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STA 4
MAY 25 1995

ENGINEERING DATA TRANSMITTAL

Page 1 of 21
1. EDT No 610642

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) TWRS Industrial Health & Safety	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: W252	6. Cog. Engr.: N. F. Barilo	7. Purchase Order No.: N/A
8. Originator Remarks: For Release !		9. Equip./Component No.: N/A
		10. System/Bldg./Facility:
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date:

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-W252-FHA-001		0	Preliminary Fire Hazard Analysis for Phase II Liquid Effluent Treatment and Disposal Facility, Project W-252	S,Q	1,2		

16. KEY		
Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

(G)		(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)				(G)	(H)			
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Cog. Eng. NF Barilo	<i>[Signature]</i>	5/12/95	R3-01	OSTI (2)		5/12/95	R3-01		
1	1	Cog. Mgr. SS Glover	<i>[Signature]</i>	5/12/95	R3-01	Central Files (2)		5/12/95	R3-01		
1	1	QA MC Arntzen	<i>[Signature]</i>	5/23/95	L4-95						
1	1	Safety Omar Jaka	<i>[Signature]</i>	5/12/95							
		Env.									
1	1	Projects KS Pedersen	<i>[Signature]</i>	5/15/95	R3-35						
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18. NF Barilo <i>[Signature]</i> Signature of EDT Originator Date: 5/24/95	19. SS Glover <i>[Signature]</i> Authorized Representative Date for Receiving Organization Date: 5/25/95	20. SS Glover <i>[Signature]</i> Cognizant Manager Date Date: 5/25/95	21. DOE APPROVAL (if required) Ctrl. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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BD-7400-172-2 (04/94) GEF097

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Document Number: WHC-SD-W252-FHA-001, Rev. 0

Document Title: PRELIMINARY FIRE HAZARD ANALYSIS FOR PHASE II LIQUID EFFLUENT TREATMENT AND DISPOSAL FACILITY, PROJECT W-252

Release Date: 5/24/95

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

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WHC Information Release Administration Specialist:

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SUPPORTING DOCUMENT

1. Total Pages 12

2. Title

WHC-SD-W252-FHA-001, Rev. 0: Preliminary Fire Hazard Analysis for Phase II Liquid Effluent Treatment and Disposal Facility, Project W-252

3. Number

WHC-SD-W252-FHA-001

4. Rev No.

0

5. Key Words

Fire Hazard
Liquid Effluent
Safety Class Systems

6. Author

Name: N. F. Barilo

N. F. Barilo
Signature


Organization/Charge Code 31N10/A2078

7. Abstract

A Fire Hazards Analysis was performed to assess the risk from fire and other related perils and the capability of the facility to withstand these hazards. This analysis will be used to support design of the facility.

8. RELEASE STAMP

OFFICIAL RELEASE BY WHC
DATE MAY 25 1995
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PRELIMINARY FIRE HAZARD ANALYSIS
FOR
PHASE II LIQUID EFFLUENT TREATMENT
AND DISPOSAL, PROJECT W-252

WHC-SD-W252-FHA-001, REV. 0

Prepared by:

N. F. Barilo
TWRS Industrial Health and Safety

May 11, 1995

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1.0 INTRODUCTION

This preliminary Fire Hazard Analysis (FHA) is intended to address fire hazards or fire-related concerns in accordance with DOE 5480.7A, related to the Phase II Liquid Effluent Treatment and Disposal facilities. The FHA is based on conceptual design information provided in the Functional Design Criteria (FDC) (Westinghouse, 1994), Conceptual Design Report (CDR) (Kaiser, 1993), Advanced Conceptual Design Report (ACDR) (Montgomery Watson, 1995), and the preliminary Safety Evaluation (PSE) (Westinghouse, 1993). Due to project descoping, this FHA will only address the B-Plant/Waste Encapsulation and Storage Facility (WESF) and 283-E modifications/construction.

1.1 BACKGROUND

The Phase II Liquid Effluent Treatment and Disposal Facility (LETD), Project W-252, will provide new facilities/equipment and existing facility modifications required to implement Best Available Technology/All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment (BAT/AKART) for the 200 East Area Phase II Liquid Effluent Streams. The project will also provide a 200 East Area Phase II Effluent Collection System (PTECS) for connection to a disposal system for relevant effluent streams to which BAT/AKART has been applied (Westinghouse 1994).

The facilities affected by Project W-252 as described in the ACDR are as follows:

B-Plant/WESF

The cooling water waste stream at WESF will be controlled by installing a closed-loop cooling system that will recirculate cooling water from the WESF storage pools and process cells heat exchangers. Water from the WESF pool flush system will be collected and pumped to the wet surface fluid coolers for makeup water. The remaining waste stream will be routed to the Treated Effluent Disposal Facility (TEDF) for disposal.

283-E Water Treatment Facility (WTF)

The backwash waste and waste from the settling basins at the 283-E WTF will be collected and pumped through a new system. This system will be designed to remove solids which will be dried in new drying beds and disposed of according to regulations. The supernatant will be returned to the 283-E WTF.

1.2 ASSUMPTIONS

The following assumptions were made on the best information available at the time of this FHA, but are being provided due to the lack of detail in the referenced documents. Should these assumptions prove to be invalid in the definitive design process, the conclusions of this FHA may not be valid. The assumptions are as follows:

- Sketches and documentation provided in the CDR and ACDR were used as the basis for this FHA.
- The construction of all new structures is assumed to be UBC Type II-N insulated preengineered metal buildings.
- The modifications of existing facilities, as identified in the CDR and ACDR, should not

result in increased fire hazards to these facilities, except during construction related activities which would result in fire hazards typically associated with that activity (recommendations for such activities are noted in this FHA).

- The polymers used in the process are either noncombustible or of limited combustibility, and should not add significant fuel loading to the facilities. (Note: This assumption is based on the likelihood that the polymers will be similar to that used in 200 West Area operations of a similar nature.)
- The fuel storage for the emergency generator at B-Plant will either be diesel (300 gallons) or propane (less than 500 gallons).

2.0 SUMMARY AND CONCLUSIONS

The FHA provides specific recommendations that impact the design and operation of the LETD. The FHA concludes that the facilities can be operated without undue risk from fire events provided that these recommendations are implemented.

3.0 DESCRIPTION OF CONSTRUCTION

3.1 CLASSIFICATION

The LETD is classified as a Low Hazard Nuclear facility (Westinghouse, 1993). The buildings associated with this project are classified as Uniform Building Code (UBC) Type II-N (F-2 Occupancy).

3.2 DESIGN

The following new structures and equipment are identified in the CDR and ACDR:

- An 11 m x 12.1 m (36 ft x 40 ft) insulated preengineered local control unit (LCU) building will be located southwest of B-Plant/WESF (near the elevated water tank). This metal building will house the LCUs, motor control centers, fluid chemical addition storage rooms and fluid cooler piping equipment (including pumps, expansion tanks and sampling equipment). The building will also house an electrical transfer switch and will be provided with ventilation, lighting and power as necessary to support the operations.
- A weather enclosure will be provided for the standby generator (either diesel or propane) located south of the LCU at B-Plant/WESF. No definitive design information was provided. **The generator and fuel storage must be designed and arranged to meet the requirements of the latest edition of National Fire Protection Association (NFPA) 30, "Flammable and Combustible Liquids Code," NFPA 37, "Installation and use of Stationary Combustion Engines and Gas Turbines," NFPA 54, "National Fuel Gas Code," NFPA 58, "Storage and Handling of Liquefied Petroleum Gases," NFPA 70, "National Electrical Code" and NFPA 110 "Emergency and Standby Power Systems," as applicable (Recommendation 3-1).**
- Three 100,000 gallon tanks used for drying beds will be provided at 283-E.
- Additionally, the project will provide new instrumentation, pumps, piping systems, cooling systems and modification of existing similar equipment at B-Plant/WESF and 283-E.

Underground effluent lines and metering manholes will also be provided.

Work performed on existing facilities should result in only minimal impact. **However, care should be taken when performing welding/cutting operations, and combustible loading associated with the construction should be minimized in existing facilities (Rec. 3-2).**

4.0 FIRE PROTECTION FEATURES

All new buildings are of noncombustible construction. Two fire hydrants (one raw and one sanitary) are located within 300 feet of the LCU building (north and northeast). No specific fire protection features are identified in the CDR/ACDR. The following requirements should be applied to the definitive design and construction of the facilities:

- (1) **A fire extinguisher(s) must be provided for the LCU building in accordance with NFPA 10 and 37 (Rec. 4-1).**

DOE 6430.1A stipulates the following design criteria:

- (2) Any materials with unusual fire characteristics, such as urethane foams, and any materials that develop significant quantities of toxic or other harmful products of combustion, shall not be used as interior finishes or other interior applications. **The use of foamed plastics in construction is prohibited unless it fully complies with Factory Mutual Data Sheet 1-57. (Section 0110-6.1) (Rec. 4-2).**
- (3) **Since the facility is classified as nonreactor nuclear, automatic sprinkler protection is required to be provided throughout. This includes all buildings which are considered part of the low hazard classification of the project. However, since no significant fire hazards are introduced as a part of this project, and the objectives of DOE 5480.7A are met, a deviation is recommended (Rec. 4-3).**

5.0 DESCRIPTION OF FIRE HAZARDS

5.1 POTENTIAL INTERNAL FIRE HAZARDS

Fire hazards at the facilities included in this project would include normal hazards associated with industrial facilities. Additionally, a 350 kW generator (diesel or propane) will be provided inside a weather enclosure south of the LCU building. **To minimize the fire exposure hazard, the generator must be located a minimum of 1.5 m (5 ft.) from the building (NFPA 37) (Rec. 5-1) (NOTE: This distance would allow openings in the wall facing the generator and fuel storage.).**

There are also inherent fire hazards associated with the construction of new facilities, and alterations of existing facilities. These fire hazards can be controlled or eliminated through early planning, scheduling and implementation fire prevention measures. **As such, all work associated with this project must follow the requirements of NFPA 241, "Standard for Safeguarding Construction, Alteration, and Demolition Operations" (Rec. 5-2).** This is especially crucial since some work will be performed in existing facilities.

5.2 POTENTIAL EXTERNAL FIRE HAZARDS

A fuel storage tank will be provided at the LCU building for the standby generator (either 1,135.6 liters [300 gallons] diesel or less than 1892.7 liters [500 gallons] propane). Diesel fuel is considered a Class II combustible liquid (NFPA 30) with a typical flash point between 38 and 60 degrees C. (100 and 140 degrees F.). Propane is a flammable gas with lower flammable limit of 2.1% and an upper flammable limit of 9.5%. **To minimize the fire exposure hazard to the LCU building and meet the requirements (distance from property line) of NFPA 30, 54 and 58, the storage tank must be located a minimum of 3 m (10 ft.) from the building (Rec. 5-3). Additionally, the storage area must have a curb or be sloped away from the LCU building and other important neighboring structures (if diesel is used), and be kept free of weeds, debris and other combustible material (NFPA 30, 54 and 58) (Rec. 5-4). Other pertinent location requirements for propane storage can be found in NFPA 54 and NFPA 58.**

Historical data indicate that grass fires within or near the Hanford site are an annual occurrence. One such fire occurred the night of August 9, 1984. The fire, started by lightning at an off site location spread to the site involving an estimated 203,536 acres of site land. Consequently, grass fires are considered a likely occurrence during the life of the LETD. This type of fire is defined as an unplanned and unwanted fire requiring suppression action. An uncontrolled fire can be associated with high wind conditions and can propagate rapidly through vegetative fuels and threaten structures. Natural wind conditions at the Hanford site can result in significant quantities of light fuels (grass, weeds, shrubs) to be deposited and accumulate adjacent to structures. In a grass fire event, these debris can represent a fuel source that if ignited will produce an intense fire of short duration. Adherence to housekeeping policies and a quick response by the Hanford Fire Department would minimize the potential exposure from this type of hazard.

6.0 PROTECTION OF ESSENTIAL SAFETY CLASS SYSTEMS

No Safety Class systems will be provided or affected as a part of this project.

7.0 LIFE SAFETY CONSIDERATIONS

These special purpose industrial facilities (NFPA 101) are provided with an adequate number and arrangement of exits (ACDR layout). However, no detailed design information was provided on the components or hardware associated with the new buildings. **Therefore, the definitive design process must ensure that the facilities are designed and constructed to conform with the specific applicable requirements of NFPA 101 (Rec. 7-1).**

8.0 CRITICAL PROCESS EQUIPMENT

Critical process equipment is that equipment whose continued integrity is essential to ensure the operability of safety class items in the event of a design basis fire. There is no critical process equipment in this project.

9.0 HIGH VALUE PROPERTY

There is no high value equipment (over \$1,000,000) associated with this project.

10.0 DAMAGE POTENTIAL

10.1 MAXIMUM POSSIBLE FIRE LOSS (MPFL)

The MPFL identifies all potential monetary liability to the government in accordance with loss limitations of DOE 5480.7A as a result of the design basis fire. The MPFL assumes the failure of manual fire fighting efforts. The MPFL that is postulated occurs as a result of a fire involving the combustibles within the LCU building. The combustible loading in this building is considered light (0-34 kg/m²/0-7 lbs/ft.²) based on anticipated use, but the damage potential to the building was not analyzed, and therefore the actual severity has not been quantified. Additionally, no fire detection or suppression system is provided. Therefore, an unlikely fire causing destruction of the LCU building is considered.

The resulting fire impinges the fluid coolers 3 m (10 ft.) east of the building, and the diesel generator and fuel storage to the west. Due to the metal construction, noncombustible contents (mostly water-filled piping) and separation distance of the second fluid cooler (greater than 13.8 feet - see Section 17.0), damage would not be expected beyond the first cooler. The postulated fire is not expected to involve radiological materials nor result in any adverse health effects (based on information provided in the PSE). Cleanup costs would most likely involve the removal of building materials, destroyed equipment, ash and soot. These resulting costs are considered to be less than \$875,000 (based on cost estimates provided in the 3/17/94 Conceptual Estimate).

10.2 MAXIMUM CREDIBLE FIRE LOSS (MCFL)

The purpose of the MCFL is to account for the mitigating features of any installed fire protection system, assuming they perform as designed. Since there are no fixed fire protection systems the MCFL is the same as the MPFL.

11.0 FIRE DEPARTMENT RESPONSE

The standard Hanford Site Fire Emergency Response is to dispatch a single aerial device/pumper and ambulance, if available, from the fire station closest to the incident with a back-up aerial device/pumper from the next closest fire station to the incident. This provides a two engine response with additional manpower/medical capabilities.

The response time to any of the facilities by the fire department 200 Area station in a fire emergency is estimated to be 5 to 10 minutes from time of initial notification. This does not include a hazardous materials response. Additional support, if necessary, from the 100 Area fire station, in the form of one pumper tanker and one water tanker, is estimated to arrive within 10 to 11 minutes from the time of initial notification.

The facility pre-fire plan has not been completed. **It is recommended that a pre-fire plan be completed prior to startup of operations (Rec. 11-1).**

12.0 RECOVERY POTENTIAL

Should the LCU building or fluid coolers be destroyed by fire, that facility may be inoperable for 6 to 12 months. Other equipment, such as the tanks and piping, though not as susceptible to fire damage could also be put back into operation within this time period. Since none of this equipment is part of a vital facility, these recovery times are considered acceptable.

13.0 POTENTIAL FOR TOXIC, BIOLOGICAL, AND/OR RADIATION INCIDENT DUE TO A FIRE

The are no fire incidents postulated that would result in a toxic, biological, and/or radiation incident due to a fire.

14.0 EMERGENCY PLANNING

Emergency planning for the new facilities has not been completed. Initial emergency planning should be started prior to completion of the final facility design to ensure that any necessary emergency considerations that impact design have been addressed. **It is recommended that emergency planning be coordinated with the fire department, completed, and reviewed by the safety group's fire protection engineer prior to startup of operations (Rec. 14-1).** Emergency planning procedures for existing facilities are considered adequate to cover activities associated with this project.

15.0 SECURITY AND SAFEGUARDS CONSIDERATIONS RELATED TO FIRE PROTECTION

There are no unusual security features for facilities affected by this project.

16.0 NATURAL HAZARDS IMPACT ON FIRE SAFETY

The referenced draft analyses (PSE, etc.) have evaluated earthquakes, flood, lightning, tornadoes, high winds (and resultant missiles) and volcanic ash. No credible scenario was presented which results in any additional impacts or new fire hazards.

17.0 EXPOSURE FIRE POTENTIAL

Exposure fire potential is evaluated based on the heat effect from an external fire which might cause ignition of, or damage to, an exposed building or its contents. The exposure hazards and separation requirements for the standby generator and fuel storage are discussed in Section 5.0. Other exposure hazards considered are the portable structures located to the east, the LCU building to the standby generator and fuel storage, and the building to the fluid coolers. The following exposure calculation is provided (per NFPA 80A).

Separation Distances Needed Based on The LCU Building Size

Assumptions - LCU building height is 4 m (13 ft.)

Exposing Fire Size (east wall) 6.1 m (20 ft.) x 4 m (13 ft.)

Fire Loading - Light

Percent Openings - 100

Width/Height Ratio - 1.54 (use 1.6 per NFPA 80A, Table 2-3)

Guide Number - 1.74

Calculation - 4 m (13 ft.) x 1.74 + 1.5 m (5 ft.) = 8.4 m (27.6 ft.)

Reduction base on noncombustible wall with no openings - 50%

Separation distance required - 8.4 m (27.6 ft.) x 50% = 4.2 m (13.8 ft.)

Based on the above calculation, the separation between the LCU and fluid coolers or standby generator would need to be at least 4.2 m (13.8 ft.) to be considered in a separate fire area.

The proposed site for the LCU building is in close proximity to portable structures (trailers, mobile offices, etc.). Since the exact location of the LCU and supporting equipment has not been defined, the potential exists for these other structures to present an exposure hazard to the LCU and its equipment. **Ensure that the separation distance between the portable structures and the LCU building/equipment meet the requirements of DOE/EV-0043, "Standard on Fire Protection for Portable Structures," (Rec. 17-1).**

18.0 RECOMMENDATIONS

- 3-1 Ensure that the generator and fuel storage are designed and arranged to meet the requirements of the latest edition of NFPA 30, 37, 54, 58, 70 and 110 as applicable.
- 3-2 Ensure that, in existing facilities, welding/cutting (hotwork) operations are performed in accordance with WHC-CM-4-41, *Fire Protection Program Manual*, and the combustible loading associated with the construction must be minimized per NFPA 1.
- 4-1 Provide a portable fire extinguisher(s) for the LCU building in accordance with NFPA 10 and 37.
- 4-2 Prohibit the use of foamed plastics in construction unless it fully complies with Factory Mutual Data Sheet 1-57.
- 4-3 Provide a deviation from the DOE 6430.1A requirement for automatic sprinkler coverage throughout the facility.
- 5-1 Ensure that the standby generator is located a minimum of 1.5 m (5 ft.) from the building to minimize the fire exposure hazard.
- 5-2 Ensure that all construction/demolition work associated with this project follow the requirements of NFPA 241.
- 5-3 Ensure that the standby generator fuel storage tank is located a minimum of 3 m (10 ft.) from the building to minimize the fire exposure hazard to the LCU building and meet the requirements of NFPA 30, 54 and 58.
- 5-4 Ensure that the storage area has a curb or is sloped away from the building and other neighboring structures (if diesel is used), and be kept free of weeds, debris and other combustible material.
- 7-1 Ensure that the facilities are designed and constructed in accordance with NFPA 101.
- 11-1 Develop a pre-fire plan prior to startup of operations.
- 14-1 It is recommended that emergency planning be coordinated with the fire department, completed, and reviewed by the facility fire protection engineer prior to startup of operations.
- 17-1 Ensure that the separation distance between portable structures and the LCU building/equipment meet the requirements of DOE/EV-0043.

19.0 REFERENCES

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