

U.S. Department of Energy
Office of River Protection

P.O. Box 450, MSIN H6-60
Richland, Washington 99352

JAN 08 2007

06-ESQ-178

Mr. C. M. Albert, Project Manager
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Mr. Albert:

CONTRACT NO. DE-AC27-01RV14136 – ASSESSMENT REPORT A-06-ESQ-RPPWTP-011, “LOW-ACTIVITY WASTE (LAW) FIRE SPRINKLER SYSTEM INSTALLATION AND LIFE SAFETY DURING CONSTRUCTION,” NOVEMBER 7 THROUGH 16, 2006

This letter forwards the results of the U.S. Department of Energy (DOE), Office of River Protection, assessment of the LAW fire sprinkler system installation and life safety during construction, conducted from November 7 through 16, 2006 (attachment). This assessment evaluated the sprinkler and standpipe system design and installation in the LAW facility against National Fire Protection Association (NFPA) and contract requirements. The assessment also evaluated whether a reasonable degree of life safety was provided in the LAW Facility during construction.

The Team concluded a comprehensive wet-pipe fire sprinkler and standpipe system was being designed and installed throughout the LAW Facility. Since the LAW Facility fire sprinkler and standpipe system designs were incomplete and design/installation was on-going, the system was not in full compliance with NFPA requirements.

The Team also concluded the life safety for construction was appropriate for the current levels of combustible hazards contained in the LAW Facility. Because the facility was nearly enclosed with siding, Bechtel National, Inc. could improve life safety and manual fire fighting efforts by fully enclosing one stairwell inside the building and conducting a periodic qualitative emergency lighting performance test commensurate with facility configuration changes and additions of combustible materials into the LAW Facility. The Team made three Observations which require no response.

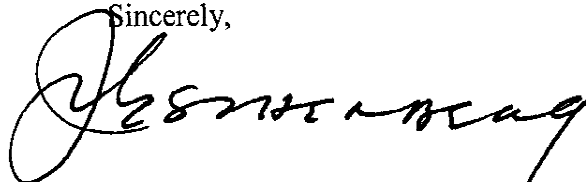
Mr. C. M. Albert
06-ESQ-178

-2-

JAN 08 2007

If you have any questions, please contact me, or your staff may call Robert C. Barr, Director, Office of Environmental Safety and Quality, (509) 376-7851.

Sincerely,



John R. Eschenberg, Project Manager
Waste Treatment and Immobilization Plant

ESQ:CPC

Attachment

cc w/attach:

D. E. Gergely, BNI
D. E. Kammenzind, BNI
W. M. Linzau, DNFSB
R. G. Quirk, DNFSB
C. R. Ungerecht, PAC
D. C. West, RL
BNI Correspondence

U.S. DEPARTMENT OF ENERGY
Office of River Protection
Environmental, Safety and Quality

ASSESSMENT: Low Activity Waste Facility Fire Sprinkler System Installation and Life Safety during Facility Construction

REPORT: A-06-ESQ-RPPWTP-011

FACILITY: Bechtel National, Inc. Waste Treatment and Immobilization Plant, Low Activity Waste Facility

LOCATION: Hanford Site

Dates: November 7 through 16, 2006

ASSESSORS: Craig P. Christenson, Lead Assessor
Dale C. West, Assessor
Jeff M. Bruggeman, Assessor

APPROVED BY: Patrick P. Carrier, Team Lead
Verification and Confirmation

Executive Summary

The U.S. Department of Energy (DOE), Office of River Protection assessed the Bechtel National, Inc. (BNI) Waste Treatment and Immobilization Plant, Low-Activity Waste (LAW) Facility fire sprinkler and standpipe system installation and life safety egress during construction from November 7 through 16, 2006. The assessment evaluated the sprinkler and standpipe system design and installation in the LAW Facility against National Fire Protection Association (NFPA) and contract requirements, and evaluated whether a reasonable degree of life safety was provided during construction in the LAW Facility.

The Team concluded a comprehensive wet-pipe fire sprinkler and standpipe system was being designed and installed throughout the LAW. Since the LAW Facility fire sprinkler and standpipe system designs were incomplete and design/installation was on-going the system was not in full compliance with NFPA requirements. The Team evaluated the hydraulic demands of the system with the areas of protection and concluded once the system design is completed and the system is fully installed it will be capable of controlling anticipated fires in the LAW Facility.

The Team also concluded the life safety for construction was appropriate for the current levels of combustible hazards contained in LAW. Since the facility was nearly enclosed with siding, BNI could improve life safety and manual fire fighting efforts by fully enclosing one stairwell inside the building and conducting a periodic qualitative emergency lighting performance test commensurate with facility configuration changes and additions of combustible materials into the LAW Facility.

The Team made the following Observations, which require no written response:

A-06-ESQ-RPPWTP-011-O01 -- Fire sprinkler systems in the LAW were not yet into full compliance with NFPA 13 requirements.

A-06-ESQ-RPPWTP-011-O02 -- None of the stairwells in LAW were enclosed. BNI should consider enclosure of at least one stair set in the LAW as soon as possible to improve overall life safety and fire fighting access of the LAW during construction.

A-06-ESQ-RPPWTP-011-O03 -- There was no schedule to conduct a periodic qualitative emergency lighting performance test to demonstrate illumination will provide enough light for personnel to see in the event of power failure.

Observations were issues based on DOE fire protection guidelines rather than regulatory or contractual noncompliances.

Details are contained in the attached report.

Table of Contents

Executive Summary	ii
List of Acronyms	iv
NFPA Standards	iv
1.0 Details.....	1
2.0 Conclusion	4
3.0 Items Opened, Closed, and Discussed	5
Signatures	5

List of Acronyms

BNI	Bechtel National, Inc.
DOE	U.S. Department of Energy
LAW	Low-Activity Waste
NFPA	National Fire Protection Association
SRD	Safety Requirements Document
WTP	Waste Treatment and Immobilization Plant

NFPA Standards

NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 14	Standard for the Installation of Standpipe and Hose Systems
NFPA 101	Life Safety Code®
NFPA 241	Standard for Safeguarding Construction, Alteration, and Demolition Operations

Bechtel National, Inc. (BNI)
Low-Activity Waste (LAW) Facility
Fire Sprinkler System Installation and
Life Safety during Facility Construction

1.0 Details

The Team investigated various performance objectives, using evaluation of documentation and interviews with the Contractor and physical inspection of the LAW Facility sprinkler and standpipe system components and walk down of egress paths in the LAW as the primary methods of data gathering to evaluate the assessment elements. The elements included requirements specified in National Fire Protection Association (NFPA) codes, contract and subcontract requirements and construction safety Federal Code of Regulations.

1.1 Performance Objective FP1

This performance object evaluated if fire sprinkler and standpipe systems in the LAW Facility are being designed and installed in accordance with the Safety Requirements Document (SRD), NFPA and contract requirements. The Team performed the following:

- Reviewed selected submittal sprinkler and standpipe drawings, hydraulic and sway bracing calculations and BNI system specifications for compliance against NFPA requirements and design methodology;
- Reviewed drawings and conducted physical in-plant inspections to determine if the sprinkler and standpipe systems are provided in all areas except as designated by the safety requirements document; and
- The installation of fire sprinkler and standpipe equipment was conducted in accordance with the approved shop drawing submittals, NFPA, and SRD requirements.

The Team concluded BNI met the performance objective but noted one area for improvement which is identified as the following Observation:

A-06-ESQ-RPPWTP-011-001 – Fire sprinkler systems in the LAW were not yet into full compliance with NFPA 13 requirements. The Team noted that while fire sprinklers and standpipes are required to be installed throughout the facility, with exception of sprinklers in specific high radiation areas identified in the SRD, sprinklers have yet to be installed under commodities, ducting, cable trays, etc., because commodities, ducting and cabling has either not all been designed or installed or is in the process of being installed. The Team noted the LAW sprinkler system risers were not installed because the rooms where the sprinkler risers are located were not constructed. Other sprinkler related equipment also was not installed including the system main drain pumps at the -21 elevation and fire alarm connections to monitor the sprinkler system valves. The result of the Team’s review and walk downs was the identification of a number of examples where the system is yet to be in full compliance with NFPA 13. This

may be the result of sprinkler systems being designed and installed before the completion of the facility/commodity design and installation or due to the sprinkler system installation and design not yet being fully completed.

Conclusions for Performance Objective FP1 – Sprinklers and Standpipe Systems

Generally, a comprehensive wet-pipe fire sprinkler and standpipe system is being designed and installed throughout the LAW in the areas expected by the U.S. Department of Energy (DOE). However, the Team observed a number of specific exceptions, including issues with sprinkler coverage, hydraulic demand areas, sway bracing, sprinkler heads, fittings, and the design which may be the result of sprinkler systems being designed and installed before the completion of the facility/commodity design and installation or due to the sprinkler system design and installation not yet being fully completed. Specific exceptions have been documented in the Assessment Notes.

Overall, the Team concluded the chosen sprinkler design density as the technical basis for establishing the system hydraulic design for the LAW sprinkler system was appropriate for the combustibles and commodities which will be installed in a final operating LAW Facility. Once the sprinkler system installation is completed and operational, the Team expect the overall system will be capable of controlling fires in the LAW Facility.

1.2 Performance Objective FP2 – Life Safety

This performance objective was to evaluate whether a reasonable degree of life safety has been provided during LAW Facility construction.

To evaluate this area, the Team:

- Reviewed physical exit and egress arrangements in the LAW Facility during the construction phase to determine if exits are arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied;
- Evaluated fire department access into the LAW Facility to conduct fire fighting operations;
- Evaluated emergency lighting and exits to verify if they readily visible signs are functional to assist personnel in emergency egress needs;
- Reviewed the BNI emergency action plan to determine if it appropriately addresses fire; and
- Evaluated if administrative controls have been appropriately implemented to prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition.

The Team concluded BNI met the performance objective but noted areas for improvement which are identified as the following Observations:

Observations:

A-06-ESQ-RPPWTP-011-O02 – None of the stairwells in LAW were enclosed. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety and fire fighting access of the LAW during construction. The stairways in the LAW Facility were found to be in usable condition at all times but they were not fully enclosed. Although there has not been a large addition of combustible materials installed in the LAW Facility, a large fire in the LAW could occur after large quantities of cabling and other combustibles are installed, spreading smoke throughout the facility and limiting the usefulness of stairways for safe evacuation. Although not required by BNI until the commissioning phase of the project, national fire consensus standard NFPA 241, Section 7.5.6.4, specifies enclosure of at least one stair set when the building exterior walls are in place. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety and fire fighting access of the LAW during construction.

A-06-ESQ-RPPWTP-011-O03 – There was no schedule to conduct a periodic qualitative emergency lighting performance test to demonstrate illumination will provide enough light for personnel to see in the event of power failure. Although a number of emergency lights have been installed and are individually tested as functional throughout the LAW Facility, the Team noted BNI has only conducted a qualitative performance test twice to demonstrate there is a reasonable degree of visibility in the LAW Facility, for personnel evacuation should primary power fail. The test involves isolation of all primary power from the LAW Facility and observation of exit sign and emergency light illumination. Since changes will occur during continued construction in the LAW Facility, including the addition of commodities and walls which will obstruct the current emergency lighting, BNI should consider a periodic schedule to conduct an emergency lighting performance test commensurate with LAW Facility changes necessary to ensure workers can safely exit during the construction phase on LAW.

Conclusions for Performance Objective FP2

A reasonable degree of life safety was provided in the LAW Facility necessary to address emergency egress of workers. BNI has established an emergency action plan which addresses fire. The plan requires the discoverer of a fire to evacuate to a safe location, and notify the Waste Treatment and Immobilization Plant (WTP) Site Security for appropriate response including the Hanford Fire Department.

Paths within the LAW Facility are available for personnel to escape the LAW facility during construction and exits and means of egress are arranged and available as to provide free and unobstructed egress from all parts of the structure at all times when it is occupied. In addition, no lock or fastening has been installed to prevent free escape of workers from the inside of the LAW Facility.

Exits in the LAW Facility were observed to be appropriately marked by illuminated signs and emergency lighting to facilitate safe egress has been installed throughout the facility. The Team noted BNI had only conducted a qualitative performance test on the emergency lighting twice to demonstrate there is a reasonable degree of visibility in the LAW Facility for personnel evacuation should primary power fail. Since changes will occur during continued construction

in the LAW Facility, including the addition of commodities and walls which will obstruct the current emergency lighting, BNI should consider a periodic schedule to conduct an emergency lighting performance test commensurate with LAW Facility changes necessary to ensure workers can safely exit during the construction phase on LAW.

Stairways were observed usable at all times but they were not fully enclosed. Although there was not a large amount of combustible materials installed in the LAW Facility, fire in the LAW could occur after large quantities of cabling and other combustibles are installed, spreading smoke throughout the facility and limiting the usefulness of stairways for safe evacuation. Although not required by BNI until the commissioning phase of the project, NFPA 241, Section 7.5.6.4, specifies enclosure of at least one stair set when the building exterior walls are in place. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety of the LAW during construction.

Fire department personnel also have clear access into the LAW Facility to conduct fire fighting operations but fire fighting access could be improved by enclosing one stairwell providing a safe operational staging area for firefighters who would make entry into the facility during fire fighting activity.

Finally, administrative controls were being implemented to prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition throughout the LAW Facility.

2.0 Conclusion

Following the review of procedures and records, completion of interviews, and physical plant inspection, the Team concluded BNI is in the process of designing and installing a comprehensive wet-pipe fire sprinkler and standpipe system throughout the LAW in the areas expected by DOE. The Team observed a number of exceptions where sprinkler system in the LAW Facility was not in full compliance with NFPA requirements due to the on-going design and installation. These exceptions are included in an overall Observation, which is discussed above and documented in an Assessment Note. However, once the system is completed and fully functional, the Team expect the system to be capable of controlling anticipated fires in the LAW Facility.

The Team also concluded the life safety for construction was appropriate for the current levels of combustible hazards contained in LAW. But since the facility was almost fully enclosed with siding, BNI could improve life safety and manual fire fighting efforts by fully enclosing one stairwell inside the building and conducting a periodic qualitative emergency lighting performance test commensurate with facility configuration changes and additions of combustible materials into the LAW Facility. These improvements to life safety during construction are included in two Observations, as discussed above.

3.0 Items Opened, Closed, and Discussed

Opened

A-06-ESQ-RPPWTP-011-O01	Observation	Fire sprinkler systems in the LAW were not yet into full compliance with NFPA 13 requirements.
A-06-ESQ-RPPWTP-011-O02	Observation	None of the stairwells in LAW were enclosed. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety and fire fighting access of the LAW during construction.
A-06-ESQ-RPPWTP-011-O03	Observation	There was no schedule to conduct a periodic qualitative emergency lighting performance test to demonstrate illumination will provide enough light for personnel to see in the event of power failure.

Closed

None.

Discussed

None.

Signatures

Craig P. Christenson
Lead Assessor

Date

Dale C. West
Assessor

Date

Jeff M. Bruggeman
Assessor

Date

Assessment Note Number: A-06-ESQ-RPPWTP-011

**Assessors: Craig P. Christenson, Lead Assessor
Dale C. West, Assessor
Jeff M. Bruggeman, Assessor**

Dates of Assessment: November 7 through 16, 2006

Areas/Items Inspected: Low Activity Waste Facility Fire Sprinkler System Installation and Life Safety during Facility Construction

The DOE Office of River Protection (ORP) assessors evaluated the Low Activity Waste (LAW) Facility fire sprinkler and standpipe installation and life safety during construction using various performance objectives, including evaluation of documentation and interviews with the Contractor defined personnel as the primary methods of data gathering and facility walk downs as delineated in the attached fire protection program criteria review and approach document (CRAD) to address the following areas:

1. Sprinkler and standpipe systems:

- Comprehensiveness of the fire protection sprinkler/standpipe design.
- Subcontractor submittal shop drawings.
- Hydraulic calculations.
- Seismic sway bracing design.
- Conformance of installed sprinkler related equipment.
- Areas of coverage.

2. Life Safety (during construction):

- Stairway and egress conditions.
- Emergency lighting and exits signage.
- Emergency communications.
- First-Aid Fire-Fighting Equipment.
- Fire fighter access.
- Administrative controls.

The assessors documented the results of the assessment in Attached Performance Objective Criteria.

Submitted By: _____/s/_____ Date: _____11/30/06_____
Craig P. Christenson

Attachment

Performance Objective Criteria

Low Activity Waste Facility

**Fire Sprinkler System Installation and
Life Safety during Facility Construction**

Bechtel National, Inc. (BNI), Waste Treatment Plant (WTP) Facilities

November 7 through 16, 2006

PERFORMANCE OBJECTIVE FP.1

Fire sprinkler and standpipe systems in the Low Activity Waste (LAW) Facility are being designed and installed in accordance with Safety Requirements Document (SRD), National Fire Protection Association (NFPA) and contract requirements.

Criteria:

1. Submittal shop drawings, hydraulic and sway bracing calculations are reviewed by the contractor before the installation of any sprinkler and stand pipe equipment.
2. Sprinkler systems are being provided in all areas except as designated by the safety requirements document.
3. Submittal shop drawings, hydraulic and sway bracing calculations are compliant with NFPA 13 and NFPA 14 requirements.
4. The installation of fire sprinkler and standpipe equipment is being conducted in accordance with the approved shop drawing submittals, NFPA, and SRD requirements.

Approach:

Record Review:

Review shop drawings, hydraulic calculations, sway bracing calculations and other BNI documentation.

Interviews:

WTP fire protection engineers and technician who have oversight of the sprinkler and standpipe design.

Observations:

Verify that the installation compared to the approved submittal drawings and calculations. Evaluate installation against NFPA 13 and NFPA 14 requirements.

PROCESS:

Records Reviewed:

BNI Documents:

- 24590-WTP-SRD-ESH-01-001-02, REV. 4, Safety Requirements Document Volume II, March 6, 2006
- 24590-CM-SRA-PY21-00003, River Protection Project Waste Treatment Plant, Document Design, Supervise, and test the Fire suppression Systems as indicated in the Attached Work Scope to Support the WTP Site, January 6, 2006

- 24590-WTP-3PS-PZ41-T0003, Rev. 3, River Protection Project Waste Treatment Plant Engineering Specification for Wet-Pipe Automatic Fire Suppression Systems and Standpipes, July 26, 2004
- 24590-LAW-P1-P01T-00001 through 00006, River Protection Project Waste Treatment Plant, LAW General Arrangement Plan, elevations -21, 3, 22, 28, 48, 68, various dates
- 24590-LAW-P4-P37T-00001 through 00041, River Protection Project Waste Treatment Plant, LAW Building Fire Protection Piping Ortho various elevations, various dates
- 24590-BOF-C2-C12T-00026, River Protection Project Waste Treatment Plant, Firewater Potable Water Plant Service Air Yard Utility Composite Plan – Area 26, June 21, 2006
- 24590-CM-HC1-PY21-00002-09-00007, River Protection Project Waste Treatment Plant, LAW Standpipe Calculation, November 3, 2005
- 24590-CM-HC1-PY21-00002-09-01, Rev. 00B, River Protection Project Waste Treatment Plant, LAW Hydraulic Calculations for -21 elevation, February 2004
- 24590-CM-HC1-PY21-00002-09-00007, through 00017 and 00056 through 00064, River Protection Project Waste Treatment Plant, LAW Hydraulic Calculations, various dates
- 24590-CM-HC1-PY21-00002-09-00065 through 000101, River Protection Project Waste Treatment Plant, LAW sprinkler brace calculations, various dates
- 24590-LAW-M9-FPW-00001 through 00008, River Protection Project Waste Treatment Plant, LAW Vitrification Building Fire Protection Layout, Various elevations, various dates
- 24590-CM-HC1-PY21-00002, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, March 2005
- 24590-CM-HC1-PY21-00002-16-00003, Rev 00A, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, October 2004
- 24590-CM-HC1-PY21-00002-16-00010, Rev 00B, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, July 2005
- 24590-CM-HC1-PY21-00002-16-00007, Rev 00A, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, January 2005
- 24590-CM-HC1-PY21-00002-16-00008, Rev 00A, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, February 2005
- 24590-CM-HC1-PY21-00002-16-00009, Rev 00A, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, March 2005
- 24590-CM-HC1-PY21-00002-16-00001, Rev 00B, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, March 2005
- 24590-CM-HC1-PY21-00002-16-00011, Rev 00B, River Protection Project Waste Treatment Plant, Patriot Fire Protection, Inc., Material Data Submittal for the fire sprinkler system at WTP, November 2005

DOE and Other Documents:

- U.S. Department of Energy, DOE O 420.1A, Facility Safety, Contract Requirements Document, Attachment 2, May 20, 2002
- U.S. Department of Energy, DOE G-420.1/B-0, Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program, September 30, 1995
- U. S. Department of Energy Contract No. DE-AC27-01RL14136, Waste Treatment and Immobilization Plant Contract, December 2005
- National Fire Protection Association 13, Standard for the Installation of Sprinkler Systems, 1999 Edition
- National Fire Protection Association 14, Standard for the Installation of Standpipe and Hose Systems, 2000 Edition
- FM Global Property Loss Prevention Data Sheet 2-8, Earthquake Protection for Water-Based Fire Protection Systems, May 1999
- A-04-AMWTP-RPPWTP-001-92, ORP Facility Representative Inspection Note, Sprinkler Piping System Installation in the LAW building, April 13, 2004.
- A-04-AMWTP-RPPWTP-003-97, ORP Facility Representative Inspection Note, Sprinkler Piping System Installation in the LAW building follow up, September 30, 2004
- A-04-AMWTP-RPPWTP-004-99, ORP Facility Representative Inspection Note, Sprinkler Piping System Installation in the LAW building, December 14, 2004

Personnel/ Positions Interviewed:

Project Fire Protection Engineers
 Responsible Engineer for Sprinkler Systems
 Subcontractor Field Superintendent
 Subcontractor Sprinkler Designer
 WTP Deputy Safety Assurance Manager

Evolutions/Operations/Shift Performance Observed:

Walk down facility fire sprinkler system in LAW.

RESULTS:

Discussion of Results:

The River Protection Project Safety Requirements Document (SRD), Section 4.5 requires BNI to implement design requirements of DOE O 420.1A into the LAW facility. DOE O 420.1A, Contracts Requirement Document, Section 4.2.2 specifies automatic fire extinguishing systems throughout all significant facilities and in all areas subject to loss of safety class systems, significant life safety hazards, unacceptable program interruption, or fire loss potential in excess of defined limits in accordance with National Fire Protection Association Standards (see Section 4.2). National Fire Protection Association (NFPA) 13, Standard for the Installation of Sprinkler Systems, 1999 Edition, Section 5-1, requires fire sprinkler to be installed throughout the premises.

Appendix K of the SRD also requires sprinklers to be installed throughout the LAW facility in accordance with NFPA 13, with exception of specific areas subject to high radiation, low combustible loading, and areas which will not have permanent access once the facility is operational. The specific areas identified in Appendix K which are excluded from sprinkler protection in the LAW include the following:

Room	Description
L-B025B	Container Transfer Corridor
L-B025C	Container Buffer Store
L-B025D	Container Buffer Store
L-B011C	Pour Cave
L-B013B	Pour Cave
L-B013C	Pour Cave
L-B015A	Pour Cave
L-123	Wet Process Cell
L-124	Wet Process Cell
L-126	Effluent Cell

Finally, DOE O 420.1A, Contract Requirements Document, Section 4.2.2, as implemented through the SRD, requires DOE facilities to also have appropriate equipment to facilitate effective intervention by the fire department, such as an interior standpipe system(s) in multi-story or large facilities with complex configurations. NFPA 14, Standard for the Installation of Standpipe and Hose Systems, specifies the specific design criteria for such system.

To evaluate this performance objective area, the assessors obtained BNI procurement specifications and drawings, subcontractor wet-pipe sprinkler and standpipe submittal and installation shop drawings, sprinkler system hydraulic calculations, and sprinklers sway bracing calculations of the fire sprinkler systems in LAW. The preaction sprinkler systems for the LAW control room and the dry-pipe system for the breathing air process area of LAW was not reviewed by the assessors because these designs have not yet commenced.

Due to the size and complexity of the system and the limited time for this assessment, the assessors conducted a graded approach in evaluating the system. The assessors conducted detailed reviews of select sprinkler and standpipe segments contained in submittal shop drawings, hydraulic calculations, sway bracing calculations and other BNI documentation and compared the documents to the specific requirements of NFPA 13 and the BNI subcontract specifications.

Although the assessors did not conduct a line by line evaluation of the BNI specifications against NFPA 13, the assessors concluded the chosen sprinkler design density as the technical basis for establishing the system hydraulic design for the LAW was appropriate for the combustibles and commodities which will be installed in a final operating LAW facility. Once the sprinkler system installation is correctly completed and operational, the assessors expect the overall system will be capable of controlling fires in the LAW facility.

The assessors reviewed BNI approved Patriot Fire Protection (BNI subcontractor) shop drawings and hydraulic calculations, against contract requirements and the NFPA Codes and BNI Fire Protection system drawings and noted the following exceptions:

- HVAC and electrical chases shown on the Bechtel Fire Protection drawings (24590-LAW-M9-FPW-00002 through 00005) indicate “no sprinkler coverage”. With exception of areas identified in Appendix K of the SRD, fire sprinklers are to be installed throughout the building per NFPA 13, Section 5-1.1.
- Some sprinkler heads were noted on drawings as exceeding the allowable 130 square feet limitation per sprinkler head (i.e., Patriot Fire Protection Drawing, sheet 51, for LAW +48, line #667, line #639). See NFPA 13, Section 5-6.2.1.
- Branch lines and sprinkler heads (Patriot Fire Protection Drawing, sheet 51, for LAW +48, line #639) were noted at a distance of 8 foot from the closest wall. The maximum distance from the wall must exceed 7 ½ feet per NFPA 13, Section 5-6.3.2.
- Branch line sizes for under duct sprinkler branch lines in the -21’ level (Patriot Fire Protection Drawing, sheet 13) were not sized by hydraulic calculations in the remote area and pipe sizes do not match the (hydraulically sized) schedule used in sizing branch lines in the -21’ level in accordance with NFPA 13. (See NFPA 13, Section 8-4.4)
- A note on the Patriot Fire Protection submittal shop drawings indicate that branch line piping may be moved up to 6” in the field to avoid obstructions. The drawings show many sprinkler heads which are already spaced at or near maximum spacing permitted by NFPA. Movement of some sprinkler heads at field discretion could result in over spacing. (See NFPA 13, section 5-5)
- In several instances (e.g., Patriot Fire Protection Drawing, sheet 12, -21’ level, remote area 10016 and sheet 52, +48’ level, remote area 00004) the contractor submittals show fire sprinkler system remote areas spanning more than one fire area which may result in incorrect pipe sizes. The system remote area must be contained within each individual fire area equal to the duration identified in NFPA 13, Table 7-2.2.1. The selected remote area is required to be a rectangular area having a dimension parallel to the branch lines at least 1.2 times the square root of the area of sprinkler operation. The design density was identified in the contract specifications as .17 gallons per minute over 3000 square feet, Ordinary Group II as characterized in NFPA 13, Figure 7-2.3.1.2. The hydraulic calculations must satisfy any single point on the Ordinary Group II curve (Figure 7-2.3.1.2). This allows the selected remote area to be less than 3000 square feet in size if the area enclosed by the 2 hour fire barrier is smaller than 3000 square feet. In accordance with NFPA 13, for areas of sprinkler operation less than 1500 square feet, the sprinkler density for 1500 square feet shall be used (0.20 gpm/ft²).
- Fire walls are not shown on the Patriot Fire Protection fire sprinkler shop drawings as required by NFPA 13, Section 8-1.1 (6).

- The water flow information used for the Patriot Fire Protection hydraulic calculations does not match the information provided in the BNI Contract Scope of Work. The water flow information used for the hydraulic calculations was 117 psi static, 95 psi residual with 1673 gpm flowing. The water flow information provided by the BNI Contract Scope of Work, Section 3.2 (b) was 111 psi static, 87 psi residual, with 1220 flowing.

The assessors also conducted building walk downs to observe and evaluate the on-going sprinkler installation for compliance against contract requirements and the NFPA requirements.

The assessors determined the wet-pipe sprinkler system engineering and installation is not yet completed. The assessors noted fire sprinklers were not installed throughout the facility including, but not limited to, the roof penthouses and under commodities, ducting, cable trays, etc., because commodities, ducting and cabling has all not been designed and installed on all levels throughout LAW. Furthermore, the LAW sprinkler system risers were not installed because the rooms where the sprinkler risers will be located are not constructed. Finally it was noted that -21 elevation system drain pumps and fire alarm connections to monitor the system valves were also not installed.

The assessors walked down a majority of the building to also determine if sprinkler coverage is provided throughout LAW with exception of those areas specified in the SRD. With exception of sprinklers not yet installed under plant commodities, ducting and cable trays required by NFPA 13, and sprinklers installed in HVAC and electrical chases, sprinklers are generally been installed in all areas of the building except as specified in the SRD (e.g. container transfer corridor, container buffer storage, pour cave, wet process cell and effluent cell).

The assessors observed piping installed, sprinkler head locations and types, sway bracing and hangars, stand piping and valves, and other system appurtenances. Since most all of the fire walls have not yet been installed into the facility and due to the height of the sprinkler to ground distance the assessors could not accurately evaluate whether ceiling sprinkler installation spacing was in excess of the requirements of NFPA 13 (e.g. 130 sq. ft head with ½ inch sprinkler orifice).

The assessors also observed Class I (2-1/2 inch outlets for fire department use) wet standpipe system installed per NFPA 14 with hose connections provided in stairwells and other locations necessary to facilitate manual fire fighting in LAW.

The assessors noted a number of miscellaneous system exceptions which could have resulted from the system being not yet completed (in progress) or errors made during the installation of the system. These include the following:

Sway bracing

- Two sway braces were found unattached to the structure in the N.W. stairwell to the -21' level and at the +48 level, south center bay. (See NFPA 13, Section 6-4.5)
- Bent or damaged sway brace on the North East +3 level (See NFPA 13, Section 6-4.5).

- Sway bracing was found not connected to structure but an adjacent sprinkler riser at the +48 level (See NFPA 13, Section 6-4.5).
- The bolt head, located in the N.E. stairwell 28' level, of the cone point set bolt on the TOLCO Figure 800 adjustable sway brace was still intact which indicated that it had not been properly torqued as required by the manufacturers technical data sheet.
- In several locations, the annular space between sprinkler piping and floor penetrations on stair landings were partially filled with wood chocks. Clearance must be provided between piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13, Section 6-4.4.
- A six inch riser in the South side of -21' does not have the 4-way sway bracing as indicted on the contractor submittal drawings. (See NFPA 13, Section 6-4.5)

Sprinkler Coverage

- Sprinklers have not been installed under ductwork over 4 foot width in the -21' level west end in accordance with NFPA. (See NFPA 13, Section 5-5.5.3.1)
- Ductwork located on the west wall of the -21' Boggy Maintenance Area (L-B025A) is blocking the spray pattern of the sprinklers installed on the branch line above it. (See NFPA 13, Section 5-6.5.2)
- Sprinklers installed directly above structural members in the east bay of the +48' level do not meet the NFPA obstruction rules preventing sprinkler discharge pattern development and completing floor water coverage (See NFPA 13, Section 5-6.5.2).
- Sprinklers were not installed in all areas under mezzanines, cable trays, electrical and mechanical chases, and equipment per NPFA. (NFPA 13, Section 5-1.1)
- Sprinkler system risers not installed because the rooms where the sprinkler risers are located are not constructed. Other sprinkler related equipment was also not installed including the system main drain pumps at the -21 elevation and fire alarm connections to monitor the sprinkler system valves.

Sprinkler Heads

- The fire sprinklers installed throughout the building under open grated mezzanines and stairs were not intermediate level type sprinkler heads as required by NFPA (NFPA 13, Section 5-5.5.3.2)
- Several sprinkler heads were observed in the -21' center portion of the building that had been taped up or covered. (NFPA 13, Section 3-2)

- Sprinkler head guards were not installed on sprinkler heads that are subject to physical damage, for example under stairs, below mezzanines, in storage rooms, etc. (NFPA 13, Section 3-2.8, and BNI Sprinkler Engineering Specification 4.2.17)

Fittings

- In several locations (e.g. +48 SE corner of the facility) bushings were used in lieu of one-piece reducing fittings (1 ½ x 1 ¼ x ½) of the appropriate size as required by NFPA. The subcontractor stated that this particular size was unavailable. The assessors were able to find this size fitting available through a regional supplier from Ward Manufacturer. (See NFPA 13, Section 3-5.5 and BNI Sprinkler Engineering Specification 4.2.2)
- Mechanical tees attached to fire sprinkler piping throughout the building did not have the “coupon” attached for verification per BNI Sprinkler Engineering Specification, Section 4.2.4.

Conclusion:

The assessors evaluated select sprinkler and standpipe segments contained in submittal shop drawings, hydraulic calculations, sway bracing calculations and other BNI documentation and compared the documents to the specific requirements of NFPA 13, NFPA 14, and the BNI subcontract specifications. The assessors also conducted building walk downs to observe and evaluate the on-going sprinkler and standpipe installation for compliance against the requirements.

The result of the assessor’s review and walk downs was the identification of a number of exceptions which may be the result of sprinkler systems being designed and installed before the completion of the facility/commodity design and installation or due to the sprinkler system installation not yet being fully completed.

The assessors noted that while fire sprinklers and standpipes are required to be installed throughout the facility, with exception of sprinklers in specific high radiation areas identified in the SRD, sprinklers have yet to be installed under commodities, ducting, cable trays, etc., because commodities, ducting and cabling has either not all been designed or installed or is in the process of being installed. The assessors noted the LAW sprinkler system risers were not installed because the rooms where the sprinkler risers are located are not constructed. Other sprinkler related equipment was also not installed including the system main drain pumps at the -21 elevation and fire alarm connections to monitor the sprinkler system valves.

Generally, a comprehensive wet-pipe fire sprinkler and standpipe system is being designed and installed throughout the LAW in the areas expected by DOE. However, the assessors observed a number of exceptions, including issues with sprinkler coverage, sway bracing, sprinkler heads, fittings, and hydraulic demand areas which must be corrected prior to completion of the system as necessary to meet NFPA 13 requirements.

The assessors concluded the chosen sprinkler design density as the technical basis for establishing the system hydraulic design for the LAW sprinkler system was appropriate for the combustibles and commodities which will be installed in a final operating LAW facility but there were some issues associated in the process of determining the hydraulic remote areas consistent with NFPA requirements. Once the sprinkler system installation is correctly designed, completed and operational, the assessors expect the overall system will be capable of controlling fires in the LAW facility.

Issues:

The fire sprinkler system in LAW is not yet into full compliance with NFPA 13 requirements. Exceptions are noted above.

Appendix
Photographs of Sprinkler System Exceptions Observed in the
Low Activity Waste Facility
During Physical Plant Assessment



Figure 1: Disconnected Sway Bracing at -21 foot elevation



Figure 2: Bent Sway Bracing on North East +28 elevation



Figure 3: Improperly torqued cone point set bolt on “TOLCO” sway brace at N.E. stairwell 28 foot elevation



Figure 4: Sway bracing not connected to structure but other sprinkler piping +48 foot elevation



Figure 5: Combustible wedges left in riser floor sleeves



Figure 6: Paper taped covered sprinkler heads



Figure 7: Incorrect installed heads under mezzanine grates & missing head guards in areas subject to physical damage



Figures 8 and 9: Example intermediate level sprinkler head (left) and sprinkler head guard (right)



Figure 10: Mechanical T's missing 'coupons'



Figure 11: Example mechanical T 'coupon'

PERFORMANCE OBJECTIVE FP.2

A reasonable degree of life safety is provided during construction in the Low Activity Waste (LAW) Facility. (Note: This was added scope. This section will be completed time permitting)

Criteria:

1. Life safety escape routes are provided for personnel throughout the LAW Facility during construction. Exits are arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied. Fire department personnel have clear access into the LAW facility to conduct fire fighting operations. No lock or fastening to prevent free escape from the inside of any building shall be installed. (24590-WTP-PL-IS-O1-OO1, Rev 5 and 29 CFR 1926).
2. At least one stairway is in usable condition at all times and is provided with lighting (NFPA 241 – Guidance)
3. Exits are marked by a readily visible signs and access to exits are marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to personnel (24590-WTP-PL-IS-O1-OO1, Rev 5 and 29 CFR 1926).
4. Emergency lighting and communications to facilitate safe egress has been addressed in LAW (24590-WTP-PL-IS-O1-OO1, Rev 5, NFPA 241)
5. BNI has established an emergency action plan which addresses fire.
6. Administrative controls have been implemented to prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition. (24590-WTP-PL-IS-O1-OO1, Rev 5)

Approach:

Record Review:

Selected contractor fire protection procedures and assessments.

Interviews:

Contractor fire protection engineers, system engineers, and managers; facility managers and selected operators; Line managers through whom fire protection personnel report.

Observations:

Walk down selected facilities with emphasis on life safety elements of this area.

PROCESS:

Records Reviewed:

BNI Documents:

- 24590-WTP-PL-IS-01-001, Rev 5, River Protection Project Waste Treatment Plant, Nonradiological Worker Safety and Health Plan, November 30, 2004
- 24590-WTP-RPT-CON-05-007, Rev 0, River Protection Project Waste Treatment Plant, NFPA Codes and Standards Applicable to Construction Activities Involving Non-Permanent Plant Installation and Maintenance, October 14, 2005
- 24590-WTP-PL-ESH-02-004, River Protection Project Waste Treatment Plant, WTP Fire Protection Program, July 31, 2006
- 24590-WTP-GPP-SIND-003, River Protection Project Waste Treatment Plant, Emergency Action Plan, November 17, 2004
- 24590-WTP-GPP-SIND-026, Rev 3, River Protection Project Waste Treatment Plant Housekeeping and Fire Prevention, December 30, 2004

DOE and Other Documents:

- U.S. Department of Energy, DOE O 420.1A, Facility Safety, Contract Requirements Document, Attachment 2, May 20, 2002
- U.S. Department of Energy, DOE G-420.1/B-0, Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program, September 30, 1995
- U. S. Department of Energy Contract No. DE-AC27-01RL14136, Waste Treatment and Immobilization Plant Contract, December 2005
- National Fire Protection Association 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2004 Edition
- 29 Code of Federal Regulations 1926, “Safety and Health Regulations for Construction”, as amended.
- A-04-AMWTP-RPPWTP-004-71, ORP Facility Representative Inspection Note, WTP construction site-wide take cover drill, November 23, 2004
- A-05-AMWTP-RPPWTP-004-43, ORP Facility Representative Inspection Note, LAW Emergency Drill with Hanford Fire Department, November 16, 2005
- A-06-AMWTP-RPPWTP-001-44, ORP Facility Representative Inspection Note, Response to LAW Fire, February – March 2006
- A-06-AMWTP-RPPWTP-003-6, ORP Facility Representative Inspection Note, Emergency drill in LAB conducted July 11, 2006, July 11, 2006
- A-06-AMWTP-RPPWTP-002-47, ORP Facility Representative Inspection Note, Emergency Preparedness program implementation at the WTP, May 23 through June 1, 2006
- A-06-AMWTP-RPPWTP-003-38, ORP Facility Representative Inspection Note, WTP Take Cover emergency drill conducted August 16, 2006, August 17, 2006
- A-06-ESQ-RPPWTP-001, OPR Assessment Fire Protection Program Implementation, April 17, 2006

Personnel/ Positions Interviewed:

ORP Facility Representative
 WTP Deputy Safety Assurance Manager
 Project Fire Protection Engineers
 Fire Chief Hanford Fire Department
 LAW Electrical Superintendent

Evolutions/Operations/Shift Performance Observed:

Walk down of all personnel accessible spaces in the LAW.

RESULTS:

Discussion of Results:

The River Protection Project Nonradiological Worker Safety and Health Plan describes the responsibilities applicable to Bechtel National, Inc. (BNI) construction activities necessary to address worker safety at the Waste Treatment Plant (WTP).

Section 4.9 of the Nonradiological Worker Safety and Health Plan specifically addresses the specific elements for fire prevention and life safety during WTP construction.

To achieve fire safety, the plan specifies the following elements during construction:

- Comply with 29 CFR 1926, *Safety and Health Regulations for Construction Subparts F, Fire Prevention and Protection, and Subpart J, Welding and Cutting*
- Prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition
- Isolate combustible materials and limit the potential spread of fires by housekeeping in and around the construction site
- Enable fire suppression systems in buildings as soon as technically feasible
- Provide access and life safety escape routes for fire-fighting personnel in each fire area
- Provide emergency lighting and communications to facilitate safe egress
- Quickly communicate a fire's location, size, and other details to construction management so it can determine whether to activate the site emergency management plan

The assessors noted 29 CFR 1926, Subparts F and J do not invoke specific life safety elements necessary to address prompt and safe evacuation of occupants to achieve reasonable degree of life safety from fire provided during construction. Rather, 29 CFR 1926, Subparts F and J specify physical features, including elements such as fire fighting equipment, water supply, portable fire fighting equipment, fire alarm devices, standpipes, smoking and ignition hazards, storage hazards, etc.

Classical life safety from fire would address those construction and occupancy egress features to minimize danger to life from fire, including smoke, fumes, or panic which would allow prompt escape of occupants from the LAW buildings. To some extent, other elements contained in Section 4.9 of the Nonradiological Worker Safety and Health Plan address this including access and escape routes, emergency lighting and communications to facilitate egress and quick communications to activate the site emergency management plan.

Additionally, the LAW facility is currently under construction and is not completed. Therefore, full compliance as an occupied facility under the National Fire Protection Association life safety

code is not expected during construction. However, since workers are inside the recently sided LAW facility, a reasonable degree of life safety should be provided to the workers so they can safely evacuate in the event of a fire.

To evaluate the overall life safety of the current layout of the Low Activity Waste (LAW) Facility the assessors walked all accessible areas of the building and observed a qualitative performance test of the emergency lighting. The assessors noted in progress construction, which included unenclosed stairwells, facility walls and commodities which have not been installed, and the building fire alarm system and sprinkler systems which are not completely installed and in service.

The assessors also reviewed a number of WTP Facility Representative 'inspection notes' related to emergency drills and responses by the Hanford Fire Department. The assessors also interviewed personnel from the Hanford Fire Department to obtain input for areas of concern.

The assessors determined:

- BNI has established an emergency action plan which addresses fire.
- The emergency action plan requires the discoverer of a fire to evacuate to a safe location, and notify WTP Site Security for appropriate response including the Hanford Fire Department.
- Paths within the building are available for personnel to escape the building during construction.
- Exits and means of egress are arranged and available as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied.
- No lock or fastening to prevent free escape from the inside of any building has been installed.
- Stairways are in usable condition at all times but they are not fully enclosed. Although there has not been a large addition of combustible materials installed in LAW, a large fire in the LAW could occur after large quantities of cabling and other combustibles are installed, spreading smoke throughout the facility and limiting the usefulness of stairways for safe evacuation. Although not required by BNI requirements, NFPA 241, Standard Section 7.5.6.4, specifies enclosure of at least one stair set when the building exterior walls are in place. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety of the LAW during construction.
- Fire department personnel have clear access into the LAW facility to conduct fire fighting operations but fire fighting access could also be improved by enclosing one stairwell providing a safe operational staging area for firefighters making entry into the area where a fire might exist.
- Exits are marked by a readily visible signs and access to exits are marked by readily visible signs.
- Emergency lighting to facilitate safe egress has been installed in LAW but a test during this assessment revealed some lighting units did not function and some areas of the facility did not have adequate illumination when the primary power was disconnected.

- Administrative controls have been implemented to prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition.

In a February 2006 ORP assessment, the assessors also reviewed the Construction Fire Prevention and Protection Plan included within the Nonradiological Worker Safety and Health Plan (24590-WTP-PL-IS-01-001). To implement the elements of the Plan, BNI put in place the following administrative controls to govern the fire protection activities at the WTP construction site:

- 24590-WTP-GPP-SIND-009, *Safety Watches*
- 24590-WTP-GPP-SIND-013, *Hazardous Work Permit*
- 24590-WTP-GPP-SIND-026, *Housekeeping and Fire Prevention*
- 24590-WTP-GPP-SIND-035, *Welding and Cutting Safety*

The February 2006 assessment determined these written administrative controls are appropriate for fire safety during the construction of WTP, including controls for housekeeping, control of hot work (e.g., welding and cutting), fire protection/fire fighting equipment (e.g., fire extinguishers, hydrants, etc.), reporting and interfacing with the Hanford Fire Department, control of flammable and combustible liquids, precautions to protect against wild land fires, fire protection design of temporary facilities, and related records documentation and control.

The February 2006 assessment reviewed the fire prevention inspections (field walk downs) reports and found evidence construction site facilities and procedures being implemented to control combustible, flammable, and hazardous materials to minimize the risk from fire. The inspections were being conducted by the area managers with assistance from the craft leads, area Safety Assurance Representatives, and Fire Protection Engineers.

The assessors reviewed a number of ORP inspection notes which documented LAW Facility Representative reviews of LAW emergency drills and responses. Overall, these indicate an affective emergency preparedness program for reporting fires and obtaining appropriate response of the on site fire department.

By walking down the facility the assessors verified the administrative controls continue to be implemented in LAW.

In the past, ORP has found problems with emergency lighting in documented these issues in Corrective Action Report (CAR) 24590-WTP-CAR-QA-05-282. The CAR was noted as being closed and the corrective actions were verified by OPR in a February 2006 assessment (A-06-ESQ-RPPWTP-001). The emergency lighting preventive maintenance procedures were revised to correctly implement the required testing of NFPA 101 Section 7.9.3. Emergency lights previously identified as not being inspected have been entered into the PM database tracking system. A program has been established to install emergency lighting during construction to protect personnel in the event of a loss of normal lighting. Repair of emergency lighting has been scheduled and inspection records are being kept in a retrievable form.

Although a number of emergency lights have been installed and are individually tested as functional throughout the LAW facility, the assessors requested BNI to conduct a qualitative performance test demonstrating there is a reasonable degree of visibility in the LAW for personnel evacuation should primary power fail. The test involved isolation of all primary power from LAW and observation of exit sign and emergency light illumination. The assessors observed the test and noted some areas in the LAW which some emergency lighting units did not function and some areas where illumination was insufficient for personnel to safely see paths of egress. The assessors noted BNI self identified these deficiencies for corrective action.

The assessors interviewed the workers who test the emergency lighting and determined this was only the second time a qualitative test of the emergency lighting was conducted and no schedule to conduct the test is formally in place. Since changes will be occurring during continued construction in LAW, including the addition of commodities and walls which will obstruct the current emergency lighting, BNI should consider a period schedule to conduct an emergency lighting performance test commensurate with LAW facility changes necessary to ensure workers can safely exit during the construction phase on LAW.

Conclusion:

To evaluate the overall life safety of the current layout of the Low Activity Waste (LAW) Facility the assessors walked all accessible areas of the building and observed a qualitative performance test of the emergency lighting. The assessors noted in progress construction, which included unenclosed stairwells, facility walls and commodities which have not been installed, and the building fire alarm system and sprinkler systems which are not completely installed and in service.

The assessors also reviewed a number of WTP Facility Representative 'inspection notes' related to emergency drills and responses by the Hanford Fire Department. The assessors also interviewed personnel from the Hanford Fire Department to obtain input for areas of concern.

The assessors determined BNI has established an emergency action plan which addresses fire and the plan requires the discoverer of a fire to evacuate to a safe location, and notify WTP Site Security for appropriate response including the Hanford Fire Department.

Paths within the building are available for personnel to escape the building during construction in the event of fire and exits and means of egress are arranged and available as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied.

No lock or fastening to prevent free escape from the inside of any building has been installed and stairways are in usable condition at all times but they are not fully enclosed. Although there has not been a large addition of combustible materials installed in LAW, a large fire in the LAW could occur after large quantities of cabling and other combustibles are installed, spreading smoke throughout the facility and limiting the usefulness of stairways for safe evacuation. Although not required by BNI requirements, NFPA 241, Standard Section 7.5.6.4, specifies enclosure of at least one stair set when the building exterior walls are in place. BNI should

consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety of the LAW during construction.

Fire department personnel have clear access into the LAW facility to conduct fire fighting operations but fire fighting access could also be improved by enclosing one stairwell providing a safe operational staging area for firefighters making entry into the area where a fire might exist.

Exits are marked by a readily visible signs and access to exits are marked by readily visible signs. Emergency lighting to facilitate safe egress has been installed in LAW but a qualitative test conducted during the assessment revealed some lighting units did not function and some areas of the facility did not have adequate illumination when the primary power was disconnected. The assessors noted BNI self identified these deficiencies for corrective action.

The assessors determined the qualitative test of the emergency lighting has been only conducted twice and no schedule to conduct this test is formally in place. Since changes will be occurring during continued construction in LAW, including the addition of commodities and walls which will obstruct the current emergency lighting, BNI should consider a period schedule to conduct an emergency lighting performance test commensurate with LAW facility changes necessary to ensure workers can safely exit during the construction phase on LAW.

Finally, administrative controls have been implemented to prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition.

Issues:

None of the stairwells are currently enclosed in the LAW facility. BNI should consider enclosure of at least one stair set in the LAW as soon as practically possible to improve overall life safety of the LAW during construction.

The is no schedule to conduct a periodic emergency lighting performance test to demonstrate illumination will provide enough light for personnel to see in the event of power failure. BNI should consider a period schedule to conduct such a test commensurate with LAW facility changes.