
29	FURNISH AND INSTALL FIRE EXTINGUISHERS	EA	4	$1,200	$4,800
30	FURNISH AND INSTALL 150# ANODES	EA	47	$1,200	$56,400
31	FURNISH AND INSTALL MECH BUILDING	LS	1	$60,000	$60,000
32	ELECTRICAL, MECHANICAL, AND LIGHTING	LS	1	$315,600	$315,600
	SUB TOTAL CONSTRUCTION				**$5,410,659**
	TOTAL CONSTRUCTION				**$9,335,898**
A	DESIGN UPLAND SURVEY	LS	1	$55,000	$55,000
B	DESIGN HYDROGRAPHIC SURVEY	LS	1	$20,000	$20,000
C	DESIGN GEOTECH PROGRAM	LS	1	$140,000	$140,000
D	DESIGN (10% OF CONSTRUCTION)	LS	1	$933,590	$933,590
E	PERMITTING CLEAN WATER ACT SECTION 10 AND 404	LS	1	$20,000	$20,000
F	PERMITTING NMFS IHA	LS	1	$80,000	$80,000
G	PERMITTING NEPA	LS	1	$100,000	$100,000
H	CONSTRUCTION ADMINISTRATION (6% OF CONSTRUCTION)	LS	1	$560,154	$560,154
	SUB TOTAL ENGINEERING AND ADMIN				**$1,908,744**

TOTAL CONSTRUCTION & ENGINEERING COST:	$11,244,642
25% CONTINGENCY:	$2,811,161
TOTAL:	$14,056,000

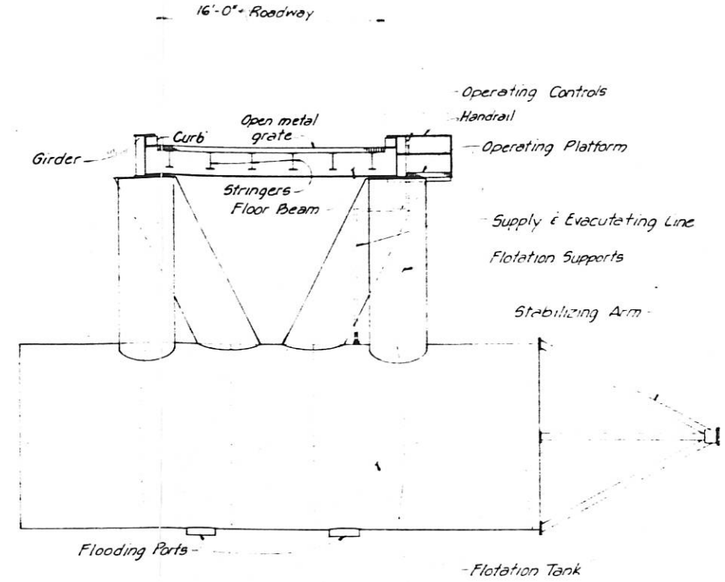
APPENDIX C

Historical Drawings

- **1981 EMPS Lutak Dock Barge Ramp**
- **1984 Sverdup Float Renovation**
- **1990 PND Fender As-Builts**
- **Unknown Anode Installation project**

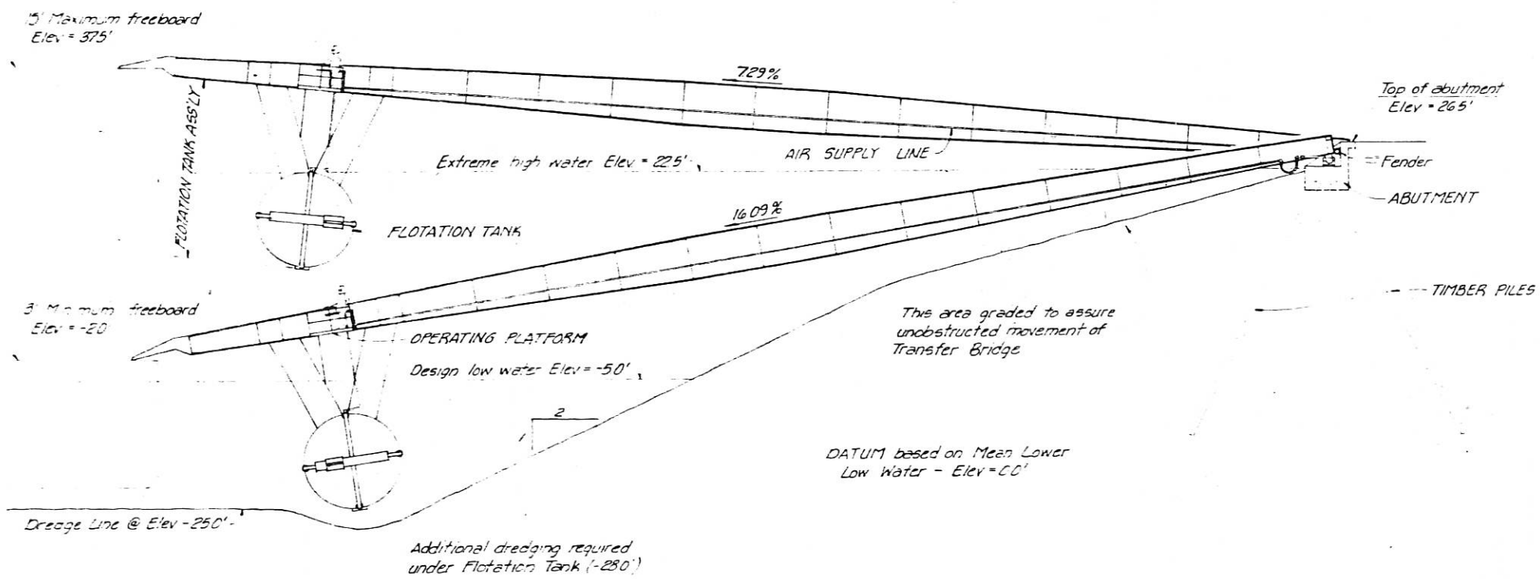


BRIDGE PLAN



TYPICAL SECTION

0 5 10 FEET 25



BRIDGE ELEVATION

0 5 10 20 FEET 50

DESIGN CRITERIA

In accordance with AASHTO "Standard Specifications for Highway Bridges", Twelfth Edition with Interim Specifications.

DEAD LOAD

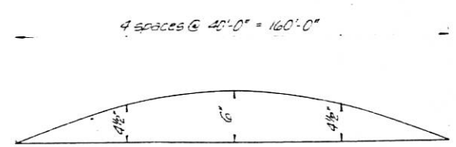
Reinforced Concrete	150 pcf
Structural Steel	490 pcf

LIVE LOAD

HS 20-44 (Caterpillar D4H60 Forklift or equivalent max axle load) 130 kips

EARTH

Soil Pressure	120 pcf
Equivalent Fluid Pressure	30 pcf



DEAD LOAD CAMBER DIAGRAM

GENERAL NOTES:

1. Concrete design, detailing and construction to be in accordance with "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" ACI-318-77 and the American Concrete Institute "MANUEL OF STANDARD PRACTICE FOR DETAILING OF CONCRETE STRUCTURES".

   The Contractor shall not allow any concrete washings to enter the salt water environment.

2. Structural Steel design, fabrication and erection shall conform to the "AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDING," latest edition.

3. Welding shall be in accordance with AMERICAN WELDING SOCIETY, STRUCTURAL WELDING CODE D1.1, latest edition.

4. STRUCTURAL MATERIALS:
   - Structural Steel - All structural steel shall be A572 except as noted in the specifications. All bolts shall be galvanized A307 bolts.
   - Concrete - All cast-in-place concrete shall be Class "A" f'c = 4000 psi.
   - Reinforcing Steel - All reinforcing steel shall conform to ASTM 615 Grade 60.

5. All dimensions shown are measured horizontally or vertically, unless otherwise noted, at a mean temp of 52°F. Shim all gaps in excess of ¼" or where authorized by the Owners Representative.

PLATE 2

HAINES, AK.

"AS BUILT"

STATE OF ALASKA 49TH

design	K.L.F. 3/10
drawn	S.G.J.
chkd	J.J.H.
date	FEB. 1978
scale hor:	As Shown
scale vert:	

emps juneau, alaska

engineering surveying architecture

GENERAL BRIDGE LAYOUT

CITY OF HAINES

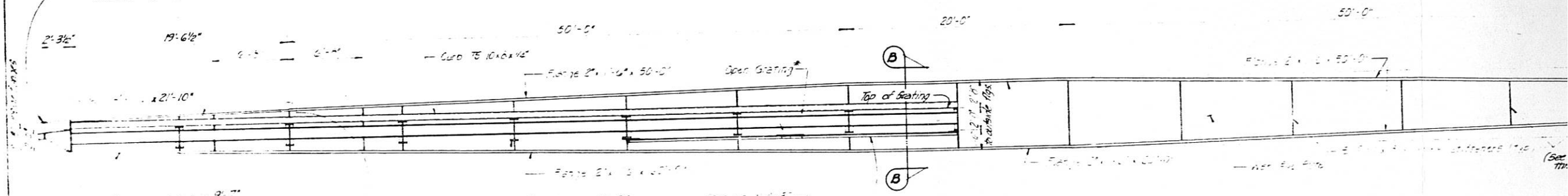
BARGE TRANSFER FACILITY

sheet 8 of 17

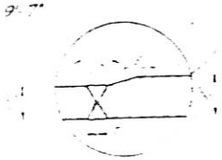
project no. 130.06

SEE "APRON" DETAILS
SHEET № 12

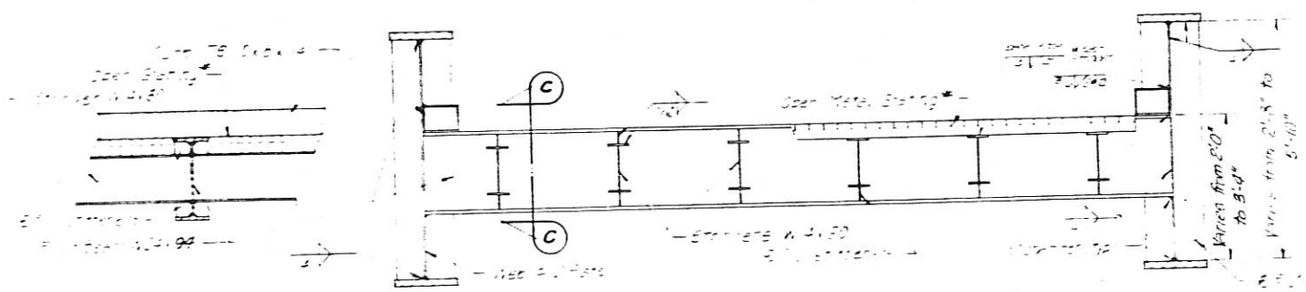
BRIDGE PLAN



SECTION & VIEW A-A



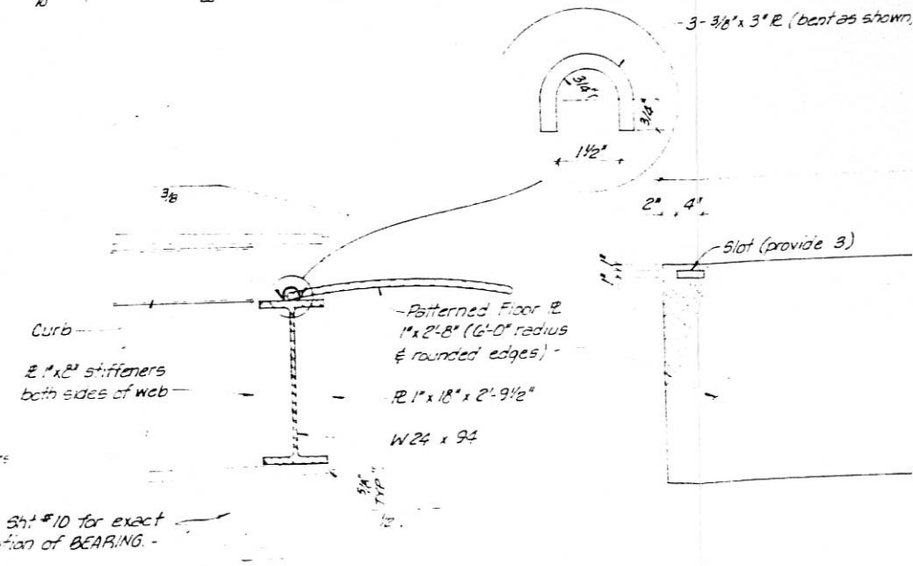
WELD DETAIL



SECTION C-C

SECTION B-B

* Open Grating is to be RELIANCE with 1 1/8" x 3/8" bearing bars 3" O.C. centers in 3'-0" wide panels, or equal. Not to exceed 22.7# sf.



SECTIONAL DETAIL

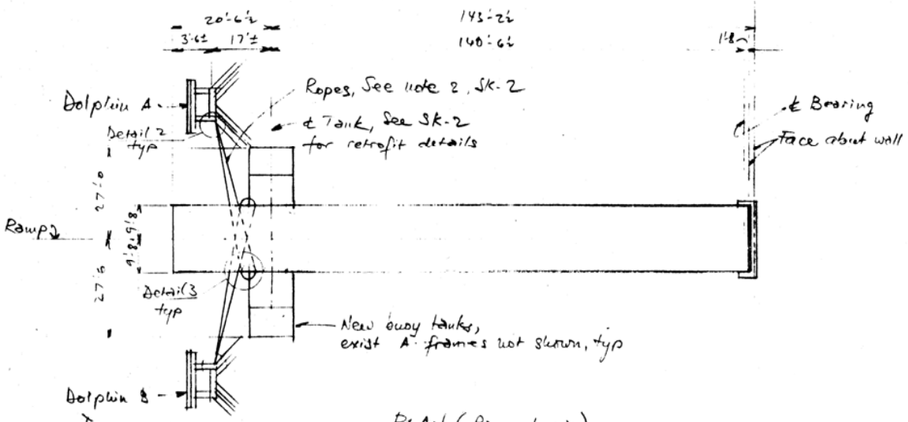
HINGED RAMP DETAILS

NOTE
All welds are to be in accordance with performance standards of current AWS Structural Welding Code

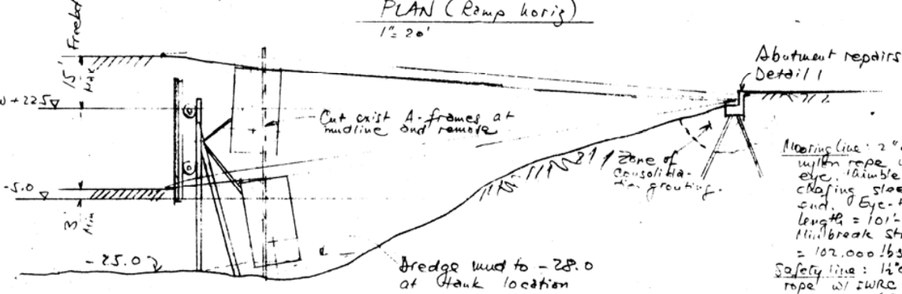
dsgn:	
drwn:	
chkd:	
date:	FEB
scale	
horz:	
vert:	

emps juneau, alaska
engineering surveying architecture

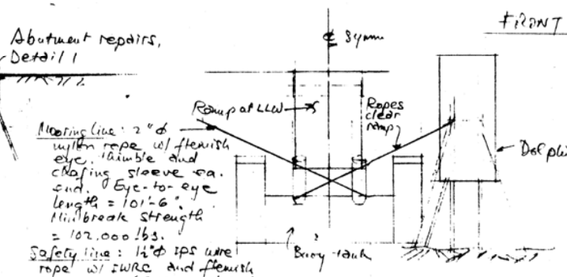
BARGE



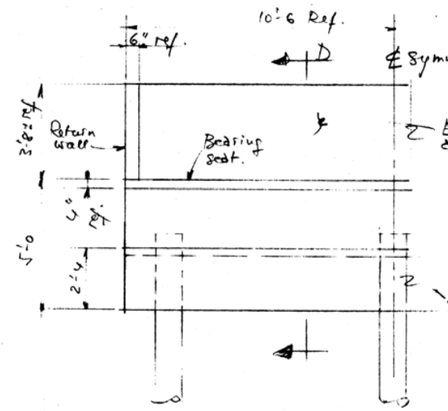
PLAN (Ramp horiz)
1" = 20'



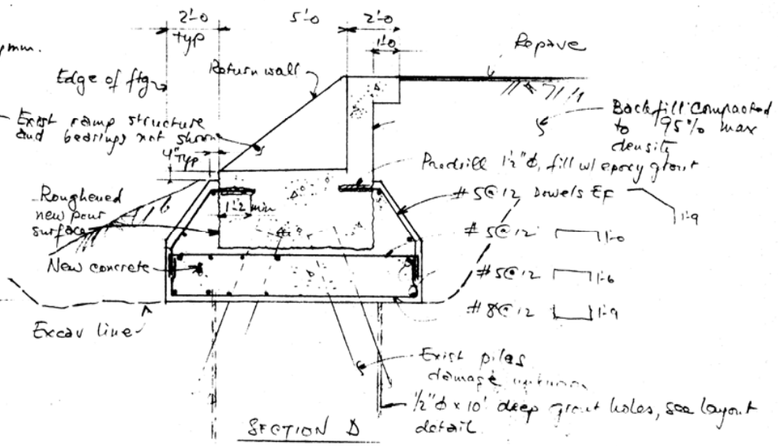
ELEVATION
1" = 20'



END ELEVATION
1" = 20'

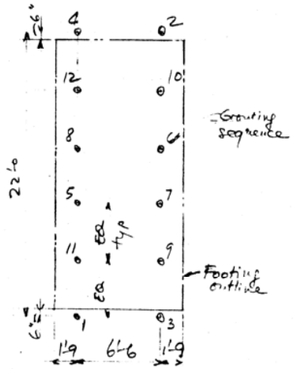


FRONT ELEVATION

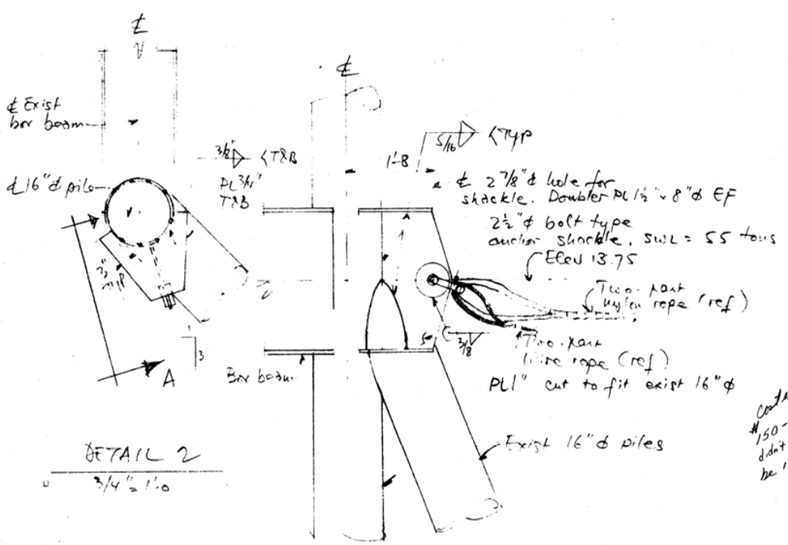


SECTION D

DETAIL 1
3/8" = 1'-0

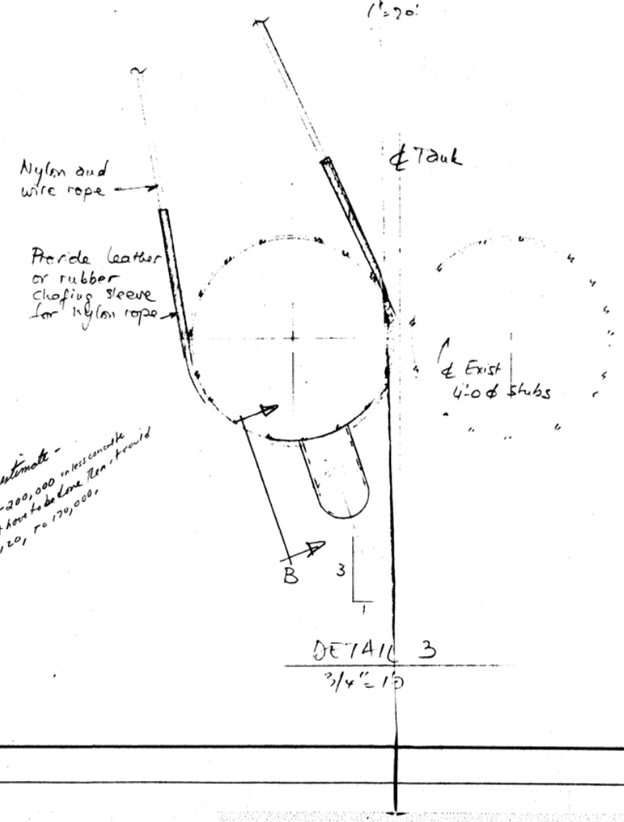


GROUT HOLE LAYOUT
3/16" = 1'-0



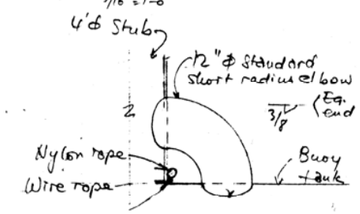
DETAIL 2
3/4" = 1'-0

ELEVATION A
3/4" = 1'-0



Contractor - $150-200,000 in excess of estimate - don't have to be low, but should be 120, not 170,000.

DETAIL 3
3/4" = 1'-0



ELEVATION B
3/4" = 1'-0

NOTES:

1. Material properties for new construction shall be:
   Steel plate A36
   Steel pipe A501 Standard
   Weld electrode E70XX
   Concrete f_c = 3,000 psi
   Reinf steel A615 Grade 60.
   High strength bolts shall be A325
   Other bolts shall be A307.
2. Shop drawings for all fabrication shall be prepared for Engineer's review and approval.
3. Consolidation grouting for soil shall be acrylate type chemical grout (AC-400 or similar). Maximum grouting pressure shall be 12 psi.

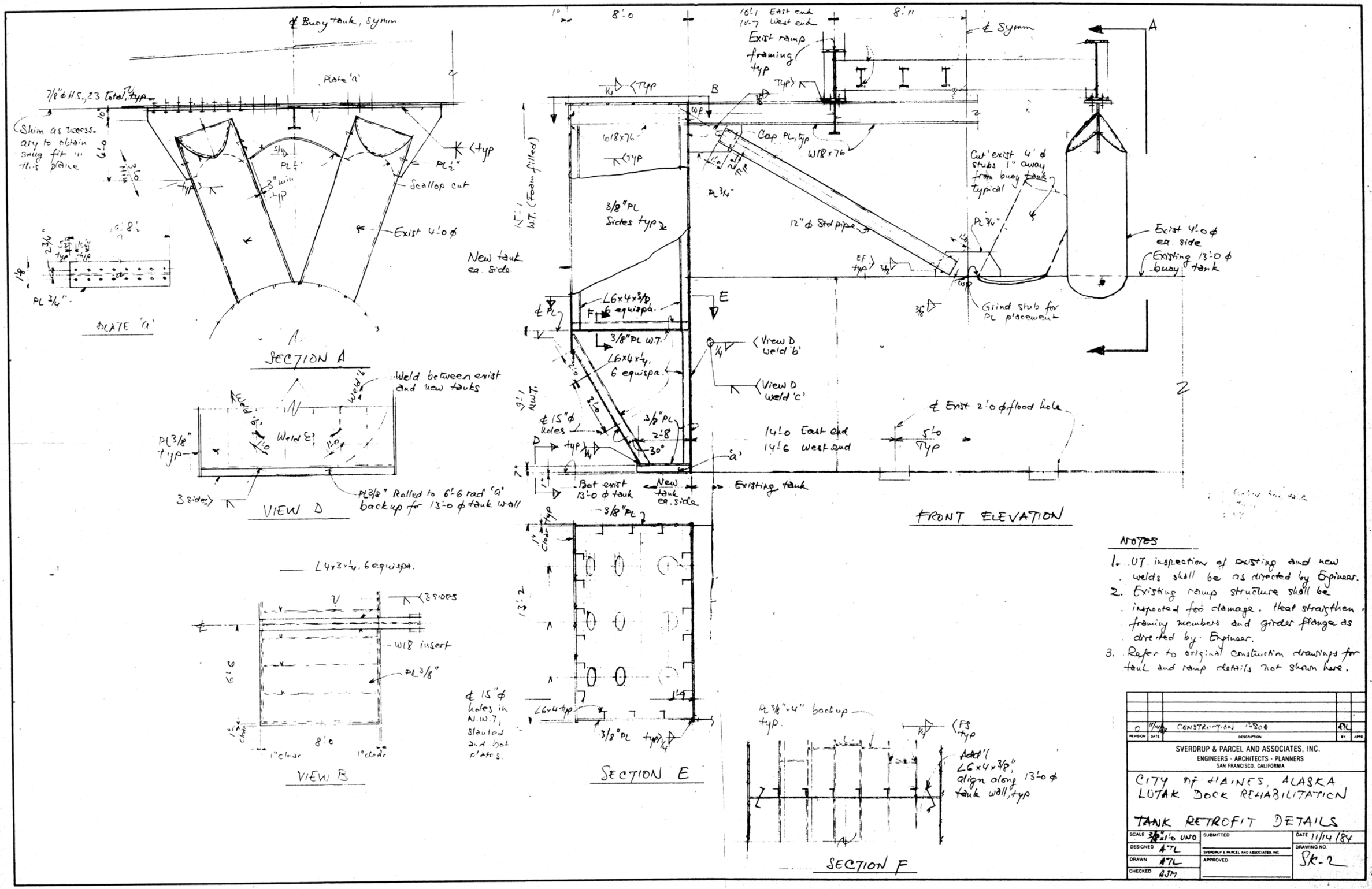
REVISION	DATE	DESCRIPTION	BY	APPD
0	11/14/84	CONSTRUCTIONAL ISSUE	ATL	

SVERDRUP & PARCEL AND ASSOCIATES, INC.
ENGINEERS · ARCHITECTS · PLANNERS
SAN FRANCISCO, CALIFORNIA

CITY OF HAINES, ALASKA
LUTAK DOCK REHABILITATION

PLANS AND DETAILS

SCALE AS NOTED	SUBMITTED	DATE 11/14/84
DESIGNED ATL	SVERDRUP & PARCEL AND ASSOCIATES, INC.	DRAWING NO.
DRAWN ATL	APPROVED	SK-1
CHECKED AJM		



NOTES

1. UT inspection of existing and new welds shall be as directed by Engineer.
2. Existing ramp structure shall be inspected for damage. Heat straighten framing members and girder flange as directed by Engineer.
3. Refer to original construction drawings for tank and ramp details not shown here.

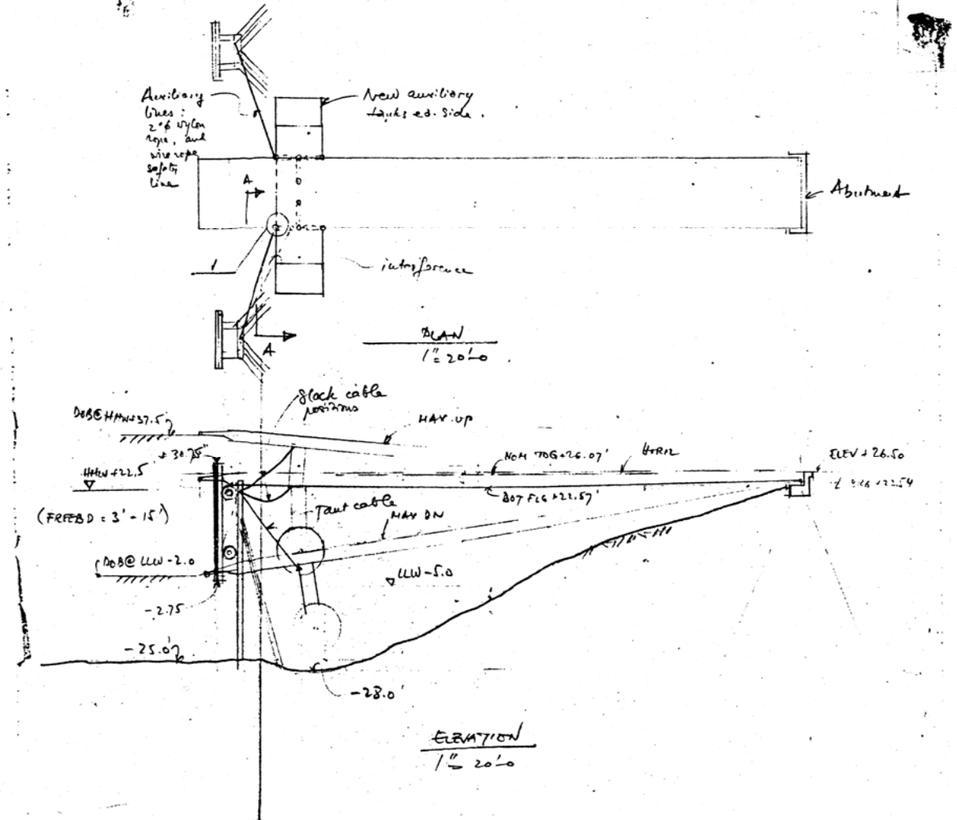
REVISION	DATE	DESCRIPTION	BY	APPD
0	11/14/84	CONSTRUCTION ISSUE	ATL	

SVERDRUP & PARCEL AND ASSOCIATES, INC.
ENGINEERS - ARCHITECTS - PLANNERS
SAN FRANCISCO, CALIFORNIA

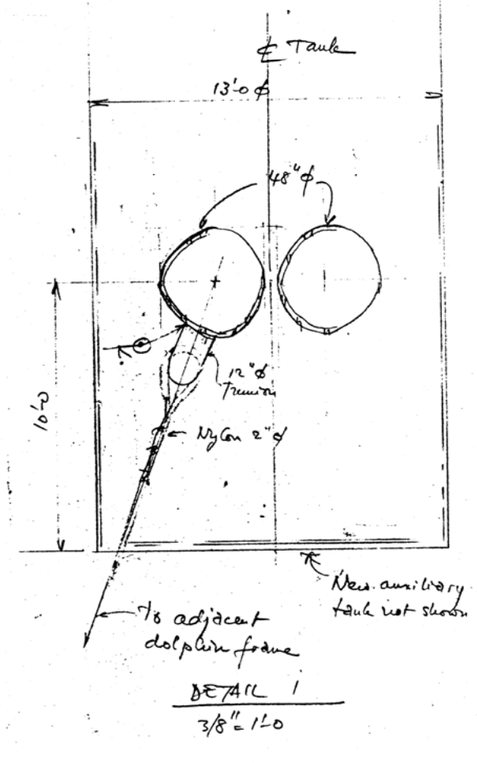
CITY OF HAINES, ALASKA
LUTAK DOCK REHABILITATION

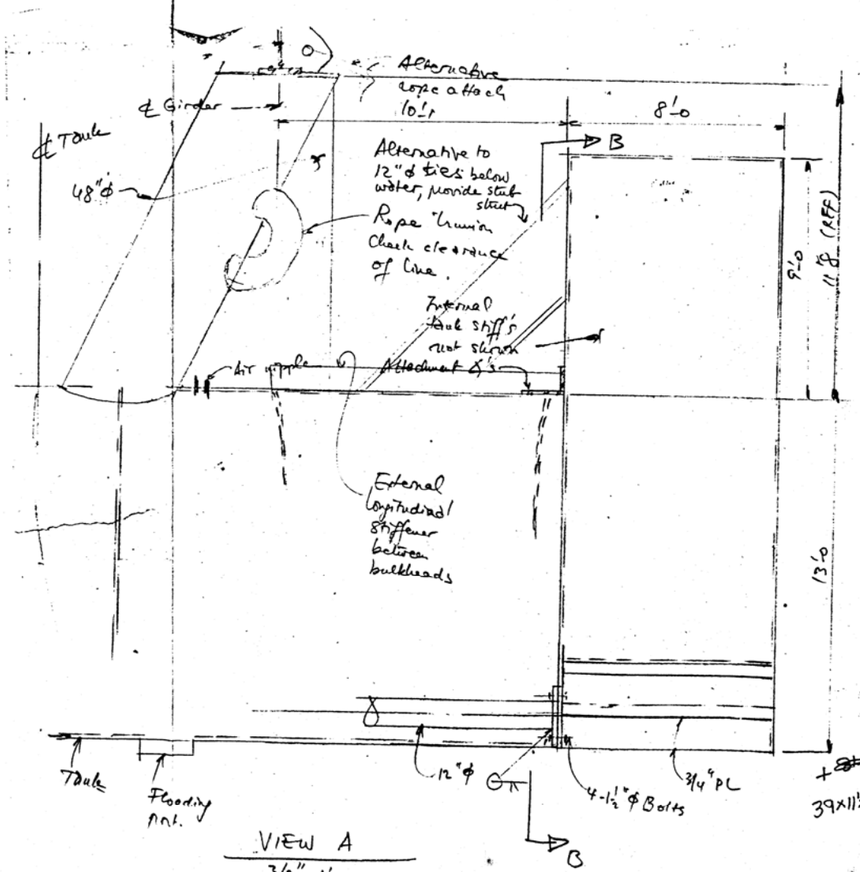
TANK RETROFIT DETAILS

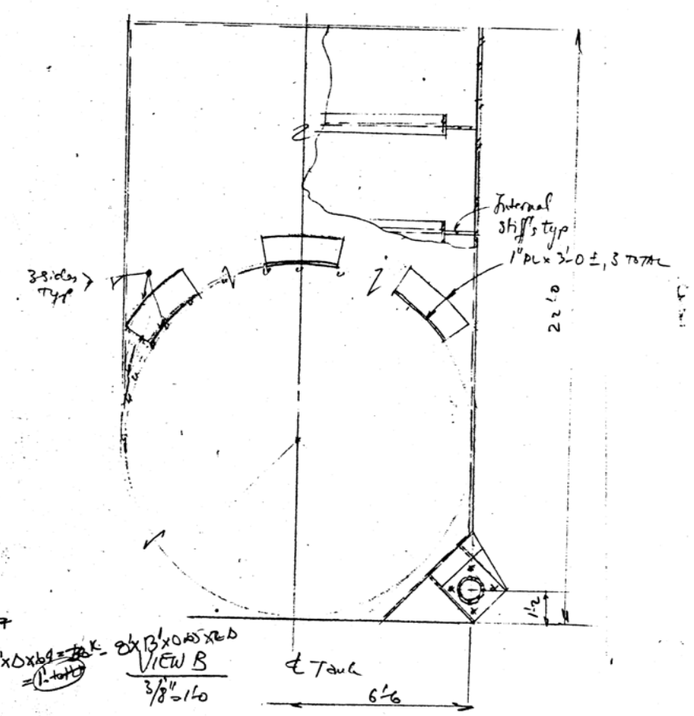
SCALE 3/8"=1'-0 UNO	SUBMITTED	DATE 11/14/84
DESIGNED ATL	SVERDRUP & PARCEL AND ASSOCIATES, INC.	DRAWING NO.
DRAWN ATL	APPROVED	Sk-2
CHECKED AJM		

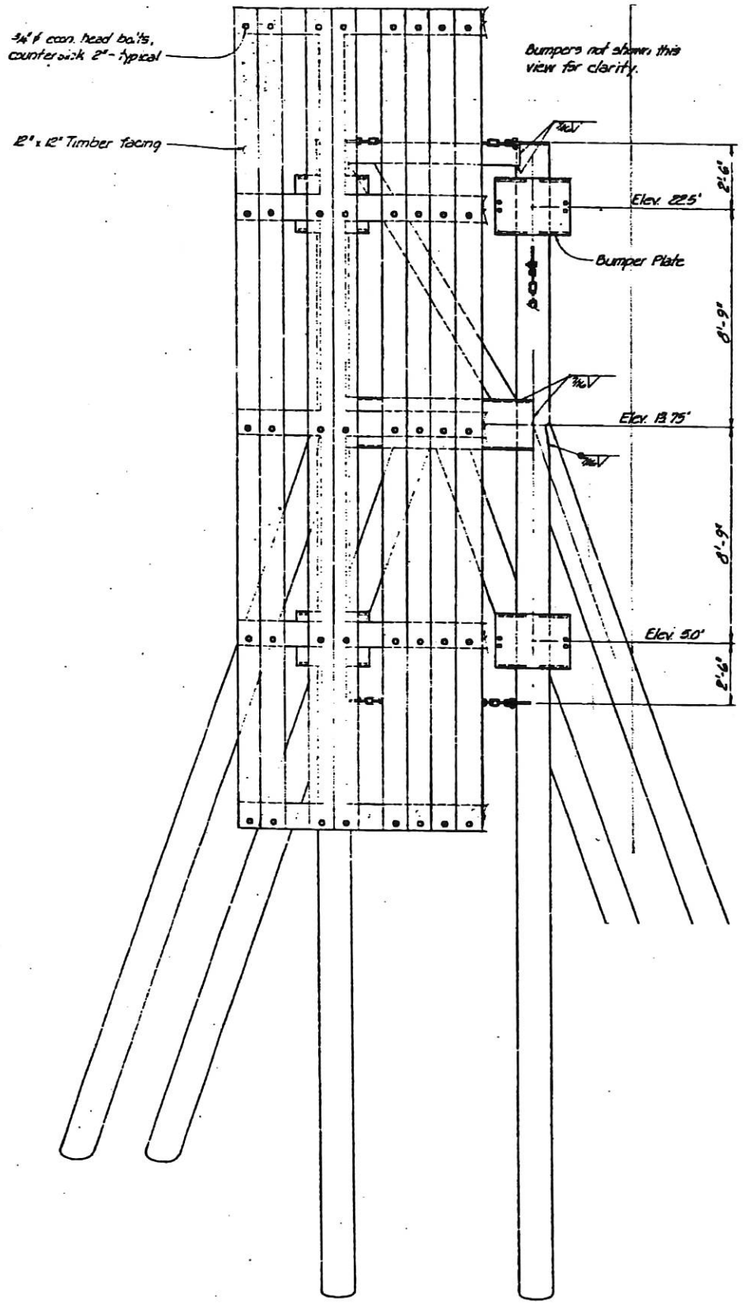

Auxiliary lines: 2" φ Nylon rope, and wire rope safety line
New auxiliary tanks ed. side.
Abutment
interference
A
A
PLAN
1" = 20'-0

Slack cable position
MAX UP
NOM TOG +26.07'
HTRL
ELEV +26.50
DOB @ HHW +37.5
+30.75
HHW +22.5
(FREEBD = 3'-15')
Taut cable
MAX DN
DOB @ LLW -2.0
LLW -5.0
-2.75
-25.0'
-28.0'
ELEVATION
1" = 20'-0

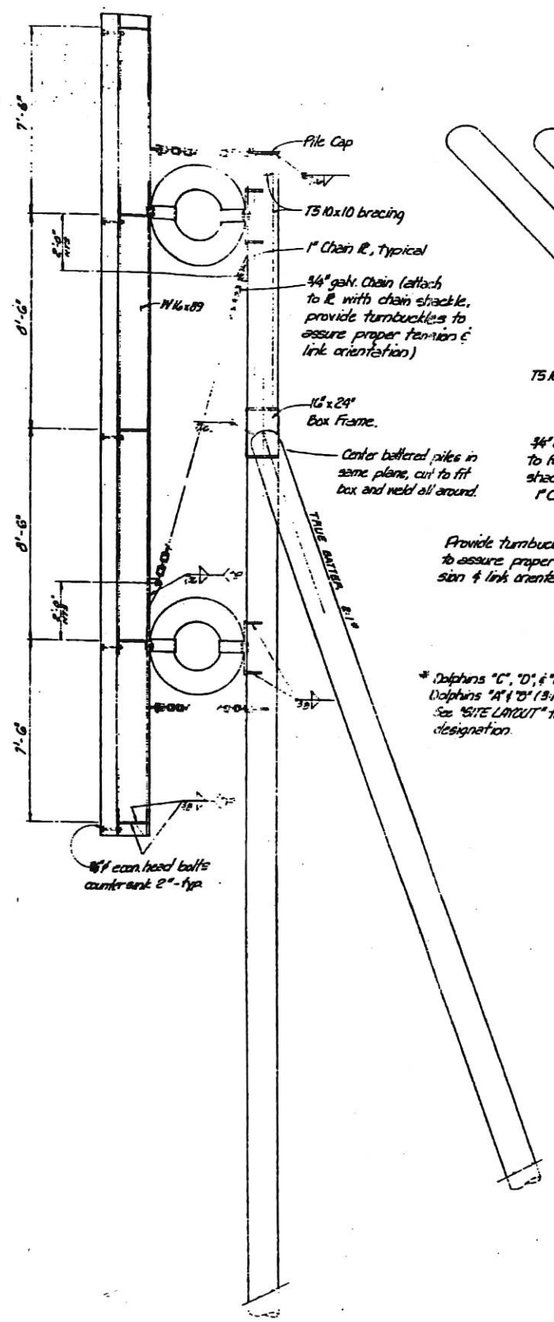

℄ Tank
13'-0 φ
48" φ
12" φ Trunion
10'-0
Nylon 2" φ
New auxiliary tank not shown
To adjacent dolphin frame
DETAIL 1
3/8" = 1'-0


Alternative rope attach
10'-0
8'-0
℄ Girder
℄ Tank
48" φ
B
Alternative to 12" φ ties below water, provide stub strut
Rope trunion check clearance of line.
Internal tank stiff's not shown
Attachment ℄'s
Eternal longitudinal stiffener between bulkheads
9'-0
11'-8 (REF)
13'-0
Tank
Flooding pnl.
12" φ
4-1½" φ Bolts
3/4" PL
B
VIEW A
3/8" = 1'-0

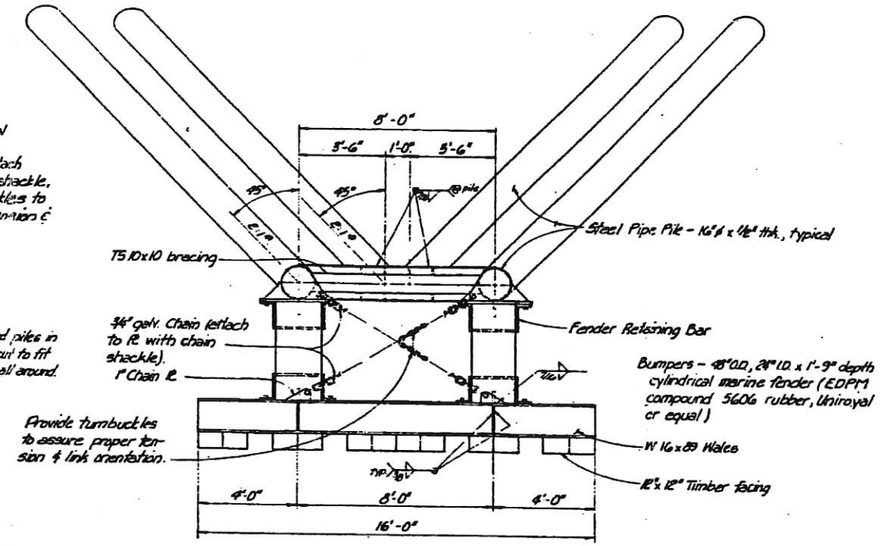

Internal stiff's typ 1" PL x 3'-0 ±, 3 TOTAL
3 sides typ
22'-0
1½
℄ Tank
6'-6
VIEW B
3/8" = 1'-0



EXIST. DOLPHIN SECTIONAL FRONT VIEW



EXIST. DOLPHIN SIDE VIEW



* Dolphins "C", "D", & "E" (2:1)
Dolphins "A" & "B" (3:1)
See "SITE LAYOUT" for designation.

EXIST. FENDER DOLPHIN PLAN

1 0 1 2 3 4 5 10
FEET

NOTE:
1. REPLACE ALL TIMBERS ON DOLPHIN 1 & 2 AND NORTHERN MOST TIMBER ON DOLHINS 3 & 4

2. TIMBERS MAY BE SPLICED AT CENTER OF EXISTING WALERS. BOLT EACH TIMBER TO WALES W/ 3/4"ϕ GALV. BOLTS. DRILL HOLES IN EXIST. WALES WHERE REQUIRED.

DRAFT

REVISIONS

	DWN.	CKD.	APP.

Peratrovich, Nottingham and Drage, Inc. (PN&D) is not responsible for safety programs, methods or procedures of operation, or the construction of the design shown on these drawings. Drawings are for the use of this project only and are not intended for reuse without written approval from PN&D. Drawings are also not to be used in any manner that would constitute a detriment directly or indirectly to Peratrovich, Nottingham and Drage, Inc.

Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants
3220 Hospital Drive, Suite 200
Juneau, Alaska 99801
TEL: (907) 586-2093 FAX: (907) 586-2099 E-MAIL: pndinc1@ptialaska.net

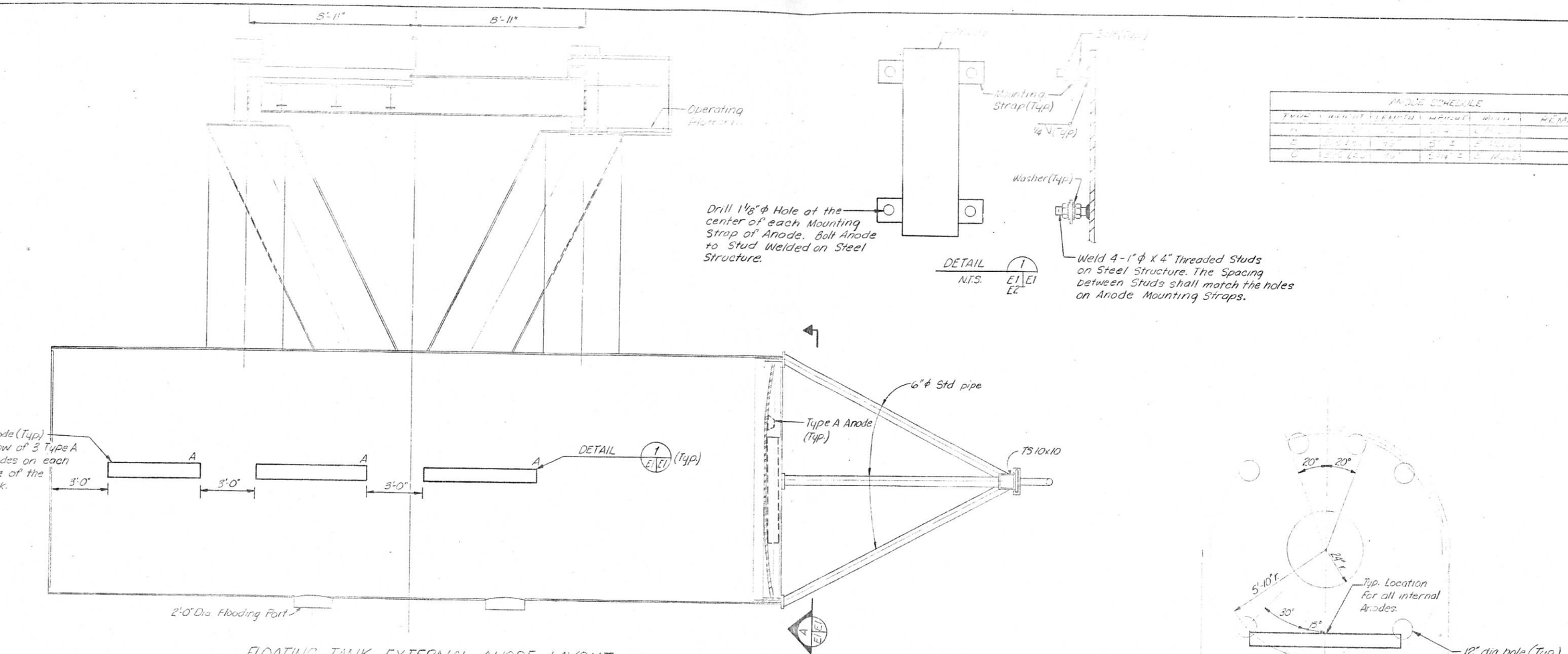
DESIGN: CRS CHECKED:
DRAWN: LLR APPROVED:
SCALE:
DATE: NOV.1, 1999

CITY OF HAINES, ALASKA
LUTAK BARGE RAMP FENDER REPAIRS

SHEET TITLE:
AS-BUILT DRAWINGS

PN&D PROJECT NO.: 99266 DWG. FILE: EXFENDER.DWG

SHEET 2 OF 2



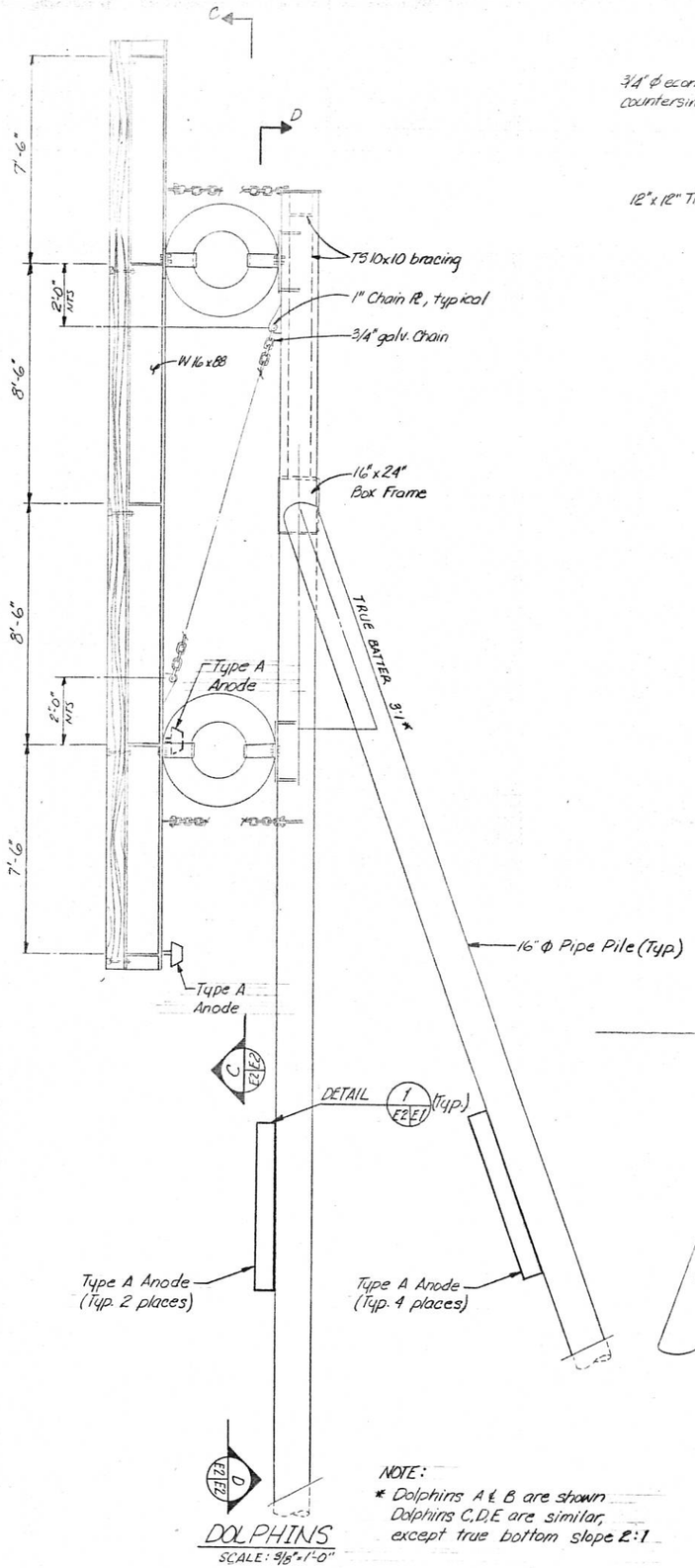
ANODE SCHEDULE						
TYPE	LENGTH	WIDTH	HEIGHT	WEIGHT	QTY	REMARK
A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
B	[illegible]	[illegible]	3"	[illegible]	3	[illegible]
C	[illegible]	[illegible]	3 1/4"	[illegible]	2	[illegible]

FLOATING TANK EXTERNAL ANODE LAYOUT
SCALE: 3/8" = 1'-0"

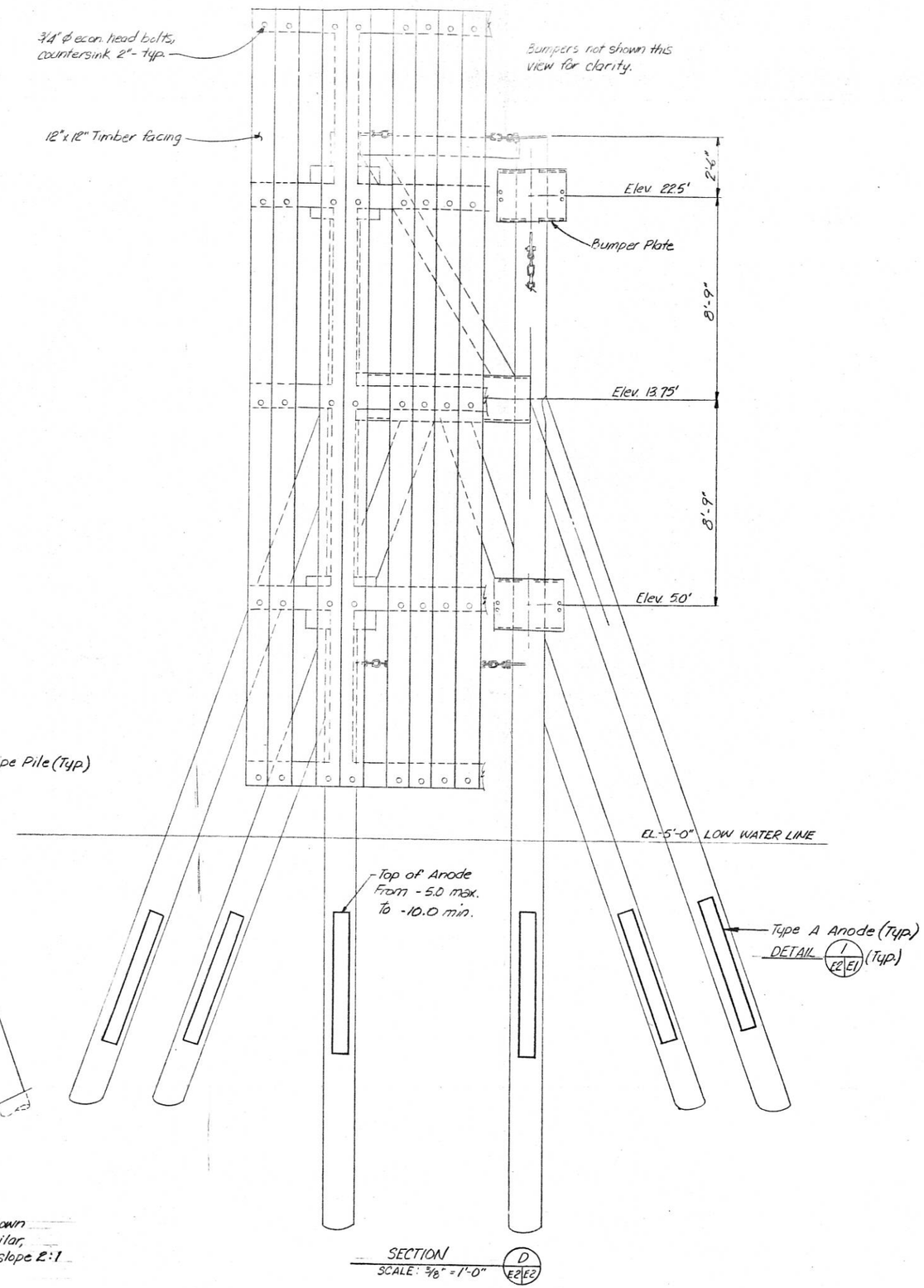
FLOATING TANK INTERNAL ANODE LAYOUT
SCALE: 3/8" = 1'-0"

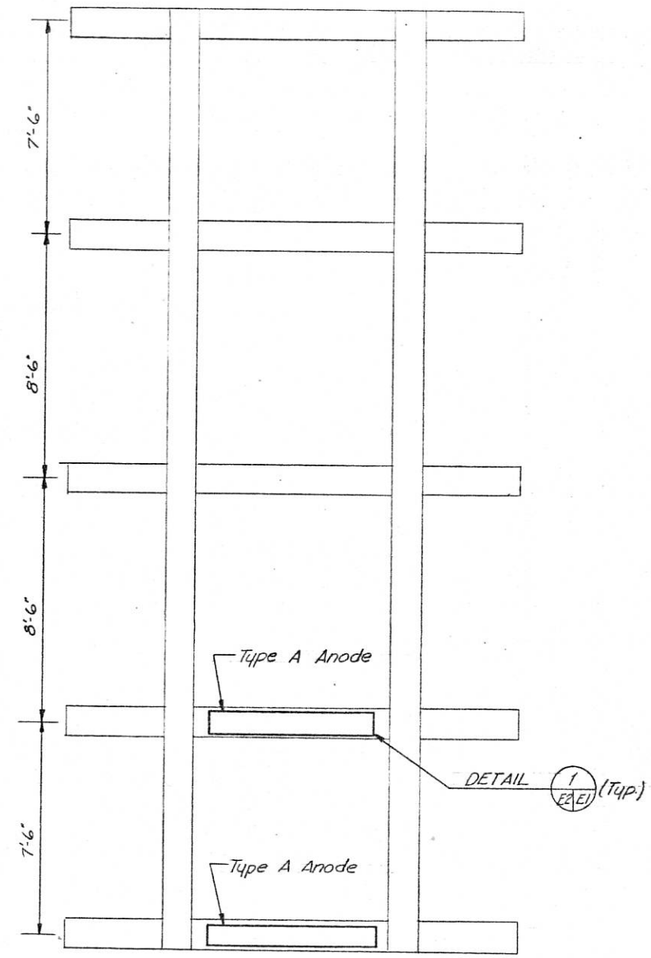
SECTION B E1 E1
SCALE: 3/8" = 1'-0"

SECTION A E1 E1
SCALE: 3/8" = 1'-0"



NOTE:
* Dolphins A & B are shown
Dolphins C, D, E are similar,
except true bottom slope 2:1





APPENDIX D

Historical Reports

- **1984 TAMS Stability Study**
- **1984 Nickum Spaulding Stability Study**
- **1995 Lutak Ramp Load Capacity Report**

STABILITY STUDY

OF BARGE RAMP

CITY OF HAINES

BARGE TRANSFER FACILITY

Prepared for

City of Haines, Alaska

Prepared by

Tippetts-Abbett-McCarthy-Stratton
A Professional Corporation

April 1984

INTRODUCTION

The barge ramp at the Lutak Barge Transfer Facility has shown signs of instability ever since its construction. The tendency of the offshore end of ramp to list has been of concern to the City. Photographs of an occurrence that took place on October 1983 are shown on Plate 1.

For this reason, City of Haines, Alaska by letter of March 12, 1984 signed by Darrell Maple, City Administrator, requested Tippetts-Abbett-McCarthy-Stratton to perform the following work.

a. Review the plans and specifications of the facility and analyze certain aspects of the design relative to the torsional stability of the structure.

b. Perform a site investigation to determine the present condition of the structure, to investigate any signs of damage or deformation, and to take water displacement measurements to be used in the buoyancy and stability calculations.

c. Retain the naval architectural firm of Nickum & Spaulding to examine the stability of the flotation tank, investigate the effects of the water in the interior of the tank on the stability and to perform preliminary investigation of means to obtain stability by revision of the floatation tanks.

d. Review the methods for redesign suggested by EMPS Engineering and determine its suitability for alleviating the problem of instability.

METHOD

TAMS was provided with the plans and specifications of the barge ramp. We have also examined the plans for the barge ramp at Wrangell, Alaska which is similar to the subject ramp.

Structural and buoyancy calculations were made to ascertain the reason for the instability.

STRUCTURAL REVIEW

A torsional analysis of the barge ramp was made to determine its capability of resisting overturning moments. According to our calculations the torsional resistance of the two main girders is approximately 3,000 foot pounds per degree of list. A secondary torsional resistance is effected by the rigid connection of the girders to the tank supports. This amounts to approximately 48,000 foot pounds per degree of list. However, this secondary resistance depends on the strength of the support connections. This resistance has been diminished due to rupture of the welds under the right girder on a previous occasion of severe listing.

By means of comparison, we have analyzed the barge ramp at Wrangell, Alaska which reportedly is functioning satisfactorily.

The Wrangell ramp system is similar to the Haines system but incorporates an orthotropic type of bridge construction which utilizes box girders as compared with the built-up ("I" shaped) girders in the Haines system. A box girder has much greater torsional rigidity than a built-up girder by virtue of its geometry. The Wrangell girders have a torsional rigidity of approximately 600,000 foot-pounds per degree as compared with 3,000 foot-pounds per degree of the Haines girder. The tor-

sional rigidity of the Wrangell box girders is sufficient to provide stability to the ramp system.

The general layout and ramp details of the Haines and Wrangell Barge ramp systems are shown on Plates 2, 3, 4, and 5.

REVIEW OF THE STABILITY OF THE FLOATATION TANKS

Field measurements of the water line were made to determine the "as-builts" displacement of the floatation unit both at high water and at low water. These values were used for the stability calculations. The study indicated that the present arrangement of the flotation tank and attached ramp is unstable even when the tank is floating in the highest, deballasted mode. The overturning moment increases as the tank is sunk.

As the tide gets lower, the center of gravity of the ramp becomes higher relative to the float. The displacement also increases as the tank tilts toward the shore. The combined effect increases the overturning moment. This causes the list of the ramp to become more pronounced at low tide.

The report by Nickum and Spaulding of their stability analysis is appended to this report.

COMMENTS ON THE MODIFICATIONS SUGGESTED BY EMPS

On the letter of October 12, 1983, Mr. George Davidson of EMPS made three suggestions toward modifying the Barge Ramp to correct the instability. These suggestions and our comments are as follows:

a) EMPS suggests a dual plumbing of the vent system with three air tight chambers for the top half of the center chamber.

Our calculations indicate that the system is unstable under any condition, even when the tanks are completely void of water. Therefore, admitting water to the tanks, selectively or otherwise cannot bring an unstable system to a stable condition.

It is our opinion that this solution will not solve the problem.

b) EMPS suggest modification of the existing guide piles to provide for an off center weight.

It is our opinion that the system is presently unstable and capable of listing in either direction. Therefore, correcting the existing torque or list is not a solution to the instability problem.

c) EMPS suggests the development of a more box-like superstructure with more torque resistance through addition of plates to the girders and/or by modifying the open deck.

We feel that this suggestion has some merit. This solution follows the method used for the Wrangell Barge Ramp. However, the structural feasibility and cost effectiveness of this solution as compared to other solutions must be investigated.

SUMMARY

1. The stability study of the flotation system indicates that the flotation tanks are unstable at all stages of displacement and does not contribute toward stabilizing the ramp system against listing even when floating at its highest levels.

2. The torsional resistance of the superstructure is critically weak. The main girders offer almost no torsional resistance. The major resistance to overturning is obtained by a secondary effect through the rigidly fixed connection of the main girders to the flotation tank. Most of this resistance was lost when the connecting welds over the right support legs failed during a previous incident when severe listing occurred.

   This rupture leaves the ramp with very little resistance to overturning and also causes the ramp to presently list to the right.

PROVISION FOR REMEDIAL WORK

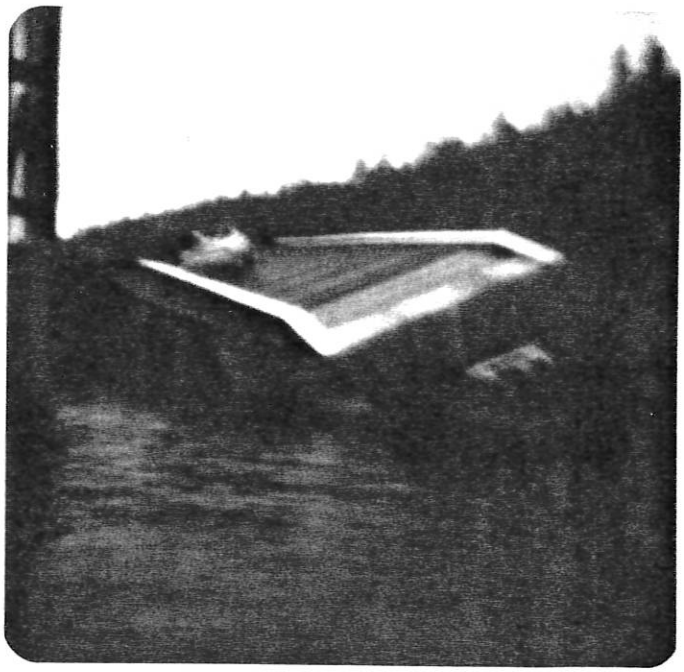
The scope of this work did not allow for a detailed analysis of the design nor of the methods to remedy the situation. However, based on our preliminary and approximate analysis, we suggest that the following means of obtaining stability be investigated for feasibility and cost effectiveness.

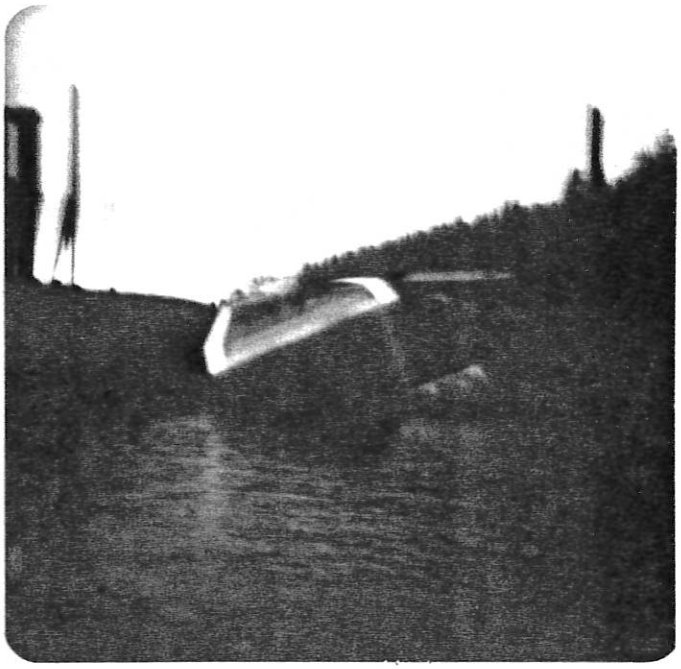
1. Obtain stability of the system by revision of the floatation tanks. One possible method would be by the addition of vertical flotation tanks on the outboard ends of the present tank. The advantage of obtaining stability through flotation is that the stresses in the superstructure will not be affected.

2. Obtain stability by increasing the torsional rigidity of the superstructure. The torsional rigidity of a girder may be increased as much as 160 times by the addition of a second web plate on the outside of the main girders. This method introduces new stresses into the superstructure and produces new upsetting forces at the abutment. The ramp must be reanalyzed for the effect of the new stresses.

3. The third alternative is to obtain stability by the use of stabilizing arms and stabilizing towers. This alternative will require careful detailing to obtain trouble-free operating characteristics. Because the barge ramp will not be stable as in alternatives 1 or 2, careful maintenance will be required to prevent an October 1983 type of incident. Because of the high potential for damage and the requirement for careful maintenance, we consider this the least desirable of the three alternatives.

4. Our visual examination of the structure did not reveal any apparent structural damage to the structure except for the rupture of the welded seams on the top of the right flotation supports. However, we suspect that many areas were severely overstressed during previous incidents of severe listing. We recommend that these areas be examined by non-destructive test methods to insure that failure has not taken place.





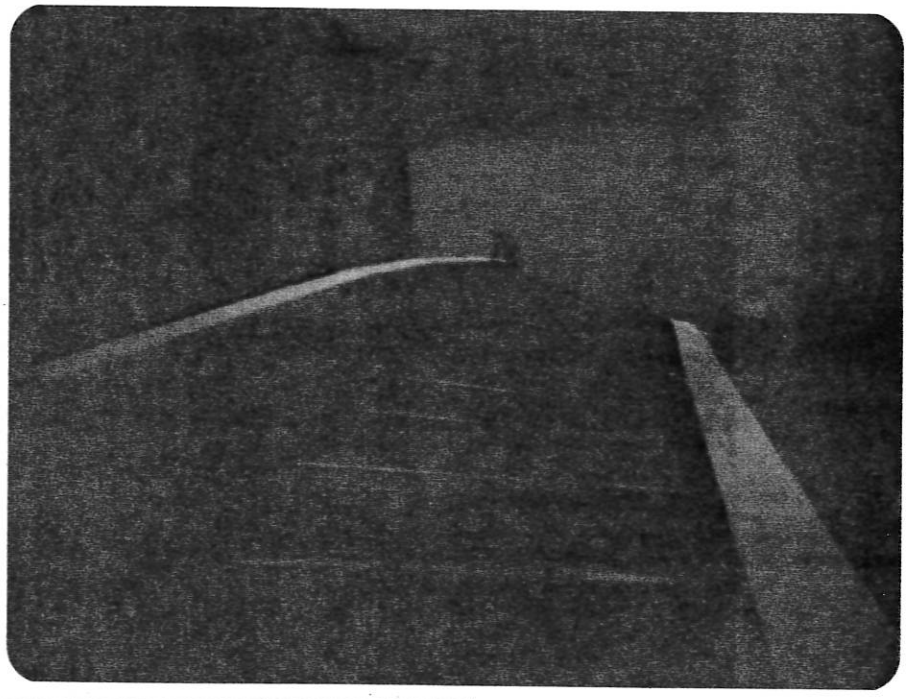
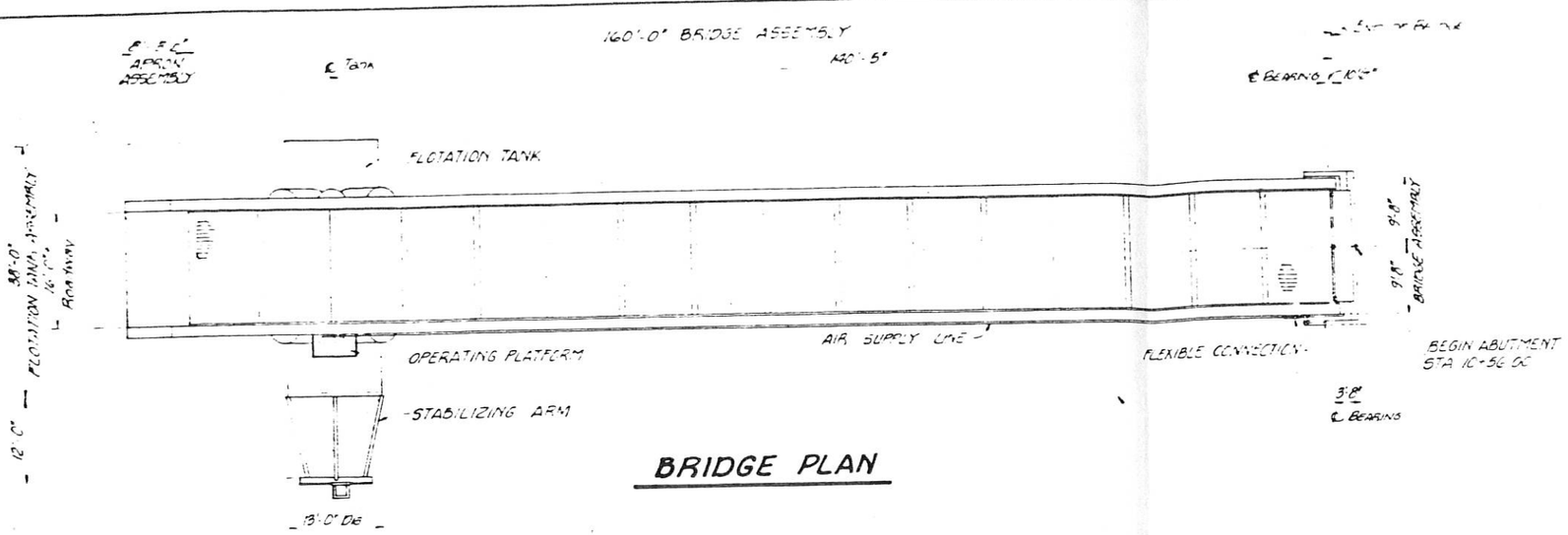
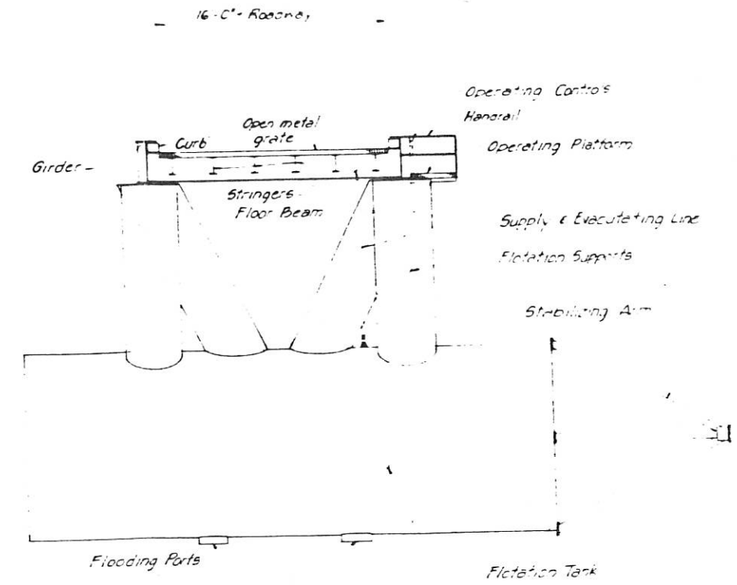


PLATE 1

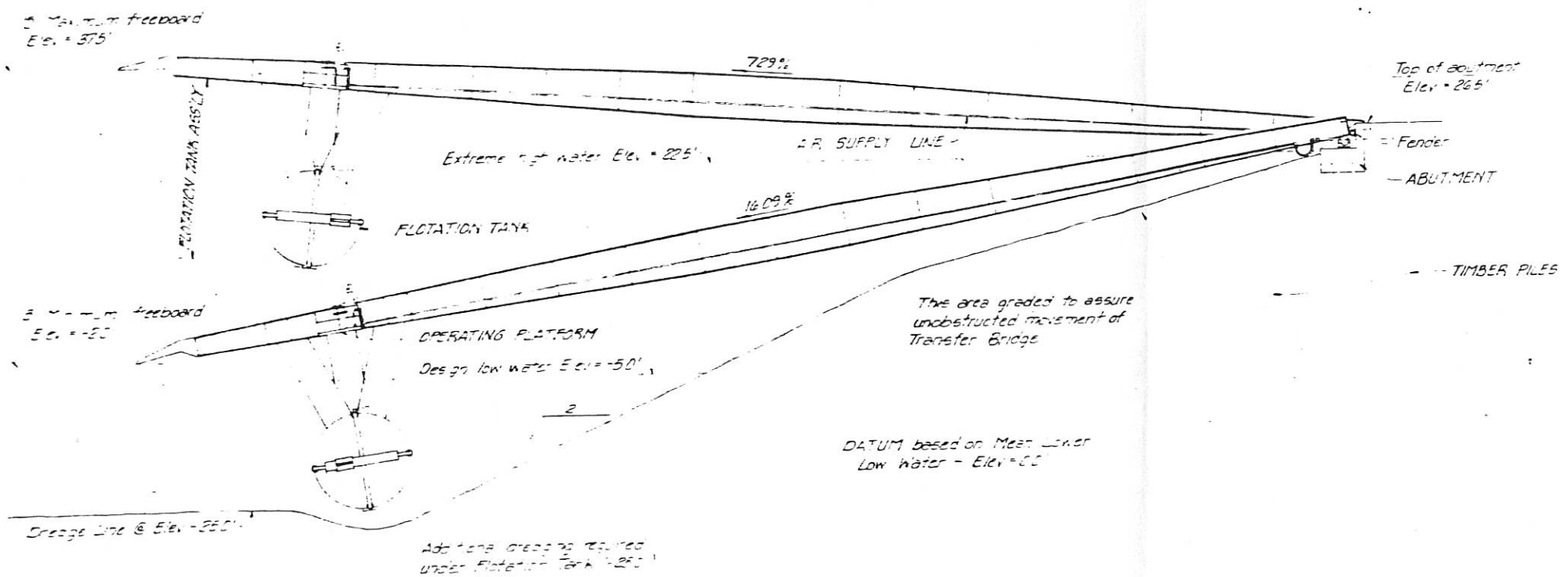


BRIDGE PLAN



TYPICAL SECTION

0 5 10 25
FEET



BRIDGE ELEVATION

0 5 10 20 FEET

DESIGN CRITERIA

In accordance with AASHTO "Standard Specifications for Highway Bridges" 1973 in conjunction with latest interim specifications.

DEAD LOAD

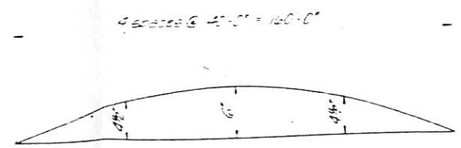
Reinforced Concrete	150 pcf
Structural Steel	490 pcf

LIVE LOAD

HS 20-44 (Caterpillar D-60)
Equivalent to 20 kips max axle load) 50 kips

EARTH

Active Pressure	120 pcf
Equivalent Fluid Pressure	50 pcf



DEAD LOAD CAMBER DIAGRAM

GENERAL NOTES:

1. Concrete design, detailing and construction to be in accordance with "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" ACI-318-77 and the American Concrete Institute "MANUEL OF STANDARD PRACTICE FOR DETAILING OF CONCRETE STRUCTURES".

   The Contractor shall not allow any concrete washings to enter the salt water environment.

2. Structural Steel design, fabrication and erection shall conform to the "AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDING," latest edition.

3. Welding shall be in accordance with AMERICAN WELDING SOCIETY, STRUCTURAL WELDING CODE D1.1, latest edition.

4. STRUCTURAL MATERIALS
   - Structural Steel - All structural steel shall be A572 except as noted in the specifications. All bolts shall be galvanized A307 bolts.
   - Concrete - All cast-in-place concrete shall be Class "A" f'c = 4000 psi.
   - Reinforcing Steel - All reinforcing steel shall conform to ASTM 615 Grade 60.

5. All dimensions shown are measured horizontally or vertically, unless otherwise noted, at a mean temp of 50°F. Shim all gaps in excess of 1/4" or where authorized by the Owners Representative.

PLATE 2

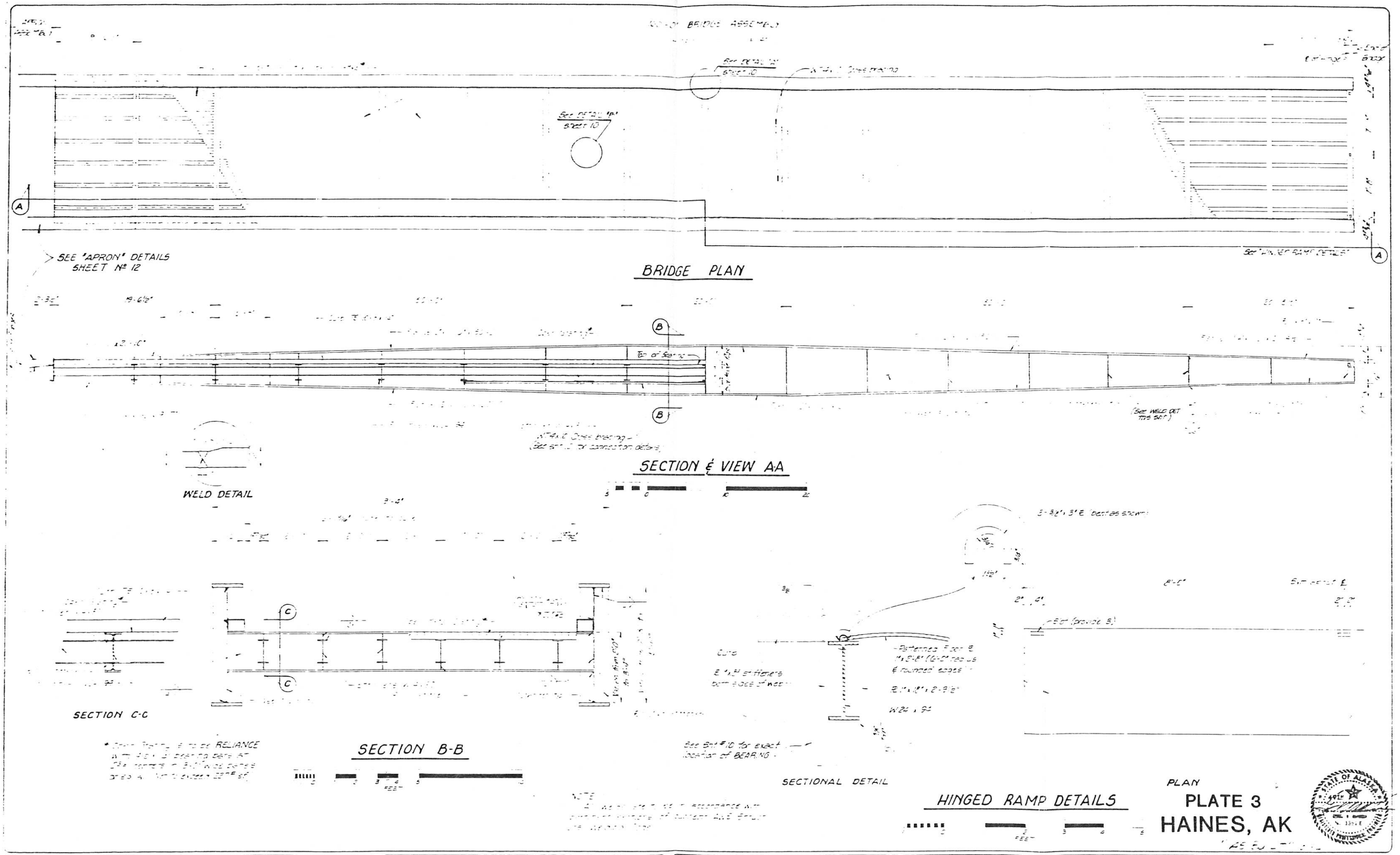
HAINES, AK.

"AS BUILT" 1980

STATE OF ALASKA

		emps juneau, alaska engineering surveying architecture	GENERAL BRIDGE LAYOUT CITY OF HAINES BARGE TRANSFER FACILITY

sheet 8 of 17
project no.



emps juneau, alaska

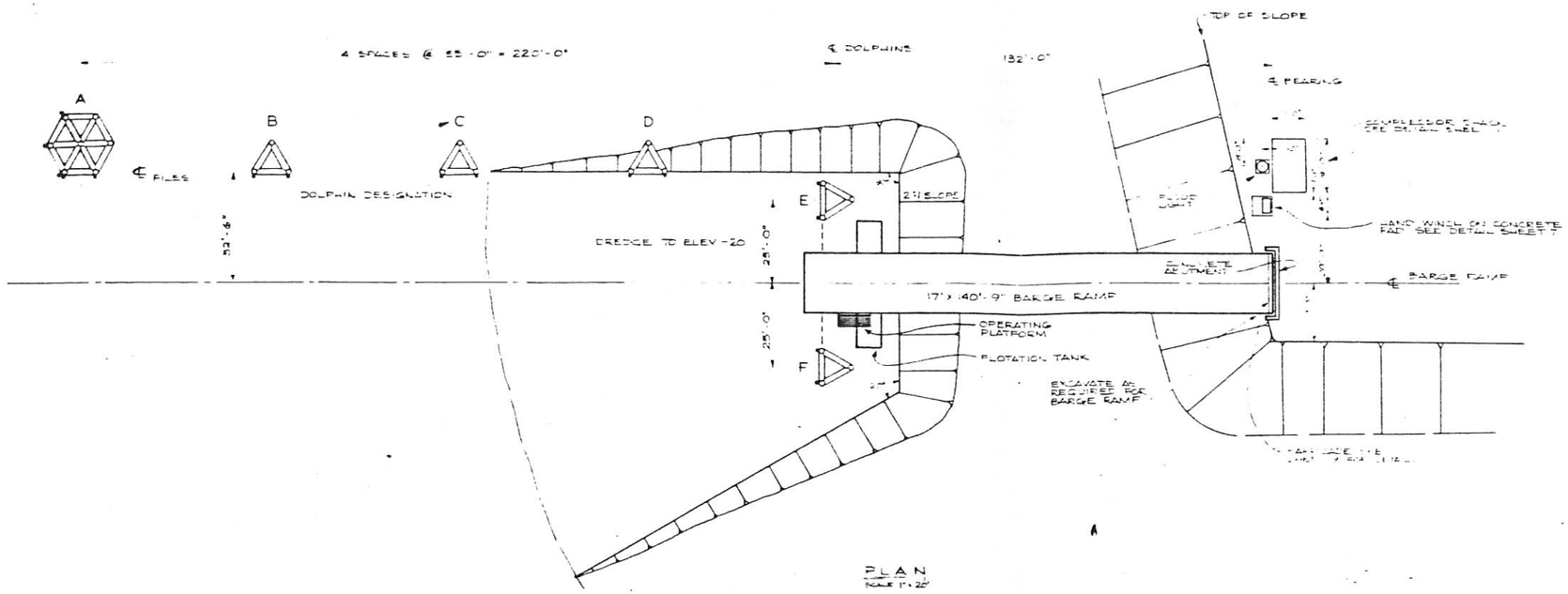
engineering surveying architecture

BRIDGE

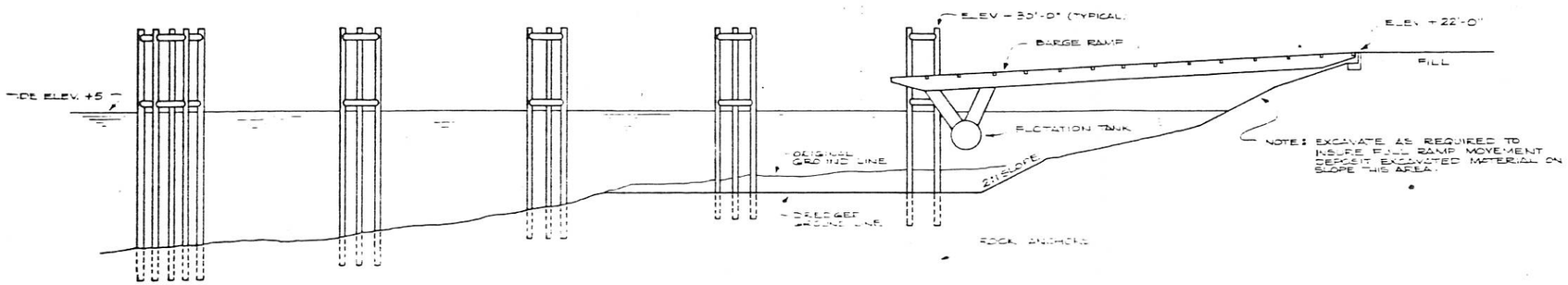
CITY OF HAINES

BARGE TRANSFER FACILITY

sheet 11 of 17



PLAN
SCALE 1" = 20'



ELEVATION

GENERAL NOTES

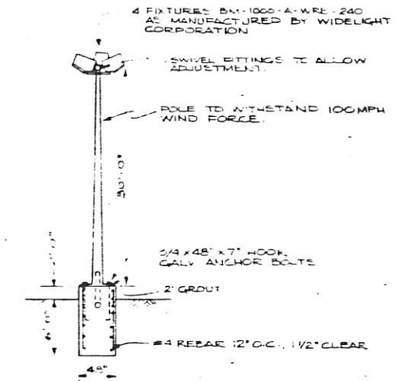
RAMP DESIGN LOAD: TIRE PRESSURE 90 PSI
WHEEL LOAD 20,000#
TOTAL LOAD 145,000#

DOLPHIN DESIGN LOAD: STATIC HORIZONTAL LOAD - 85,000#
DOCKING ENERGY ABSORPTION - 17,500 FT. LBS.

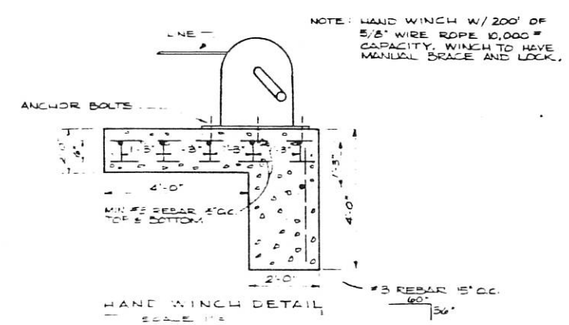
MATERIALS: ALL STEEL SHALL BE A36 UNLESS OTHERWISE NOTED.

ALLOWABLE STRESSES: STEEL 24,000 PSI

DOLPHIN "A" LOADS: STATIC HORIZONTAL LOAD - 45 TONS
DOCKING ENERGY ABSORPTION - 66,000 FT. LBS.



FLOODLIGHT POLE & BASE



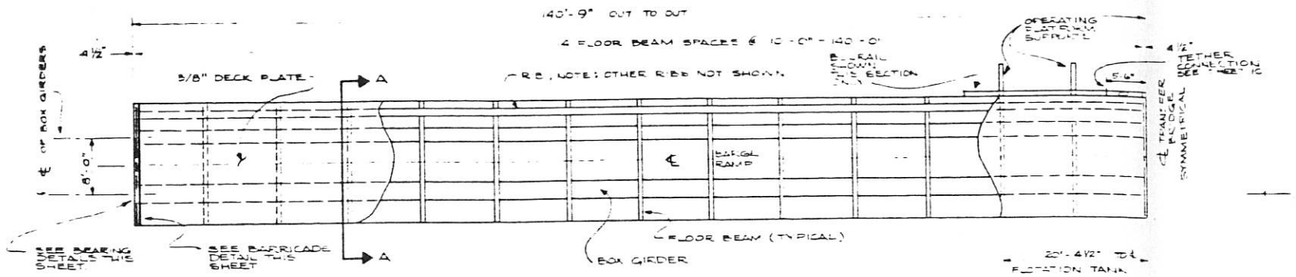
HAND WINCH DETAIL

PLATE 4
WRANGELL, AK.

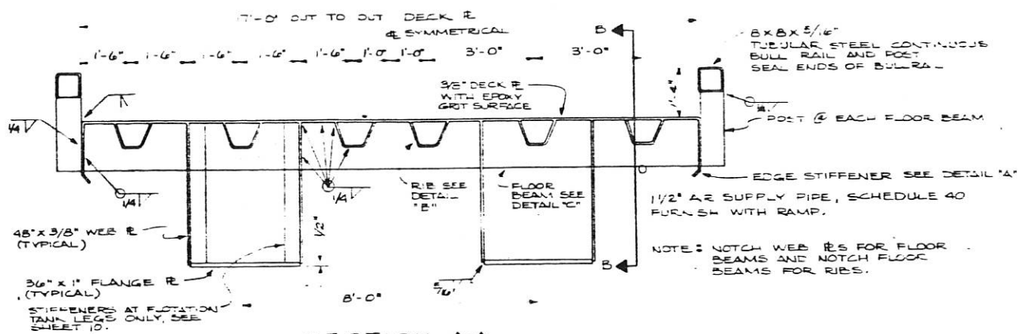
BARGE TERMINAL LAYOUT

CHARLES POOL & ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
BOX 2609, KETCHIKAN, ALASKA 99901

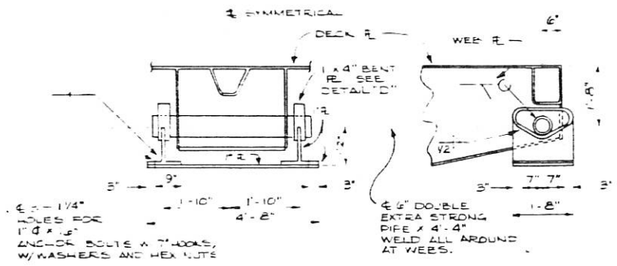
DESIGNED BY	DATE	DRAWN BY	PROJ NO
WILLIAM GUTE		SH	11103-37-02
SCALE	DATE	CHECKED BY	



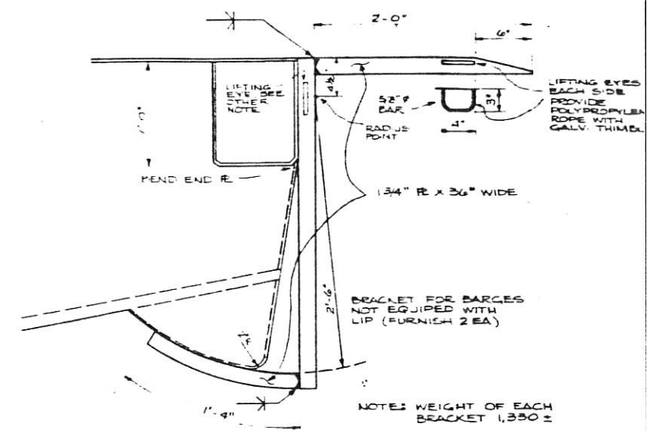
PLAN VIEW OF TRANSFER BRIDGE
SCALE 1" = 10'-0"



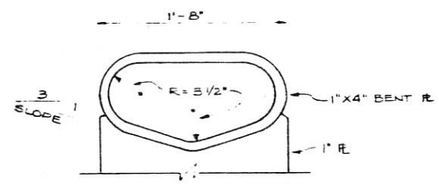
SECTION A-A
SCALE 1/2" = 1'-0"



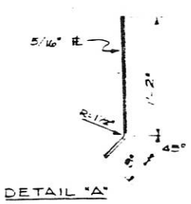
BEARING DETAILS
SCALE 1/2" = 1'-0"



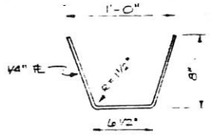
BARGE BRACKET DETAILS
SCALE 1 1/2" = 1'-0"



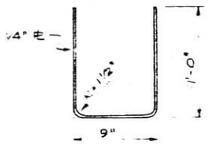
DETAIL "D"
SCALE 1/2" = 1'-0"



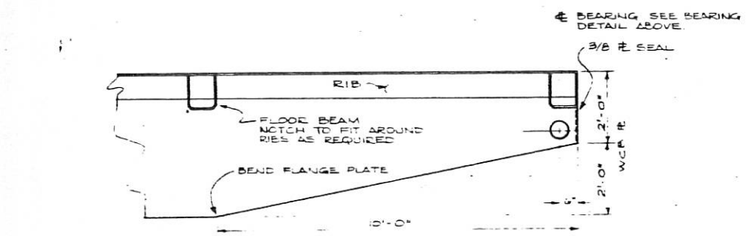
DETAIL "A"
EDGE STIFFNER
SCAL 1/2" = 1'-0"



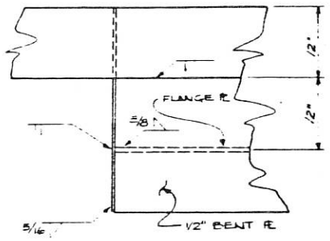
DETAIL "B"
RIB
SCALE 1/2" = 1'-0"



DETAIL "C"
FLOOR BEAM
SCALE 1/2" = 1'-0"

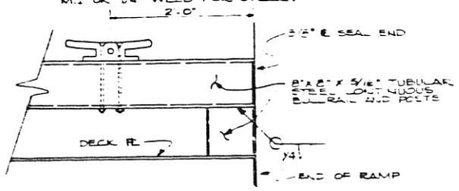


SECTION B-B BOX GIRDER BEARING END DETAIL
SCALE 1/2" = 1'-0"

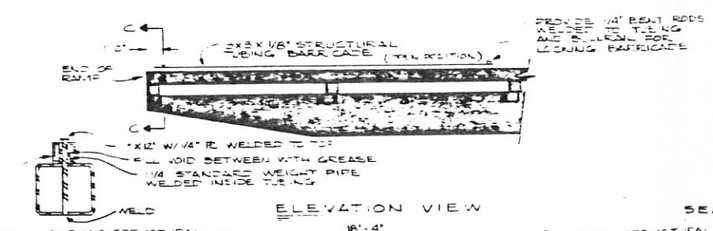


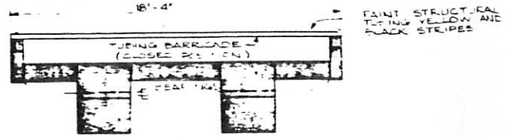
DETAIL "E"

END VIEW OF BARGE RAMP END "E"
SCALE 1" = 1'-0"

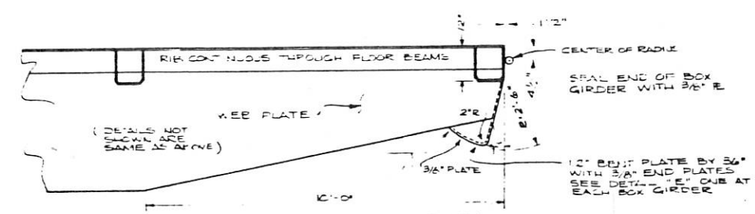


BARGE RAMP CLEAT DETAIL
SCALE 1" = 1'-0"
(TYPICAL EACH SIDE)





SECTION VIEW
BARR CADE DETAILS
SCALE 1" = 1 1/4" = 1'-0"



SECTION E-E BOX GIRDER BARGE END DETAIL
SCALE 1/2" = 1'-0"

PLATE 5
WRANGELL, AK.

BARGE RAMP
DETAILS

CHARLES POOL & ASSOCIATES
CONSULTING ENGINEERS & SURVEYORS
BOX 2609, KETCHIKAN, ALASKA 99901

DESIGNED BY	DATE	DRAWN BY	PROJ. NO.
WILLIAM GUTE		SH	11103-37-02
SCALE	DATE	CHECKED BY	SHEET 9 OF 11
AS SHOWN		J BENSON	

STABILITY ANALYSIS OF RO/RO RAMP FLOATING TANK SUPPORT

Prepared for:

Tippets, Abbett, McCarthy & Stratton

Prepared by:

NICKUM & SPAULDING ASSOCIATES, INC.
2701 First Avenue
Seattle, Washington 98121

84030/3409A

March 1984

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AIM	1
METHOD	1
RESULTS	1
CONCLUSIONS	2
CALCULATIONS	3

Reference: (a) EMPS Drawings - City of Haines, Lutak Dock Expansion, Barge Transfer Facility

AIM

To evaluate the stability of the floating tank portion of the RO/RO ramp located in Haines, Alaska.

METHOD

A deadweight survey was made April 3, 1984, at Haines, Alaska to determine the displacement of the floating tank.

A weight estimate for the tank and its support legs was made and used with the deadweight survey information, to estimate the total weight supported and its vertical center of gravity.

Hydrostatic properties for the intact floating tank were obtained by hand calculations from geometry defined by Reference (a). Hydrostatic curves were drawn from the results of the calculations, (Sheet 4).

An evaluation of stability during submerging and surfacing was made by a series of calculations of displacement, height of center of gravity of the system and the free surface effect with the center tank flooded to successively greater depths. This was done for the bridge in a horizontal position, i.e., parallel, with the water surface and also at low tide when the bridge is sloping down towards the water.

RESULTS

The results of the calculations consisting of the displacement and height of the center of gravity of the system adjusted for free-surface effect, were plotted as shown on Sheet 3, together with the height of the metacenter. The minimum metacentric height is determined as the smallest vertical distance between the two curves and is negative when the KG curve is above the KM curve and positive when the KG curve is below the KM curve.

As can be seen from the plot on Sheet 3, the metacentric height (GM) is negative at all times.

CONCLUSION:

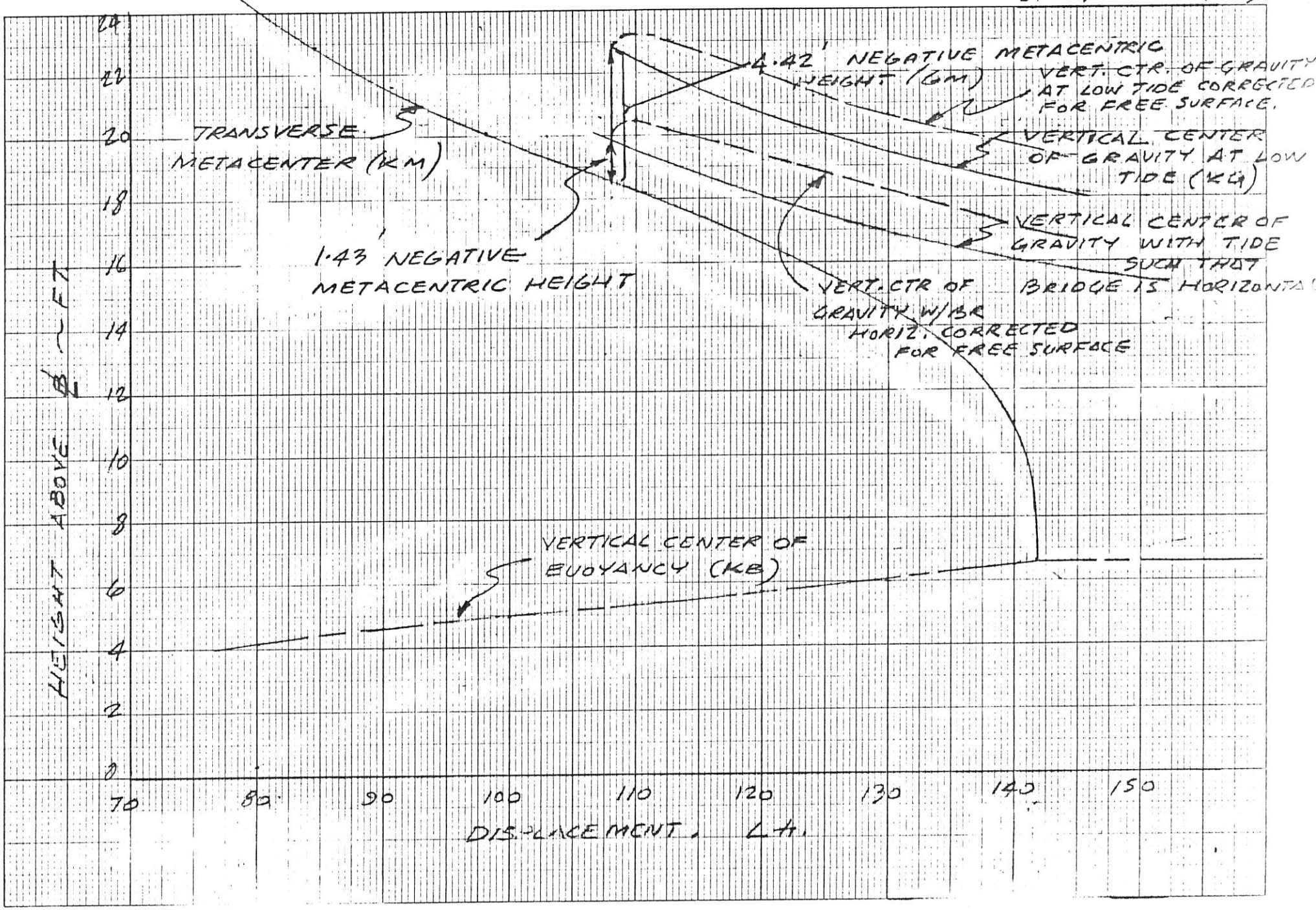
The floating tank with the bridge attached is unstable at all times, when floating at a mean draft of about 9'-4", or when being submerged. The instability increases as the tide goes out since the vertical center of gravity (KG) of the system increases as the bridge center of gravity moves further away from the tank when the bridge slopes downwards.

This means that the floating tank cannot assist the bridge in resisting torsional loads from wind or unsymmetrical loading, but rather will add to the torsional loads because being unstable, the tank will always try to capsize when it is subject to any kind of heeling force.

Free liquids in a floating vessel have the effect of reducing the vessel's stability. The subject tank is unstable with or without free surface in the center ballast tank.

K+E 20 X 20 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

PLOT OF TRANSVERSE METACENTER (KM), TRANSV CTR. OF BUOY (KB) & VERT. CTR. OF GRAVITY. (KG)



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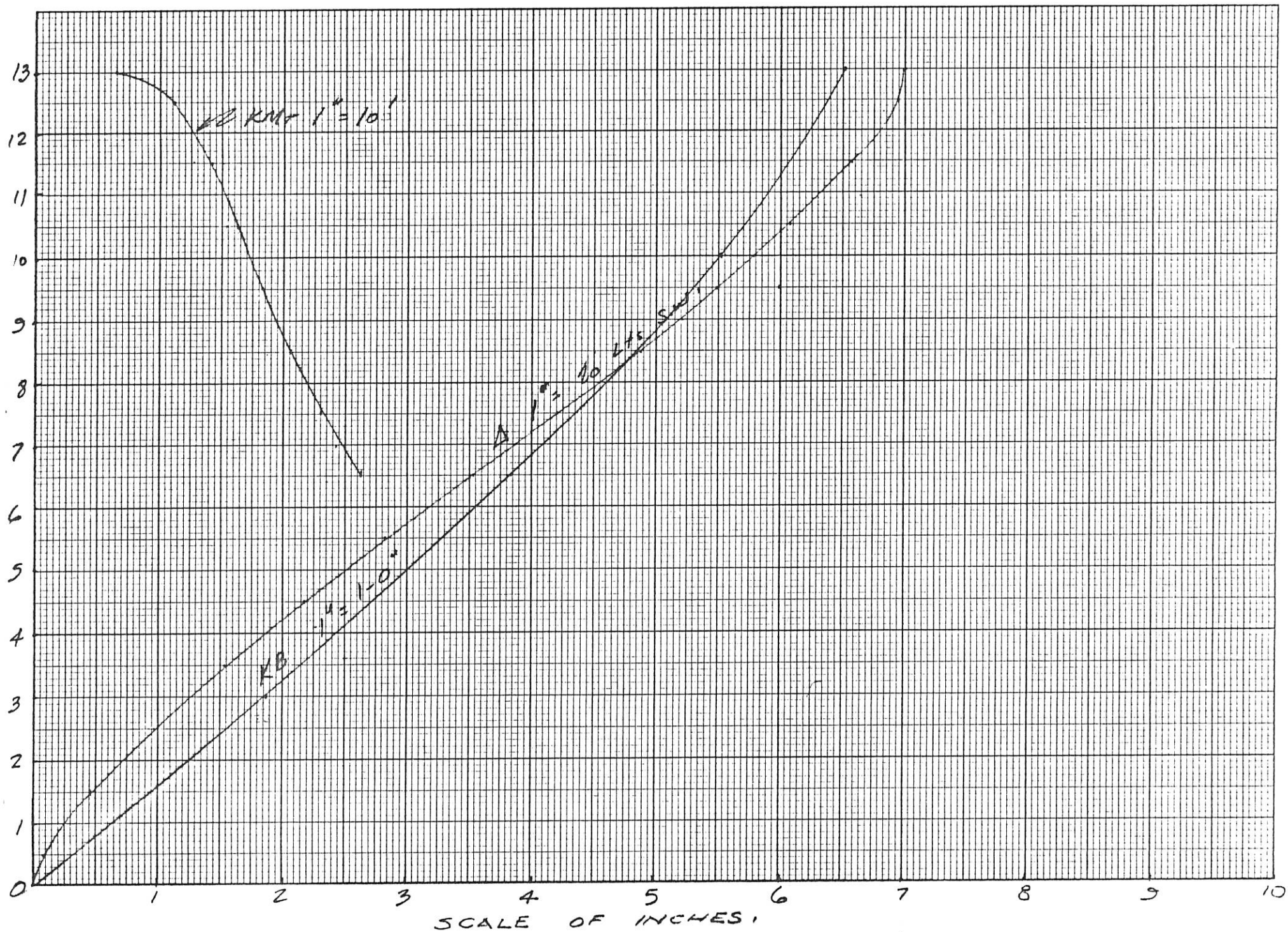
84030

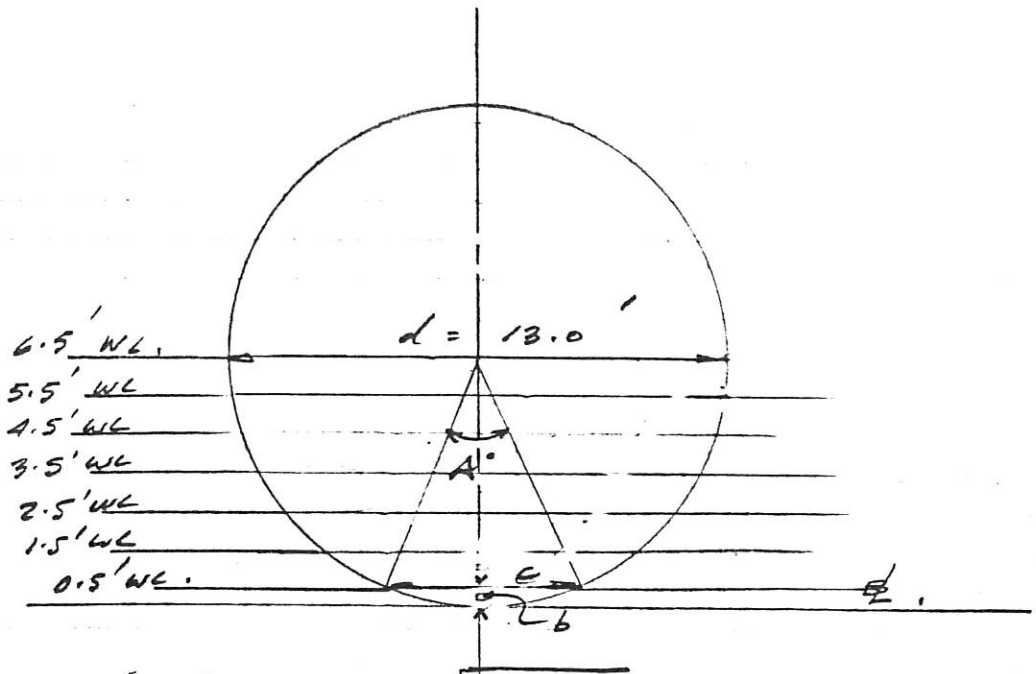
K+E 20 X 20 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1242

HYDROSTATIC CURVES



FLOTATION TANK GEOMETRY



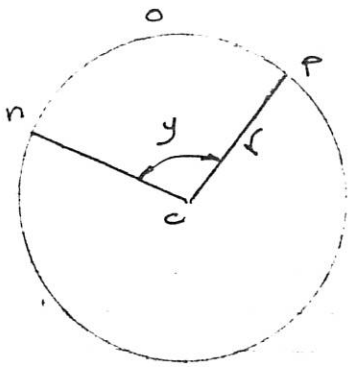
chord $c = 2\sqrt{2br - b^2}$

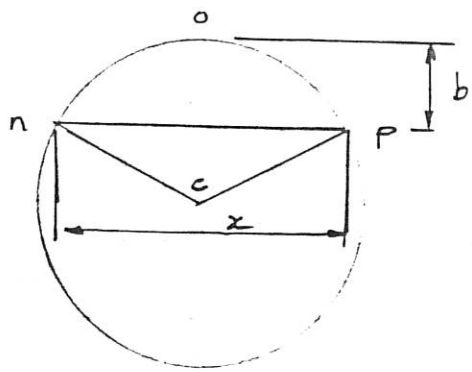
where r = radius ~ 6.5'
b = rise, ~ W.L.

rise b W.L. (ft.)	chord c (breadth @ W.L.) (ft).
0.5	5.0
1.5	8.31
2.5	10.25
3.5	11.53
4.5	12.37
5.5	12.85
6.5	13.0

Rise $b = \frac{c}{2} \tan \frac{A^\circ}{4}$

rise b. W.L.	chord. c.	A°
0.5	5.0	45.0
1.5	8.31	79.4
2.5	10.25	104.0
3.5	11.53	125.0
4.5	12.37	144.75
5.5	12.85	162.25
6.5	13.0	180.0



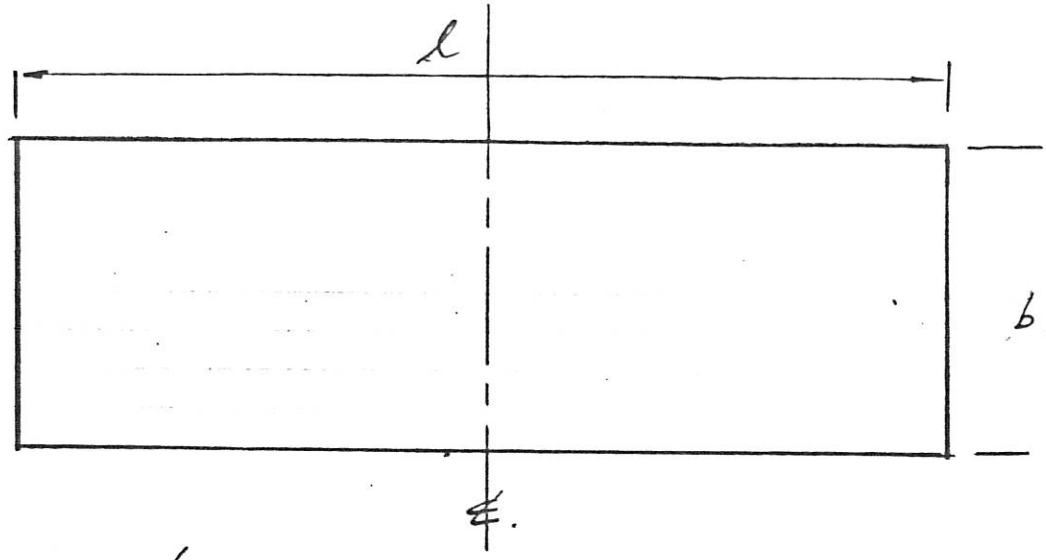


Area sector ncpo = $0.0087266 \times r^2 \times y$

Area segment nop = $\frac{(\text{Length of arc nop} \times r)}{2} - x(r-b)$

W.L. vic. b.	Area of sector ncpo.	Area of segment npo.
0.5	16.59	1.59
1.5	29.27	8.50
2.5	38.34	17.94
3.5	46.09	28.80
4.5	53.15	40.78
5.5	59.82	53.40
6.5	66.37	66.37

W.L.	Vol = l.	area × l. vol. (ft^3)	l = 38.0 ft. Δ Lt. sw.
0	38.0	–	–
0.5	37.87	60.32	1.72
1.5	37.69	321.38	9.18
2.5	37.50	672.57	19.21
3.5	37.37	1082.81	30.94
4.5	37.25	1529.78	43.71
5.5	37.12	1999.05	57.12
6.5	37.10	2480.37	70.87
7.5	37.12	2961.69	84.62
8.5	37.25	3430.95	98.03
9.5	37.37	3877.93	110.80
10.5	37.50	4288.22	122.52
11.5	37.69	4639.86	132.55
12.5	37.87	4900.42	140.01
13.0	38.0	4960.74	141.74



@ 6.5' WL. $b = 13.0'$

l: varies from 37.10 to 38.0

Area of waterplane = $l \times b$.

$TPI = \frac{l \times b}{420}$ Lts/inch S.W.

$BM_T = \frac{I_T}{V}$ $I_T = \frac{b\,l^3}{12}$

$KM_T = BM_T + KB$.

WL	l	WP. Area (ft^2)	TPI.	I_T, ft^4	V (ft^3)	BM_T (ft)
0.5	37.87	189.4	0.45	22629	60.32	375.2
1.5	37.69	313.2	0.75	37076	321.38	115.4
2.5	37.50	384.4	0.92	45044	672.52	67.0
3.5	37.37	430.9	1.03	50144	1082.81	46.3
4.5	37.25	460.8	1.10	53280	1529.78	34.8
5.5	37.12	477.0	1.14	54770	1999.05	27.4
6.5	37.10	482.3	1.15	55320	2480.37	22.3
7.5	37.12	477.0	1.14	54770	2964.69	18.5
8.5	37.25	460.8	1.10	53280	3430.95	15.5
9.5	37.37	430.9	1.03	50144	3877.93	12.9
10.5	37.50	384.4	0.92	45044	4288.22	10.5
11.5	37.69	313.2	0.75	37076	4639.36	8.0
12.5	37.87	189.4	0.45	22629	4900.42	4.6
13.0	38.0	0	-	-	4960.74	-

CALC: _____, - -
CHKD: _____, - -
APVD: _____, - -

Nickum & Spaulding Associates, Inc.
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SHEET 7 OF

FOR 3.0' W.L.

W.L (ft)	breadth b (ft)	Area (ft²)	SM.	Prod. of Area.	lever abt. base	Moments of prod. of Area.
0	-	-	1	—	0	—
1.5	8.31	313.2	4	1252.8	1	1252.8
3.0	10.95	410.1	1	410.1	2	820.2
				1662.9		2073.0

KB abv. ℄ = $\frac{2073}{1662.9} \times 1.5 = 1.87'$

FOR 6.5' W.L.

W.L.	breadth b (ft)	Area (ft²)	SM	Prod. of Area.	lev. abt base	Moments of prod. of Area
0	-	—	1	—	0	—
1.63	8.47	318.9	4	1276	1	1276
3.25	11.26	421.1	2	842	2	1684
4.88	12.59	468.4	4	1874	3	5622
6.50	13.0	482.0	1	482	4	1928
				4474		10510.

KB abv. ℄. = $\frac{10510}{4474} \times 1.63 = 3.83'$

CALC: _____, - -
CHKD: _____, - -
APVD: _____, - -

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SHEET 8 OF

For 13'-0" W.L.

W.L. (ft).	breadth b	Area ft².	Sm.	Prod. of areas.	levers abt. base.	Mom't of product of Areas.
0	-	-	1	-	0	-
1.63	8.47	318.9	4	1275.6	1	1276
3.25	11.26	421.9	2	842.2	2	1684
4.88	12.59	468.4	4	1873.6	3	5621
6.50	13.0	482.0	2	964.0	4	3856
8.14	12.59	468.4	4	1873.6	5	9368
9.77	11.26	421.9	2	842.2	6	5053
11.40	8.47	318.9	4	1275.6	7	8929
13.0	-	-	1	-	8	-
				8947		35787

KB above base = $\frac{35787}{8947} \times 1.63 = \underline{6.52}$

For 10'-0" WL.

	Δ. Lt.	KB. ft	Moment.
to 13.0' WL.	140.7	6.52	917.4
10' to 13' WL.	— 25.2	11.13	— 280.5
	115.5		636.9

KB to 10' WL = $\frac{636.9}{115.5}$ = 5.51' abv. base.

W.L.	K.B.	BMT	KMT.	KG
0.5	0.32	375.2	375.5	19.83
1.5	0.95	115.4	116.4	
2.5	1.55	67.0	68.6	
3.5	2.15	46.3	48.5	
4.5	2.72	34.8	37.5	
5.5	3.27	27.4	30.7	
6.5	3.84	22.3	26.1	
7.5	4.36	18.5	22.9	
8.5	4.85	15.5	20.4	
9.5	5.30	12.9	18.2	
10.5	5.71	10.5	16.2	
11.5	6.07	8.0	14.1	
12.5	6.38	4.6	11.0	
13.0	6.50		6.5	

CALC: _____, - -
CHKD: _____, - -
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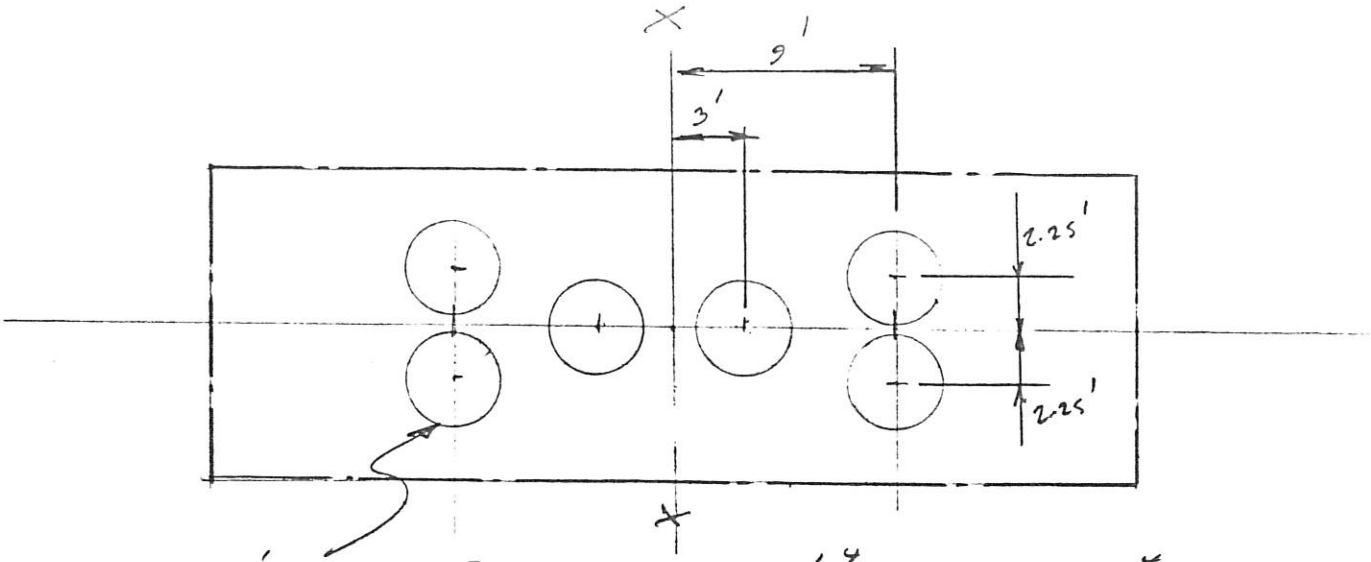
SHEET 9 OF

PROPERTIES OF FLOODABLE COMPT.

W.L.	Segment A (ft²)	b (ft)	vol. (ft³)	wt (Lt. sw)
0	-	-	-	-
0.5	1.59	18.26	28.83	0.82
1.5	8.50	18.62	159.71	4.55
2.5	17.84	19.00	335.40	9.58
3.5	28.80	19.26	545.06	15.57
4.5	40.78	19.50	777.23	22.21
5.5	53.40	19.76	1024.96	29.29
6.5	66.37	19.80	1281.51	36.61
7.5	79.34	19.76	1538.05	43.91
8.5	91.96	19.50	1785.79	51.02
9.5	103.94	19.26	2017.96	57.66
10.5	114.90	19.00	2227.62	63.65
11.5	124.24	18.62	2403.31	68.67
12.5	131.15	18.26	2534.19	72.41
13.0	132.74	18.0	2563.02	73.23

W.L.	b	l	i $\left(\frac{l b^3}{12 \times 35}\right)$
0	—	—	—
0.5	18.26	5.0	72.48
1.5	18.62	8.31	127.73
2.5	19.00	10.25	167.39
3.5	19.26	11.53	196.13
4.5	19.50	12.37	218.39
5.5	19.76	12.85	236.06
6.5	19.80	13.0	240.26
7.5	19.76	12.85	236.06
8.5	19.50	12.37	218.39
9.5	19.26	11.53	196.13
10.5	19.00	10.25	167.39
11.5	18.62	8.31	127.73
12.5	18.26	5.0	72.48
13.0	=	—	—



4' dia. $I_{NA} = 0.049087\, d^4 = 12.57\ ft^4$.

$A = \frac{\pi d^2}{4} = 12.57\ ft^2$.

$I_{xx} = I_{NA} + Ah^2$.

$I_{xx} = \left[\left(12.57 + 12.57(3)^2\right) + \left(25.14 + 25.14(9^2)\right)\right] 2$

$= \left[125.7 + 2061.5\right] 2 = 4374\ ft^4$.

$BM = \frac{I}{V} = \frac{4374}{142(35)} = 0.88'$.

$KB = 6.5$.

$KM_T = 7.38'$.

$KG = 15.80'$

uncorr. $GM = -8.42'$

fl. cor $= -1.17$.

Corr. $GM = -9.59'$

CALC: _____ , _____	Nelson & Spaulding Associates, Inc. naval architects · marine engineers	84030
CHKD: _____ , _____	2701 first avenue, suite 350, seattle, wa. 98121	SHEET 11 OF
APVD: _____ , _____		

FLOODED ON EVEN KEEL (fore & aft & transv.)

Initial Displ. Δ	Added wt.	Result. Δ.	Initial KG.	KG added water	Result. KG.	Result. draft.	Result. KM	Result. GM - Corr.	Result. F.S Corr.	Corr. GM.
108.2	0.82	109.02	19.83	0.32	19.68	9.40	18.40	-1.28	-0.66	-1.94
	4.55	112.75		0.95	19.07	9.80	17.60	-1.47	-1.07	-2.54
	9.58	117.78		1.55	18.35	10.30	16.60	-1.75	-1.26	-3.01
	15.57	123.77		2.15	17.61	10.70	15.80	-1.81	-1.32	-3.13
	22.21	130.41		2.72	16.92	11.40	14.20	-2.72	-1.31	-4.03
	29.29	137.48		3.27	16.31	12.20	11.90	-4.41	-1.25	-5.66
	36.61	144.81		3.84	15.80	17.0+	6.50	-9.30	-1.14	-10.44

FLOODED AT LOW TIDE

Initial Displ. Δ	KG. (even keel)	Bv. wt.	Bv. KG change	Result KG.	KG Diff Br. level & Bv @ low tide.
109.02	19.68	69.45 +	4.7	22.67	+2.99
123.77	17.61	69.45	4.7	20.24	+2.63
144.81	15.80	69.45 +	4.7	18.05	+2.55

The Hawkins & Greenhalgh Associates
naval architects · marine engineers
2701 first avenue, suite 300, seattle, wa. 98121

CHLC: CHKD: APVD:

SHEET 12 OF

54050

WEIGHT ESTIMATE

SECTION NO.

GROUP	ITEM	QUANTITY	UNIT WT.	WEIGHT	VERT. LEVER	VERT. MOMENT	LONG. LEVER	LONG. MOMENT
	From deadweight	survey	4/3 &	4/4/84				
	4/3 High tide.	mean draft	=	$\frac{(13.0-4.0)+(13.0-3.35)}{2}$				= 9.325
	4/4 Low tide	"	"	= $\frac{(13.0-5.14)+(13.0-2.04)}{2}$				= 9.41
	Draft blown down		=	9.37 ft.		Δ = 108.2 Lt.		
	Summary Flotation Tank & Support legs.							
	Flotation tank			61566	6.5			
	Support legs			18,535	19.45			
	Stabilizing arms	2	2723	5446	6.5			
				85547	9.31			
	Welding/Mill tolerance			1242				
				86789	9.31			
				38.75	Lt.			
	Tank from above.			38.75	9.31			
	Bridge.			69.45	25.70			
				108.2	19.83			

CALC:
CHECKED:
APPVD:

Nickum & Spaulding Associates, Inc.
NAVAL ARCHITECTS — MARINE ENGINEERS

84030

SHEET 13 OF

WEIGHT ESTIMATE

SECTION NO.

GROUP	ITEM	QUANTITY	UNIT WT.	WEIGHT	VERT. LEVER (above underside of tank.)	VERT. MOMENT	LONG. LEVER	LONG. MOMENT
	Shell pltg.	1552	15.3	23,746	6.5			
	18" band 40.84(2)	81.7	25.5	2083				
	12" band. 40.84(2)	81.7	40.8	3333				
	24" band 40.84(2)(2)	163.4	25.5	4167				
	6" band 40.84(15)(2)	40.8	40.8	1665				
	1/2" pl diaph .127(2)	254	20.4	5,182				
	flooding ports .0.5(2)	1	48	48				
	domed diaph 133(4)	532	25.5	13,566				
	foam in end compts.	2654	1.5	3,981				
	anodes.	9	300	2700				
	"	2	385	770				
	"	1	325	325				
				61,566	6.5			
	Support legs 13.1(6)	78.6	192.3	15,115	18.84			
	" " cap pltg.	95	20.4	1938	24.67			
	" " foam.	988	1.5	1482	18.84			
				18,535	19.45			
	Stabilizing arm. (One)							
	6" ϕ std pipe.	50	18.97	949	6.5			
	4" ϕ " "	6	10.79	65				
	1 1/4 pl	3	51	153				
	" "	12	51	612				
	5x5x7/16 L	4.5	27.2	122				
	1" pl	2	40.8	82				
	[illegible]	10	74.2	740				
				2725	6.5			

CHECKED:
APPVD:

Marvin A. Spaulding and Associates, Inc.
NAVAL ARCHITECTS — MARINE ENGINEERS
911 WESTERN AVE · SEATTLE, WASHINGTON 98104 · (206) 382-4444

34030

SHEET 14 OF

SHIP- HAINES BRDG FLOAT (TAMS) SERIAL NUMBER- 8430 DATE- 4-20-84

INTACT CURVES OF STATICAL STABILITY

DISPL	LCG	POLE HT	HEEL	RA	TCB	VCB	DRAFT	TRIM
110.361	-.000	19.83	5.000	-.106	1.169	5.254	9.422	0.000
			10.000	-.288	2.253	5.395	9.565	0.000
			15.000	-.849	2.950	5.544	9.958	0.000
			20.000	-1.690	3.357	5.671	10.607	0.000
			25.000	-2.647	3.631	5.783	11.454	0.000
			30.000	-3.656	3.831	5.886	12.484	0.000
			40.000	-5.711	4.095	6.068	15.139	0.000
			50.000	-7.731	4.225	6.196	18.770	0.000
			60.000	-9.582	4.292	6.291	24.333	0.000
			70.000	-11.173	4.328	6.368	34.787	0.000

DRAFT = 9.37
BRIDGE HORIZ.
NO BALLAST WATER
IN TANK.

SHIP- HAINES BRDG FLOAT (TAMS) SERIAL NUMBER- 8430 DATE- 4-20-84

INTACT CURVES OF STATICAL STABILITY

DISPL	LCG	POLE HT	HEEL	RA	TCB	VCB	DRAFT	TRIM
110.361	-.000	22.40	5.000	-.330	1.169	5.254	9.422	0.000
			10.000	-.734	2.253	5.395	9.565	0.000
			15.000	-1.513	2.950	5.544	9.958	0.000
			20.000	-2.567	3.357	5.671	10.607	0.000
			25.000	-3.732	3.631	5.783	11.454	0.000
			30.000	-4.940	3.831	5.886	12.484	0.000
			40.000	-7.361	4.095	6.068	15.139	0.000
			50.000	-9.698	4.225	6.196	18.770	0.000
			60.000	-11.805	4.292	6.291	24.333	0.000
			70.000	-13.585	4.328	6.368	34.787	0.000

DRAFT = 9.37'

LOW TIDE

NO BALLAST WATER IN TANK.

SHIP- HAINES BRDG FLOAT (TAMS) SERIAL NUMBER- 8430 DATE- 4-20-84

INTACT CURVES OF STATICAL STABILITY

DISPL	LCG	POLE HT	HEEL	RA	TCB	VCB	DRAFT	TRIM
139.514	0.000	20.13	5.000	-.886	.316	6.353	12.624	0.000
			10.000	-2.020	.377	6.361	13.631	0.000
			15.000	-3.173	.403	6.366	14.860	0.000
			20.000	-4.314	.417	6.371	16.261	0.000
			25.000	-5.426	.427	6.375	17.809	0.000
			30.000	-6.499	.434	6.379	19.541	0.000
			40.000	-8.492	.447	6.387	23.764	0.000
			50.000	-10.228	.457	6.395	29.636	0.000
			60.000	-11.654	.463	6.406	38.869	0.000
			70.000	-12.722	.470	6.421	56.596	0.000

DRAFT = 12.200

LOW TIDE

F.S. EFFECT INCLUDED -

DRAFT 9.37' DISPL = 110.36
TIDE SUCH THAT BR IS HORIZ.
KG. 19.83
NO BALLAST WATER IN TANK.

Ø	R.A.'	M_{TANK} k'	M_{BR} k'	Σ
5	-0.106	- 26.2	240	213.8
10	-0.288	- 71.2	480	408.8
15	-0.849	- 209.9	720	510.1
20	-1.690	- 417.7	960	542.3
25	- 2.647	- 654.3	1200	545.7
30	- 3.656	- 903.8	1440	536.2

(1)

DRAFT 9.37. DISPL. 110.36
LOW TIDE.
KG = 22.40
NO BALLAST WATER IN TANK.

Ø	RS'.	M_{TANK} k.'	M_{BR} k'.	Σ
5	-.133	81.6	240	158.4
10	-.734	181.5	480	298.5
15	-1.513	374.1	720	345.9
20	-2.567	634.7	960	325.3
25	- 3.732	922.8	1200	277.2
30	- 4.940	1221.5	1440	218.5

(2)

DRAFT 12.20 DISPL 132.5
LOW TIDE
KG = 20.13
WATER IN BALLAST TANK

(3)

CHKD:
APVD:

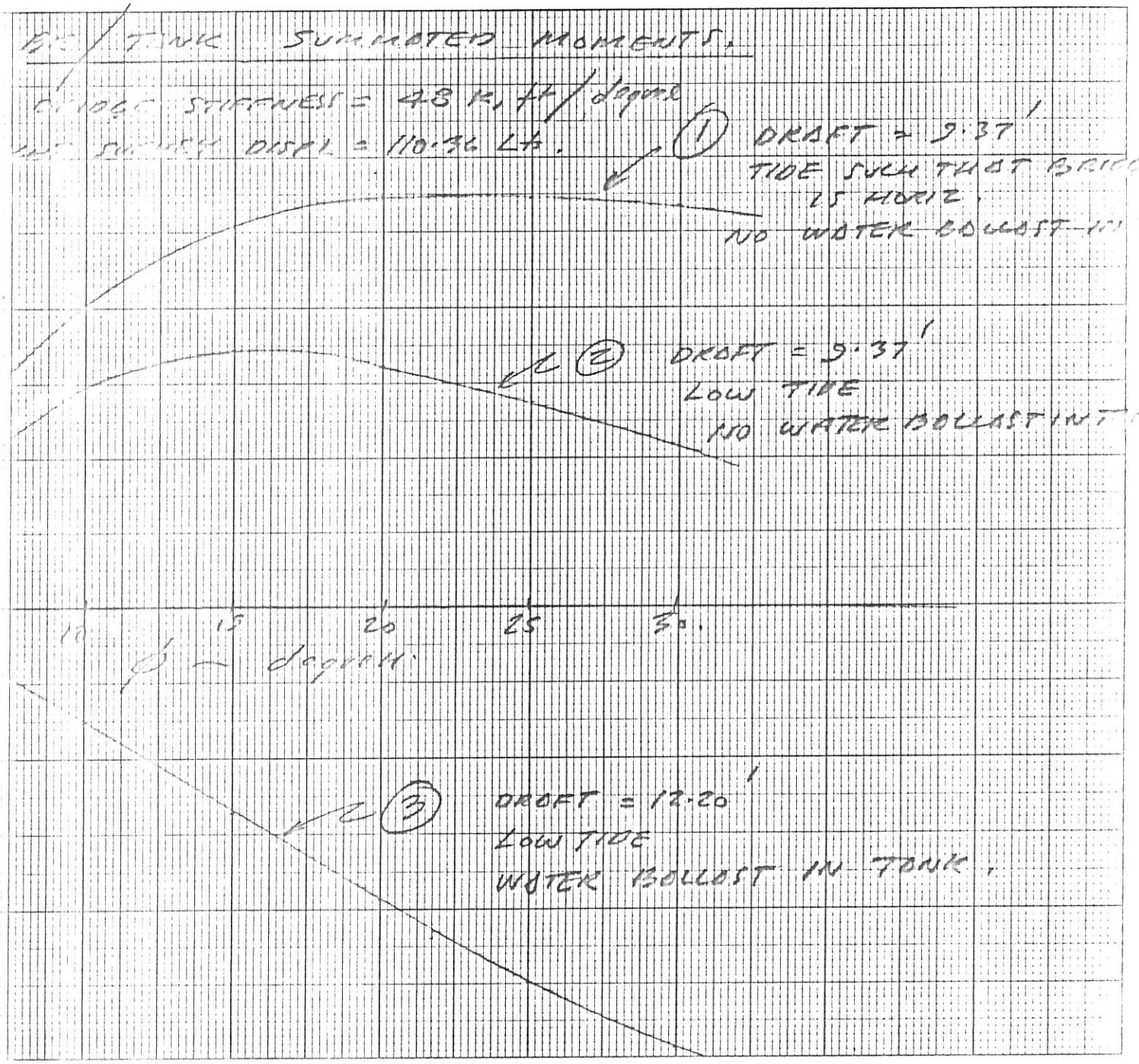
SHEET 10 OF

20 X 20 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

BRIDGE / TANK SUMMATED MOMENTS.

BRIDGE STIFFNESS = 4.8 K, ft/degree

WITH SUMMER DISPL = 110.36 LT.



WEIGHT ESTIMATE

SECTION NO. Mods. (One end)

GROUP	ITEM	QUANTITY	UNIT WT.	WEIGHT	VERT. LEVER	VERT. MOMENT	LONG. LEVER	LONG. MOMENT
		Additions.						
	Outrigger tank.	366	10.2	3733	16.3			
	" " top pl.	54	10.2	551	24.6			
	" " " " stiffns.	20	17.5	350	24.8			
	Upper struct. side Ts	108	17.5	1890	24.4			
	" " struct Ts	10.5	17.5	184	24.4			
	" " diagonals	34	17.5	595	24.4			
	" " bkt pls	4	30.6	122	24.6			
	" " " "	12	15.3	184	24.6			
	Bottom pl. horiz.	90	15.3	780	8.0			
	" struct. Ts.	96	17.5	1680	7.8			
	" " bkts.	8	15.3	122	8.0			
	" " vert tees	16	17.5	280	10.0			
	" " " conn. pl.	12	15.3	184	10.0			
	" " W12	13	26.0	338	10.0			
	Rolled conn. pl.	231	15.3	3534	12.0			
	foam	640	1.5	960	16.3			
	closing pl. Mods to col. tops.			1200	22.5			
				16687	16.13	269130		
	Two ends	= 14.90		Lt.				
		VCG	=	16.13	abv	under side of		
					Main floation tank.			

CALC: [illegible]
CHECKED: 7/22/85
APPVD:

Nickum & Spaulding Associates, Inc.
NAVAL ARCHITECTS — MARINE ENGINEERS

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SHEET 1 OF 2

WEIGHT ESTIMATE

SECTION NO.

GROUP	ITEM	QUANTITY	UNIT WT.	WEIGHT	VERT. LEVER	VERT. MOMENT	LONG. LEVER	LONG. MOMENT
	Weight removed. (Both ends)							
	(2) Support legs.			5038	18.84			
	foam in (2) legs	293	1.5	440	18.84			
	Mods to top of (4) legs	88	15.3	1346	23.0			
				6824	19.66	134163		
				3.05 Lt.				
	Summary of Modified Dr.							
				Lt.				
	From deadst							
	Survey 4/3/84			108.2	19.89			
	Wt to add.			14.90	16.13			
	" " deduct		-	3.05	19.66			
	New wt			120.05	19.38	2326		
				Lt.				

CALC:
CHECKED:
APPVD:

Nichum & Spaulding Associates, Inc.
NAVAL ARCHITECTS — MARINE ENGINEERS

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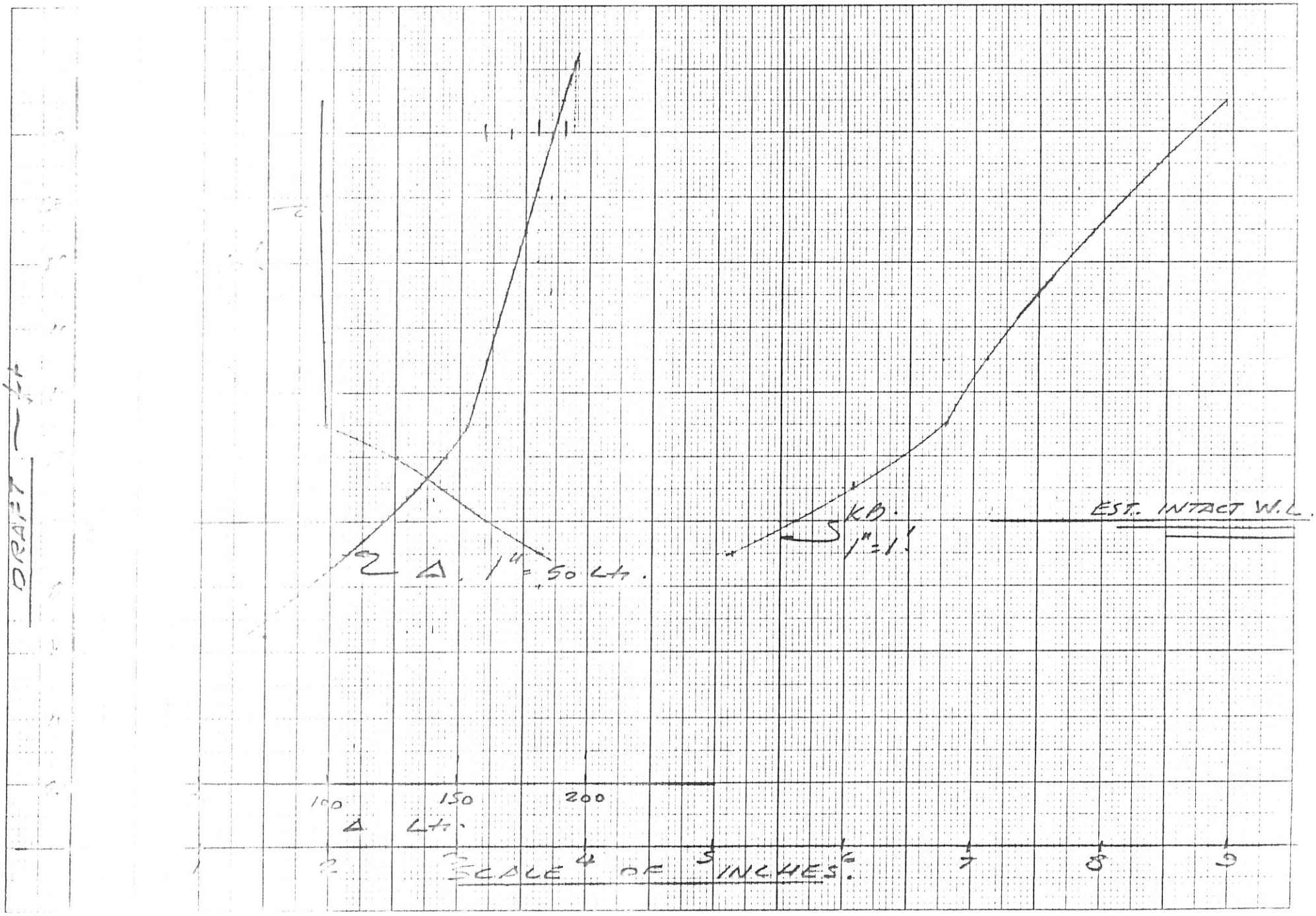
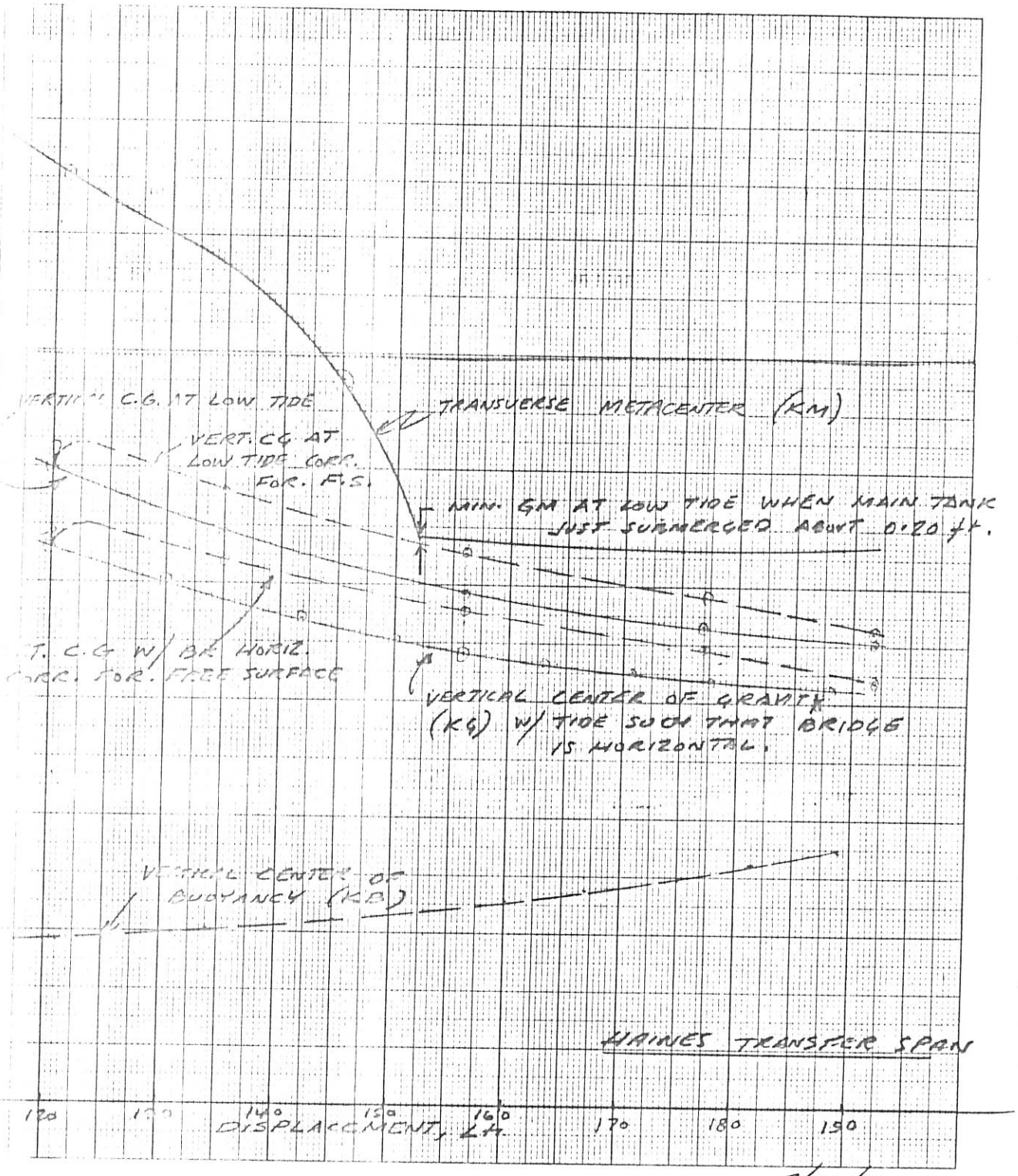
SHEET 2 OF 2

20 X 20 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

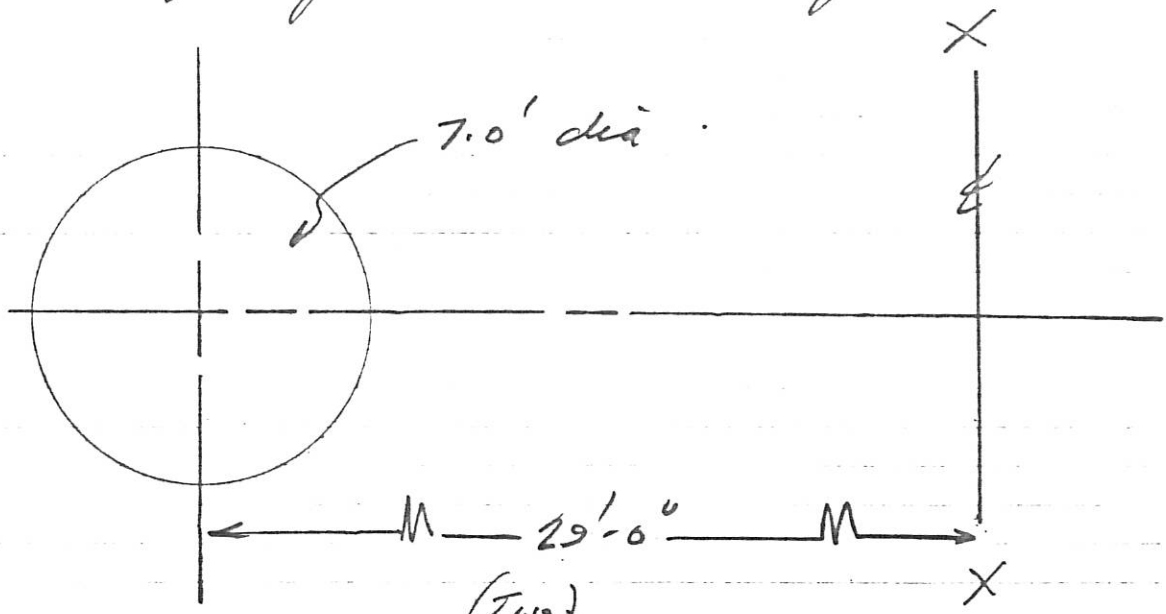
HYDROSTATIC CURVES (INTACT.)




VERTICAL C.G. AT LOW TIDE
TRANSVERSE METACENTER (KM)
VERT. CG AT LOW TIDE CORR. FOR. F.S.
MIN. GM AT LOW TIDE WHEN MAIN TANK JUST SUBMERGED ABOUT 0.20 ft.
T. C.G W/ BR. HORIZ. CORR. FOR. FREE SURFACE
VERTICAL CENTER OF GRAVITY (KG) W/ TIDE SUCH THAT BRIDGE IS HORIZONTAL.
VERTICAL CENTER OF BUOYANCY (KB)
HAINES TRANSFER SPAN
120
130
140
150
160
170
180
190
DISPLACEMENT, LT.

7/23/85

Review of SVERDRUP & PARCEL proposed fix of Haines bridge float.



Outrigger WL	Composite WL	(Two) Outrigger A (ft²)	V (ft³)	I_{cg} (ft⁴)	I_{xx} (ft⁴)	ΣI (ft⁴)
1.0	9.0	38.5 (2)	77.0	117.87	64757 =	64875
2.0	10.0		154			
3.0	11.0		231			
4.0	12.0		308			
5.0	13.0		385			
7.0	15.0		539			
9.0	17.0		693			
11.0	19.0		847			
13.0	21.0		1001			
15.0	23.0		1155			

WL	Min float V.	Outrigger V.	ΣV.	Min float I_T	Outrigger I_T	ΣI_T
5	3653	77	[illegible]	51717	11875	116,587
						116,[illegible]
						105,235
						94,755
						64875

CHKD:
APVD.

SHEET 2 OF

Floodable compt. total ∇ = 73.22 Lth. sw.

Est. Δ intact = 120 Lth.

Δ to 13'-0" WL (intact) = $\frac{5346}{35}$ = 152.74 Lth.

Diff = 32.74 Lth.

Δ to 23" WL (intact) = $\frac{6621}{35}$ 189.17 Lth.

Low intact Δ = 189.17 - 120 = 69.17 < 73.22

∴ Bridge float will sink to draft corresponding to a Δ of 193.22 Lth = 24'-2"

Depth to top of outrigger = 24'-8"

freeboard = 6" (16'-8" long)

TPI 7' outriggers = 0.183 Lth/inch

PER S&P K. RCVD 7/23/85

Vol. of 7' dia outriggers (2) = 1282 ft³ ~ 36.6 Lth. sw.

Vol of 8' " " (2) (18'-8" long) = 1575 ft³ ~ 45.0 Lth sw.

Diff = 8.4 Lth.

TPI 8' outriggers = 0.232 Lth/inch

Added wt of outriggers = 14,700 - 7400 = 7300 # ~ 1.5 Lth

CHKD.
APVD.

SHEET OF

WL	Tank & Outrigger V.	Support logs(4) V.	Σ V	Tank & outrigger I_T	Support logs. I_T	Σ I_T.	BMT. $\left(\frac{I}{V}\right)$ ft.
9	3730	-	3730	116587	-	116587	31.26
10	4237	-	4237	112 469	-	112469	26.54
11	4694	-	4694	105,935	-	105935	22.57
12	5078	-	5078	94728	-	94728	18.65
13	5346	-	5346	64875	4123	68998	12.91
15	5500	101	5601	↓	↓	↓	12.32
17	5654	202	5854				11.79
19	5808	303	6111				11.22
21	5962	404	6366				10.84
23	6116	505	6621				10.42

9' WL	V.	KB.	Prod.
Tank.	3653	5.08	18557
outrigger	77	8.5	655
support logs.	-		
	3730	5.15	19,212
	106.57 Lts.		

KM = 5.15 + 31.26 = 36.41'

10' WL.	V	KB	Prod.
Tank.	4083	5.5	22457
outrigger	154	9.0	1386
support logs	-	-	-
	4237	5.63	23843
	121.06 Lts.		

KM = 5.63 + 26.54 = 32.17'

11' WL.	V	KB	Prod.
Tank	4463	5.89	26287
Outrigger	231	9.5	2195
Support logs	-	-	-
	[illegible]	[illegible]	[illegible]

KM = 6.07 + 22.57 = 28.64'

SHEET OF

13' WL.

	V	KB	Prod.
Tank	4961	6.5	32247
Outrigger	385	10.5	4043
support legs	–	–	–
	5346	6.79	36290
	152.74 Lts.		

KM = 6.79 + 12.91 = 19.70

15' WL

	V	KB	Prod.
Tank	4961	6.5	32247
outrigger.	539	11.5	6199
support. legs.	101	14.0	1414
	5601	7.11	39850
	160.03 Lts.		

KM = 7.11 + 12.32 = 19.43

17' WL.

	V	KB	Prod.
Tank	4961	6.5	32247
Outrigger	693	12.5	8663
support legs	202	15.0	3030
	5856	7.50	43940
	167.31 Lts.		

KM = 7.50 + 11.79 = 19.29

19' WL

	V	KB	Prod.
Tank.	4961	6.5	32247.
Outrigger	847	13.5	11435
support legs	303	16.0	4848
	6111	7.94	48530
	174.6 Lts		

KM = 7.94 + 11.29 = 19.23

21' WL.

	V	KB	Prod.
Tank.	4961	6.5	32247
Outrigger	1001	14.5	14515
support legs	404	17.0	6868
	6366	8.42	53630
	[illegible]		

KM = 8.42 + 10.84 = [illegible]

LOADED ON EVEN KEEL

Added wt.	Result Δ	Intact KG.	KG added water	Result KG.	Result draft	Result KM	Result GM.	F.S. Corr.	Corr. GM
0.82	120.82	19.38	0.32	19.25	10.05	31.7	12.45	-0.60	11.85
4.55	124.55		0.95	18.70	10.40	30.8	12.10	-1.03	11.07
9.58	129.58		1.55	18.06	10.75	29.6	11.54	-1.29	10.25
15.57	135.57		2.15	17.40	11.15	28.4	11.00	-1.45	9.55
22.21	142.21		2.72	16.78	11.80	25.5	8.72	-1.54	7.18
29.29	149.29		3.27	16.11	12.60	22.0	5.89	-1.58	4.31
36.61	156.61		3.84	15.74	13.60	19.50	3.76	-1.53	2.23
43.93	163.93		4.33	15.34	15.60	19.40	4.06	-1.44	2.62
51.02	171.02		4.85	15.04	17.80	19.10	4.06	-1.28	2.78
57.66	177.66		5.33	14.82	19.00	19.00	4.18	-1.10	3.08
63.65	183.63		5.75	14.66	20.80	19.00	4.34	-0.91	3.43
68.68	188.68		6.13	14.56	22.70	19.00	4.44	-0.89	3.55
72.41	192.41		6.43	14.51	23.70	19.00	4.49	-0.37	4.12
73.23	193.23		6.50	14.5	24.00	19.00	4.50	—	4.5

FLOODED AT LOW TIDE.

Δ	KG. (even keel)	Bu wt.	Bu. KG Change.	Result KG.	KG Diff. Bu/[illegible] to Bu @ low tide
120.82	19.25	69.45	+4.7	21.95	+ 2.70
135.57	17.40			19.81	+ 2.41
156.61	15.74			17.82	+ 2.08
177.66	14.82			16.66	+ 1.84
192.41	14.51			16.21	+ 1.70

SHEET 7 OF

From TAMS. Study dated April. 1984.

Bridge. stiffness = 3,000 ft # / degree of list.
= 1.33 ft. tons / " "
= 3 k ft.

w/ tank @ 10' W.L. GM reqd per USCG weather criteria
w/ $\theta = 2\frac{1}{2}°$.

$$\underline{GM\ reqd} = \frac{0.005(530)20.}{120(\tan 2\frac{1}{2}°)} = \frac{53}{5.24} = \underline{10.11}$$

<u>Avail</u> w/out br. = <u>10.4'</u> @ low tide.

w/ winds @ 60 mph flat pl. press. 12.5 #/ft².
Total P = 530 × 12.5 = 6.6 kips
upsetting moment = 6.6 (20) = 132 k ft.
w/ GM = 10.4'. righting mom't @ small angles
= Δ GM sin θ.
120 (10.4) sin θ = 21 k ft. + 3 (lw) = 24 @ 1°.
= 54 k ft + 7.5 (lw) = 61 @ 2½°
= 87 + 12 = 99 @ 4°.

U.S. Navy Wind heeling arm.

$$P = 0.004 V^2$$

where V = wind vel. in knots.

say 60 knots for harbors.

$$\text{Heeling arm due to wind} = \frac{0.004\, V^2\, A\, L \cos^2\theta}{2240 \cdot \Delta}$$

$L = 14.7 + 5 = 19.7$.

$A = 530\ ft^2$.

$V = 60$. $\theta = 2\frac{1}{2}°$.

$$\text{Heeling arm} = \frac{0.004 (60)^2\, 530\, (20) \cos^2 2\frac{1}{2}}{2240\, (120)}$$

$= 0.56'$

Righting arm $GZ = GM \sin\theta$ (for small angles)

$= 10.4 \sin 2.5$

$= 0.45'$.

SHEET OF

Current force.

say 5 knots (5.758 miles). p.h.

= 8.44 fps.

$$F = \frac{\rho}{2} A v^2 = \frac{1.9905}{2} (228) 8.44^2 = 16,164^{\#}$$

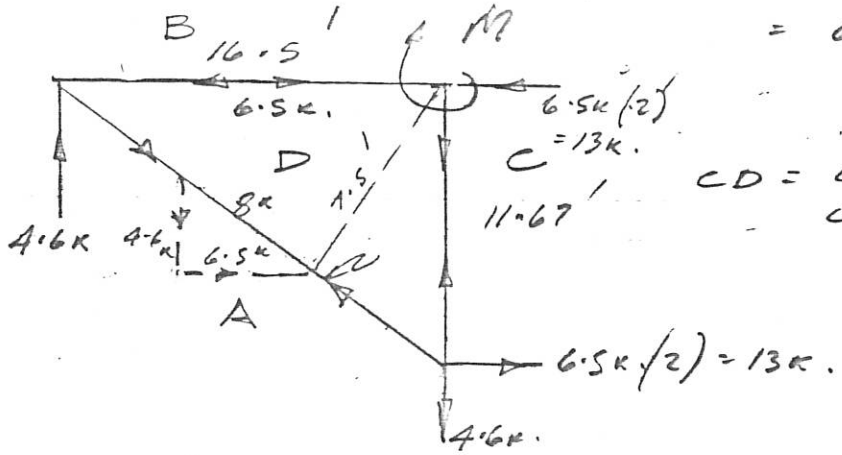
16.16 kips.

heeling moment = 16.16 (16) = 258 k.ft.

$M = \frac{48}{2}$ ft.kips / degree lift. For $2\frac{1}{2}°$.

$M = 24(2\frac{1}{2})$

$= 60$ ft.kips



CD = 4' dia column

Force in AD from mom't = $60/7.5$ = 8 kips

vert comp. = $\frac{8}{20.2}(11.67)$ = 4.6 k.

horiz comp = $\frac{8}{20.2}(16.5)$ = 6.5 k.

WT 6 × 18# A = 5.3 in². r = 1.55.

For member BD $l = 16.5(12) = 198''$

$l/r = 198/1.55 = 127. > 120.$ (N.G.)

Try WT 7 × 21.5# A = 6.32 in² r = 1.87.

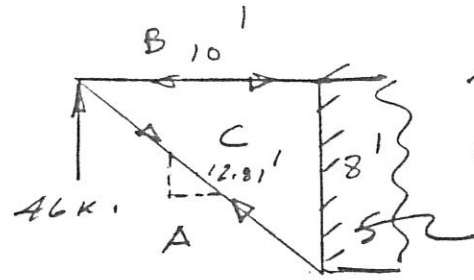
$l/r = 198/1.87 = 106$; f. allow. = 11.55 ksi

$P/A = 6.5/6.32 = 1.03$ ksi. / 11.55 (OK)

For member AD P = 8k.

[illegible] A = 5.53 in² r = 2.25

Buoy. force from outrigger = 53k − 7k (wt) = 46 k.



BC is rolled pl. w/ 6 thk pl. → min floatation tank.

Force in AC = $46\left(\frac{12.81'}{8}\right)$ = 73.6 k. (tension)

For same arrgt w/ outriggers out of water
Force in AC from wt = $7\left(\frac{12.81}{8}\right)$ = 11.2 k. (compr)

<u>6" std pipe</u> A = 5.58 in² r = 2.25.

$\frac{l}{r} = 153.7/2.25 = 68.32$ f. allow = 14.69 ksi

$\frac{P}{A} = \frac{11.2}{5.58} = 2.0$ ksi < 14.69 OK

in tension $P/A = 73.6/5.58 = 13.18$ ksi. OK

FLOAT SUPPORTED BRIDGE SPAN.

DESIGN CRITERIA

OPERATING RANGE – HEIGHT OF APRON ABOVE WATER MIN. & MAX. AT LOW AND HIGH TIDES.

WEIGHT BUOYANCY RELATIONSHIP

LOST BUOYANCY / ADDED WEIGHT REQUIREMENT FOR LOWERING BRIDGE.

RESERVE BUOYANCY REQUIREMET.

STABILITY – WATERPLANE INERTIA REQUIREMENT AT ALL OPERATING LEVELS TO MEET WIND HEEL AND CURRENT HEEL

DYNAMIC STABILITY REQUIREMENTS

SYNCHRONOUS MOTIONS – PITCH / ROLL PERIODS, SEA STATES.

STRENGTH REQUIREMENTS.

INTERFACE W/ BRIDGE

TORSIONAL STRENGTH

LOCAL BUCKLING STRENGTH

MAINTENANCE

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

MEMORANDUM CITY OF HAINES

To: Bob Stokley, Harbormaster

From: Tom Healy, City Administrator

Date: September 14, 1995

Subject: Lutak Barge Ramp Capacity

I have found general information on the maximum carrying capacity of the Lutak Dock barge ramp. This is not definite information, and I have made several assumptions.

The original 1981 design for the ramp specified the following live load:

> HS 20-44 (Caterpillar AH60 forklift or equivalent maximum axle load) 130 kips

Ken Pugh of NC Machinery in Anchorage (800-478-7000) said the AH60 forklift has a carrying capacity of 60,000 pounds and a weight (with forks) of about 80,000 pounds, for a total of 140,000 pounds. He didn't know how the weight was distributed on the axles. A conservative guess of 80% (front) and 20% (back) axle loading gives a front axle load of 112,000 pounds. This is below the 130,000 pound (130 kips) specification.

Pugh said the Caterpillar V620 forklift is equal to the older AH60 except that it has a carrying capacity 2000 pounds heavier. Its total weight (84,000 lbs.), plus maximum load (62,000 lbs.), is 146,000 pounds. 80/20 axle loading puts 117,000 pounds on the front axle. This is still below the 130 kips specification.

Ward's transport says that the new AML forklifts are Cat V925 forklifts. Its total weight (145,000 lbs.), plus maximum load (93,000 lbs.). is 238,000 lbs. 80/20 axle loading puts 190,000 pounds on the front axle. This is almost one and a half times more than the 130 kips maximum axle load allowed.

Attached to this memo is a copy of a portion of the 1981 design showing the design criteria. The design loads may have changed when the City reconstructed the ramp after it rolled over, but we cannot find anything to confirm this. Also attached is a fact sheet on HS 20-44 (Highway Standard 20, published in 1944).

It is recommended that AML be notified that use of the V925 forklifts should be restricted to a maximum axle load of 130,000 pounds.