

# START

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## ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN **196708**

Proj.  
ECN

9413199.2036

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. <b>R. R. Lehrschall, Environmental Restoration Safety Support, H4-67, 376-6788</b>		4. Date <b>2/22/94</b>		
	5. Project Title/No./Work Order No. <b>Safety Assessment for the 200 West Area ERA for Remediation of CCl<sub>4</sub></b>		6. Bldg./Sys./Fac. No. <b>200 West Area</b>		7. Impact Level <b>2 ESQ</b>
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) <b>WHC-SD-EN-SAD-004, Rev. 2</b>		9. Related ECN No(s). 169357 (O-A) 186789 (O-B) 198802 (Rev. 1) 189905 (Rev. 1-A) 189915 (Rev. 1-B) 196705 (Rev. 2)		10. Related PO No. <b>N/A</b>

11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. <b>N/A</b>	11c. Modification Work Complete <b>N/A</b> _____ Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) <b>N/A</b> _____ Cog. Engineer Signature & Date
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12. Description of Change  
 The time weighted average (TWA) exposure limit for carbon tetrachloride (CCl<sub>4</sub>) in 29 CFR 1910/1000 (1991 ed.) was 2 p/M. The permissible exposure limit (TWA concentration that shall not be exceeded during any 8-hour shift in a 40-hour work week) is now 10 p/M (29 CFR 1910.1000 [1993 ed.]). The Occupational Safety and Health Administration will enforce the threshold limit value of 5 p/M (more conservative than the 10 p/M limit) for CCl<sub>4</sub>, set by the American Conference of Governmental Industrial Hygienists.



13a. Justification (mark one)	Criteria Change <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>
As-Found <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

13b. Justification Details  
 Changes to the safety assessment are necessary to comply with current criteria in 29 CFR 1910.1000 (1993 ed.). See Block 12.

14. Distribution (include name, MSIN, and no. of copies) See attached distribution sheet.	RELEASE STAMP OFFICIAL RELEASE <b>20</b> BY WHC DATE <b>MAR 03 1994</b> <i>Sta. 21</i>
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Date Received: 3/3/94

# INFORMATION RELEASE REQUEST

Reference: WHC-CM-3-4

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Title Safety Assessment for the 200 West Area Expedited Response Action for Remediation of Carbon Tetrachloride	Unclassified Category UC-	Impact Level 2 ESQ
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New or novel (patentable) subject matter? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has disclosure been submitted by WHC or other company? <input type="checkbox"/> No <input type="checkbox"/> Yes Disclosure No(s).	Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)
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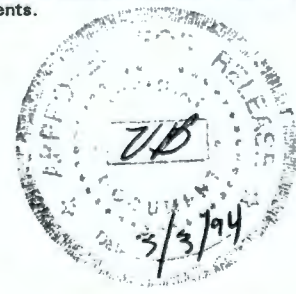
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### CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval
			Name (printed) Signature Date
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Patent - General Counsel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Approval per OGC Memo H. E. Marquez 2/23/94
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Information conforms to all applicable requirements. The above information is certified to be correct.

References Available to Intended Audience	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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R. R. Lehrscha [Signature]	2-24-94
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Date Cancelled	Date Disapproved

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**SUPPORTING DOCUMENT**

1. Total Pages **282**

2. Title

Safety Assessment for the 200 West Area Expedited Response Action for Remediation of Carbon Tetrachloride

3. Number

WHC-SD-EN-SAD-004

4. Rev No.

2-A

5. Key Words

granular activated carbon  
safety assessment  
gas membrane separation system  
low hazard

**APPROVED FOR PUBLIC RELEASE**  
*V. Diskland*  
*3/3/94*

6. Author

Name: R. R. Lehrscha11

*RR Lehrscha11*  
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7. Abstract

The time weighted average for carbon tetrachloride has changed from 2 p/M to 5 p/M (per 29 CFR 1910/1000 [1992 ed.]). Changes to the safety assessment reflect the new 5 p/M limit.

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10. RELEASE STAMP

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9. Impact Level 2 ESQ

9413199.2038

**RECORD OF REVISION**

(1) Document Number

WHC-SD-EN-SAD-004

Page 6

(2) Title

Safety Assessment for the 200 West Area Expedited Response Action for Remediation of Carbon Tetrachloride

**CHANGE CONTROL RECORD**

Authorized for Release

(3) Revision

(4) Description of Change - Replace, Add, and Delete Pages

(5) Cog. Engr.

(6) Cog. Mgr. Date

1-A

Rev. 0 released per EDT 129408  
 Rev. 0-A released per ECN 169357  
 Rev. 0-B released per ECN 786789  
 Rev. 1 released per ECN 189902  
 Rev. 1-A released per ECN 189905  
 Rev. 1-B released per ECN 189915  
 Rev. 2 released per ECN 196705  
 Rev. 2-A released per ECN 196708

2

Replace entire document. Revisions reflect potential consequences based on the new accident criteria defined in DOE-STD-1027-92. Revisions also address operations at the 216-Z-9 and 216-Z Crib Sites. Also included is information obtained from test data that provides the basis for additional controls to mitigate the potential for a granular activated carbon (GAC) overheating event.

2

Deleted the OSL requirement that addresses maintaining the outlet airstream temperature to within 20°F of the inlet airstream temperature. The justification for this change is provided in Appendix J.

2

Changed the flow differential requirement in the OSL from 10% variance to 20% variance in flow for automatic shutdown of blower (programmed interlock). The justification for this change is discussed in Appendix J.

S.A. Driggers  
 (signature on file)

G.C. Henckel  
 (signature on file)

2-A RS

Replace pages 1-4, 3-8, 3-9, 3-10, 3-12, 4-4, and 4-9. The time weighted average exposure limit for carbon tetrachloride has changed from 2 p/M to 5 p/M (29 CFR 1910/1000, 1992 ed.). The new limit is reflected in the changes to the safety assessment. *ECN-196708*

S.A. Driggers

*Signature*  
 2-24-94

G.C. Henckel

*Signature*  
 2-24-94

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release that would result in consequences to the uninvolved individual and the public exceeding the threshold limit values (TLV) for a low hazard operation.

The analysis also disclosed that concentrations of  $\text{CCl}_4$  at 100 m (330 ft) from the work site could exceed the time weighted average (TWA) limit. The following is the second OSL required to mitigate the potential consequences of an event below the exposure limits for the occupational and uninvolved workers as defined in 29 CFR 1910.119/1000. The following are the mitigating requirements based upon system design features:

- Placement of a  $\text{CCl}_4$  detector downstream of the final GAC canister (stack monitor) that is set to alarm (production units are interlocked with the logic system to shut down the blower) if concentration of  $\text{CCl}_4$  exceed 25 p/M if the system is operating in automated mode.
- Flow rate meters, located upstream of the primary GAC canister and downstream of the final GAC canister, will be in place and interlocked with the logic system to shut down the blower if there is a flow rate variance greater than 20% (Appendix J). Reliability of the system (flow rate meters and logic system) must ensure instruments fail safely to assure shut down of the blower.
- A minimum of two GAC canisters in place (two in series) with the second canister having full adsorptive capacity when placed into operation to adsorb any  $\text{CCl}_4$  if breakthrough of the first GAC canister occurs when operating the VES production and characterization units.

The following are the mitigating requirements based upon administrative controls:

- The sampling frequency (by operations personnel) will be required a minimum of every 2 hours for the production units and every 1 hour or 30 minutes for the characterization unit to assure the concentration of  $\text{CCl}_4$  at the point of discharge (as a result of GAC saturation and breakthrough) does not exceed 25 p/M. The sampling frequency is based upon a maximum concentration of 10,000 p/M  $\text{CCl}_4$ . The maximum flow rate assumed in the analysis for the production units is 500  $\text{ft}^3/\text{min}$  and 130  $\text{ft}^3/\text{min}$  for the characterization unit. The maximum time required for breakthrough of  $\text{CCl}_4$  through the GAC is also considered in the analysis. There shall be a minimum of two GAC canisters in place (production and characterization units) at all times.
- Verification of the hose configuration for the GACs and piping is required by the responsible operating organization before startup.
- Monitoring of flow rate meters will be required by operations personnel as prescribed in the work procedures if interlocks are not operable to detect a flow rate variance of greater than 20% (exceeding 20% variance for more than one minute will require shut down of the VES). If flow rate meters and interlocks are not operable, constant monitoring (with instruments for detection of  $\text{CCl}_4$  vapors) is required around the portion of the VES under positive air pressure. Detection of  $\text{CCl}_4$  vapors that exceed

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observed at the Hanford Site in the 34-year period between 1945 and 1978. Although one of these touched ground, it caused no damage. The nearest reported tornado damage was in Yakima (April 30, 1957), about 28 km (45 mi) to the west, and at Wallula Junction (June 26, 1958), about 31 km (50 mi) to the southwest; only minor damage was noted. The potential consequences in terms of airborne concentrations have been found below risk acceptance consequences (WHC-CM-4-46, *Nonreactor Facility Safety Analysis Manual*).

### 3.6 THRESHOLD VALUES

The inventory and resulting source terms were analyzed for  $\text{CCl}_4$ . The other VOCs that were extracted during the test phase (based upon the temperatures required to vaporize these contaminants) were 2-butanone and trace amounts of chloroform. Because these other contaminants are present in much lower quantities than of  $\text{CCl}_4$  and the toxicity of both chloroform and 2-butanone are less than  $\text{CCl}_4$ , these contaminants are bounded by the  $\text{CCl}_4$  analysis.

The toxicity limit values for the chemical contaminants identified in this section are provided in Table 3-2. These limits were derived from the guidelines using the concentration values reported in the *1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (ACGIH 1992) and 29 CFR 1910.119/1000.

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acceptance guidance (WHC-CM-4-46).

The receptors of concern are the nearest onsite and offsite individuals. The closest onsite facility to the remediation sites is the PFP. The nearest offsite location is Highway 240, 4.5 km (2.8 mi) southwest of the 216-Z-18 crib. The site boundary (nearest resident) is 7.7 mi (12.5 km) southwest of the crib sites.

The bounding postulated scenario involves the continuous release of  $CCl_4$  as it is recovered due to a component failure or the saturation of the GAC beds (Appendix G). The source term would consist of 5.9 lb/min of  $CCl_4$  being released. A summary of the receptor exposures for this scenario is provided in Table 3-3.

Table 3-3. Receptor Exposures Caused by Release of 5.9 lb/min of Carbon Tetrachloride.

Release of $CCl_4$ (lb) per minute	Resultant exposures			Limits	
				IDLH	TWA
	Onsite 100 m (330 ft)	Nearest public access 4.5 km (2.7 mi)	Offsite 12.5 km (7.7 mi)	300 p/M	5 p/M
5.9	11 p/M 70 mg/m <sup>3</sup>	.020 p/M 1.3 mg/m <sup>3</sup>	< 5.7 E-03 p/m <sup>3</sup> < 3.6 E-02 mg/m <sup>3</sup>		

One postulated scenario identified the worst-case production of phosgene gas near heating units in the GAC system. The heaters should not provide sufficient temperatures to heat the GAC units resulting in the production of phosgene (some hydrolysis of  $CCl_4$  could begin to occur at air stream temperatures of 205°C [401°F] with the maximum production of phosgene taking place at 730°C [1346°F] with the hydrolysis reaction going to completion or near completion) as indicated in Appendix I. The inline heater design will have a maximum temperature capacity of 93°C (200°F) at 500 acfm.

Table 3-4 provides the consequences if sufficient temperatures could be achieved for phosgene production. The conversion rate is 2.7E-4 lb phosgene produced per pound of  $CCl_4$  exposed to the stated temperatures in the presence of oxygen. Other assumptions show that phosgene produced is also vented to the environment without being adsorbed in the GAC unit, and does not undergo hydrolysis as the temperature decreases.

Even if sufficient temperatures are achieved, the consequences would not exceed the limits for a low hazard activity (Table 3-4), but the TWA limit for exposure to phosgene may be exceeded for the site worker (Appendix G). Prudent actions are recommended in Section 4.2, addressing the maximum air stream temperature capacity for the heaters.

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Table 3-5. Receptor Exposures Caused by a Release of 11 g/s of Hydrogen Chloride.

Release of HCl (g/s)	Resultant exposures			Limits	
	Onsite	Nearest public access	Offsite	IDLH	Ceiling
	100 m (330 ft)	4.5 km (2.7 mi)	--		
11 g/s	12 p/M 17 mg/m <sup>3</sup>	2.1 E-02 p/M 3.1 E-02 mg/m <sup>3</sup>	6.0 E-03 p/M 8.9E-03 mg/m <sup>3</sup>	100 p/M 152 mg/m <sup>3</sup>	5 p/M 8 mg/m <sup>3</sup>

The consequence analysis also indicated that several postulated scenarios could result in consequences to the site worker and nearest uninvolved individual that exceeds the Occupational Safety and Health Administration (OSHA) limits for exposure to CCl<sub>4</sub>. Section 3.8 identifies the system or component failures, consequences as a result of those failures and mitigative features available to reduce or eliminate the potential consequences to the site worker and nearest uninvolved worker.

Those components designed for providing or maintaining confinement of the VES are defined as safety class 3 components (WHC-CM-1-3, *Management Requirements and Procedures*). The consequences of this operation could affect the health and safety of the site workers caused by accidental releases of chemicals.

The VES production and characterization units are located in closer proximity to the PFP than has been analyzed in the PFP accident analysis. The CCl<sub>4</sub> workers located within the PFP safety envelope are required to be trained for emergency response actions to those accidents at the PFP that may result in any potential consequences to the VES work sites. The PFP Final Safety Analysis Report discusses the accidents and potential consequences to the site worker, onsite worker, and the public (Carlson 1990).

The mitigation features and controls required to assure concentrations to the site and nearest uninvolved worker are controlled below the OSHA limit for CCl<sub>4</sub> (identified in Section 3.8) and are discussed in Section 4.0.

### 3.8 ASSESSMENT OF HAZARDS AND CONTROLS

#### 3.8.1 Failure of Piping

**3.8.1.1 Component Failure and Consequences--Failure of Piping.** Failure of piping (hole in a flex hose), failure to hook up hoses, fittings, saturation of both the GAC canisters causing CCl<sub>4</sub> to breakthrough, or failure of a control system could cause a continuous release resulting in consequences to the uninvolved individual. Concentrations of CCl<sub>4</sub> at 100 m (330 ft) would be a maximum of 11 p/M.

1.6 RECOVERY:

**Noncompliance with the requirements of the OSL**

- a. VES operations shall cease until Health and Safety Assurance approves restart of the operation.
- b. The fire department shall be notified requesting standby at the work site until full recovery actions are completed.
- c. The location of the fuel source shall be reestablished at a minimum of 15 m (50 ft) as soon as reasonably possible.
- d. The location of the electric generator shall be reestablished at a minimum of 8 m (25 ft) as soon as reasonably possible.
- e. The number of saturated canisters in storage shall be reduced to 12 as soon as reasonably possible.
- f. Locating the fuel sources and generator closer to the GAC canisters than is allowed in the requirements, and exceeding the number of canisters allowed in a storage location will constitute an OSL violation and shall be documented as an unusual occurrence report.

**Noncompliance with the surveillance requirement**

- a. The surveillance shall be performed immediately.
- b. If surveillance determines noncompliance with the requirement, the recovery actions identified in paragraph 1.6, "Noncompliance with the requirements of the OSL" shall be initiated.
- c. Failure to implement a surveillance requirement shall be documented as an off-normal occurrence.

1.7 AUDIT POINT:

An auditable log shall be maintained at the site documenting the results of the surveillance. This log shall be reviewed weekly by the operating organization assuring compliance with the requirements and surveillance. The audit and surveillance frequencies shall be determined by the Quality Assurance and Environmental Assurance organizations, respectively.

1.8 BASIS:

A minimum 15 m (50 ft) separation between the propane tank and the  $\text{CCl}_4$  canisters, whether in storage or being used at the VES production and characterization units, and a minimum 8 m (25 ft) separation between the generator and the canisters allows adequate clearance for flames that could result from a failure of the propane tank or the fuel hose to the generator. This separation would provide a conservative distance at which a flame could affect the  $\text{CCl}_4$  canisters. The primary cause of a release of  $\text{CCl}_4$  is high

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are not operable, constant monitoring (with instruments for detection of  $\text{CCl}_4$  vapors) is required around the portion of the VES under positive air pressure. Detection of  $\text{CCl}_4$  vapors that achieve  $\geq 5$  p/M will require personnel to don PPE (as required) for troubleshooting the system for identification of any leaks or shut down the system until repair.

- b. Personnel who operate the VES production and characterization unit shall be trained to monitor, sample, and shut down the blower in the event that  $\text{CCl}_4$  vapors are detected around the portion of the VES under positive air pressure that achieve  $\geq 5$  p/M.

Surveillance: a. The data, documenting any flow variances, shall be reviewed weekly to verify compliance with these requirements. Results of the weekly surveillance shall be documented in the field log.

- b. Personnel training shall be verified for those individuals responsible for operating, sampling, and shutting down the VES production and characterization units before initial startup.

Recovery:

**Noncompliance with the requirements**

- a. Once a determination is made that the operating organization is not in compliance with the requirements of this OSL, operations shall immediately cease. The approval of Health and Safety Assurance will be required for restart of the operation.
- b. Failure of operations personnel to monitor the readout for detecting variances in the flow rate meters (if interlocks are not functioning) or not monitoring the portion of the VES under positive air pressure (if flow rate meters and interlocks are not operable) for detection of  $\text{CCl}_4$  vapors that achieve  $\geq 5$  p/M will require shut down of the VES.
- c. Failure to operate the VES production and characterization units with trained personnel shall require shut down of sampling operations until trained personnel are provided.
- d. Failure to (1) monitor flow rate meters, (2) monitor for  $\text{CCl}_4$  vapors around the portion of the system under positive air pressure, or (3) monitoring with trained personnel will constitute an OSL violation and shall be documented as an unusual occurrence report.

**Noncompliance with the surveillance**

- a. The surveillance shall be performed immediately.

**DISTRIBUTION SHEET**

To Distribution	From R. R. Lehrschall	Page 1 of 1
		Date February 22 1994
Project Title/Work Order WHC-SD-EN-SAD-004, REV. 2-A SAFETY ASSESSMENT FOR THE 200 WEST AREA EXPEDITED RESPONSE ACTION FOR REMEDIATION OF CARBON TETRACHLORIDE		EDT No. N/A
		ECN No.196708

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