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Title/Desc:
FLEXIBLE RECEIVER ADAPTER & SECONDARY BAGGER SUPPORT FRAME ANALYSIS FOR 241AP102 MIXER PUMP REMOVAL
2. To: (Receiving Organization)  
Tank Farm Transition Projects  

3. From: (Originating Organization)  
Analytical Services  

4. Related EDT No.:  
N/A  

5. Proj./Prog./Dept./Div.:  
AP102 Pump Removal Project  

6. Cog. Engr.:  
C. F. Hoffman  

7. Purchase Order No.:  
N/A  

8. Originator Remarks:  
Approval for Release of Document  

11. Receiver Remarks:  

15. DATA TRANSMITTED

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18. M. D. Axup  
Signature of EDT  
Originator  

19. C. F. Hoffman  
Authorized Representative Date for Receiving Organization  

20. T.W. Bohan  
Cognizant Manager  

21. DOE APPROVAL (if required)  
Ctrl. No.  

[Approved] [
[Approved w/comments] [
[Disapproved w/comments] [
RELEASE AUTHORIZATION

Document Number: WHC-SD-WM-DA-206, Rev. 0

Document Title: Flexible Receiver Adapter and Secondary Bagger Support Frame Analysis for 241API02 Mixer Pump Removal

Release Date: 9/29/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

[Signature]

9/29/95

C. WILLINGHAM

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2. Title
Flexible Receiver Adapter and Secondary Bagger Support Frame Analysis for 241AP102 Mixer Pump Removal

5. Key Words
Grout Process Startup, Mixer Pump, 241-AP102, Flexible Receiver Adapter, Secondary Bag, Secondary Bagger Frame, Pump Removal

7. Abstract
As part of the Grout Process startup, the 241AP102 Mixer Pump, failed in 1993, is scheduled to be removed. A structural analysis was performed on two components to be used in the bagging process for the failed pump. The loading criteria was based on a worst case accident of the entire pump weight (including a 50% impact load) being applied over a small localized area. The results show that the design of each structure is adequate to protect against failure, i.e., yield.

9/29/95
FLEXIBLE RECEIVER ADAPTER AND SECONDARY BAGGER SUPPORT FRAME ANALYSIS FOR 241AP102 MIXER PUMP REMOVAL

September 1995

PREPARED BY:  
M. D. Axup, Structural Engineer  
Analytical Services  

Date

J. V. Egger, Structural Engineer  
Operations/Maintenance Support Services

4/27/95

REVIEWED BY:  
T. K. Peterson, Engineer  
Analytical Services

Date

APPROVED BY:  
R. M. Boger, Manager  
Analytical Services

Date

ICF Kaiser Hanford Company  
Hanford Operations and Engineering Contractor  
for the  
U. S. Department of Energy  
Richland, Washington
## TYPICAL CHECKLIST FOR INDEPENDENT REVIEW

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Software QA Log Number: NA

Reviewed by: [Signature]  
Date: 9/28/95
TYPICAL CHECKLIST FOR INDEPENDENT REVIEW

Document Reviewed: WHC-SD-WM-DA-206

Author: J. V. Egger

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Software QA Log Number: N/A

Reviewer: [Signature]

Date: 9/8/95
TYPICAL CHECKLIST FOR INDEPENDENT REVIEW

Document Reviewed: WHC-SD-WM-DA-206, APPENDIX C

Author: T. K. Peterson

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Software QA Log Number: N/A

Reviewer: [Signature]

Date: 28 Sept 95
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## APPENDICES

- Appendix A: Flexible Receiver Adapter Calculations A-1
- Appendix B: Secondary Bagger Support Frame Calculations B-1
- Appendix C: Secondary Bagger Length Calculations C-1
FLEXIBLE RECEIVER ADAPTER AND SECONDARY BAGGER SUPPORT FRAME ANALYSIS
FOR 241AP102 MIXER PUMP REMOVAL

1.0 INTRODUCTION

The 241AP102 Mixer Pump (APMP) is a 150-horsepower submersible slurry pump (CVI #21924). The pump is approximately 50 ft long below the flange, and fits in a 42-in. riser. It is a 10-in. GN-Hazleton Type "SSB" Pump, serial number N-20556. The pump weighs approximately 12,700 lbs. The pump was installed in 241AP102 to mix the tank contents to a homogeneous mixture. From the tank, the waste was to be pumped to the wet grout facility where it would be mixed into grout. Then the grout would be pumped to the grout vaults where it will be stored as low level radioactive waste. In 1993, the mixer pump failed in the tank. The pump is scheduled to be removed and replaced as part of the Grout Process startup.

2.0 DISCUSSION

The flexible receiver adapter, secondary bagger and secondary bagger support frame are approval designator Safety and Quality. The design is in accordance with Manual of Steel Construction, (AISC 1989) and with SDC 4.1. All welds and weld inspection are in accordance with AWS D1.1-1994.

The flexible receiver adapter, secondary bagger and secondary bagger support frame are designed to accommodate the mixer pump. The following are the pump's governing dimensions and weights:

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<th>Measurement</th>
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<td>Length mounting flange to bottom</td>
<td>49 ft-11 7/16-in.</td>
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<tr>
<td>Height above mounting flange</td>
<td>1 ft-1/2-in.</td>
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<tr>
<td>Max. diam. below flange</td>
<td>3 ft-4 1/2-in.</td>
</tr>
<tr>
<td>Diam. of flange</td>
<td>4 ft-5-in.</td>
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<tr>
<td>Pump C.G. from top of flange</td>
<td>30.7 ft</td>
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<tr>
<td>Weight of pump</td>
<td>12,688 lbs</td>
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2.1 FLEXIBLE RECEIVER ADAPTER

The flexible receiver adapter is the load distribution frame for the blast shield and flexible receiver bag. It also serves the purpose of supporting the flexible receiver equipment in place over the 241AP102 central pump pit 42" riser. The adapter also houses the water jet cutter and its backup as well as two cameras for viewing the cutter in operation.

The flexible receiver adapter was designed to provide a smooth transition between the 42" riser and the blast shield. The transition prevents the pump from becoming caught during removal. The adapter is also designed to take loads due to the pump being accidentally lowered onto the
blast shield during a rewashing effort. The allowable design values have been increased by 1.6 to determine the factor of safety against failure due to the accidental weight of the pump being applied to the adapter. The adapter was designed with jack screws to allow for greater flexibility while mounting it in the central pump pit.

The flexible receiver system is to be assembled in accordance with H-14-100176 and WHC-SD-WM-OMM-023. The camera and cutter is to be installed in accordance with the instructions of H-14-100190 and WHC-SD-WM-OMM-021.

2.2 LEAK CONTAINMENT BAG SUPPORT FRAME

The leak containment bag was designed to provide a secondary bag for leak containment during 42" riser equipment removal for projects W-151 and W-320. The secondary bag was designed to attach to the bottom of removed equipment to ensure no tank waste fluid from the removed equipment would leak onto the ground. However, the leak containment equipment was designed to cover only a short section of the removed equipment. For the purposes of API02 mixer pump removal, it was decided a longer bag was needed to ensure the main flexible receiver bag would not drip fluid on the ground. Therefore, the decision was made to suspend the secondary bag over the central pump pit to provide the necessary length for the longer equipment. To this end, the secondary bag support frame was designed to be mounted on top of the 241AP02 central pump pit.

The secondary bag support frame shall be assembled and installed per H-14-100490, H-14-100176, and WHC-SD-WM-OMM-023.

3.0 RESULTS / CONCLUSIONS

The flexible receiver adapter and leak containment bag support frame have been designed based on a worst case accident of the entire pump weight being applied (including a 50% impact) over a small localized area. As a result, both structures were analyzed based on the design provision of the AISC manual and qualified using material yield stresses in lieu of allowable stress. The results show that the design of each structure is adequate to protect against failure, i.e., yield.

9/28/95

5.0 REFERENCES


**Drawings**


**Certified Vendor Information**

CVI #21924, 10-in. GN Hazleton Type “SSB” Pump
APPENDIX A

FLEXIBLE RECEIVER ADAPTER CALCULATIONS
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTER
Originator: J.V. EGGER
Checker: MARK D. AUM

Page 1 of 1

OBJECTIVE:

ANALYZE FLEXIBLE RECEIVER ADAPTER FOR WEIGHT OF PUMP (13000 lb) DURING LOWERING AND CRANE CAPACITY (24000 lb) DURING RAISING (24000 - 13000 = 11000 lb) FLEXIBLE RECEIVER ADAPTER SHOWN ON H-19-100190

CRITERIA

1. CHECK FLEXIBLE RECEIVER FOR LOADS INCREASED 50% FOR IMPACT.

2. USE AISG TO CHECK ALLOWABLE STRESS (SAFETY FACTOR 3/4)

3. LOAD CONDITION RESULTS FROM AN ACCIDENT DURING TITE REMOVAL OF THE PUMP

4. DETERMINE SAFETY FACTOR AGAINST FAILURE

RESULTS

LEVELING SCREW HAS SMALLEST SAFETY FACTOR AGAINST FAILURE - 1.039
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTOR
Originator: J.V. FAGER
Checker: M.L. DANE

Date: 9/22/95
Date: 9/27/95

DRAWINGS
H-14-100190 REV 0 SH 1-4
H-14-100153 REV 0 SH 1

REFERENCES
1. MANUAL OF STEEL CONSTRUCTION ALLOWABLE STRESS DESIGN 9th ED. (AISC)
2. ROARK'S FORMULAS FOR STRESS & STRAIN 7th ED.
3. CCMAIL MESSAGE T.K. PETERSON TO M.J. AXUP 9/30/95 9:29 AM
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTER

Originator: J. V. EGGLETON

Date: 9/22/95

Checker: W. D. ANDERSON

Date: 9/27/95

CHECK STIFFNECKS FOR VERTICAL PUMP LOADING.

\[ r = \sqrt{\frac{2}{k}} = \sqrt{\frac{12E}{6k^2}} = \frac{d}{\sqrt{12}} \]

\[ \frac{P}{r} = \frac{5}{\sqrt{12}} = 0.1443 \text{ in} \]

\[ \frac{d}{r} = \frac{2.3}{0.1443} = 139 > 126.1 \]

\[ F_a = 7.73 \text{ kpsi} \] (AISC PG 5-42 5-122)

\[ P = 13^k (1.5) = 19.5^k \]

\[ A_{req} = \frac{19.5}{7.73} = 2.523 \text{ in}^2 \]

WIDTH \( A_{req} = \frac{2.523 \text{ in}^2}{0.5 \text{ in}} = 5.0453 \text{ in} \)

MINIMUM WIDTH 6.75" OK

CHECK HOUSING FOR PUMP LOADING.

\[ \frac{D}{L} = \frac{56.25}{6.25} = 225 \] (AISC PG 5-36)

\[ \frac{3300}{F_y} = \frac{3300}{130} = 550 > 225 \text{ NO LOCAL BUCKLING} \]

\[ F_a = 0.64 F_y = 23.76 \text{ kpsi} \]

\[ A_{req} = \frac{19.5^k}{23.76} = 0.8207 \text{ in}^2 \]

WIDTH \( A_{req} = \frac{0.8207 \text{ in}^2}{0.25 \text{ in}} = 3.2828 \text{ in} \)
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ANALYSIS

Originator: J. V. Eggert

Checker:

Date: 9/22/95

Date: 9/27/95

CHECK 3/8" STIFFNESS

\[ r = \frac{0.375}{0.12} = 3.125 \text{ in} \]

\[ \frac{F}{r} = \frac{21.0431}{0.1083} = 194.3038" \]

\[ K \frac{F}{r} > C_c \]

\[ l = \sqrt{(15.25)^2 + (4.5)^2} \]

\[ l = 21.043" \]

\[ F_a = 3.96 \text{ k/ft} \]

(AISC pg 5-122)

\[ A_{REQ} = \frac{19.5}{3.96} = 4.9242 \text{ in} \]

\[ W10TH_{REQ} = \frac{4.9242}{0.375} = 13.1313 \text{ in}, < 19.5" \]

OK.
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTER
Originator: J. V. ENGEL
Date: 9/22/95
Checker: Mark A. Arno
Date: 9/3/95

CHECK COLUMN 19 (Konek pg 453)

\[ P = \frac{ES}{(1-v^2)Ma^2} \left[ (h - \delta) \left(h - \frac{\delta}{2}\right) t + t^3 \right] \]

\[ \tau_a = \frac{-ES}{(1-v^2)Ma} \left[ c_1 (h - \frac{\delta}{2}) + c_2 t \right] \]

\[ \tau_b = \frac{-ES}{(1-v^2)Ma} \left[ c_1 \left(h - \frac{\delta}{2}\right) - c_2 t \right] \]

\[ \frac{q}{b} = \frac{68.75}{56.25} = 1.222 \frac{q}{b} \]

\[ M = 0.32665 \quad c_1 = 1.02555 \quad c_2 = 1.05999 \]

\[ h = 3.375'' \quad t = 6.25'' \quad v = 0.30 \]

\[ P = 19.500 \text{ ft} \]

\[ 19.500 = \frac{29,000,000 \delta}{(1 - 0.3^2) (0.3265) (68.75)^2} \]

\[ \left[ (3.375 - 0.0857) (3.375 - \frac{0.0857}{2}) (0.15) + 0.25^3 \right] \]

BY TRAIL & ERROR

\[ \delta = 0.0857'' \]

\[ \tau_a = \frac{-29,000,000 (0.0857)}{(1 - 0.3^2) (0.3265) (68.75)^2} \]

\[ \left[ 1.02555 (3.375 - 0.0857) + 1.05999 (0.25) \right] \]

\[ \tau_a = -26.054 \text{ ft/} \omega^2 \]

\[ \tau_b = -22.304 \text{ ft/} \omega^2 \]
CHECK CGX9.2 FOR VERTICAL PUMP LOAD

\[ M = \frac{P_l}{4} = \frac{19.5 \times (24.4375)}{4} = 119.1328 \text{kip}\]

\[ f_b = \frac{M}{s} = \frac{119.1328}{4.38} = 27.1993 \text{kips/ft}^2 \]

\[ F_b = \frac{12 \times 10^3}{2 \left(8^\frac{1}{2}\right)} = \frac{12000}{(24.4375) \times (9.10)} = 53.9614 \text{kip} \]

\[ F_b \leq 0.6 F_{uy} = 0.6 \times (36) = 21.6 \text{kip/ft}^2 \text{ N.G.} \]

CHECK BEARING

\[ \frac{R}{f_n (N + 5K)} = \frac{19.5}{(0.260) \left(\frac{1}{2} + 5(15\%\right)} = 213699 \text{kip/ft}^2 \text{ OK.} \]

\[ 0.66 F_{uy} = 0.66 \times (36) = 23.76 \text{kip/ft}^2 > 213699 \text{kip/ft}^2 \]

SAFETY FACTOR

\[ SF = \frac{1.6 \times (21.6)}{27.1993} = 1.27 \text{ OK.} \]
ANALYTICAL CALCULATIONS

**Subject:** FLEXIBLE RECEIVER ADAPTER

**Originator:** J. V. EGGGER

**Checker:** Wadd D. Amo

**Date:** 9/22/95

**Check:** 4 x 4 x 1/2 for Pump Lomo

\[ M = 16.2778 \times 12.0625 = 196.3513 \text{ kips} \]

\[ F_0 = \frac{M}{s} = \frac{196.3513}{6.3} = 32.0312 \text{ kips} \]

\[ L_c = \frac{1200 b}{2F_0} = \frac{1200 (4)}{39} = 123 \text{ in} > 73 \text{ in} \text{ OK} \]

\[ F_v = 0.66 F_y = 0.66 (39) = 25.74 \text{ kips} \]

\[ F_v > F_0 \]

\[ f_v = \frac{16.2778}{2(1/2)(4)} = 4.0695 \text{ kips/ft}^2 \]

\[ F_v = 0.40 F_y = 0.4 (39) = 15.6 \text{ kips} > 4.0695 \text{ kips/ft}^2 \text{ OK} \]

**Safety Factor**

**Failure Stress**

\[ F = 1.6 (25.74) = 41.18 \text{ kips/ft}^2 \text{ use } 39 \text{ kips/ft}^2 \]

\[ S_F = \frac{39}{32.0312} = 1.2176 \text{ OK} \]
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTOR

Originator: J. V. Engen

Checker: Mark D. Ams

Date: 9/22/95

Date: 9/27/95

CHECK LEVELING SCREW

\[ K = 0.847 \text{ in} \]

\[ A = \frac{\pi (0.847)^2}{4} = 0.5635 \text{ in}^2 \]

\[ r = \frac{d}{4} = \frac{0.847}{4} = 0.2118 \text{ in} \]

\[ \frac{KL}{r} = \frac{0.81(12)}{0.2118} = 45.3258 \]

\[ \frac{KL}{r} = \frac{45.3258}{120.1} = 0.3594 \]

\[ C_a = 0.521 \quad (AISC \ p9.5-117) \]

\[ F_a = 0.521(34) = 18.756 \text{ kips} \]

\[ f_a = \frac{16.2778}{0.5635} = 28.857 \text{ kips/in}^2 \]

SAFETY FACTOR

\[ SF = \frac{18.756(1.6)}{28.857} = 1.039 \]

CHECK BEARING ON CONCRETE

\[ A = \frac{\pi (4)^2}{4} = 12.5664 \text{ in}^2 \]

\[ f_{p} = \frac{16.2778}{12.5664} = 1.2933 \text{ kips/in}^2 \]

\[ F_p = 0.7 f_{p} = 0.7(3) = 2.1 \text{ kips} \quad \text{OK} \]

(AISC 5-79

* 3-107)
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTER
Originator: J.V. Eggem
Checker: W. D. Sax

Page 9 of 11

MAXIMUM UPLIFT ON SUPPORT IS COMBINED DESTA CO MODEL 374 CLAMPS.

4000#/CLAMP

4(4000) = 16,000#

CRANE CAPACITY = 24,000#

PUMP WEIGHT = 13,000#

NET UPLIFT = 11,000#

CHECK END RESTRAINING ANCHOR BOLTS

MINIMUM BOLT SPACING

LOCATION OF APPLIED LOAD 8" FROM WALL

\[ P_y = \frac{16,000}{4} = 4000\# \]

SHEAR ON BOLT

\[ \frac{P_y}{4} = 1000\# \]

\[ M_z = P_x (21.75) \]
**ANALYTICAL CALCULATIONS**

Subject: FLEXIBLE RECEIVER ADAPTER

Originator: J. V. EGGERT

Date: 9/22/95

Checker: Mark D. Fang

Date: 9/27/95

\[ I_z = 4 \left( 5^2 + 5.5^2 \right) = 221 \text{ in}^2 \]

\[ C = \sqrt{5.5^2 + 5^2} = 7.4330 \]

\[ \frac{M_z}{I_z} = \frac{P_x (21.15) (7.4330)}{221} = 0.7315 P_x \]

**TENSION on BOLT**

\[ M_x = P_y (s) = 9,000 (s) = 32,100 \text{ in} - \text{lb} \]

\[ I_x = 4 \left( 5.5 \right)^2 = 121 \text{ in}^2 \]

\[ \frac{32,100 \left( 5.5 \right)}{121} = 1455 \text{ in}^2 \]

\[ M_y = P_x (8) \]

\[ I_y = 4 (5)^2 = 100 \text{ in}^2 \]

\[ \frac{P_x (8) (5)}{100} = 0.4 P_x \]

**ALLOWABLE LOADS on \( \frac{3}{4} \) EXPANSION MUCCHOR**

\[ T = 3870 \text{ lb} \]

\[ V = 3710 \text{ lb} \]

\[ \frac{1455 + 0.4 P_x}{3870} + \frac{1000 + 0.7315 P_x}{3710} \leq 1.0 \]

\[ (3870)(3710) > 3710 (1455) + 3870 (1000) + \left[ 0.4 (3710) + 0.7315 (3870) \right] P_x \]

\[ 14357700 > 9268050 + 4315 P_x \]

\[ 1180 > P_x \]

**MAXIMUM LATERAL LOAD**

\[ z(1180) = 23.60 \text{ lb} \]

A-11
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER ADAPTER  
Originator: J. V. EGGER  
Checker: W. D. AXEL  
Date: 9/22/95  
Date: 9/27/95

CHECK TORSION ON 12 3/4" X 15" PLATE.

\[ T = 12 \times 1180 = 14160 \text{ lb} \]

\[ f_y = \frac{T}{\frac{1}{8}bt^2} = \frac{14160}{\frac{1}{8}(12)(0.75)^2} = 5635 \text{ psi} \]

\[ F_y = 0.4 \times 30 = 14.4 \text{ psi} > 5.035 \text{ psi} \text{ on} \]

CHECK BENDING ON 1½ PLATE ON 3/4 PLATE

\[ f = \frac{4000}{1.5(3/4)} = 3556 \text{ psi} \text{ on} \]
APPENDIX B

SECONDARY BAGGER SUPPORT FRAME CALCULATIONS
ANALYTICAL CALCULATIONS

OBJECTIVE

Analyze Flexible Receiver Bagger Stand for weight of pump (3000#) during lowering.

CRITERIA

1. CHECK FLEXIBLE RECEIVER BAGGER
   Maximum allowable load on 42" leak containment bag/stand.

2. USE ASC TO CHECK ALLOWABLE STRESS (FACTOR OF SAFETY 5/3)

3. LOAD CONDITION RESULTS FROM AN ACCIDENT DURING THE LOWERING
   OF THE PUMP INTO THE SECONDARY BAG.

4. DETERMINE SAFETY FACTOR AGAINST FAILURE.

RESULTS

W6 x 15 SAFETY FACTOR AGAINST FAILURE LOAD ON BAGGER STAND
15 1.272
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER BAGGED SPINDLE
Originator: J. V. Fjeld
Checker: W. D. Aug
Date: 9/25/95
Date: 9/29/95

DRAWINGS

- H-14-100490 REV 0 SH 1-2
- H-2-79362 REV 1 SH 1-7

REFERENCES

1. MANUAL OF STEEL CONSTRUCTION
   ALLOWABLE STRESS DESIGN 9th ED. (AISC)
2. ASME B31.3 - 1993 EDITION
   TABLE A-1 & TABLE C-6
3. EC MAIL MESSAGE T.K. PETERSON TO
   M.P. BUXF 9/10/95 9:29 Am
ANALYTICAL CALCULATIONS

Subject: FLEXIBLE RECEIVER BAGGER STAND
Originator: J.V. Engen
Date: 9/22/93
Checker: Mark A. Eng
Date: 9/27/95

DESIGN FLEXIBLE RECEIVER BAGGER STAND SUPPORT FOR MAXIMUM AXIAL LOAD FOR TWO FLEXIBLE RECEIVERS 42" LEAK CONTAINMENT BAG STAND ASSY LE: 12x2x4/4 ASTM 276 304L SST.

\[ F_y = 25 \text{ ksi} \]  
\[ E = 28,300 \text{ ksi} \]  

\[ K_L = \frac{2.0(16)}{0.391} = 81.8414 \]

\[ C_L = \sqrt{\frac{2\pi E}{F_y}} = \sqrt{\frac{2\pi (28300)}{25}} = 149.4817 \]  
\[ (AISC \ Pg \ 5-42) \]

\[ K_L C_L \]

\[ = \frac{81.8414}{149.4817} = 0.5475 \]  
\[ (AISC \ Pg \ 5-119) \]

\[ F_a = C_L F_y = 0.459 (25) = 11.475 \text{ ksi} \]

\[ P_a = F_a A = 11.475 (6.938) = 76.36 \text{ kips} \]

\[ 31.65 \]  
\[ 10.763 \text{ kips} \]

\[ 8.1861 \]

\[ 130.5 \]

\[ 2.5775 \text{ kips} \]
\[ M = 8.1861 \times 31.25 = 255.8163 \text{ k-In} \]

\[ f_o = \frac{255.8163}{9.72} = 26.3185 \text{ k/In}^2 \]

\[ L_n = 12 \text{ ft} \quad (AISC \; pg \; 2-73) \]

\[ F_n = 0.6 \cdot F_y = 0.6 \cdot (36) = 21.6 \text{ k/In}^2 \quad (AISC \; pg \; 2-32) \]

**SAFETY FACTOR**

\[ SF = \frac{21.6}{26.3185} = 0.82131 \]
Mark,

With the crane located 75 feet from the pump pit (as shown on the sketch), the crane has a capacity of 24,000 lbs with the 180 foot boom on the L-518 crane. The pump weighs approximately 13,000 lbs.

Theresa

SAFETY CLASS 3
APPENDIX C

SECONDARY BAGGER LENGTH CALCULATIONS
Purpose: Calculate length of secondary containment bag required to cover bottom of 241AP/102 mixer pump to above the flexible receiver horse tail.

Given:
- Pump length covered is bottom of pump to top of pump cap.
- Pump Drawing: Hazelton E20556
- Pump cap drawing: WHC H-14-100177

\[
\text{Pump length} = 47' - 63/8'' \quad \quad \text{pump below flange} \\
\quad \quad \quad \quad \quad 3\frac{3}{8}'' \quad \quad \text{top flange} \\
\quad \quad \quad \quad \quad 6'' \quad \quad \text{miscellaneous bottom parts} \\
\quad \quad \quad \quad \quad 9\frac{3}{4}'' \quad \quad \text{pump cap}
\]

\[
51' - 1\frac{3}{8}'' 
\]

\[
\approx 51' 
\]

Flexible receiver bag length is long enough to be looped up to the side from the pump bottom to prevent the unsealed bag end from leaking pump wash water.

Flexible Receiver bag drawing: WHC H-14-100179

Flexible Receiver bag length = 58' - 6''

Assuming: Folding the bag over the bottom of the pump will reduce the effective length of the bag by 1/2 foot.

Therefore: The maximum length of the bag being horse tailed up the side of the pump is 7 feet.
Because the secondary containment bag has a flat bottom of a larger diameter than the pump bottom, only the height of the pump needing to be double bagged is considered.

To ensure the horsetail of the flexible receiver bag is inside the secondary containment bag add ½ foot onto the maximum required length of 7 feet.

Therefore: The secondary containment bag needs to be a minimum of 7 ½ feet long.
ANALYTICAL CALCULATIONS

Subject: Secondary Containment Bagger Support Height

Originator: Thyeza Peterson
Date: 8/25/95

Checker: Vanessa Tuck
Date: 29 Aug 95

Purpose: Determine required height above 2H/1P102 central pump pit so the secondary containment bagger must be supported.

Given: The bagger will be located over the pump pit away from the 4'2" riser to allow the mixer pump to be removed without interference.

Bagger height: 2'-8" (Ref. H-2-79362)

Central Pump Pit depth: 6'-4'3/4" (Ref. H-2-90447)
measured from pit floor to top of pit wall

Central Pump Pit floor obstructions height: 4'-2" (Ref. H-2-90563)
measured from floor to top of 4" riser
4'-3" (Ref. H-2-90563)
measured from floor to top of 12" riser long dowel

Therefore: Should clear bottom of pit floor by minimum of 2 feet to avoid riser obstructions.
Height usable from bagger and pit = 2'-8"
+ 6'-4'3/4"
- 2'
≈ 7'

The support for the bagger spanning the pit must have a minimum height of 6 inches for use with a 7 1/2 foot long secondary containment bag.