Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

NOV 17 1994

94-PMDA-217

President
Westinghouse Hanford Company
Richland, Washington

Dear Sir:

PROJECT W-405, K BASIN ESSENTIAL SYSTEMS RECOVERY, FIRE PROTECTION SUBPROJECT DESIGN CRITERIA DOCUMENT (WHC-SD-W405-CR-001, REV. 0)

The subject document has been reviewed by RL and is approved upon satisfactory resolution and/or incorporation of the enclosed comments.

The RL Quality, Safety and Health Division (QSH) conducted a review of the Preliminary Fire Hazards Analysis (PFHA) for the 100K Area Buildings 105KE, 105KW, and 190KE. QSH comments are enclosed for resolution and/or incorporation into the PFHA.

If you have any questions, please contact Julie Schmitz on 376-5875.

Sincerely,

J. L. Daily, Acting Director
Nuclear Materials Division

PMD:JKS

Enclosures

cc w/encls:
J. M. Henderson, WHC

RL COMMENTS ON DESIGN CRITERIA DOCUMENTS
PROJECT W-405
K BASIN ESSENTIAL SYSTEMS RECOVERY

NOVEMBER 14, 1994

FIRE PROTECTION SUB-PROJECT DESIGN CRITERIA DOCUMENT

1. The PFHA 105KE/105KW, Section (h), Damage Potential, MPFL indicates that the total estimated values are estimated at a total of approximately $45 million dollars which is near the limit established by DOE 5480.7A, Section 9.b(4) (a) for the addition of redundant fire protection to limit losses, "When the MPFL exceeds $50 million, a redundant fire protection system, will limit the loss to $50 million." Provide additional substantiation as to the thought process for obtaining the loss/cost figures associated with the MPFL in accordance with the guidance provided by C.P. Christenson, RL-QSH, in the cc:Mail, YOUR DSI RE: MPFL FOR PROJECT W-405 DATED OCTOBER 13, 1994, dated October 17, 1994.

2. Suggest changing the wording of the third paragraph of Section 1.2 to read as follows: In June 1994, a Fire Barrier Evaluation was performed by Columbia Energy and Environmental Services, Inc. for the wall between the active and inactive areas of the 105KE and 105KW buildings. This evaluation concludes that the wall is capable of being upgraded to provide an equivalent level of fire resistance as a qualified barrier having a fire resistance rating of 2 hours (Johnson, 1994c).

3. Section 1.4, letter (e), remove the comma following the grouted.

4. Section 1.5, suggest revising the first sentence to read, "In the event that fire protection upgrades were not implemented for 105KE, 105KW, and 190KE, the potential for a fire loss and subsequent clean-up and restoration effort, would have a severe programmatic impact on the operation of the K Basins."

5. Section 2.1 should include a statement regarding the necessary tie-in to be provided for the sprinkler system for the maintenance/support offices. The Design Criteria document for that subproject states that the fire protection subtask will provide the tie-in to the fire water supply.

6. Suggest revising Section 2.3 as follows: The existing wall between active and inactive areas of the 105KE and 105KW facilities shall be modified to provide an equivalent level of fire resistance to that of a qualified 2-hour fire rated barrier in accordance with DOE 5480.7A, *Fire Protection*, and DOE 6430.1A, *General Design Criteria*. The recommendations of WHC-SD-W405-PD-001 (Johnson, 1994c) shall be implemented to modify the existing wall to the required equivalent level of fire resistance.

   The existing wall between 190KE and 165KE shall be modified to provide an equivalent level of fire resistance to that of a qualified 2-hour fire rated barrier. This wall consists of reinforced concrete, 18 in.

thick. The tunnel opening at each end of the below grade area of 190KE will not require any additional sealing or modification. All remaining unsealed penetrations in the barrier will be upgraded to 2 hour fire resistance and all doors will be upgraded to 1-1/2 hour fire rated doors.

The operating floor of Building 190KE shall be sealed off to provide an equivalent level of fire resistance to a qualified 2-hour fire rated barrier. Stairways shall ....

7. Section 4.1.1, reword paragraph 3 to include the suggested wording: "A Hazard and Operability Report (HAZOP) will be prepared during the design phase to identify risks and hazards associated with construction and operation for this subproject. This information shall be incorporated into the design media as applicable."

RL-QSH COMMENTS
PRELIMINARY FIRE HAZARDS ANALYSIS
for the 100K Area
Buildings 105KE, 105KW, and 190KE

NOVEMBER 14, 1994

1. Recommendation 1 for 105KE/105KW: change "manor" to "manner".

2. Recommendation 4 for 105KE/105KW: change "rest" to "entire".

3. No mention of protection for the void space between the two roof structures over the 105KW basin area is included in the recommendations.

4. Recommendation 6 for 190KE: change "rest" to "entire".

5. The purpose of the PFHA was to look at the changes to be implemented by W-405 and if the facilities would meet the objectives of DOE 5480.7A when it is completed. This has not been consistently applied through the document, some areas only addressed only the present conditions. Refer to 190KE Section (c) Fire Protection Features (Fire Alarm and Detection and Fire Barriers), 190KE Section (d) MCFL as examples.

6. 190KE, Section (d), MPFL total cost doesn't add up, should be 7.5 million.

7. 190KE, Section (d), MCFL - change "server" to "severe"

8. 190KE, Section (d), MCFL - the total loss amount addresses the value of the material "presently" stored in the facility, in lieu of what is anticipated to be stored in the facility and the cost of any new equipment to support the new use of the facility. This should be corrected.

9. 190KE, Section (j), Recovery Potential: The conclusion that a fire in this facility would not immediately impact the K Basin mission appears to be in contrast to statements made in the Design Criteria Document for the project. This item should be clarified to show agreement between the two documents.

10. 190KE, Section (n), Natural Hazards: Again, a conclusion is stated that the mission of K-Basins will not be critically effected by the loss of the 190KE building. This statement is in contrast with the Design Criteria Document for the project. This point should be clarified to show agreement between the two documents.

11. 190KE, Section (n), Natural Hazards: Conclusive statement regarding the impact on fire safety due to earthquake is needed.

12. 190KE, Section (o), Exposure Fire Potential, East: change "replaces" to "replaced".

13. 190KE, Section (o), Exposure Fire Potential, South: clarify how the openings will be sealed, i.e. fire rated seals of smoke and hot gas seals.

14. 105KE/105KW, Section (a), Description of Construction: There is no description of the below grade area beneath the offices which is active.

15. 105KE/105KW, Section (h), Damage Potential, MPFL: Original comments to the draft PFHA requested additional substantiation as to the thought process for obtaining the loss/cost figures associated with the MPFL. This has not been provided.

16. 105KE/105KW, Section (h), Damage Potential, MCFL: Statement is included which reads "The fuel storage basins have no material susceptible to fire except portions of the roof covering." WHC needs to address the potential effects which transient combustibles in the area may have on the MCFL.

    Similar types of roofing systems were fire tested as well as involved in fires in the mid to late 1950's. Results showed that small fires originating in facilities would ignite this type of roof construction. The roof construction once ignited resulted in flame propagation across the roof and roof collapse. Prior to roof collapse, melting and vaporization of the asphalt/tar resulted in a) dripping of the asphalt/tar through joints in the decking and b) flaming across the underside of the roof deck.

    Factory Mutual identifies the construction of the roof over both facilities as combustible and that the construction can provide fuel that will contribute significantly to an interior fire.

    Results of this testing and fire experience resulted in requirements for sprinklers to be installed beneath these types of roof systems.

    Also, it is documented that fire can spread both horizontally and vertically beyond the area of fire origin and through compartments or spaces which do not contain combustibles. Heated unburned pyrolysis products will mix with fresh air and burn as they flow outward. This results in extended flame movement under ceilings, up walls and through vertical openings.

RELEASE AUTHORIZATION

Document Number:	WHC-SD-W405-CR-001, REV 0
Document Title:	Design Criteria Document, Fire Protection Task, K Basin Essential Systems Recovery, Project W-405
Release Date:	12/13/94

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz — December 13, 1994

SUPPORTING DOCUMENT

1. Total Pages 47

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Design Criteria Document, Fire Protection Task, K Basin Essential Systems Recovery, Project W-405	WHC-SD-W405-CR-001	0

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Project W-405, K Basins, Fire Protection, 105KE, 105KW

APPROVED FOR PUBLIC RELEASE

KMB 12/13/94

6. Author

Name: B. H. Johnson

B.H. Johnson 12/6/94

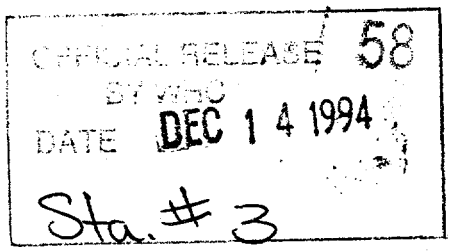
Signature

Organization/Charge Code 7FA20/L123B

7. Abstract

This Design Criteria Document provides the criteria for design and construction of fire protection modifications for the 105KE, 105KW and 190KE Buildings that are essential to reduce the risk of fire and protect the safe operation and storage of spent nuclear fuel in the K Basin facilities.

8. RELEASE STAMP



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DESIGN CRITERIA DOCUMENT
FIRE PROTECTION TASK
K BASIN ESSENTIAL SYSTEMS RECOVERY, PROJECT W-405

Issued by:
WESTINGHOUSE HANFORD COMPANY
December 8, 1994
for the
U.S. DEPARTMENT OF ENERGY
RICHLAND FIELD OFFICE
RICHLAND, WASHINGTON

PREPARED BY:

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Project Engineering & Integration — 11/3/94 Date

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DEPARTMENT OF ENERGY APPROVAL:

U. S. Department of Energy
Richland Field Office — 11-18-94 Date

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1.0 INTRODUCTION

1.1 Purpose

The purpose of Project W-405's Fire Protection Task is to correct Life Safety Code (NFPA 101) non-compliances and to provide fire protection features in Buildings 105KE, 105KW and 190KE that are essential for assuring the safe operation and storage of spent nuclear fuel at the 100K Area Facilities' Irradiated Fuel Storage Basins (K Basins).

1.2 Background

The K Basins were constructed in the early 1950's with a 20 year design life. The K Basins are currently in their third design life and are serving as a near term storage facility for irradiated N Reactor fuel until an interim fuel storage solution can be implemented.

In April 1994, Project W-405, K Basin Essential Systems Recovery, was established to address (among other things) the immediate fire protection needs of the 100K Area.

In June 1994, a Fire Barrier Evaluation was performed by Columbia Energy and Environmental Services, Inc. for the wall between the active and inactive areas of the 105KE and 105KW buildings. This evaluation concludes that the wall is capable of being upgraded to provide an equivalent level of fire resistance as a qualified barrier having a fire resistance rating of 2 hours (Johnson, 1994c).

In July 1994, Project W-405 procured the consulting services of Columbia Energy and Environmental Services, Inc., of Richland, Washington, to provide technical assistance in assessing the fire protection needs of the active 100K Area facilities assuming a limited remaining service life of 6 to 12 years. The consultants identified immediate fire protection needs in the 105KE, 105KW and 190KE Buildings (Johnson, 1994a).

In November 1994, a Preliminary Fire Hazards Analysis (FHA) was prepared by the K Basins Engineering organization to support the basis and justification for the scope of this project (Schmidt, 1994).

Also in November, DOE-RL Project Management Division provided their position on "Conditional Acceptance of Fire Protection Plans for Project W-405" (Schmitz, 1994). This document addresses the items required to be considered, administrative controls required, modifications necessary to be completed in order to support DOE-RL's concurrence with fire protection equivalency requests needed for the W-405 Fire Protection Task scope. (Schmitz, 1994) is included with this Criteria Document as Attachment 1.

The Fire Protection Task is one of four separate Tasks included within the scope of Project W405, K Basin Essential Systems Recovery. The other three Tasks are the Water Distribution System Task, the Electrical System Task, and the Maintenance Shop/Support Facility Task.

1.3 Project Description

The Fire Protection Task shall:

(1) Install an automatic fire suppression system to protect the operating floor of Building 190KE and the exterior of the enclosed office structure proposed by the Maintenance Shop/Support Facility Task. The Maintenance Shop/Support Facility Task shall provide for fire protection within the enclosed office structure and any special fire protection needs related to shop layout or operations.

(2) Obtain an RL approved equivalency from requirements to install automatic fire suppression system in the below grade area of Building 190KE in accordance with (Schmitz, 1994) and paragraph 1.4.1 below.

(3) Install supervised fire detection, alarm and communications systems, emergency lighting, and exit signs on the operating floor area of the 190KE building.

(4) Seal all penetrations in the asbestos-cement (transite) panelled north and south exterior walls of 190KE.

(5) Complete the installation of automatic fire suppression systems within the office areas of buildings 105KE and 105KW (these areas are presently approximately 60% covered), including the vestibule and foyer area between the office areas leading to the inactive areas of the building.

(6) Install automatic fire suppression systems in the chiller, fuel storage basin and transfer areas of buildings 105KE and 105KW.

(7) Install an automatic fire suppression system in the void space beneath the standing metal seam roof structure over the 105KW fuel storage basin.

(8) Install automatic fire suppression systems in the Exhaust Fan Room area beneath the office areas of buildings 105KE and 105KW.

(9) Install supervised fire detection, alarm and communications systems, emergency lighting and exit signs in the active areas (office, chiller, basin and transfer areas) of buildings 105KE and 105KW.

(10) Modify the existing wall between active and inactive areas of buildings 105KE and 105KW to provide an equivalent 2-hour fire rated barrier. Obtain an RL approved equivalency for this barrier in accordance with (Schmitz, 1994) and paragraph 1.4.2 below.

(11) Install supervised fire detection, alarm and communications systems, emergency lighting, and exit signs in all the active areas (office, chiller, basin and transfer areas) of buildings 105KE and 105KW.

1.4 Equivalency Requirements

1.4.1 190KE - Below Grade Area

An RL approved equivalency from requirements to install automatic fire suppression system in the below grade area of Building 190KE shall be obtained in accordance with the conditional requirements of (Schmitz, 1994). This equivalency is contingent on the actions summarized as follows:

(a) Install sprinklers throughout the new office and maintenance structure in accordance with NFPA 13 according to the appropriate hazard classification.

(b) Install sprinklers to protect the 190KE shell structure surrounding the new office and maintenance facility in accordance with NFPA 13 according to the appropriate hazard classification.

(c) Seal off the two stairways leading from the operating floor to the below grade level with a 2-hour fire rated enclosure.

(d) Install steel plate over the approximate 16'0" by 25'0" grated opening which presently allows for communication between the operating floor and below grade areas. The steel plate will be of equal thickness to the existing steel plates in other floor separations in the building.

(e) Seal unsealed pipe and conduit penetrations between the operating floor and below grade areas of 190KE and between the 165KE and 190KE buildings to provide 2-hour fire rated seals. Poured, or grouted in place penetrations containing piping or conduit will require no additional work. Unsealed sleeved penetrations will require 2-hour fire rated seals. The tunnel opening at each end of the below grade area of 190KE will not require any additional action or modification.

(f) Upgrade the existing doorway between the 190KE and 165KE buildings with a 1½-hour fire rated doorway.

(g) Install and maintain NFPA 101, Life Safety Code features and any other applicable fire protection requirements of DOE 5480.7A and RLID 5480.7, for the operating floor area of 190KE. The Maintenance Shop/Support Facility Task shall provide for Life Safety Code compliance within the enclosed office structure and any special Life Safety features related to shop layout or operations.

(h) Implement strict administrative controls for access to the below grade area. Entrances to the below grade area shall be under lock and key. Access shall not be permitted to this area with the exception of necessary inspection or maintenance activities.

(i) Remove all transient combustibles from the below grade area and establish strict control of transient combustibles for the entire 190KE building.

(j) Disallow storage or other uses of the below grade area of the building (signs to this effect shall be required on each entrance to the below grade area). In the event that this area is to be used for storage or any other purpose, the appropriate automatic fire suppression system shall be required.

(k) Establish an inspection program for sealed floor and wall penetrations to ensure that the configuration remains in the same (or better) condition as the configuration approved by the equivalency.

1.4.2 105KE and 105KW - Fire Barrier

An RL approved equivalency shall be obtained for the wall between the active and inactive areas of the 105KE and 105KW buildings as an equivalent 2-hour fire rated barrier in accordance with the conditional requirements of (Schmitz, 1994). This equivalency is contingent on the actions summarized as follows:

(a) Seal unsealed pipe and conduit penetrations between the active and inactive areas of both the 105KE and 105KW facilities with 2-hour fire rated penetration seals. Those penetrations which were either poured in place or grouted in place will require no additional work. Unsealed sleeved penetrations will require 2-hour fire rated seals.

(b) Install sprinklers throughout the active areas of both buildings and in accordance with NFPA 13 for the appropriate hazard classification. This includes sprinklers over the chiller, basin, and fuel transfer areas of each of the facilities due to the combustible construction of the roof. Sprinklers shall also be required in the Exhaust Fan Rooms beneath the office areas of both buildings due to active MCC equipment. Sprinklers (or suitable

alternative protection allowed by NFPA 13) will be required in the concealed space between the new and old roofing systems over the basin area of 105KW.

(c) NFPA 101, Life Safety Code requirements, including travel distance from the Exhaust Fan Room, emergency lighting and alarm system requirements, will be reviewed for the active portion of both buildings and upgraded as necessary.

(d) Upgrade doors in the proposed fire barrier wall between active and inactive areas to 1½-hour fire rated doorways in both buildings.

(e) Remove all transient combustibles from inactive areas and establish strict control of transient combustibles for the all (active and inactive) areas of both buildings.

(f) Establish an inspection program for sealed floor and wall penetrations to ensure that the configuration remains in the same (or better) condition as the configuration approved by the equivalency.

(g) Carry out any additional upgrades to the wall that may be recommended by the Final Fire Hazards Analysis for these buildings. The Final FHA is currently scheduled for completion in January 1995.

1.5 Basis of Need

In the event that fire protection features were not implemented for the 105KE and 105KW buildings, an unmitigated fire and subsequent clean-up and restoration effort, would have a severe programmatic impact on the operation of the K Basins. A fire would unnecessarily jeopardize and delay the accomplishment of Tri-Party Agreement Milestones related to relocation of spent nuclear fuel away from the Columbia River and is not in the best interest of public safety or the environment.

Fire protection features are required to be installed in the 190KE building to support implementation of the Maintenance Shop/Support Facility.

The scope of the Project W-405 Fire Protection Essential Systems Recovery Task will address the immediate fire protection needs for the 100K Area. These needs are based on:

- Correcting life safety deficiencies (Johnson, 1994a and Johnson, 1994b).
- Consideration of the recommendations of Columbia Energy and Environmental Services, Inc. (Johnson, 1994a).

- Reducing the risk of fire placed on active areas of 105KE and 105KW facilities (Johnson, 1994a, Johnson, 1994b and Johnson, 1994c).

- Implementation of the recommendations of the Preliminary Fire Hazards Analysis for the 105KE, 105KW and 190KE facilities prepared by K Basins Engineering (Schmidt, 1994).

- Implementation of the Conditional Acceptance of Fire Protection Plans for Project W-405 (Schmitz, 1994).

2.0 PERFORMANCE REQUIREMENTS

Fire protection system recovery actions performed under this task shall be designed for 20 years of operation. The systems must continue to be functional following completion of the spent nuclear fuel storage mission at the K Basins (presently targeted for December, 2002) in support of decontamination and decommissioning of the 100K Area facilities.

The requisite level of performance of fire protection systems upgraded and installed by this task shall be assured through compliance with the mandatory fire protection criteria contained in DOE 5480.4 Attachment 2, Section 2.C, DOE 5480.7A, RLID 5480.7, National Fire Protection Association (NFPA) Codes and Standards, DOE 6430.1A, and related DOE Orders, Directives and Standards.

Application of fire protection criteria, Codes and Standards, is summarized below:

2.1 Automatic Fire Suppression Systems

Sprinkler systems shall include a water flow alarm and check valve with electrically operated attachments in accordance with NFPA 13, *Installation of Sprinkler Systems*, and NFPA 72, *National Fire Alarm Code*.

The design and completion of automatic sprinkler systems in the Building 105KE and 105KW office, vestibule and foyer areas involves adding on to the existing sprinkler system in these areas and shall be consistent with the Ordinary Hazard Occupancy (Group 1) of NFPA 13. The new automatic suppression system that will be installed in the exhaust fan room areas of 105KE and 105KW, as well as the system installed in the chiller, fuel storage basin, and transfer areas shall also be consistent with the Ordinary Hazard Occupancy (Group 1) classification of NFPA 13. This classification is given to areas where combustibility is low, quantity of combustibles is moderate, stockpiles of combustibles do not exceed 8 ft., and fires with moderate rates of heat release are expected.

The automatic fire suppression system for the operating floor of Building 190KE shall be designed in accordance with NFPA 231, *General Storage*, for Class IV commodities. Class IV commodities include measurable amounts of

items with plastic parts, wood or metal framed upholstered furniture with plastic covering and/or padding, and insulated conductor and power cable on reels or in cartons.

The suppression system installed in building 190KE shall interface with and facilitate the tie-in to the sprinkler system that will be installed by the Maintenance Shop/Support Facility.

All new sprinkler lead-ins shall be at least 6 inches in diameter unless hydraulic calculations substantiate the use of a 4 inch diameter lead-in. In no case shall the lead-in be smaller than the size of the sprinkler riser. All lead-ins shall be connected with the sprinkler system at the base of the riser. Alarm valves shall be located as close as practical to the building entry point.

An allowance of 500 gpm shall be included for hose streams in all sprinkler flow calculations.

All sprinkler or other automatic suppression system components shall be UL-listed or FM-approved for service in fire protection applications.

2.2 Fire Detection, Alarm and Communications Systems

All fire alarm systems shall be provided in accordance with Sections 28-3.4 and 7-6 of NFPA 101, *Life Safety Code*, NFPA 72, *National Fire Alarm Code*, and SDC-7.8, *Standard Electrical Design Criteria for Fire Alarm Systems*.

Each fire alarm system shall be capable of detecting the operation of signal-initiating devices, such as flowswitches and manual pull stations, and shall initiate a signal through the local fire alarm panel which will alarm locally and transmit a coded signal to the Hanford Fire Department, 200 Area Fire Station, via a Radio Fire Alarm Reporting (RFAR) box. The capability to detect and transmit supervisory and trouble signals via the fire alarm panel trouble contacts shall also be provided.

Each fire alarm system shall be capable of annunciating at least three separate conditions: 1) a fire alarm, 2) a supervisory alarm, and 3) a trouble signal indicating a fault in either of the first two. Annunciation of each condition shall be separate and distinct from the other two.

The system shall be provided with an emergency battery backup system sized for a minimum of 60 hours of operation.

2.3 Fire Barriers

The existing wall between active and inactive areas of the 105KE and 105KW facilities shall be modified to provide an equivalent level of fire resistance to that of a qualified 2-hour fire rated barrier in accordance with DOE 5480.7A, *Fire Protection*, and DOE 6430.1A, *General Design Criteria*. The

recommendations of WHC-SD-W405-PD-001 (Johnson, 1994c) shall be implemented to modify the existing wall to the required equivalent level of fire resistance.

The existing wall between 190KE and 165KE shall be modified to provide an equivalent level of fire resistance to that of a qualified 2-hour fire rated barrier. This wall consists of reinforced concrete, 18 in. thick. The tunnel opening at each end of the below grade area of 190KE will not require any additional sealing or modification. All remaining unsealed penetrations in the barrier shall be upgraded to 2-hour fire resistance and all doors shall be upgraded to 1½-hour fire rated doors.

The operating floor of Building 190KE shall be sealed off to provide an equivalent level of fire resistance to a qualified 2-hour fire rated barrier. Stairways shall be sealed off with a 2-hour fire rated enclosure. Steel plate shall be installed over the approximate 16'0" by 25'0" grated opening which presently allows for communication between the operating floor and below grade areas. The steel plate will be of equal thickness to the existing steel plates in other floor separations in the building. Unsealed pipe and conduit penetrations between the operating floor and below grade areas of 190KE and between the 165KE and 190KE buildings shall be modified to provide 2-hour fire rated seals. Poured, or grouted, in place penetrations containing piping or conduit will require no additional work. Unsealed sleeved penetrations require 2-hour fire rated seals.

Approved equivalencies shall be obtained for these barriers in accordance with the conditions set forth by DOE-RL (Schmitz, 1994).

All new fire doors shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Windows*.

UL-listed and/or FM-approved doors, fire stopping material and configurations shall be used.

3.0 PROJECT INTERFACES

3.1 Civil/Structural

Installation of sprinkler piping in the 105KE, 105KW, and 190KE Facilities shall interface with facility structural components.

The additional weight of fire suppression system piping, fittings and valves to that weight already supported by the 105KE, 105KW and 190KE superstructures is expected to be negligible. This expectation will be evaluated and addressed during system design.

3.2 Utilities

3.2.1 Water

The Water Distribution Task will provide a dedicated fire water supply system at the 100K Area that makes use of the existing service water system piping to the maximum extent possible. The Water Distribution Task includes installation of two new fire pumps, one electric and one diesel, each with the capacity to pump 1,500 gpm at 100 psi.

Water for fire protection systems at the 100K Area is made available through existing service water system piping. All new automatic fire suppression systems shall interface with this piping as configured by the Water Distribution Task.

Tie-ins to water systems, including approval of system design, require the approval of the 100K Area Site water purveyor, K Basins Engineering and Spent Nuclear Fuel Safety.

3.2.2 Electrical

Modifications to the fire alarm system circuitry in the 105KE and 105KW Facilities shall interface with the existing electrical power supply for fire alarms in these facilities.

All electrical work shall comply with NFPA 70, *National Electrical Code* and ANSI C2, *National Electrical Safety Code*.

4.0 GENERAL REQUIREMENTS

4.1 Safety

4.1.1 Safety Analysis

The Safety Basis for the irradiated fuel storage at the 100K Area is contained in WHC-SD-WM-SAR-062 (WHC 1993a), WHC-SD-WM-OSR-006 (WHC 1993b), WHC-SD-NR-TA-020 (WHC 1992), and WHC-SD-NR-HC-002 (WHC 1991).

Fire protection and related systems, AC and DC power distribution systems, and building structural components at the 100K Area are Safety Class 3 systems (Langevin 1993).

Construction and operation of fire protection features in building 190KE involves hazards that are routinely encountered and accepted in the course of everyday living by the vast majority of the general public. Construction and operation of fire systems in building 190KE is designated as a Hazard Type - Normal Public Risk (NPR).

Buildings 105KE and 105KW are non-reactor nuclear facilities which require special consideration for potential hazards during construction and operation.

Section 4.5 concludes that there is no adverse impact on the operability of Safety Class equipment or criticality safety due to the proposed fire protection features.

A Safety Evaluation shall be performed during detailed design to assure that the proposed changes to the 105KE, 105KW and 190KE buildings do not present an unreviewed safety question as required by WHC-CM-1-3 *Management Requirements and Procedures*. In addition, a Hazard and Operability (HAZOP) shall be prepared during detailed design to identify risks and hazards associated with construction and operation of the proposed fire protection systems. The results of the HAZOP shall support the Safety Evaluation and shall be considered during construction planning to minimize the risk to construction workers.

Safety reviews performed during normal planning, design, and execution of the project will mitigate identified hazards associated with construction and operations in this building.

4.1.2 Industrial Safety

All construction work shall be performed in accordance with WHC-CM-4-3 *Industrial Safety Manual*. Off-site sub-contractors, if utilized, shall be required to follow all OSHA safety requirements.

4.2 Industrial Hygiene

All construction work shall be performed in accordance with WHC-CM-4-40 *Industrial Hygiene Manual*. Off-site sub-contractors, if utilized, shall be required to follow all OSHA safety requirements.

4.3 Environmental Protection and Compliance

All applicable State and regional environmental regulations in addition to required National Environmental Policy Act (NEPA) documentation shall be met.

The requirements of WHC-CM-7-5 *Environmental Compliance* shall be followed in handling and disposing of asbestos or other hazardous materials which may be encountered during construction.

Identification of environmental requirements (i.e., permitting, cultural resource clearance, etc.) shall be made through the point of contact within the Project Services organization in accordance with WHC-CM-7-5.

4.4 ALARA

Construction will require work in radiologically controlled areas in some facilities. All radiological work shall be accomplished in accordance with WHC-CM-1-6 *WHC Radiological Control Manual*. All construction work shall be coordinated with K Basins Radiological Control personnel.

4.5 Operational Requirements

Fire protection systems shall be designed to meet the applicable seismic requirements of the Uniform Building Code (UBC) and applicable National Fire Protection Association (NFPA) Standards.

Fire protection systems that are designed to meet the applicable seismic requirements of the Uniform Building Code (UBC) and applicable National Fire Protection Association (NFPA) Standards that are not designed to mitigate design basis accidents, insure safe shutdown of a facility process, or prevent a safety class system from performing it's intended function do not require additional seismic qualification analysis (Holten 1993).

There are no Safety Class 1 systems, structure or components in Building 190KE. The only Safety Class 1 systems, structures or components in Buildings 105KE and 105KW are the reinforced concrete fuel storage basin structure, the underwater storage racks and railcar control bumpers affixed to building structural columns (Langevin 1993). The basin structure, underwater storage racks and railcar bumpers are passive, rugged components the safety function of which would not be adversely affected by a failure of a fire protection system during a seismic event.

The 105KE and 105KW buildings contain fissionable materials and have been designated Category B areas to assure criticality safety during firefighting activities (Jensen, 1994). In a Category B area, water is allowed to be used in any form and in any amount for fighting fires (WHC-CM-4-29 *Nuclear Criticality Safety Manual*).

Construction work shall be coordinated with K Basins Operations and K Basins Work Control Organizations. Security Maintenance is required to be present for any work that affects security related electrical systems.

A turnover checklist shall be prepared by the project and approved by K Basins Operations. This checklist shall specify completion of appropriate operator training and acceptance requirements for turnover to the K Basins organization.

Project related power outages in the 105KE and 105KW Facilities shall be coordinated with Security Operations, the Hanford Fire Department (HFD), and WHC Fire Protection Programs (WHC-FPP), with 24-hour notice required. Additionally, 100K Area water system outages required for system installation shall be coordinated with the HFD and WHC-FPP with 24-hour notice required.

4.6 Access and Administrative Requirements

The scope of work requires access to the fuel storage basin and transfer areas within buildings 105KE and 105KW. When accessing these areas, workers shall follow the requirements for security escorts in effect as dictated by the K Basins Operations Shift Manager.

4.7 Quality Assurance (QA)

The contractors involved in the design, construction, testing, and inspection associated with this proposed Project effort shall establish a Quality Assurance Program Plan (QAPP). This Program shall adhere to the applicable programmatic requirements defined by Subpart A, General Provisions, of 10 CFR 830, Nuclear Safety Management, Section 830.120, Quality Assurance Requirements (10 CFR 830), and by the American Society of Mechanical Engineers (ASME) NQA-1-1989, Quality Assurance Program Requirements for Nuclear Facilities. Prior to implementation, the QAPP shall be submitted to Westinghouse Hanford Company (WHC) Spent Fuel Support Projects Management for concurrence. The contractors shall, upon WHC request, submit the Project QAPP implementing procedures for WHC review and concurrence.

The contractors shall provide access to all project related documents, files, and work stations for the purposes of audit or surveillance of ongoing activities contracted by WHC, and/or it's agents. The contractors shall provide support, as requested, for audits or surveillances to be conducted by other project participants.

4.8 Maintenance

All new or upgraded equipment installed under the Fire Protection Task shall be as interchangeable as practical with other existing or planned systems to simplify maintenance related problems. All equipment shall be designed to permit safe operation and easy access for maintenance and testing.

Routine maintenance at intervals as specified by manufacturer's recommendations, Codes and Standards, or as specified by WHC-CM-4-41 *Fire Protection Program Manual* will be required for equipment installed by the Fire Protection Task. Routine testing and maintenance will be performed by the Hanford Fire Department Fire System Testing and Maintenance Organization in accordance with a memorandum of understanding to be negotiated.

4.9 Materials

All materials, components and systems shall comply with applicable NFPA Codes and Standards. Only UL-listed or FM-approved components (for fire protection service) shall be used as applicable and available.

4.10 Testing

Following installation, testing of new or upgraded systems shall be performed to demonstrate operability per the manufacturer's recommendations, NFPA Codes and Standards or as directed by WHC-CM-4-41.

Acceptance Test Procedures shall be reviewed and approved by the HFD Fire System Testing and Maintenance Organization, reviewed and witnessed by a member of the WHC-FPP staff or a Fire Protection Engineer within the K Basin Safety Organization, and reviewed, approved and witnessed by K Basins Engineering. The HFD Fire System Testing and Maintenance Organization shall participate in all operational and acceptance test activities.

4.11 Design Format

Design documentation shall integrate the use of system/component numbering and identification, modification of existing drawings, and drawing traceability between new and existing drawings.

In accordance with WHC-CM-6-2 *Project Management* the cognizant engineer shall ensure the adequacy of the design review to support the user/sponsor needs and shall sign the appropriate design documentation to indicate this approval.

5.0 CODES AND STANDARDS

Project design and construction shall be in accordance with the latest edition of the following codes, standards and criteria at the time that detailed design commences unless specifically exempted by DOE waiver:

ASME, *Quality Assurance Program Requirements for Nuclear Facilities*, ASME NQA-1, American Society of Mechanical Engineers, Fairfield, New Jersey

DOE, 1989, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1993, *Hanford Plant Standards (HPS) Program*, DOE/RL 6430.1C, SDC-7.8, "Standard Electrical Design Criteria for Fire Alarm Systems," U.S. Department of Energy Richland Field Office, Richland, Washington

ANSI, *National Electrical Safety Code*, ANSI Standard C2, American National Standards Institute, New York, New York

UBC, *Uniform Building Code*, International Conference of Building Officials, Whittier, California

NFPA, *Standard on Installation of Sprinkler Systems*, NFPA 13, National Fire Protection Association, Quincy, Massachusetts

NFPA, *National Electrical Code*, NFPA 70, National Fire Protection Association, Quincy, Massachusetts

NFPA, *National Fire Alarm Code*, NFPA 72, National Fire Protection Association, Quincy, Massachusetts

NFPA, *Life Safety Code*, NFPA 101, National Fire Protection Association, Quincy, Massachusetts

NFPA, *General Storage*, NFPA 231, National Fire Protection Association, Quincy, Massachusetts

WAC 248-54, "Public Water Supplies," *Washington Administrative Code*, as amended

WHC-CM-1-3, *Management Requirements and Procedures*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-1-6, *WHC Radiological Control Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-4-2, *Quality Assurance Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-4-3, *Industrial Safety Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-4-29, *Nuclear Criticality Safety Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-4-40, *Industrial Hygiene Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-4-41, *Fire Protection Program Manual*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-6-1, *Standard Engineering Practices*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-6-2, *Project Management*, Westinghouse Hanford Company, Richland, Washington

WHC-CM-7-5, *Environmental Compliance*, Westinghouse Hanford Company, Richland, Washington

In addition, all other Hanford Plant Standards, DOE and DOE-RL Orders, Directives, Procedures and Policies, Occupational Safety and Health Act (OSHA) Regulations, and national consensus Codes and Standards that are or that become applicable to the design or construction of this project shall be followed.

6.0 REFERENCES

DOE, 1993, *Fire Protection*, DOE Order 5480.7A, U.S. Department of Energy, Washington, D.C.

DOE, 1994, *Environmental Protection, Safety and Health Protection Information Reporting Requirements*, DOE Order 5484.1, U.S. Department of Energy, Washington, D.C.

10 CFR 830, 1994, Nuclear Safety Management, *Code of Federal Regulations*, as amended

DOE-RL, 1991, *Project Management System*, DOE/RLIP 4700.1A, U.S. Department of Energy Richland Field Office, Richland, Washington

DOE-RL, 1994, *Fire Protection*, DOE/RLID 5480.7, U.S. Department of Energy Richland Field Office, Richland, Washington

Holten, R. A., 1993, *Fire Protection Systems Seismic Design Requirements*, (letter to President, Westinghouse Hanford Company, August 23, 1993), U. S. Department of Energy Richland Field Office, Richland, Washington

Jensen, M. A., 1994, *Basis for Category B Designation for K Basins*, WHC-SD-SNF-CSER-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Johnson, B. H., 1994a, *Tech Assist/Fire Safety Assessment of 100K Area Facilities for K Basin Essential Systems Recovery, Project W-405*, WHC-SD-W-405-PD-002, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Johnson, B. H., 1994b, *Engineering Study 100K Area Fire Protection Upgrades Project N037*, WHC-SD-N037-ES-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Johnson, B. H., 1994c, *Fire Barrier Evaluation of the Wall Between Spent Nuclear Fuel Storage Basins and Reactor Areas, 105KE and 105KW, Project W-405, K Basin Essential Systems Recovery, Fire Protection Upgrade Task*, WHC-SD-W405-PD-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Langevin, M. J., 1993, *Safety Equipment List for K Area*, WHC-SD-NR-SEL-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Schmitz, J. K., 1994, *Necessary Requirements to Support QSH Concurrence w/FP Equiv* w/attached file *Conditional Acceptance of Fire Protection Plans for Project W-405*, (cc:Mail to B. H. Johnson, November 1), U. S. Department of Energy Richland Field Office, Richland, Washington

Schmidt, J. P., 1994, *Preliminary Fire Hazards Analysis*, (internal memo to G. Hansrote, November 3), Westinghouse Hanford Company, Richland, Washington

WHC, 1993a, *Safety Analysis Irradiated N Reactor Fuel*, WHC-SD-WM-SAR-062, Westinghouse Hanford Company, Richland, Washington

WHC, 1993b, *Operations Safety Requirements, Defense Reactor Division, KE and KW Fuel Storage Basins*, WHC-SD-WM-OSR-006, Rev. 0, Westinghouse Hanford Company, Richland, Washington

WHC, 1992, *Safety Evaluation of Fuel Encapsulation in the 105KE Storage Basin*, WHC-SD-NR-TA-020, Rev. 0, Westinghouse Hanford Company, Richland, Washington

Attachment 1

Necessary Requirements to Support QSH Concurrence w/FP Equiv w/attached file Conditional Acceptance of Fire Protection Plans for Project W-405

[45] From: Julie K Schmitz at ~DOE5 11/1/94 11:04AM (9416 bytes: 24 ln, 1 fl)
To: Bennett H Johnson at ~WHC352, Stanley C Wallace at ~WHC79
cc: John M (Mark) Henderson at ~WHC174, Robert M Hiegel, Roseann E Conrad at ~MTC1, Oscar M Holgado at ~DOE14
Subject: Necessary requirements to support QSH concurrence w/FP equiv
---------- Message Contents ----------

Text item 1:

Ben,

The attached file documents requirements that need to be completed to support the QSH concurrence with the proposed fire protection equivalency requests, in support of Project W-405.

Note the following:

1) Formal RL approval of the PFHA is not required. However, the PFHA should be provided with the Fire Protection Design Criteria Document when submitted to RL for review and approval.

2) The attachment and RL approval of the Design Criteria Document, will document that conditional requirments are acceptable. However, WHC is encouraged to submit the equivalencies to RL for approval prior to validation.

If you have any questions, please contact me on 376-5875.

Thanks,
Julie

File item 2: W405EQVB.CND 11/1/94 10:58AM

CONDITIONAL ACCEPTANCE OF FIRE PROTECTION PLANS FOR PROJECT W-405

The following will serve to document a) the items required to be considered, b) administrative controls required and c) modifications which will be necessary to be completed, in order to support the QSH concurrence with the proposed fire protection equivalency requests needed to support Project W-405.

Facility 190KE

In order to process an equivalency for the lack of sprinkler protection in the below grade area of the 190KE facility it will be necessary to process an equivalency for the separation of the above grade and below grade areas to justify that they are considered two separate fire areas. In order to do so, the equivalency will justify the separation between the two areas as equivalent to a qualified two hour fire rated barrier/separation.

1. Sprinklers will be installed, as planned, throughout the new office and maintenance structure in accordance with NFPA 13 according to the appropriate hazard classification. This portion of the scope will be perfomed under the maintenance shop/office subtask.

2. Sprinklers will be installed, as planned, to protect the 190KE shell structure surrounding the new office and maintenance facility in accordance with NFPA 13 according to the appropriate hazard classification.

3. Sprinklers will not be required in the below grade area of the 190KE facility based upon the completion/implementation of the following:

   a) Seal off the two stairways leading from the grade level to the below grade area with a rated 2 hour enclosure.

   b) Put in place strict administrative controls for access to the below grade area. Access will not be permitted to this area with the exception of necessary inspection or maintenance activities.

   c) The entrances to the below grade area will be maintained under lock and key.

   d) All transient combustibles will be removed from the below grade area.

   e) Strict control of transient combustibles will be established for the entire facility.

   f) Steel plate will be installed in the approximate 16'0" by 25'0" grated opening which presently allows for communication between

the above and below grade areas. The steel plate will be of equal thickness to the existing steel plates in other floor separations in the facility.

g) Unsealed pipe and conduit penetrations between the above and below grade areas of 190KE and between the 165KE and 190KE facilities will be sealed with 2 hour fire rated penetration seals. Those penetrations which were either poured in place or grouted in place will require no additional rework. Unsealed sleeved penetrations will require two hour fire rated seals.

h) The two doorways between the 190KE and 165KE facilities will be upgraded to 1-1/2" hour fire rated construction.

i) The tunnel opening at each end of the below grade area of 190KE will not require any sealing.

j) NFPA 101, Life Safety Code features and any other applicable fire protection requirements of DOE 5480.7A and RLID 5480.7 for the above grade area of 190KE will be installed and maintained as part of the new maintenance shop and office area subtask of the project.

k) There will be no allowance for combustible storage or use of the below grade area of the facility (Signs to this effect will be required on each entrance to the below grade area). In the event this area is to be used fire suppression will be required.

l) There will be an inspection program established for the barrier to ensure that the configuration remains in the same condition (or better than the configuration) as the configuration approved through the equivalency.

105KE/KW

In order to process an equivalency for the barrier between the inactive and active sides of this facility to support the lack of sprinkler protection in the inactive areas it will be necessary to process an equivalency for the separation of the active and inactive areas to justify that they are considered two separate fire areas. In order to do so, the equivalency will justify the separation between the two areas as equivalent to a qualified two hour fire rated barrier/separation.

a) Unsealed pipe and conduit penetrations between the active and inactive areas of both the 105KE and 105KW facilities will be sealed with 2 hour fire rated penetration seals. Those

penetrations which were either poured in place or grouted in place will require no additional rework. Unsealed sleeved penetrations will require two hour fire rated seals.

b) All transient combustibles will be removed from the inactive portion of both facilities.

c) Strict control of transient combustibles will be established for the entire facility.

d) There will be an inspection program established for the barrier to ensure that the configuration remains in the same condition (or better than the configuration) as the configuration approved through the equivalency.

e) Sprinklers will be required throughout the entire active area of the facility and shall be installed in accordance with NFPA 13 for the appropriate hazard classification. This includes sprinklers over the chiller, basin, and fuel transfer areas of each of the facilities due to the combustible construction of roof. Sprinklers will also be required in the active area of the basement below the office area due to active MCC equipment. Sprinklers (or suitable alternative protection allowed by NFPA 13) will be required in the concealed space between the new and old roofing systems over the basin area of 105KW.

f) NFPA 101, Life Safety Code requirements will be reviewed for the active portion of the facility and upgraded as necessary. Primary areas to review include travel distance in the below grade area, emergency lighting and alarm system requirements.

g) Doors which are located in the common wall between the active and inactive areas of the facility will be upgraded to 2 hour fire rated.

h) Existing conditions (with the exception of transient combustibles) on the inactive side of the facility will be addressed as part of the formal Fire Hazards Analysis currently scheduled for completion in 1/95. At the time the FHA(s) for the 105KE and 105KW facilities is completed, any additional recommendations for fire protection upgrades which affect the barrier covered by this equivalency will be carried out.

Attachment 2

**Preliminary Fire Hazards Analysis
for the 100K Area
Buildings 105KE, 105KW and 190KE**

PRELIMINARY

FIRE HAZARDS ANALYSIS

FOR THE 100K AREA

BUILDINGS 105KE, 105KW AND 190KE

Westinghouse Hanford Company

November 2, 1994

Prepared By

SC Wallace

K-Basins Support Systems Engineering

Introduction

The purpose of this preliminary Fire Hazards Analysis (FHA) is to assess the risk from fire and other perils within selected 100K fire areas so as to ascertain whether the objectives of DOE 5480.7A, Fire Protection, are met by the scope of Project W-405. Only two areas where selected for this FHA, the 105KE and 105KW Basins and office/support areas, because of the fuel storage, and the 190KE building because of the new construction to be built within that structure. The remainder of the facility is addressed in the 1993 Self Assessment of 5480.7A. This Fire Hazards Analysis was prepared as required by WHC-CM-4-41, Fire Protection Program Manual, Section 3.4, Fire Hazards Analysis Requirements, on a preliminary basis. A more in depth FHA will be completed for all of the buildings covered by the Interim Safety Basis at a later date.

The K-Basins Irradiated Fuel Storage Basins (portions of the 105KE and 105KW buildings) is a part of the 100K Reactor Facility which was constructed in the early 1950's and designed for a 20 year life span. After the 100K Reactors were shut down in the early 1970's the Fuel storage basins were used for storing irradiated fuel from the 100N Reactor until it could be transferred to the Purex Facility for further processing. The K-Basins are currently being used as near term storage for the N-Reactor fuel until an interim fuel storage plan can be implemented. A change to the Tri-Party Agreement (TPA) in January of 1994 established a target date for the removal of all fuel and sludge from the basins by December of 2002.

The 105KE/KW buildings are split by use into two basic areas, first, the basins area which includes the office/support facilities and the fuel storage basins, and second, the unoccupied area, which includes the reactor.

The 190KE building lies directly south of the 165KE building and has a common wall with that building. This building is used for storage of parts and materials for maintenance and operation of the 100K facilities, and as the main pump house for the service water pumps. The 190KE building is the location proposed by the W-405 project for the new office/maintenance shop for K-Basins

Recommendations

105KE/105KW:

1. A barrier wall as described in WHC-SD-W405-PD-001 Rev 0 **Fire Barrier Evaluation** section 3.3, exists within the 105KE and 105KW buildings. Upgrade this wall as stated in section 8.0. In a similar manner, seal the floor beneath the office area to provide an equivalent two hour barrier.

2. Extend the automatic sprinkler system to include all unsprinklered rooms on the office/support side of the buildings. Obtain an exemption, equivalency or install automatic sprinklers in the basement beneath the office area.

3. Install a new Fire Alarm Control Panel, new manual fire alarm pull stations, low voltage alarm bells, and smoke detectors in the chiller bay, basins and the high bay "transfer area".

4. Remove all transient combustibles from the unoccupied portion of the building. Implement operational procedures to administratively limit transient combustibles in the entire facility.

5. Obtain an exemption, equivalency or install automatic sprinklers in the fuel storage basin and transfer areas.

6. Obtain an exemption, equivalency or install automatic sprinklers beneath the standing metal seam roof structure over the 105KW fuel storage basin.

190KE:

1. Upgrade the concrete wall between 165KE and 190KE to a 2 Hr. barrier. This will include: sealing all penetrations through the wall and replacing the door with a UL Listed fire door with a fire rating of 1 1/2 hr.

2. Seal all penetrations in the transite paneling above the wall on the north side of the building, and in the transite panels on the south wall above the clearwell.

3. Seal all floor penetrations and the two stair wells to stop smoke penetration from the tunnel area.

4. Add automatic sprinklers at the roof level and within the new office/shop structure per the requirements of DOE 5480.7A

5. Add a Fire Alarm Control Panel, manual fire alarm pull stations, and fire alarm bells, emergency lighting and exit signs throughout the existing occupied area of the building and within the new structure.

6. Remove all transient combustibles from the unoccupied portion of the building. Implement operational procedures to administratively limit transient combustibles and storage in the entire facility.

7. Obtain an exemption, equivalency or install automatic sprinklers in the basement of this facility.

Preliminary FHA - 105KE/105KW

(a) Description of construction

The 105KE/105KW Reactor buildings have eight basic levels. All levels are deactivated and awaiting decommissioning and dismantling activities, with no plans for reactivation, except for a portion, approximately 30,000 ft^2, of the ground level (el. 0'-0"). This area includes the fuel storage basins and handling areas, some supporting office spaces, MCC rooms, and the compressor rooms remain active. The exhaust fan room area is located directly beneath the office area (el. -12'-0") contains active 480V MCC's and decommissioned equipment. The 105KE/105KW buildings consist of noncombustible construction materials. Exterior walls are corrugated asbestos-cement panels (transite) on a steel frame or reinforced concrete; interior walls are reinforced concrete or gypsum board, and floors are reinforced concrete. The roofs consists of transite panels (as roof decking) covered with one layer of approximately 1 in. to 2 in. of light-weight insulating (perlite) concrete, 1 in. of rigid fiberboard insulation, and layers of asphalt and paper typical of a built-up roofing system.

At 105KW a steel roof structure has been installed over, but independent of, the built-up roof over the basin area, creating a void space approximately 5'-0" high. Access is strictly controlled administratively because of site wide concern about roof access and this area is not normally occupied and does not contain any operating equipment. Project W-405 will upgrade an existing barrier between the active and inactive areas. A detailed description of the barrier is contained in WHC-SD-W405-PD-001 "Fire Barrier Evaluation". A general description of the barrier wall is as follows: The concrete wall along the south side of the basin from the west exterior wall of the building, to east end of the entry airlock to the basins. From that point south to the north wall of the reactor control room, and from there east to the east exterior wall of the building. The areas north and east of the wall that forms this line are considered the active portion of the building. The areas south and west of this line are considered inactive.

(b) Protection of essential safety class equipment

Safety class equipment includes 1. The basin structure which is the entire concrete pool area responsible for retaining the basin water, 2. The underwater storage racks situated on the concrete floor of the fuel storage basin, constructed of steel, and 3. The railcar control system which consists of bumpers affixed to building structural columns inside the building and derailing devices and rail switches located outside of the building.

As stated in section 5.6 of WHC-SD-SNF-SAR-001, K Basins Safety Analysis Report, "There are no safety class 1 structures, systems, or components that require fire protection to perform their safety function".

(c) Fire protection features

The existing water distribution system is supplied from the Columbia River. This water is pumped from 181KE, the river pumping station, by one 31,500 gpm, 181 ft head, 4160 volt river pump to the holding basins at 183KE (two additional river pumps are currently being rebuilt). Water is then gravity fed through filters to the clearwell south of 190KE. Service water pumps in 190KE draw suction from the clearwell. The service water pumps supply water throughout the 100K Area via the 24 in. service water lines and 6 in. underground water distribution system for the 100K Area facility fire hydrants. This distribution system is a tree type system rather than a looped system. There are three 4160 volt electric service water pumps rated at 4000 gpm at 100 psi in the 190KE building that are normally operated one at a time. These pumps require manual start up in the event of operating pump failure. The service water pumps are not UL Listed fire pumps and all of the 4160 volt power comes from a single source.

Manual Fire Fighting Equipment: There are three fire hydrants around the 105KE/KW buildings. One located 80 ft. north of the northeast corner of the building. One 60 ft. east. One 100 ft. south of the building.

Automatic Suppression System - Approximately 60% of the active portion of the office support area is provided with automatic wet pipe sprinkler protection. The suppression system is supplied by a 4 in. connection to the 8 in. service water main in Corridor 5. A vane-type water flow switch is provided in the 4 in. line. This partial system is sized and installed correctly, with the proper temperature rated heads. This installation does not meet the requirements of the current DOE Orders, but offers some limited level of property protection. Under project W-405 the system will be extended throughout the active portion of the building to come into compliance with current DOE Orders.

Portable Fire Extinguishers - Extinguishers are located throughout the occupied areas of the building, sized and located according to code.

Fire Alarm and Detection - The facilities are provided with manual pull boxes located at the exits from the active portions of the building. There are heat detectors in MCC Room No.1, but the interconnecting wiring is not run in conduit. The alarm bells are adequate and can be heard throughout the occupied sections of the building. Alarms are transmitted to the Hanford Fire Department via Radio Fire Alarm Reporting Box 1250 at 105KE and 1290 at 105KW. The current fire alarm system in the facility complies with the requirements of DOE Order 5480.7A and NFPA with the exception that the initiating, and indicating circuits are not supervised as specified in NFPA 72. The inactive portions of the building do not contain alarm or detection features.

Fire Barriers - No rated fire barriers currently exist. Under project W-405 Fire Barrier will be created as recommended in WHC-SD-W405-PD-001, "Fire Barrier Evaluation" to separate the active and inactive areas of the building. This upgrade will provide an equivalent two hour fire barrier.

(d) Description of fire hazards

Non-combustible potentially contaminated materials in wooden crates stored in the inactive areas.

Minor amounts of transient combustible material in basin and transfer areas.

Office areas contain the kinds and amounts of combustible materials normally found in an office occupancy. Also within the office area are two change rooms containing clean personal protective clothing required for entry into some radiation areas.

Infrequent cutting/welding operations are controlled by procedures found in WHC-CM-4-41 Section 5.3 (Controlling Hotwork)

Flammable/combustible liquids are stored as required in WHC-CM-4-41 (Flammable/Combustible Liquids), in flammable liquids cabinets (three in 105KE and three in 105KW).

(e) Life safety considerations

In accordance with NFPA 101, *Life Safety Code*, the active portion of the 105-KE Building is a mixed occupancy consisting of half special purpose industrial and half business. Within the active portion of the building, there are several doors that can be accessed during an emergency. The hardware on the doors allow for an unobstructed exit from the inside. This complies with NFPA 101, Section 29-2.4.1. Dead ends do not exceed 50-ft, no common paths exceed 50-ft per Section 29-2.5.4, and the travel distance to an egress is well within the 200-ft limit per Section 29-2.6.

Project W-405 will provide a barrier separating the active side of the building from the inactive, the following is a brief description of the inactive side of the building with regards to life safety issues. A thorough evaluation will be contained in the building Fire Hazards Analysis by the facility landlord.

The inactive portion of the building is classified as a special purpose industrial occupancy with incidental storage, in accordance with NFPA 101, *Life Safety Code*. The deactivated portion is unoccupied and entry is administratively controlled. Personnel entry into this part of the building is required only during daily routine inspections of some equipment which remains operational, and as necessary to respond to off normal operational situations. There is no emergency lighting in the deactivated portion of the building.

(f) Critical process equipment

There is no critical process equipment in this building now and none planed in the future. The main purpose of the 105KE/KW buildings is to safely store spent nuclear fuel. The safety class equipment in place is static, is structural in nature, and does not require any fire protection feature to continue to operate during or after a design basis accident. See WHC-SD-SNF-SAR-001 for more detail.

(g) High value property

The criteria for high value property is subjective. The estimated values for the building and contents is given in the Damage Potential section.

(h) Damage potential:

MPFL - After the W-405 project upgrades the Maximum Possible Fire Loss (MPFL) Would be the loss of the entire building on the active side of the fire barrier. The costs involved would be to rebuild the office and basin and to clean up any debris that fell into the basin and to set up temporary facilities for support of daily operations. There is minor contamination that would be released within the boundary of the facility; however, the site is extensively contaminated from past practices and any additional cleanup costs are judged be to minimal.

The MPFL assumes failure of automatic fire suppression equipment and manual fire fighting efforts for either the 105KE or 105KW facility, and is estimated as follows:

Assumptions -

(1) The active and inactive sides of 105KE/105KW are assumed to be separated by an equivalent 2-hour fire rated barrier (following implementation of Project W-405). Only losses on the active side of the buildings are of concern.

(2) All building contents, for the purpose of loss estimation, are assumed lost. The office area is assumed to be a complete loss, resulting in a need to provide replacement office space as part of fire recovery actions.

(3) The roofing system is made up of combustible and non-combustible components. Asphalt, tar, adhesives and paper are assumed to be combustible materials. Gravel, rigid insulation board, lightweight (perlite) insulating concrete, and asbestos cement roof decking are assumed to be non-combustible components.

(4) The roofing system is assumed to be 6 in. thick, equating to (30,000 ft^2 x 0.5 ft) 15,000 ft^2, or 560 yd^3 of material requiring disposal following the postulated roof fire.

(5) The following assumption contains a preliminary assessment of the postulated roof fire and is considered to be conservative. The roof system over 105KE and 105KW is not tested, listed or otherwise approved as a fire resistive system. The extent of the postulated fire is based on experience with past roof fires in built-up roofing systems. The preliminary FHA has postulated an extensive fire for the purposes of defining fire protection features needed for coverage of the 105KE and 105KW buildings.

The postulated fire is assumed to originate in the office area, and propagate across, through and beneath the roof along the underside of the asbestos cement roof decking. The 2-½ ft elevation change between office and basin area roofs, and the 23 ft elevation change between basin and transfer area roof, are assumed not to inhibit fire propagation. The heat of combustion will result in hot, free flowing asphalt and tar in liquid and vapor form which will seep downward through cracks in the roofing system and into the fuel storage basin, chiller and transfer areas. Vapor will ignite and propagate the fire beneath the asbestos cement roof deck. Liquid will ignite as it falls from the ceiling onto pumps, piping, electrical cable, fixed and transient combustibles, concrete Ion Exchange Module (IXM) and Ion Exchange Column (IXC) shielding, concrete floor, and through steel grate into the fuel pool. The fire is assumed to be limited to the roofing system and tertiary affects caused by liquid asphalt and tar falling on fixed and transient combustible materials inside of the building.

(6) Combustible materials found in the fuel storage basin, chiller and transfer areas is assumed to be low in quantity and not capable of supporting a prolonged, sustained fire, or propagation of fire from equipment to equipment, or affect the load carrying capacity of the building's structural steel.

(a) Fixed equipment located in the fuel storage basin, chiller and transfer areas consists of pumps and motors in steel casings and frames, steel piping, steel heat exchangers, and IXMs/IXCs shielded inside of concrete cases or vaults. This equipment is not densely packed. Electrical cable insulation inside motors, cable trays and control panels represents the fixed combustibles inside these areas.

(b) Transient combustibles located in the basin, chiller and transfer areas includes minor quantities of yellow plastic bags, rubber hose, wood products, a barrel of anti-C clothing, etc. that are judged and assumed not to be capable of supporting a significant fire for a sustained period.

(7) The building structure is assumed to remain essentially intact during the postulated roof fire.

(a) The load carrying capacity of the building's vertical structural members (columns) are assumed not to be affected to the point of causing the structural collapse of the building. The non-combustible nature of the exterior walls of the facility, the low level of fixed and transient combustible materials that could be ignited by liquid asphalt and tar falling from the ceiling, and the location of these fixed and transient combustibles away from the exterior walls and structural steel columns will prevent or limit adverse affects due to excessive heat.

(b) Failure of horizontal minor structural members (joists), which support the asbestos cement roof decking, is assumed to occur due to exposure to the intense heat and flames from the burning roofing system. However, the main horizontal structural members over the fuel storage basin areas are substantial continuous trusses, are not in direct contact with the roof panel surfaces, are approximately 3-½ ft deep, and are assumed to deform but remain intact, supported by the building's structural columns during the fire.

(8) The roofing system is assumed to be a complete loss. Roof decking, lightweight concrete, rigid insulation and residual roofing system components are assumed to collapse between structural steel members and onto the concrete floor or grated platform below. The grated platform above the fuel storage pool is assumed to prevent significant quantities of the collapsed roofing material from entering the pool. Reestablishment of confinement over the fuel storage basin is a necessary recovery action.

(9) Spent fuel canisters and contents are assumed to remain stored beneath 16 ft of water and to suffer no direct consequences as a result of the postulated fire.

(10) It is assumed that minor radiological contamination would be released within the building perimeter during the fire. Most of the radiological hazard in the 105KE and 105KW buildings is contained with the spent nuclear fuel, which will remain unaffected beneath 16 ft of water. The concrete shielding which surrounds the IXMs and IXCs is assumed to provide adequate protection against release of radionuclides due to damage by falling debris or liquid asphalt. Radiological clean-up, as a result of the fire, will not be significantly greater than future D & D of the buildings following spent nuclear fuel removal. For the purposes of estimating loss due to clean-up, all resulting debris will be assumed to be radiologically contaminated for burial. This approach is considered to be conservative.

(11) The existing K Basins staff is assumed to focus their efforts on restoring services to the fuel storage pool, such as water filtration and water treatment, pool cooling, and make-up. A recent Engineering Report, WHC-SD-WM-ER-375 "Thermal Analysis for Determination for Maximum Pool Temperatures for the K East and K West Spent Fuel Storage Basins," indicates that the minimum period for either the 105KE or 105KW to heat-up from 50 degrees F to 130 degrees F is 84 days (at 105KW), with a maximum temperature of 186.3 degrees F occurring at the 105KW basin. Portable pumps, chillers, filtration, treatment, and electrical supplies may be required to support fuel storage during restoration, however, emergency pool cooling, make-up, filtration and treatment is assumed not to be necessary.

(12) Clean-up is assumed to require a crew of 150 workers, 1 full year (50 weeks), at $100 per hour per worker. Clean-up activities must also include crane, truck, and disposal services.

Recovery Costs -

(1) Replacement Office space:

Purchase 10,000 ft^2 replacement office space (mobile offices) at $45/$ft^2$.

($45/$ft^2$ x 10,000ft^2) =	$ 450,000	Replacement office space
	120,000	Furnishings
	100,000	HLAN hookup
	150,000	Utilities/hookups
	60,000	Engineering
	25,000	Moving expenses
	$ 905,000	

Sub-Total = $ 905,000 (Source: ICF KH Facilities)

(2) Cost of Clean-up:

150 workers at $75/hr for 50 weeks = $ 22,500,000

Cranes, trucks, equipment at $ 5,000/week for 50 weeks = $ 250,000

(Note: Crane rate through WHC is between $600 - $800 per day)

Disposal of 550 yd^3 residual roofing materials

$72/$ft^3$ burial cost x 27 ft^3/yd^3 x 550 yd^3 = $ 1,069,200

(Note: Landfill costs are $13.30/$yd^3$ for packaged asbestos, non-contaminated waste)

Sub-Total = $ 23,819,200

(3) Cost of replacement roof structure (similar to free standing metal seam roof over 105KW basin at $\$110/ft^2$ = 20,000 ft^2 x $\$110/ft^2$ = $ 2,200,000

(Source: ICF KH estimate, existing system cost $ 1.1M in 1988)

Sub-Total = $ 2,200,000

(4) Cost of portable pumps, chillers, generators, filtration at $25,000/week for 50 weeks = $ 1,250,000

(Note: 500 gpm portable pumps rent for $2,000/week, portable generators rent for $3,000/week - Source: K Basins Engineering)

Sub-Total = $ 1,250,000

(5) Estimates for the structure and content replacement:

105KE Replacement cost	$0.00
Content replacement cost	$11,626,045.00
Total	$11,626,045.00

105KW Replacement cost	$0.00
Content replacement cost	$11,918,984.00
Total	$11,918,984.00

(Source: RL Property System, "Fire Replacement Costs for WHC and KEH Buildings")

Sub-Total = $ 11,918,984

MPFL Estimate = $40,093,184

MCFL - The W-405 project will extend the existing automatic suppression system throughout the active office areas of the building and provide a two hour equivalent fire barrier between the active and inactive areas of the building. After these upgrades the Maximum Credible Fire Loss (MCFL) within the 105KE or 105KW buildings would be a fire in the office areas of the active facilities. The fire, for the purposes of this report, is presumed to start in one of the sprinklered rooms when the building is unoccupied and is expected to be controlled before it can spread to another room. The water flow alarm will activate send a fire alarm to the fire department. By the time the fire department arrived the fire would be controlled or extinguished. The fuel storage basins have no material susceptible to fire except portions of the roof covering, so the fire is not expected to cause any significant damage and the fuel storage basins structure itself could not be damaged by fire. The costs associated with this fire would be the cost to rebuild the office area affected (Approximately $100,000.00), the cost to clean up smoke damage

($50,000.00) and the cost to provide temporary space if required during the cleanup activities ($100,000.00). MCFL is estimated to be $250,000.

(i) Fire Department/Brigade Response

The 100 Area Fire Station is the closest to the 100K Area Facilities (approximately 2.5 miles). This station is located midway between 100K Area and 100N Area. Estimated response time, from the time the alarm is received at the central dispatch/communications center until the time the first piece of fire apparatus arrives on the scene of an incident at the 100K Area, is four to five min. This response time assumes the fire fighters are in the 100 Area Fire Station and normal road and traveling conditions exist.

The present scenario for a Hanford Site Fire Emergency Response is to dispatch a single aerial device/pumper from the fire station closest to the incident with a backup aerial device/pumper from the next closest fire station to the incident. This provides a two-engine response. The first engine on the scene constitutes what is termed "Initial Attack Response Capability."

(j) Recovery potential

In the event of the loss of the 105KE or 105KW building due to fire, the primary mission of the facility would be continued by setting up temporary office/support trailers adjacent to the existing building. If required, debris would be cleared from the basin area and a temporary structure erected over the basin.

(k) Potential for toxic, biological and/or radiation incident due to fire

The WHC-SD-SNF-ISB-001 Interim Safety Basis identifies the potential for a toxicological, biological or radiological incident as the result of a fire as an unlikely event. Additionally the 105KE and 105KW are unable to support a fire that results in a radiological or toxicological release.

(l) Emergency planning

The Hanford Fire Department maintains Pre-Fire Plans for this facility on a three year review cycle. The existing plan is up to date and contains information on the building fire protection systems.

Emergency preparedness - Specific instructions for fire and explosion are contained in WHC-IP-0263-100K "Building Emergency Plan for 100K Facilities" section 7.2.4 "Fire and Explosion Control".

(m) Security considerations related to fire protection

In the event of a fire, security personal will operate in conjunction with the Hanford Fire Department to maintain the security posture of the facility and to assist with the fire fighting efforts of the fire department.

(n) Natural hazards (earthquake, flood, wind) impact on fire safety

The Design Basis Earthquake (DBE), Probable Maximum Flood (PMF) and Wind and Tornados are discussed in the draft Safety Analysis Report (SAR). The preliminary conclusions are as follows, and indicate no impact on fire safety:

Earthquake - The results indicated a positive margin of safety for the design basis seismic event. The fuel storage racks and the canisters will maintain geometric configuration during and after a DBE. The cooling pool water supply and recirculating system equipment, equipment foundations and support structures, will not damage the water retention capability of the basin nor the geometric control of the stored fuel during or after the DBE. In the event of a fire after an earthquake, the fire fighting water source will be the Columbia River as the clearwell is not seismically qualified to UBC requirements and may not be available.

Flood - The fuel storage facility and the vital supporting equipment are at least 13 meters (42 feet) and 11 meters (36 feet) above the maximum flood level. In this instance, the clearwells are capable of supplying water to the cooling pools as needed.

Wind - The one story steel buildings, which form the walls and roofs over the fuel storage basins, was designed to resist lateral forces caused by a bomb blast. These forces are more severe than those caused by high winds. Some peripheral damage to the facility may occur but its structural integrity will be maintained. The design basis missile, 2 X 4 timber plank of 7 kg @ 81 kmph (15 lb @ 50 mph), does not have sufficient energy to damage the essential safety systems.

(o) Exposure fire potential, including the potential for fire spread between fire areas

The facility was reviewed in accordance with NFPA 80A for exposure hazards. The buildings listed below are beyond the required exposure distance.

North - There are no exposure hazards from adjacent buildings.

South - The 1706KE building is approximately 50 feet.

West - The 1706KER building is approximately 16 feet.

East - The 1713KE and the 1714KE buildings are approximately 20 feet.

Exposure of and from adjacent buildings meets NFPA 80A separation requirements.

These buildings will each contain two fire areas after the W-405 project upgrades are completed, one on the inactive side and one on the active.

References:

1. DOE Order 6430.1A

2. Doe Order 5480.7A

3. NFPA 101, Life Safety Code

4. NFPA 80A, Protection of Buildings form Exterior Fire Exposures

5. WHC-SD-SNF-SAR-001, DRAFT, Spent Nuclear Fuels Safety Analysis Report

6. WHC-CM-4-41, Fire Protection Programs Manual

7. WHC-CM-4-46, Nonreactor Facility Safety Analysis Manual

8. WHC-IP-002, Preliminary Assessment of N-Reactor Graphite Combustion, E.M. Woodruff, 10-27-87

9. WHC-IP-0263-100K, "Building Emergency Plan for 100K Facilities"

10. WHC-SD-W405-PD-001, "Fire Barrier Evaluation"

11. WHC-SD-W405-PD-002, Tech Assist/Fire Safety Assessment of 100K Area Facilities K Basins Essential Systems Recovery, Project W405

Preliminary FHA - 190KE

(a) Description of construction

The 190KE Building is of noncombustible construction with 52,000ft^2 on the ground level and a basement of approximately 42,000ft^2. The roof consists of asphalt and gravel on 2 in. of foamglass insulation on heavy steel beams and steel columns. The exterior walls are transite on steel with fiberglass insulation. There are no interior walls. The floors are reinforced concrete with two open stairways to the basement level and several areas of open grating or steel plate over openings left when pumps and motors were removed. The basement level contains no operating equipment and is normally unoccupied. There is a small amount of construction debris remaining in the basement left over from the removal of the high lift pumps and motors on the 0'-0" level. The piping tunnel (approximately 25ft. by 25ft.) from the 183KE to 105KE building runs through the basement. The tunnel is of heavy concrete construction, contains no operating equipment, is open to the basement level on the north and south sides of the building, and is unoccupied.

The adjacent 165KE Building is of fire resistive construction. The roof consists of asphalt and gravel on reinforced concrete on concrete pillars. The exterior walls are concrete. Interior walls are concrete, concrete block, and cement asbestos panels on wood frame. The floors are reinforced concrete with several open steel grated areas.

The common wall that separates 165KE and 190KE is constructed of 18 inch thick, reinforced concrete from the basement level up to the roof level of the 165KE building, from that level to the roof of the 190KE building, the wall is transite on steel with fiberglass insulation. At the basement level this wall has a 25ft. by 25ft. opening at the tunnel. On the 0'-0" level there is one heavy steel door from the 165KE building to the 190KE building. This barrier is not a qualified fire barrier; however, the construction of this wall is comparable to that of a 2-hr fire resistive barrier, on the 0'-0" level. It is expected that this barrier will provide fire separation between the two areas provided the door is kept closed.

Future:
Project W405 will construct a two story Maintenance Shop/Office within the 0'-0" level of the building. This structure will be of non-combustible construction and will will consist of approximately 8000ft^2. on the ground level including locker rooms, lunch room, offices, instrument shop and electrical shop. The upper level is approximately 3500ft^2 and contains offices and

restrooms. There will also be a single story, 500ft.^{2} welding shop with a 10'-0" ceiling height. The remaining 0'-0" level will be utilized for a 6000ft.^{2} Receiving/Storage/Tool area, 1500ft.^{2} Maintenance area, 1500ft.^{2} Shop Equip. area, and approximately 3600ft.^{2} will remain as pump area, used to support the existing pumps.

(b) Protection of essential safety class equipment

There is no Essential Safety Class Equipment located in this building.

Future:
Project W-405 will not add any Safety Class Equipment to building 190KE.

(c) Fire protection features.

Fire Hydrant - One fire hydrant is located 40 ft N.E. of the 165KE building and another fire hydrant is located approximately 100 ft. north of the 165KE building.

Portable Fire Extinguishers - Are located throughout the occupied areas of the 165KE and 190KE buildings.

Fire Alarm and Detection - The 165KE Building is equipped with automatic heat detection consisting of heat detectors in the switch gear room, the control room, and in battery rooms in the basement. The heat detectors are connected directly to a Radio Fire Alarm Reporting Box to transmit an alarm directly to the Hanford Fire Department. The detection system is wired with non metallic sheathed cable. (Romax)

Fire Barriers - No rated fire barriers currently exist, therefore the 165KE and 190KE buildings are one fire area.

Future:
To support future Maintenance Shop/Support Facility operations, Project W405 will provide automatic sprinkler protection for the ground level of 190KE, an RL-approved equivalency from requirements for a sprinkler system for the basement level which includes an equivalent 2-hour fire rated wall between buildings 165KE and 190KE and an equivalent 2-hour fire rated floor between basement and ground levels, a sprinkler system within the future Maintenance Shop/Support Facility structure, and a fire alarm system inside 190KE and future Support Facility.

(d) Description of fire hazards

Current:
Stored combustible and non-combustible materials in wooden crates and cardboard boxes throughout the 0'-0" level of the building.

Infrequent cutting/welding operations are controlled by procedures found in WHC-CM-4-41 Section 5.3 (Controlling Hotwork)

Flammable/combustible liquids are stored as required in WHC-CM-4-41 (Flammable/Combustible Liquids)

Future:
Same as current fire hazards with additional combustible loading due to housing of 75 people and associated maintenance shop activities provided by the Maintenance Shop/Support Facility design basis.

The storage function described above will remain. Cutting and welding operations will remain. A future designated area for welding is included with the Maintenance Shop subproject. Two new flammable liquids storage buildings and one gas bottle storage building are planned to be constructed exterior and away from 190KE as part of project W-405.

(e) Life safety considerations

In accordance with NFPA 101, Life Safety Code, the 190KE Building presently has a classification of Special Purpose Industrial and Storage. The building contains both active and inactive (deactivated) parts.The contents of the storage area are classified as ordinary hazard per Section 4-2 of NFPA 101, Life Safety Code.

The basement is the deactivated portion of the building and is unoccupied. Access is administratively controlled. Personnel entry into this part of the building is required only during off normal operating conditions.

The building has several doors on the ground level that can be accessed during an emergency. The hardware on the doors allow for an unobstructed exit from the inside. This complies with NFPA 101, Section 29-2.4.1. Dead ends do not exceed 50-ft, no common paths exceed 50-ft per Section 29-2.5.4, and the travel distance to an egress is well within the 200-ft limit per Section 29-2.6.

Future:
Under Project W-405 the facility will be a mixed occupancy consisting of half industrial and the other half business. The basement will be separated from the ground level by a

two hour separation and will remain unoccupied. Access to the basement will be administratively controlled with access points under lock and key. The ground level will have sprinklers installed at the roof and within the maintenance shop/support area. The project will install a fire alarm system in 190KE and inside the future support spaces. Another exterior exit will be installed in the east wall of the building approximately 45 ft. from the south wall. Dead ends are allowed, common paths of travel and travel distances increase when the occupancy is fully sprinklered.

(f) Critical process equipment

There is no critical process equipment in this building now and none planed in the future. The main purpose of the 190KE building is to house the service water pumps that supply make up water to the basins, and service water to the site. The Basins can be operated for at least 21 days without make up water at the highest recorded leak and evaporation rates. During that time, alternate methods of pumping water to the basins could be put into place. In the event of the loss of the service water pump the Fire Department will station a tanker truck on site for fire protection use.

(g) High value property

The criteria for high value property is subjective. The estimated values for the building and contents is given in the Damage Potential section. The cost to replace a service water pump would be less than $100,000.00.

(h) Damage potential:

Estimates for the structure and content replacement per the "Fire Replacement Costs for WHC and KEH Buildings" list, dated 9/6/94, are:

Replacement cost		$0.00
Content replacement cost		$1,345,496.00
W-405 Upgrades		$4,491,447.00
190KE	Total	$5,836,943.00

Replacement cost		$1,162,060.00
Content replacement cost		$6,609,157.00
165KE	Total	$7,772,217.00

MPFL - The Maximum Possible Fire Loss (MPFL) would be considered to the loss of all property within one fire area and the failure of the automatic suppression system. Under W-405 the new structure and the existing 190KE ground level

will be fully sprinklered. The wall between 165KE and 190KE will be upgraded to a two hour equivalent wall and the 190KE floor will be sealed to provide a two hour equivalent barrier. With these upgrades a fire on the 190KE ground level will be the MPFL in the 190KE building. The fire would start in the storage area and spread throughout the ground level of the building. The loss would be the entire 190KE building above the ground. Costs would include: Cleanup and disposal of the debris, $500,000.00, Construction of a replacement facility $6,000,000.00, Temporary facilities and service water pumping facilities, $1,000,000.00, Total costs: $7,500,000.00.

MCFL - After W-405 upgrades are made the MCFL will be a fire on the ground level of the 190KE building. The most severe fire will probably be in the storage area. The sprinkler system will control the fire but would cause some water damage to stored materials. The cost of the fire would be the cost to replace damaged materials and to clean up smoke damage to the building. Materials stored in the building at present, have a value of less than $250,000.00. The value of materials in storage following conversion of 190KE to house the Maintenance Shop/Support functions is not anticipated to significantly increase the value of storage in this area. This storage area already serves as the storage area for 100K Area operations and maintenance. Most of the smoke damage is expected to be to the 190KE "shell", and clean up costs would be less than $500,000.00, Total costs:$750,000.00.

(i) Fire Department/Brigade Response

The 100 Area Fire Station is the closest to the 100K Area Facilities. This station is located midway between 100K Area and 100N Area. Estimated response time, from the time the alarm is received at the central dispatch/communications center until the time the first piece of fire apparatus arrives on the scene of an incident at the 100K Area, is four to five minutes. This response time assumes the fire fighters are in the 100 Area Fire Station and normal road and traveling conditions exist.

(j) Recovery potential

In the event of a loss of the 190KE building as the result of a fire the main mission of K-Basins would not be immediately affected. The Basins can be operated for several weeks without adding makeup water. In the interim, portable pumps and generators would be set up to provide potable water and power for support personal and services. Temporary office/shop facilities will be arranged.

(k) Potential for toxicological, biological and/or radiological incident due to fire.

None - The 190KE building is used for clean storage. No toxicological, biological or radiological materials are contained in this building. Future use of this building as a maintenance facility will not add any toxicological, biological or radiological materials within the building.

(l) Emergency planning

The Hanford Fire Department maintains Pre-Fire Plans for this facility on a five year review cycle. The existing plan is up to date and will be revised to reflect all changes made by project W-405.

Emergency preparedness - Specific instructions for fire and explosion are contained in WHC-IP-0263-100K "Building Emergency Plan for 100K Facilities" section 7.2.4 "Fire and Explosion Control".

(m) Security considerations related to fire protection

In the event of a fire, security personal will operate in conjunction with the Hanford Fire Department to maintain the security posture of the facility and to assist with the fire fighting efforts of the fire department.

(n) Natural hazards (earthquake, flood, wind) impact on fire safety

The Design Basis Earthquake (DBE), Probable Maximum Flood (PMF) and Wind and Tornados are discussed in the Safety Analysis Report (WHC-SD-SNF-SAR-001, Not yet approved). The Safety Analysis Report is written on the 105KE/KW buildings, the mission of K-Basins would not be critically effected by the loss of the 190KE building.

Earthquake - The 165KE/190KE buildings have not been analyzed for earthquake damage potential. However, the affect of an earthquake on fire safety for 190KE is anticipated to be negligible. Although working quantities of flammable liquids and gas bottles will be stored (and secured) within 190KE, significant quantities of these items will be stored in adjacent buildings constructed by project W-405 for this purpose. Flammable vapors are not anticipated to be exposed to ignition sources during an earthquake. Tanks containing flammable liquids or gas are not present. No source of natural gas exists to 190KE.

Flood - The operating floor of the 190KE building is at least 14 meters (45 feet) above the maximum flood level as described in the Safety Analysis Report. No impact is anticipated from a flood.

Wind - The 165KE/190KE buildings have not been analyzed for wind damage potential. The construction of the 190KE building is similar to the 105K Basins structure. The Safety Analysis Report indicate "some peripheral damage to the facility may occur but its structural integrity will be maintained".

(o) Exposure fire potential, including the potential for fire spread between fire areas.

This facility was reviewed in accordance with NFPA 80A for exposure hazards.

North - The 1706KE building is approximately 200 ft away, which exceeds the separation distance required in the prescribed standard. No exposure hazard.

East - Three oil filled 4160 volt transformers are located approximately 12 ft. from the building. This is less than the allowable exposure distance. A fire in a transformer could potentially spread into the 165KE building through ventilation ports in the east wall of the building. Under the W-405 project the 165KE and 190KE buildings will be separated by a two hour equivalent fire wall. Additionally, the 4160 volt transformers will be replaced with 13.8 K volt to 480 volt dry type transformers that will be located in accordance with appropriate OSHA and NFPA requirements.

South - The clearwell attaches directly to the 190KE building. A fire on the roof of the clearwell could potentially spread into the 190KE building through the south wall of the building. Project W-405 will install automatic sprinklers inside of building 190KE which will substantially reduce this exposure hazard (per NFPA 80A). Beneath the clearwell roof is steel, concrete, and water. This area is not inhabited and no ignition sources exist in the volume beneath this roof. Project W-405 will seal all wall penetrations in the south wall to preclude introduction of smoke and hot gas into the 190KE building.

West - The 166KE Oil Storage facility, which is inactive, is approximately 300 ft away, which exceeds the required separation distance. No exposure hazard. Project W-405 will construct auxiliary buildings west of

building 190KE to for storage of flammable liquids, gas bottles, snow removal equipment, and a lay-down area. The new construction will comply with NFPA Codes and Standards regarding exposure to/from adjacent structures.

References:

1. DOE Order 6430.1A

2. Doe Order 5480.7A

3. NFPA 101, Life Safety Code

4. NFPA 80A, Protection of Buildings form Exterior Fire Exposures

5. WHC-SD-SNF-SAR-001, DRAFT, Spent Nuclear Fuels Safety Analysis Report

6. WHC-CM-4-41, Fire Protection Programs Manual

7. WHC-CM-4-46, Nonreactor Facility Safety Analysis Manual

8. WHC-SD-W405-PD-002, Tech Assist/Fire Safety Assessment of 100K Area Facilities K Basins Essential Systems Recovery, Project W405