PLANT ITEM MATERIAL SELECTION DATA SHEET

PWD-VSL-00046 (PTF)
C3 Floor Drain Collection Vessel

- Design Temperature (°F)(max/min): 225/20
- Design Pressure (psig) (max/min): 68/FV
- Location: outcell

ISSUED BY
APP-WTP PDC

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached Process Corrosion Data Sheet

Options Considered:

- Normal operating conditions
- Assumption: water provided by BOF will be treated

Materials Considered:

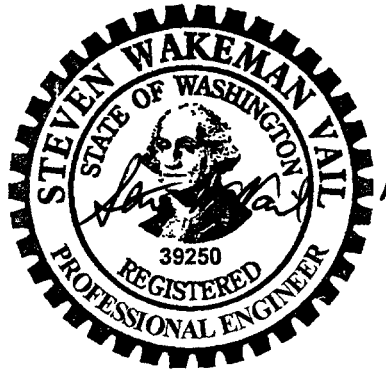
Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00		X
316L (S31603)	1.18	X	
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1	X	

Recommended Material: 316 (max 0.030% C; dual certified)

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- Develop rinsing/flushing procedure for acid and water



1/6/06

EXPIRES: 12/07/07

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This bound document contains a total of 6 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
2	1/6/06	Issued for Permitting Use			
1	6/25/04	Issued for Permitting Use	DLA	JRD	MWH
0	9/24/02	Issued for Permitting Use	DLA	JRD	MWH

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Corrosion Considerations:

PWD-VSL-00046 normally receives floor drains from all C3 areas in the PT facility generated from normal cleanup activities or small leaks as well as any material in the pit sump. During abnormal operations, the vessel could receive sprinkler water discharge from the C3 area sprinkler system. Additionally, solids could be introduced through the floor drains.

a General Corrosion
In normal operation, the vessel will essentially contain water. Based on Uhlig (1948), little uniform corrosion is expected at these conditions. The stated solutions are compatible with the 300 series stainless steel.

Conclusion:
304L or 316L is expected to be sufficiently resistant to the waste solution with a probable general corrosion rate of less than 1 mpy.

b Pitting Corrosion
Normally the vessel is to operate between 50 and 77°F at neutral pH. At this temperature and with the stated waste, 304L has the potential of pitting, particularly if the liquid is stagnant. Because of the water sources, it is likely that the water will contain dirt and other solids. Additionally, any sand tracked into the building will end up in the drain tank. Consequently, the likelihood of pitting will be higher. The time to initiate would depend on the concentration of the residual chlorides, the cleanliness, and the temperature. Depending on expected conditions, at least 304L and probably more pitting resistant alloys will be needed.

Conclusion:
Localized corrosion, such as pitting, is common but can be mitigated, if caused by chlorides, by alloys with higher molybdenum contents. Based on the expected operating conditions, and the possibility of the presence of solids, the more pitting-resistant 316L is recommended.

c End Grain Corrosion
End grain corrosion only occurs in metal with exposed end grains and in highly oxidizing acid conditions.

Conclusion:
Not applicable.

d Stress Corrosion Cracking
The exact amount of chloride required to cause stress corrosion cracking is unknown. In part this is because the amount varies with temperature, metal sensitization, and the environment. But it is also unknown because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as 10 ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1987), chloride stress corrosion cracking does not usually occur below about 140°F and 304L is expected to be satisfactory. A better long-term choice would be 316L.

Conclusion:
At the normal operating environment and due to anticipated abnormal conditions, the minimum alloy recommended is a 316L stainless.

e Crevice Corrosion
At the proposed operating temperature, if deposits or other crevices are present, 304L is not acceptable. The applicability of 316L for this waste is accepted if no significant deposits are present. In addition, see Pitting.

Conclusion:
It is assumed that no deposits form and the no other crevices are present. Therefore, 316L is acceptable.

f Corrosion at Welds
Corrosion at welds is not considered a problem in the proposed environment.

Conclusion:
Weld corrosion is not considered a problem for this system.

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g Microbiologically Induced Corrosion (MIC)
The normal operating conditions are ideal for microbial growth if the system is infected. However, the most likely source of infection is process water so the use of treated water makes infection unlikely.

Conclusion:
Not expected to be a concern.

h Fatigue/Corrosion Fatigue
Corrosion fatigue does not appear to be a concern.

Conclusions
Not expected to be a concern.

i Vapor Phase Corrosion
Vapor phase corrosion will be a function the degree of agitation, solution chemistry, and temperature. Nonetheless, it is not deemed a problem in this tank.

Conclusion:
Not likely to be a concern.

j Erosion
Velocities are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not expected to be a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
No significantly dissimilar metals are present.

Conclusion:
Not expected to be a concern.

n Cavitation
None expected.

Conclusion:
Not believed to be of concern.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Nitric Acid Addition
The upset condition that was most likely to occur is lowering of the pH of the vessel content by inadvertent addition of .5 M nitric acid. Nitric acid passivates these alloys; therefore, lower pH values brought about by increases in the nitric acid content of process fluid will not cause high corrosion rates for these alloys.

Conclusion:
The recommended materials will be able to withstand a plausible inadvertent addition of .5 M nitric acid.

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References:

1. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. B, *WTP Process Corrosion Data*
3. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
4. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158
5. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158

Bibliography:

1. CCN 130171, Ohl, PC to PG Johnson, Internal Memo, Westinghouse Hanford Co, *Technical Bases for Cl- and pH Limits for Liquid Waste Tank Cars*, MA: PCO:90/01, January 16, 1990.
2. CCN 130173, Dillon, CP (Nickel Development Institute), Personal Communication to J R Divine (ChemMet, Ltd., PC), 3 Feb 2000.
3. Agarwal, DC, *Nickel and Nickel Alloys*, In: Revie, WW, 2000. *Uhlig's Corrosion Handbook*, 2nd Edition, Wiley-Interscience, New York, NY 10158
4. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
5. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
6. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
7. Koch, GH, 1995, *Localized Corrosion in Halides Other Than Chlorides*, MTI Pub No. 41, Materials Technology Institute of the Chemical Process Industries, Inc, St Louis, MO 63141
8. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084

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24590-WTP-RPT-PR-04-0001, Rev. B
WTP Process Corrosion Data

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) C3 floor drain collection vessel (PWD-VSL-00046)

Facility PTF

In Black Cell? No

Chemicals	Unit[1]	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l					
Chloride	g/l					
Fluoride	g/l					
Iron	g/l					
Nitrate	g/l					
Nitrite	g/l					
Phosphate	g/l					
Sulfate	g/l					
Mercury	g/l					
Carbonate	g/l					
Undissolved solids	wt%					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					Assumption 1
Temperature	°F					Assumption 2

List of Organic Species:

References

System Description 24590-PTF-3YD-PWD-00001, Rev 1
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: See section 4.9.15, Routine Operations
Off Normal Input Stream # (e.g., overflow from other vessels) See section 4.9.15, Non-routine Operations
P&ID 24590-PTF-M6-PWD-P0043, Rev 2
GA: 24590-PTF-P1-P01T-P0006, Rev 2
Technical Reports:

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max

Assumptions:

1. Assume pH 7.0
2. Assume 50 °F (fire water) to 77 °F (any vessel heel present)

4.9.15 C3 Floor Drain Collection Vessel (PWD-VSL-00046)

Routine Operations

During normal operations, vessel PWD-VSL-00046 receives floor drains from all C3 areas in the PT facility generated from normal cleanup activities or small leaks. PWD-VSL-00046 will also receive any material in the pit sump.

Transfers out of the vessel will normally go to RLD-VSL-00017A/B. If needed, this vessel may be sampled and if the material meets the BOF nonradioactive liquid waste disposal system (NLD) acceptance criteria, it may be transferred to PWD-VSL-00045. Transfers from PWD-VSL-00046 to PWD-VSL-00045 will require installation of a removable spool piece.

Vessel PWD-VSL-00046 vents to the pit via a local HEPA filter and will overflow into the pit.

Non-Routine Operations that Could Affect Corrosion/Erosion

During abnormal operations, vessel PWD-VSL-00046 receives sprinkler water discharge from the C3 area sprinkler system. Miscellaneous solids could be introduced into the vessel through the floor drains. Water in the pit sump PWD-SUMP-00071 is transferred to PWD-VSL-00045 or PWD-VSL-00046.