

R10378683

**PLANT ITEM MATERIAL SELECTION DATA SHEET**

**HOP-SCR-00001 & HOP-SCR-00002 (HLW)**

**NOx Selective Catalytic Reducer**

- Inlet Temperature (°F) (max/normal): 330/330
- Design Pressure (in WG) (max/min): 80/-80
- Location: outcell

ISSUED BY  
RPP-WTP PDC

**Contents of this document are Dangerous Waste Permit affecting**

**Operating conditions are as stated on sheets 4 and 5**

**Operating Modes Considered:**

- Normal operations up to a maximum temperature of 330 °F.

**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

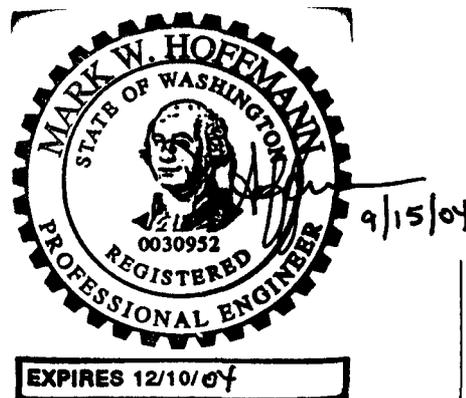
**Recommended Material: 316 (max 0.030% C; dual certified)**

**Recommended Corrosion Allowance: 0.00 inch (includes 0.00 inch erosion allowance)**

**Process & Operations Limitations:**

- Develop a procedure for equipment review and examination if temperature exceeds 900°F.

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.



This bound document contains a total of 5 sheets.

1	9/15/04	Issued for Permitting Use			
0	9/25/02	Issued For Permitting Use	DLA	JRD	M Hoffmann
<b>REV</b>	<b>DATE</b>	<b>REASON FOR REVISION</b>	<b>PREPARER</b>	<b>CHECKER</b>	<b>APPROVER</b>

**PLANT ITEM MATERIAL SELECTION DATA SHEET****Corrosion Considerations:**

Column receives gas from thermal catalytic oxidizer and sends scrubbed gas to silver mordenite column. In the reducer, NO<sub>x</sub> is reduced to nitrogen and water. This equipment normally operates at low relative humidity. Condensation is not expected during normal operations.

**a General Corrosion**

None anticipated.

*Conclusion*

304L is satisfactory.

**b Pitting Corrosion**

Pitting corrosion will only be a concern if column is allowed to cool below 225°F in the presence of moisture. Use 316L for safety.

*Conclusion*

At the stated operating conditions, pitting corrosion is not a concern. Recommend 316L.

**c End Grain Corrosion**

None anticipated.

**d Stress Corrosion Cracking**

Stress corrosion cracking will only be a concern if column is allowed to have multiple cooling cycles below 225°F in the presence of moisture.

*Conclusion*

At the stated operating conditions, pitting corrosion is not a concern.

**e Crevice Corrosion**

Crevice corrosion will only be a concern if column is allowed to cool below 225°F in the presence of moisture.

*Conclusion*

At the stated operating conditions, pitting corrosion is not a concern.

**f Corrosion at Welds**

None anticipated.

*Conclusion*

Not a concern.

**g Microbiologically Induced Corrosion (MIC)**

Conditions in this equipment are not conducive to MIC

*Conclusion*

Not a concern.

**h Fatigue/Corrosion Fatigue**

Equipment shall be designed to accommodate the expected fatigue cycles over the 40 year design life.

*Conclusion*

Not a concern.

**i Vapor Phase Corrosion**

Offgas equipment is essentially entirely vapor space. Comments under General Corrosion apply.

*Conclusion*

Not a concern.

**PLANT ITEM MATERIAL SELECTION DATA SHEET****j Erosion**

Velocities are not expected to be sufficient to cause concern.

*Conclusion*

Not a concern.

**k Galling of Moving Surfaces**

None expected.

*Conclusion*

Not a concern.

**l Fretting/Wear**

None anticipated.

*Conclusion*

Not a concern.

**m Galvanic Corrosion**

None anticipated.

*Conclusion*

Not a concern.

**n Cavitation**

None anticipated.

*Conclusion*

Not a concern.

**o Creep**

Creep is possible if off normal operation at or above 900°F is frequent.

*Conclusion*

At the stated operating conditions, creep is not a problem.

**p Inadvertent Addition of Nitric Acid**

Introduction of nitric acid into the offgas stream is not a likely scenario.

*Conclusion*

Not applicable.

## PLANT ITEM MATERIAL SELECTION DATA SHEET

## OPERATING CONDITIONS

## PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) NOx selective catalytic reducer  
(HOP-SCR-00001, HOP-SCR-00002)

Facility HLW

In Black Cell? No

Chemicals	Unit <sup>1</sup>	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/m <sup>3</sup>					
HCl	g/m <sup>3</sup>					
HF	g/m <sup>3</sup>					
Iron	g/m <sup>3</sup>					
NO	g/m <sup>3</sup>	2.86E-01	2.97E-01			
NO <sub>2</sub>	g/m <sup>3</sup>	1.05E-01	1.14E-01			
Phosphate	g/m <sup>3</sup>					
SO <sub>2</sub>	g/m <sup>3</sup>					
Mercury	g/m <sup>3</sup>					
Carbonate	g/m <sup>3</sup>					
Undissolved solids	wt %					
Other (NaMnO <sub>4</sub> , Pb,...)	g/m <sup>3</sup>					
Other	g/m <sup>3</sup>					Note 2
Humidity	%	0.067%	0.064%			
Temperature	°F					Note 3
<b>List of Organic Species:</b>						
<b>Notes:</b>						
1. Concentrations less than $1 \times 10^{-4}$ g/m <sup>3</sup> do not need to be reported, list values to two significant digits max.						
2. Anhydrous ammonia is injected into the SCR to aid in the conversion of NO <sub>x</sub>						
3. Tmin not provided, Tmax 330 °F.						
<b>Assumptions</b>						

**PLANT ITEM MATERIAL SELECTION DATA SHEET****5.4.8.4 NO<sub>x</sub> Selective Catalytic Oxidizer Reducer (HOP-SCR-00001, HOP-SCR-00002)****Routine Operations**

The NO<sub>x</sub> SCR's reduce (destroy) nitrogen oxides (NO<sub>x</sub>) in the process offgas. Gas from the TCO flows into a chamber where the gas is mixed, due to the turbulent flow, with ammonia gas injected into the gas stream. The ammonia is added at a stoichiometric ratio of slightly more than 1 to ensure efficient reaction of about 95 %. The ammonia addition rate is controlled based on an in-stream analysis of the concentration and flow rate of the NO<sub>x</sub> into the NO<sub>x</sub> SCR. The ammonia slip needs to be controlled because ammonia is also an air pollutant. The offgas from the mixing chamber flows into the NO<sub>x</sub> SCR catalyst bed at a temperature of about 750 °F where the reaction takes place. The inlet temperature is well above the temperature for ammonium nitrate formation (NH<sub>4</sub>NO<sub>3</sub> decomposes above 410 °F). In the SCR, NO<sub>x</sub> is reduced to nitrogen and water.

**Non-Routine Operations that Could Affect Corrosion/Erosion**

This equipment is operated at low relative humidity. Any extended facility shutdown mode that results in cessation of airflow through offgas system, resulting in condensation of effluent inside equipment, is not desirable.