TECHNICAL REPORT

FIRE PROTECTION SURVEY
WESTINGHOUSE IDAHO NUCLEAR COMPANY
IDAHO FALLS, IDAHO

By

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Prepared for:

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Factory Mutual Research

A handwritten signature in cursive script, reading "Paul H. Dobson", written over a horizontal line.

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MASTER

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PURPOSE

A fire protection survey was conducted for the Department of Energy at the Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, Idaho, on April 24-27, April 30-May 4, June 4-8, and June 11-15, 1990. The purpose of the survey was to review the facility's fire protection program and to make recommendations according to the following criteria established by the Department of Energy:

1. Recommendations which would be made as the result of an improved risk or Highly Protected Risk (HPR) fire inspection of an industrial insured facility.
2. Identification of areas which are presently not protected or are inadequately protected where provision of automatic protection would reduce a fire or explosion loss to less than \$1 million.
3. Identification of areas where loss potentials exceed \$50 million assuming a failure of automatic protection systems and subsequent reliance only on separation and fire walls.
4. Evaluation of adequacy of compliance with recommendations made in prior surveys.

In private industry, the effect of insured losses on continuity of operations is referred to as Business Interruption and is usually expressed in monetary terms to cover continuing expense and loss of profit until such time as repairs are made and production is resumed. Loss of use of a facility of this type does not lend itself to expression in monetary terms. Findings and recommendations in this report reflect to some degree the relative importance of the operation and the time to restore it to useful condition in the event that a loss were to occur.

The following levels of programmatic importance are defined:

Critical

The sudden loss of a critical facility would cause shutdown or serious interruption of several other facilities housing important, expensive, and/or hazardous operations.

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Vital

A vital facility houses people and equipment involved in a major program. The equipment is usually specialized and expensive and would require many months or years to replace. The loss of this type of facility would not significantly affect other programs. The fact that some of these facilities are provided backup from another facility permits them to be classified as vital rather than critical.

Important

Facilities placed in this category house people, equipment or services involved in important programs, the loss of which would not have a serious impact on other programs.

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CONCLUSIONS

This facility has a number of major fire protection improvements in various stages of planning. Fire protection equipment inspection and maintenance programs are being developed which should result in improved inspection of fire protection equipment.

There were no loss potentials discovered where the loss would exceed \$50,000,000 with protection out of service. There are 15 recommendations made where the existing loss expectancy is in excess of \$1,000,000 or where there could be significant impact on programs.

There are 25 other recommendations that would be made in a typical highly protected risk (HPR) inspection.

Major improvements needed are: (1) Program to place fire protection systems in service following installation and testing. Two shut sprinkler control valves were found for systems that had been installed and successfully pressure tested five months previously at the FPR project. (2) Automatic rather than manual operation for water spray systems for the calciner hot cell in Building 659, and for the prefilters of HEPA filter systems for Building 601 and Building 659 exhaust systems. The delay inherent in manual actuation of these systems would result in damage to hot cell windows and cell exhaust systems. 3) Inspection of main exhaust duct and HEPA filters of Building 601 for combustible deposits. Fire tests are based on heat from a fire exposing final filters. No tests have been conducted where combustible residues are in duct or on final filters. 4) A transformer oil testing program for main substation transformers and transformers supplying power to critical or vital facilities. These tests are an indication of a potential fault which could lead to rupture of the transformer casing, followed by fire.

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I

INTRODUCTION

This report contains recommendations made as the result of a fire protection review conducted on April 24-27, April 30-May 4, June 4-8, and June 11-15, 1990 at the Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, Idaho. This review was conducted in accordance with DOE Contract No. DE-ACOI-88EH79072. Mr. P. H. Dobson, Senior Engineer, Factory Mutual Research Corporation (FMRC), conducted this review.

The visit included: 1) a tour of the facility, 2) water tests, 3) review of records of testing and inspection of fire protection equipment, and 4) tests of selected fire protection equipment.

Recommendations that would be made during a Highly Protected Risk (HPR) visit are included in Sections II and III. Major recommendations are included in Appendix B. The status of recommendations made in previous inspections is indicated in Appendix F. Abbreviations used in this report are defined in Appendix A.

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II

OVERALL REVIEW OF FIRE PROTECTION

2.1 WATER SUPPLY

2.1.1 Recommendations

90-1 Two independent water supplies, each capable of meeting the maximum fire protection water demand for a minimum of four hours. Fire pumps should be sized such that the maximum demand can be met with largest fire pump out of service. Diesel fire pumps are recommended.

Reason: Increased reliability of fire protection system water supply.

90-2 Fire service mains should be separated from process water mains. Jockey pump(s) should be arranged to maintain pressure within 10 psi of churn pressure of the highest rated fire pump. The first fire pump should be arranged to start automatically on a pressure drop of 5 psi below the start pressure of the jockey pump. Additional fire pumps should be arranged to start at 10 psi increments lower for each additional pump.

Reason: Low start pressures subject the underground mains to water hammer on pump actuation.

2.1.2 Description

Present water supplies for fire protection are from two process water tanks: one 525,000 gallon capacity and one 450,000 gallon capacity. These tanks are filled from two deep well pumps rated at 3,000 gpm at 40 psi. One pump is on line at all times. It automatically starts on tank level drop to 27 ft and stops at tank level of 35 ft. If level drops to 26 ft, a low level alarm is received in the boiler house. If the tank level drops to 25 ft, a low level alarm is transmitted to CFA. Tech Specs require 50% of tank capacity to be available at all times. The tanks in turn supply water for both process and fire protection use. Low tank level alarms have been provided on both tanks. There are three pumps, which are presently considered

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fire pumps, as follows: 1) a 2,000 gpm at 125 psi diesel driven fire pump located in Building 614. This pump is set to start at 60 psi; 2) an electric-driven pump located in Building 606. This pump was originally rated at 2,000 gpm at 86 psi. It is set to start at 75 psi; 3) a twin diesel originally rated at 2,000 gpm at 125 psi. This pump is set to start automatically at 40 psi. Both the 2,000 gpm at 86 psi electric and 2,000 gpm at 125 psi twin diesel have had major modifications since installation, such as shaved impellers. These pumps were not tested, since it is expected the results would be substantially different than the manufacturer's pump curve with no way of determining condition of pumps.

2.2 UTILITIES

2.2.1 Recommendations

90-3 Transformer oil from main substation transformers and transformers supplying power to critical or vital facilities, such as Buildings 601-Process Building, 659-NWCF, 666-FAST, etc., should be tested at a minimum two year frequency for the following:

- a. electric breakdown voltage
- b. neutralization number
- c. interfacial tension
- d. water content
- e. gas analysis

Reason: Improved power supply reliability. These tests are an indication of transformer condition. An internal fault in a transformer could result in overpressurization of the transformer with release of oil. The two 10 MVA rated transformers in the switchyard east of Building 613 supply power to the site. Loss expectancy for the substation transformers is approximately \$200,000; however, replacement time could be expected to exceed one year. Loss expectancies for other transformers would be substantially lower, but their loss would impact continued operation of the facility.

2.2.2 Description

Electric power is supplied to the chemical plant substation on overhead lines from the Scoville substation. These are two overhead lines entering the CPP plant switchyard. One 138 kV line runs north, then east, a distance of approximately 2.5 miles. A second 138 kV line runs east, north, then west, a distance of approximately 54 miles. Both lines are from the Scoville substation. These lines supply two 10 MVA transformers west of Building 613, the CPP substation.

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2.3 FIRE PROTECTION SYSTEMS

Responsibility for inspection, testing and maintenance rests with the WINCO utility group and EG&G Life Safety Systems.

It is recognized that the preventative maintenance program for supervisory systems on sprinkler and special protection systems is not on schedule. This is due to the effort being expended by the Life Safety Systems group to develop procedures to test fire protection equipment. It is expected that procedures will be completed and testing brought up to schedule by August 1990. The development of testing procedures containing acceptance criteria is a positive step. It should reduce accidental actuation during system testing and allow immediate determination of problem areas.

2.3.1 Sprinkler Control Valve Supervision

Recommendations

90-4 All sprinkler control valves should be locked open with nonbreakable shackle locks and visually inspected weekly.

Non-indicating sprinkler control valves should be spring tested to verify full open position monthly.

Reason: Limited access to sprinkler control valves and more frequent inspection will improve reliability of fire protection systems.

90-5 The sprinkler control valve form should be revised to show proper position of valve: open or closed. The completed form should be promptly reviewed and necessary action taken.

Reason: To enable immediate action to be taken on valves for which deficiencies are identified.

Description

All valves are locked with breakable shackle locks and sealed. Most sprinkler control valves are electrically supervised with alarm to the Fire Department. Most sectional valves are not supervised although valves being installed now will be supervised. Valves are visually inspected monthly to verify the seal is in place. If a broken seal is found, the valve is physically tested to determine it is in full open position and resealed.

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Valves are operated to full closed position and reopened annually. The valve inspection form is being brought up to date, with valves added as they are found. The form should be revised to show normal valve status (open or closed) and valve status at the time of inspection. Completed forms should be promptly reviewed.

Impairment procedures involve approval of all work done on fire protection systems using an outage form. This requires 48 hour advance notice unless an emergency arises. It is routed to the Fire Protection Engineer by the Outage Coordinator. The Fire Protection Engineer then adds the necessary instructions for temporary protection measures needed. When approval is granted, and before the system is taken out of service, the utility operations foreman notifies the Fire Department. Outage forms are for a specified period of time. One month of outage forms were reviewed. It was noted that none were in excess of 8 hours. When the system is returned to service, the Outage Coordinator and the Fire Department are notified. The Outage Coordinator follows through in the event work is not completed in the time specified.

Responsibility for inspection, testing and maintenance of fire protection systems for property operated by WINCO has been assigned and inspection programs are carried out by well qualified personnel.

2.3.2 Sprinkler System Test and Maintenance

Recommendations

90-6 Water flow alarms should be tested monthly.

Reason: Improve reliability of fire protection systems. Water flow alarms are presently tested semiannually by the Life Safety Systems group.

Description

A bimonthly water flow alarm test was conducted by the Fire Department. The program has been turned over to the utility group who are in the process of developing procedures to perform these tests.

A test of the dry pipe system in Building 1608 was witnessed. The test involved a trip test of the valve using the inspector's test connection and a test of the air compressor automatic start feature, supervisory signals regarding low air pressure, low room temperature alarm, water flow alarm and supervisory signal on the PIV valve controlling water flow to the dry system. All test results were satisfactory.

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2.3.3 Fire Pumps

Recommendation

90-7 Fire pumps should be "listed" pumps. No modifications should be made to a fire pump without the Listing Agency and equipment manufacturer's approval.

Reason: Increased fire protection water supply reliability.

90-8 Fire pump installations should be such that each pump can be flow tested annually to verify pump condition.

Reason: Same as above.

Description

The three fire pumps are started automatically on pressure drop and run for 30 minutes weekly. The diesel driven pump in Building 614 is tested annually at 0%, 100%, and 150% of rated flow. The two fire pumps in Building 606 have been substantially modified since installation and are expected to rate lower than the manufacturer's pump curve. The diesel driven fire pump in Building 614 was tested during this visit and rates "excellent." Results are in Appendix D.

2.3.4 Special Protection Systems

Recommendations

90-9 For cross zoned systems there should be no delay between receipt of the signal from the first detector and operation of interlocked items such as door closure or ventilation interlocks. There should be no more than a 20 sec delay between actuation of the detector and discharge of the system.

Reason: To allow time to close door, shut off ventilation systems to contain extinguishing concentration of halon.

90-10 Circuitry on all deluge valves should be checked to determine that systems will actuate automatically. Test procedures should be modified to allow a full functional test to verify that the detection system will automatically trip the deluge valve.

Reason: Reliability. One system was converted from automatic to manual without proper authorization. The possibility exists that other systems have been converted.

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90-11 An analysis should be made periodically to determine the percentage of foam concentrate in the space between bladder and tank for the AFFF system in Building 1607.

Reason: A tear in the bladder would prevent foam concentrate from being injected into the sprinkler piping at the proper concentration.

Description

Special protection systems are inspected by the WINCO utility group and EG&G Life Safety Systems. The Life Safety Systems group checks operation of all interlocked devices such as HVAC, as well as operation of special protection systems, semiannually. The WINCO utility group checks agent level or weight semiannually.

Records were reviewed and one halon and one water spray system were tested.

The halon system selected was for Room 034 in Building 666. Room 034 contains a 1500 kVA transformer and switchgear. The system actuates on cross zoned smoke detection with the first detector closing dampers and transmitting an alarm to the Fire Department and the second detector discharging halon. There is a keyed bypass in the room which will abort halon discharge, and a manual actuation feature which will immediately discharge halon if actuated. Two tests were conducted in which smoke was applied to a photoelectric and an ionization detector. The ventilation interlock functioned 25 sec after the first detector went into alarm. The system actuated 4 sec after the second detector went into alarm. The system should be revised to allow for immediate actuation of the interlocked features (ventilation) and not more than 20 sec delay in discharge of halon after actuation of the second detector.

The deluge system tested was the system protecting the bucket elevator in the coal plant. The system was originally designed to be actuated automatically by heat detectors in the bucket elevators. Actuation of a detector was simulated using a heat gun. The alarm was transmitted to the panel in the control room and to the Fire Department, but the deluge valve did not trip. It was determined by examination of wiring in the local panel in the control room that the deluge valve was not wired to trip on heat detection. The detection circuitry was arranged to alarm only, and operation of deluge valve would be manual after an operator was sent to investigate. This results in an unacceptable time delay.

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The 510 gal AFFF foam system, located in Building 1607, is designed to apply a 6% AFFF solution to the Waste Solvent Storage Building. The system is designed such that water pressure on a bladder in the AFFF tank forces foam into the system. A leak in the bladder results in an inadequate supply of foam delivered. Measurements over the past two years have indicated foam concentrate in the space between the bladder and the wall of the tank.

2.3.5 Fire Hydrants

Recommendations

None

Discussion:

Fire hydrants are visually inspected monthly. Hydrants are flowed annually by the WINCO utility group.

2.3.6 Fire Extinguishers

Recommendations

None

Discussion

Fire extinguishers are visually checked monthly by the WINCO utility group. Extinguishers are weighed, hose and nozzles are inspected annually. Extinguishers needing hydrostatic testing have been identified and a test program is underway.

2.3.7 Fire Doors

Recommendations

90-12 Fire doors should be functionally tested annually.

Reason: Present inspection program is a monthly visual inspection.

Fire doors have a failure rate of from 10-15%, depending on type of door, according to recent FMRC field reports.

Description

Doors are visually inspected by the WINCO utility group. When it is obvious the door has been tampered with, a test is conducted and problem corrected or work order written.

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2.3.8 Detection

90-13 Detection systems located in hazardous areas such as high radiation areas or areas containing combustible dust areas should be tested at recommended frequencies or as frequently as possible as follows:

- a. Detectors should be installed that permit self checking from outside the area. This may be possible for existing installations on a replacement basis and should be done for new installations, or
- b. Testing should be scheduled when entry is made for other reasons.

Reason: Improve reliability of detection systems.

Discussion:

Smoke and heat detectors are tested semiannually by the Life Safety Systems group where accessible. Smoke detectors are annually cleaned and tested for sensitivity after remounting. This has resulted in a reduction in false alarms.

Heat detectors in high radiation areas such as cells K, W, T, Q and P in Building 601 cannot be tested on a regular basis. When work is done in the cell for other reasons, testing should be arranged. Heat detectors in bag type dust collectors at the coal plant also cannot be tested.

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2.4 FIRE RESPONSE

Recommendation

None

Description

Fire response for incipient fires is handled by a WINCO Emergency Response team. The Fire Department takes over on arrival at the fire scene. The Emergency Response Team for each shift is made up of a minimum of the following personnel: three (3) captains (operations shift foreman for each area), two (2) personnel from each of the following groups - Fuel Separations (601-602), FAST and Fuel Handling (666-603), Waste Processing (604, 605, 659), Maintenance, Health Physics and one individual each from Analytical (684) and Utilities (606, 687). The Team Captain would assign an individual to stand by the sprinkler control valve in event of fire. Valve locations and areas they control are designated on prefire plans in the response vehicle. Drills are held quarterly during off-shift periods.

Recommendations concerning the Fire Department are presented in the INEL report.

During the visit, a response to a waterflow alarm of Building 626 was witnessed. The writer arrived at Building 626 about 2 minutes after the alarm. The members of the Emergency Team were assembled outside the building and had determined that there was no fire in progress. A 1500 gpm/500 gal "Telesquirt" with an officer and four firefighters arrived 4 minutes after the alarm and entered the building in bunker gear and airpacks.

2.5 CUTTING AND WELDING

Recommendation

90-14 The cutting and welding permit system should include TIG and MIG welding.

Reason: To reduce the possibility of ignition of combustible materials.

Description

Cutting and welding safety procedures are described in the WINCO Industrial Safety Manual Procedure 11.0. Paragraph 11.6.7 describes Fire Prevention and Protection precautions to be taken. These precautions

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essentially require: 1) removal or covering of combustibles within 35 ft of the operation, 2) provision of fire extinguishers, 3) provision of a fire watch except where welding in other than designated areas or where approved by Fire Protection Engineer for a period of at least 30 min after the operation. An exception to the above, contained in paragraph 11.6.2, is TIG or MIG welding in nonhazardous atmospheres.

2.6 COMBUSTIBLE EXTERIOR INSULATION

Recommendations

90-15 The polyurethane insulation on exterior walls of Buildings 601, 602, 627, 637, and 640 should be replaced with a noncombustible insulation or coated with a cementitious material.

Reason: A fire involving this material could cause structural damage to the building and may result in spread of smoke and heat into the building.

Description

Several buildings have a 2 in. thick spray-on polyurethane coating on exterior wall surfaces. This material presents a significant exposure to the building. Where there are windows in the building, fire may spread inside with resultant fire and water damage.

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III

REVIEW OF SITE FIRE PROTECTION

Recommendations

Building 601

90-16 An investigation should be made to determine whether there are combustible deposits on the final filters and in the main exhaust duct from Building 601.

Reason: Final filter fire protection system testing to date has been based on heat from a fire in a process cell transmitted to the final filters through an exhaust duct. Testing has not been carried out involving combustibles in the duct or on the filter. If combustible deposits exist, an exposure to the final filter could result which would release radioactive materials. Loss expectancy is in excess of \$1,000,000 with vital program impact.

90-17 Protection should be provided for the control and plant protective system enclosures in the operating corridor on the operating floor. Protection may be either of the following:

- a. The enclosure should be roofed over and provided with halon protection, or automatic sprinkler protection should be provided over the enclosure, or
- b. Dress-out stations should be located outside the control enclosures. Drums for storage of contaminated clothing should have automatic closing covers.

Reason: Fire loading within enclosures containing control and plant protective system equipment is sufficient to cause major damage with extended plant shutdown.

90-18 * Automatic sprinkler or water spray protection should be provided within cells G, H, K, P, Q, R, S, T, W, Y processing organic solvents and over, and for 20 ft beyond organic solvent piping

* Recommendation from 1979 report

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systems in the operating corridor, access corridor, service corridor and process make up areas. The system should be designed to provide 0.3 gpm/ft^2 over the operating area.

Reason: It is recognized that carbon dioxide systems are installed within process cells and at least one cell (K cell) was successfully discharge tested. This system is not in service at all times. For life safety reasons carbon dioxide systems are taken out of service while personnel are working in the cell. A solvent release could result in loss in excess of \$10,000,000 with extended down time.

90-19 An automatic sprinkler system should be provided for areas where work activities would be expected to result in location of dress-out stations or maintenance activities which generate a significant amount of combustibles.

Reason: A fire would result in spread of radioactive contamination.

Building 604

90-20 Automatic sprinkler protection should be provided on a wet pipe system with 165°F rated heads designed to a minimum 0.20 gpm/ft^2 density.

90-21 A gaseous agent suppression system should be provided for the electronic process controllers in the control room.

Reason: Damage to equipment in the control room would result in shutdown of critical process equipment. Loss expectancy would be in excess of \$1,000,000 with high impact on plant operations.

Building 637

90-22 An interlock should be provided with sprinkler water flow or process controller to shut down the transfer pump in the event of fire in the Solvent Extraction Pilot Plant.

Reason: To reduce the amount of combustible liquid released in a fire. Loss expectancy \$1,000,000.

90-23 Automatic sprinkler protection should be provided over the organic receiver tanks in the Centrifugal Contactor Mock-up.

Reason: This area is shielded by mezzanines from overhead automatic sprinkler protection. Loss expectancy, more than \$100,000.

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Building 644

90-24 A one-hour rated fire barrier should be installed between switchgear and emergency diesel generator. In addition, conduit from switchgear passing through the area containing the emergency diesel generator should be protected with a wrap or coating Approved for one-hour fire resistance.

Reason: A fuel or lube oil line break on the 1200 Kw diesel generator could result in loss of electric power from commercial sources and from emergency standby generators to Buildings 601, 602, 606 and the exhaust fan for the main exhaust stack.

Building 649

90-25 The manual water spray system for the prefilters for the Building 601 final filter system should be made automatic.

Reason: The present arrangement allows for the possibility of an uncontrolled fire in a cell in Building 601, resulting in sufficiently high enough temperatures to damage the final filter system and release radioactive contamination. Loss expectancy is in excess of \$1,000,000.

Building 654

90-26 To properly protect rack storage in this building the following should be done:

- a. Aisles should be maintained clear of storage.
- b. Ordinary temperature sprinklers should be replaced with 286°F heads.
- c. Plywood shelves should be removed or one level of in-rack sprinklers should be provided below the top shelf.
- d. For rack storage of plastics (dress-out clothing), one level of in-rack sprinkler protection should be provided below the top shelf.

Reason: To limit damage to the building structure and goods in storage. Loss expectancy \$2,000,000.

Building 659

90-27 The water spray system protecting walls and windows of the calciner hot cell should be made automatic.

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Reason: A manually actuated system may not be operated in event of fire. Loss expectancy in excess of \$1,000,000.

90-28. The following should be done for the manual water spray system for the calciner and decon exhaust system prefilters.

a. The deluge valves should be relocated so the control valve can be safely accessed for manual operation.

b. The manual water spray system should be made automatic.

Reason: The location of the valves makes access difficult in a fire situation. Reliability is increased by making valves automatically actuated. Loss expectancy in excess of \$1,000,000.

90-29 An automatic gas extinguishing system should be provided for the control panels in the calciner control room.

Reason: Wire and cable concentrations are high within these cabinets and there is no physical separation between cabinets.

90-30 The 4 ft deep by 4 ft wide trench containing approximately 120 power cables in the switchgear room should be protected with a gaseous agent extinguishing system.

Reason: Fire in this trench would not be detected and trench could not be accessed to fight fire. Loss expectancy in excess of \$100,000.

Building 660

90-31 Storage of flammable or combustible liquids should be moved out of Area 2 to areas designated for storage and dispensing of combustible liquids (Area 1).

Reason: The automatic sprinkler system in Area 2 is not adequate to handle a combustible liquid fire. Loss expectancy is in excess of \$100,000.

Building 663

90-32 To properly protect rack storage, one level of in-rack sprinklers should be installed.

Reason: The existing ceiling level sprinkler system is not adequate to protect plastics stored. This material will result in

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a high heat release rate fire with damage to adjacent bin storage and structural damage to the building.

Building 666

90-33 The prefilter section of the supply air plenum F-FV-887 should be equipped with automatic sprinkler protection. One line should be provided for each bank of filters. Automatic sprinklers should be on 8 ft spacing and rated for 165°F.

Reason: A fire involving dust collected on prefilters and plastic prefilters would result in smoke damage to equipment and interior building surfaces. Loss expectancy is in excess of \$100,000.

Building 687

90-34 Cable penetrations into the control room should be sealed.

Reason: To prevent spread of fire and smoke into control room from a fire originating outside the room. Loss expectancy more than \$100,000.

90-35 Automatic sprinkler protection should be provided for the emergency diesel generator room.

Reason: The fuel and lube oil system presents a significant combustible loading. Loss expectancy more than \$100,000.

90-36 Automatic sprinkler protection should be provided for the maintenance shop to protect cable trays near ceiling level.

Reason: A fire in the maintenance shop would damage cable needed for operation of the boilers.

90-37 A procedure should be developed to check combustion safeguards.

Reason: To ensure proper operation in event of an upset condition. A procedure was being developed the time of this visit.

Building 688

90-38 The manually activated system protecting the bucket elevator, crusher and feeder are, or should be made, automatic.

Reason: Reliability is greatly improved with automatic activation.

Building 1617

90-39 This building should be provided with an automatic sprinkler system on a dry pipe system with 165°F rated heads designed to a minimum 0.20 gpm/ft² density.

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Reason: This building could have 25% of floor area occupied by plastic bags containing low level radioactive waste. Loss expectancy more than \$100,000.

Building Descriptions

Building 601

This is a four-story building of noncombustible construction. The top two stories were visited. Access to other areas could not be obtained due to need for extended Health Physics training. Descriptions of these areas were obtained from the site fire protection engineer and plant operators. The process involves charging of fuel received from Building 666, dissolving of fuel in nitric acid, separation of uranyl nitrate from fission products by solvent extraction, with the end product being uranyl nitrate.

The process make-up area (elevation 10'6") contains tanks largely filled with inorganic (nonflammable) liquids. Two tanks, one containing n-dodecane and one containing kerosene, are located on this floor along with a transfer station for pumping the contents of 55 gallon drums to the tanks. The tanks and transfer station are protected with an automatic water spray system activated by heat detectors. The dikes are adequately sized for contents of the tanks.

The operating floor (elevation -0) has control and plant protective system equipment in the control corridor between the cells. Control and plant protective systems are located within four open top metal enclosures approximately 5 ft wide x 6 ft high and 60 ft long. The enclosures contain electric and pneumatic controls necessary for operation of the process. Access is needed for maintenance, and due to contamination within the panels, HP dress-out stations are provided. There is a concern that fire starting in clothing will damage equipment within an enclosure with interruption of plant operation for an extended period.

Total flooding carbon dioxide systems have been provided for cells handling organic solvents, namely cells G, H, K, T, Q, P and W. There is one bank of cylinders with a connected reserve designed for the largest cell. One or two heat detectors have been provided per cell depending on

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cell size. Detectors cannot be checked on a scheduled frequency due to radiation levels in the cell. However, an effort was made to check as many as possible in March 1988 and all except D and H cells were checked and found operational. CO₂ from one cylinder was discharged into each cell to check integrity of piping and one of the sections of piping failed at the entry point into the cell. The piping has since been repaired. K cell was concentration tested on March 12, 1979. With the cell door damper closed, concentrations in excess of 50% were maintained for one hour. When damper was opened, concentrations dropped rapidly to less than 16% on the floor and 0% at 2 ft off the floor.

As noted, elevation -8 and elevation -22 was inaccessible due to HP requirements.

Building 602

This is a laboratory building of noncombustible construction which is undergoing extensive renovations. Laboratory hoods being installed are provided with sprinkler protection. Service penetrations between first floor and basement are being sealed. A wet pipe automatic sprinkler system is provided throughout the building.

Building 603

This building is two floors and a basement. The first and second floors are occupied by offices, laboratory and a computer room. Laboratory hoods are protected by installation of one automatic sprinkler per hood. Automatic sprinkler protection at ceiling level is on a wet pipe system with spacing varying from 120 ft² for office areas to 80 ft² for laboratory areas.

The basement contains the denitrator and cell used to convert uranyl nitrate to uranium trioxide by means of an electrically heated fluidized bed reactor. Z cell is occupied by hold-up tanks containing uranyl nitrate. Both denitrator cell and Z cell are protected by a total flooding halon system. Vaults used for storage of product reportedly have minimal combustibles with product stored in metal cans on metal shelves. Other basement areas are occupied by laboratories and hot cells. Automatic sprinkler protection is provided for these areas.

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Building 604

This building has two basement levels, grade level and second level. It is of transite wall on steel beam construction with an insulated metal roof.

Grade level is occupied by a control room which monitors and controls service waste, LET&D (nitric acid recycle), the evaporators in Building 161 and 169, gas plant and tank farm. While fire damage to the control room would reportedly result in fail safe conditions for processes controlled, it would result in shutdown of critical processes; notably, the evaporators in Building 161 and 169.

The second floor contains process mix tanks for inorganic (non flammable) liquids and a switchgear room. The basement and sub-basement contain pipe corridors and three cells used for removal of off gases.

The building is not provided with protection at this time. Reportedly, automatic sprinkler protection will be installed. Halon protection is also planned for seven control panels, five of which have recently been installed.

Present panels are mostly pneumatic controls and do not need halon protection.

Building 606

This building is constructed of corrugated asbestos-on-steel frame walls and houses four oil fired boilers. Two are 22,500 lbs/hr Babcock and Wilcox boilers, one is a 45,000 lbs/hr Murray, and the fourth a 45,000 lbs/hr Cleaver Brooks boiler. The boilers use a propane ignitor and are fired on No. 2 fuel oil. The gas train for the ignitor is equipped with an interlock to shut off the gas valve on high or low gas pressure and flame failure. Actuation closes two solenoid valves on the gas line. The oil line is also equipped with high and low pressure sensors which close a Maxon safety shutoff valve. In addition, the boilers are equipped with purge timers, flame sensors and a forced draft pressure sensor. All except high pressure switches and forced draft pressure interlock are tested weekly. Devices are on order to simulate high pressure and low forced draft pressure to allow more frequent testing of these interlocks.

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The boilers are generally not needed in the summer. At least one is used in the winter to supplement the steam plant.

Building 607

This is an uninsulated metal-on-metal frame structure. It is used for storage of mostly noncombustible materials in the open, or in cardboard boxes in racks to less than 12 ft high. It is protected by a dry pipe system on ordinary hazard pipe schedule with 212°F rated heads on approximately 20 ft² spacing.

Building 608

This is an insulated metal-on-metal column building with insulated metal-on-steel beam roof used for storage of mostly noncombustible materials in wood boxes to 10 ft high. The building is adequately protected by dry pipe sprinkler system.

Building 613

This substation is a one-story building of reinforced concrete wall and floor construction with roof of concrete-on-steel I beam. The main substation area has smoke detection. The cable way below the floor has halon protection activated by a heat detector.

There are two 10 MVA oil filled transformers located east of this building. The transformers are spaced 55 ft apart and are 10 ft from this building.

Building 617

This is an insulated metal-on-metal column building with insulated metal-on-steel beam roof used for storage of mostly noncombustible materials in wood boxes to 10 ft high. The building is adequately protected by a dry pipe sprinkler system.

Building 626

This is a metal-on-steel frame building with gypsum board interior partitions for use as change room and lunch room for Fuel Receipt and Storage. The building is adequately protected by a dry pipe automatic sprinkler system.

Building 630

This is a two-story high building occupied for laboratory and office use by the Technical Department. Some laboratories contain high value

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equipment such as mass spectrometers and electron microscopes. One office area contains a Lektreiver Series 80 automated file retrieving system. Heat detection is provided inside. In addition a halon bottle actuated by a thermal link provides internal protection.

Automatic sprinkler protection has been provided at approximately 100 ft² spacing and 165°F rated heads.

Building 633

This is a one-story and basement building of noncombustible construction housing the calciner. This operation has been discontinued although equipment is still in place. No protection is provided or needed due to low values and noncombustible construction.

Building 637

This building is part one- and two-story offices, chemistry labs and pilot plant for research and development activities related to the plant process. The building is of concrete block wall construction with a 2 in. thick sprayed-on urethane coating on the exterior walls. The roof is metal deck.

The one-story laboratory wing has offices along the outside wall and laboratories in the interior. The laboratories handle mostly inorganic chemicals. The two-story wing has offices on both stories.

Automatic sprinkler protection on a wet pipe system, approximately 60 ft² per head, is provided throughout laboratory areas.

There is a pilot plant at the south end of the building. Most pilot plant operations handle aqueous solutions. Two pilot plant operations handle organic liquids (n-dodecane). The solvent extraction pilot plant is located in a 30 x 12 x 40 ft high area. The operation involves transfer of n-dodecane from a 400 gal reservoir through pyrex columns one 3 in. diameter, 25 ft high; two 2 in. diameter, 20 ft high. In addition to grade level, there are three mezzanine levels. Automatic sprinklers are provided for all levels on approximately 60 ft² spacing. Drainage is also provided at floor level. There is presently no interlock to stop the pump in event of fire in the cell.

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In addition, there are organic receiver tanks which are part of the centrifugal contactor mockup, also in the high bay. Automatic sprinkler protection is provided at ceiling level but mezzanines shield these tanks from sprinkler water.

Building 640

This building has reinforced concrete and concrete block walls and a roof. The building is occupied largely by a hot cell used to process fuel used in the Rover Project. Processing is complete and the hot cell is not used. A halon system used for protection within the cell is not being maintained for this reason. The building is adequately protected by a wet pipe sprinkler system using 212°F rated heads on less than 120 ft² spacing.

Building 644

This is a one-story building of metal deck-on-steel frame roof and transite-on-steel beam wall construction. The building contains switchgear for commercial power and a 1200 Kw diesel generator. The emergency diesel generator is available on loss of off-site power to provide power to fans for the main exhaust stack and emergency power to Buildings 601, 602 and 606.

There is approximately a 15 ft separation between switchgear panels and the oil and fuel supply for the diesel generator. Conduit from switchgear passes above the area occupied by the diesel generator.

The building is provided with an automatic sprinkler system which should protect against most exposures. Under some fire conditions, such as a pressurized oil spray fire, additional protection is needed. Separation of switchgear from the diesel generator and fireproofing of conduit passing through the area housing the diesel generator is advised.

Building 649

This building is one-story and basement of reinforced concrete wall and roof construction. It contains the prefilter and HEPA filter system for Building 601.

No fixed protection or detection is provided in the building. Heat detection has been provided in the main exhaust duct, along with a manual

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water spray system. This system was automatic, but was converted to a manual system reportedly to prevent accidental operation. The control valve for the system is in the basement and may not be accessible in event of fire. The valve also shuts off water to hose stations in the building.

Building 651

This building is of reinforced concrete construction, and is used for storage of special nuclear material (SNM) in noncombustible containers. There is a truck unloading area and two storage areas. The truck unloading area and one storage area is protected by an automatic sprinkler system on a dry pipe system. The system is on 160 ft² spacing using 165°F rated automatic sprinklers. In addition, both storage areas are provided with halon protection actuated by cross-zoned smoke detection. This protection is satisfactory.

Building 652

This is a one-story and part basement building of reinforced concrete wall construction and roof construction. The building is occupied by a cafeteria, with additional space for a conference room and a room designated for emergency action planning. The basement contains HVAC equipment. Automatic sprinkler protection is provided on an approximately 110 ft² spacing with 165°F rated automatic sprinklers. The exhaust ducts and deep fat fryers are protected with a wet water system.

Building 654

This a one-story high insulated metal panel building used for office and warehouse occupancy. The warehouse storage is arranged on two- and three-tier high single and double row racks with plywood shelves. Storage is to 20 ft high. Aisles between racks are 7 ft but, in several cases, storage was located in aisles. Storage is part metal parts in wood boxes in the center and east of the warehouse, and plastic in cardboard boxes in the south section of the warehouse.

There are offices on the west side of the building.

The value of material in storage varies, but, at the time of the visit, was \$3,000,000. A substantial part of the storage was subject to quality assurance and it could be expected that, in event of fire, salvage would be low.

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The sprinkler system was hydraulically designed for 0.32 gpm over 3,000 ft² using 212°F rated automatic sprinklers. This protection is not adequate for this storage configuration.

Building 655

This is a one-story high maintenance shop constructed of insulated metal siding and insulated metal deck roof. The building contains lift trucks, miscellaneous equipment used to maintain yard areas, a carpenter shop, and an area containing storage in double row racks to 12 ft high. Storage is mostly noncombustible storage in cardboard boxes. Automatic sprinkler protection is provided on 100 ft² spacing with 165°F rated heads.

Building 657

This building is of reinforced concrete wall and roof construction. The building contains offices and a computer room used for accountability of special nuclear material. The building is provided with an automatic sprinkler system. The computer room, in addition to sprinkler protection, has a halon system activated by a cross-zoned smoke detection system.

Building 659

This building is constructed of part reinforced concrete and part metal panel-on-steel beam walls and metal deck-on-steel beam roof. The building is occupied as the New Waste Calciner Facility (NWCF), and is used to calcine waste in a fluidized bed calciner. A high bay area in the center of the building is used, via overhead crane, to gain access to the cell areas below grade. The cells contain the calciner and off gas treatment systems.

First floor areas, including the control and computer rooms, contain support equipment for the process. The control room is protected with a total flooding halon system in the room and below the raised floor. The system is actuated by a cross-zoned smoke detection system. In addition, automatic sprinkler protection has been provided in both areas. The control panels are not protected and are joined together in a U-shaped array. Wire and cable loading in these cabinets is high, and protection should be extended to these cabinets. Equipment is being removed from the

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computer room as it is no longer considered necessary to support the control room. This room is in the same fire area as the control room and is protected similar to the control room. First floor areas also contain decontamination areas where steam and inorganic solutions are used to clean tools and larger equipment such as transfer casks.

The first floor also contains supply air HVAC, a calciner exhaust plenum room, calcium nitrate storage, a switchgear room, and an emergency diesel generator room. The calciner and decon exhaust systems have prefilters followed by two sets of HEPA filters. Exhaust air temperatures are monitored and alarmed on high temperature in the control room in the event temperature exceeds 160°F. Operator action is required to actuate the protective water spray system to cool the exhaust gas stream. An automatic system was used at one time, but has been converted to manual. The manual control valve, which is located in the room near the filter plenum, would be inaccessible in event of a fire. The system should be automatic with manual actuation in an accessible area. The control room is protected with an automatic sprinkler system and a total flooding halon system. The halon system protects the room and areas below the raised floor. It is actuated by a cross-zoned smoke detection system.

The diesel generator room contains two 1,000 Kw diesel generators. One is dedicated to FAST, Building 666; the second to NWCF. Fuel supply for each generator is from a 5,000 gal tank buried outside the building to a 150 gal day tank at the base of each unit. The room is protected by automatic sprinkler protection at ceiling level. There is no separation between generators, and no automatic fuel shutoff in event of fire on one unit.

The switchgear room contains switchgear with power cable located in a 4 ft deep x 4 ft wide trench covered by metal plate. Approximately 120 power cables are located in this trench. Access for manual fire fighting would not be possible due to size and weight of the cover plates. Protection should be provided for this area.

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There is a cross-tie between the sprinkler system in one half of the building and the sprinkler system in the other half of the building fed from another main. The cross tie is normally closed and would be opened in an emergency. It would be advisable to have it opened and locked at all times.

The calciner and its exhaust system are located in a hot cell. The primary fuel for the calciner is kerosene. Much of what is processed is an aqueous waste stream. Organic waste streams, however, are also processed. Before an organic solvent is buried in the calciner, its auto ignition temperature is determined.

The start-up procedure is such that the fluidizing air stream is electrically heated to 660°F (350°C). Kerosene and oxygen are introduced and ignite off the bed. No flame scanning is provided since bed temperatures are about 72°F (40°C) above autoignition temperature of kerosene. When bed temperatures reach 930°F (500°C), the secondary fuel is introduced. A rapid shutdown (RSS) is initiated if bed temperature drops below 788°F (420 °C). At this point, the secondary fuel is shut off. At a bed temperature of 644°F (340°C), kerosene and oxygen are shut off and piping flushed with water.

The flow rate of kerosene could be a maximum of 11.4 gph at a pressure in excess of 45 psi. There is an excess flow valve on each of the four kerosene lines which shuts off if flow exceeds 11.4 gph. There is also a combined cell temperature and air flow alarm that will shut off kerosene flow. It is unknown what conditions are needed for this to happen. Kerosene piping in the cell is welded stainless steel. No automatic shutoff is provided in event of leakage and fire in the cell.

A manually actuated water spray system is provided in the hot cell. It is believed that this system protects hot cell windows near the calciner. The water spray system would be actuated by manual OS&Y valves located on second level by an operator responding from the control room on the first level. This system should be automatic.

Flue gas passes up through the bed to a cyclone collector, venturi scrubber, HEPA Filter and exhaust stack.

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Basement and sub-basement areas in the building consist of access corridors and rooms containing support equipment for activities within the hot cell.

There are two lube oil reservoirs in excess of 300 gal capacity located in Room 202. Stainless steel piping from the reservoirs to compressors in the hot cell is mostly welded within the cell, and flanged and bolted at the compressors. An automatic water spray system is provided for the compressors in the cell.

Building 660

This building is insulated metal panel-on-steel beam roof with part concrete block wall and part insulated metal panel walls. It is used for hazardous material storage. Area 1 contains solvent based paints in solid shelf racks and is a dispensing and storage area for 55 gal drums of combustible liquids stored three high in racks in an adjacent area.

Area 2 is used mostly for storage of inorganic materials in fiberboard drums and plastic barrels. At the time of this visit oil in 55 gal barrels, two pallets high, was being stored in Area 2. The automatic sprinkler system in this area is designed for 0.15 gpm/ft^2 . Area 3 contains open storage of cylinders of flammable and nonflammable compressed gasses. Oxidizers are separated from flammable gases by concrete block walls 5 ft high. Automatic sprinkler protection under 100 ft^2 spacing on an antifreeze system is provided.

Building 662

This is a one-story building of metal deck-on-steel beam roof and insulated metal panel-on-steel beam wall construction, adjacent to Building 663. The building is occupied for plasma welding and as an insulator shop. It is fully protected with a wet pipe sprinkler system.

Building 663

This is a one- and part two-story maintenance building. The building has metal panel-on-steel frame walls and metal deck roof. A concrete block wall with fire doors separates shop areas from an office area on the second floor and storage and office occupancy on the first floor. Shop areas are machine shop, welding and spray booth, and pipe insulator shop.

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A storage area on the first floor is in part occupied for rack storage and in part metal shelf storage. Metal shelf storage is above and below a mezzanine. The rack storage area occupies a 600 ft² area. Storage is largely plastics and paper products in cardboard cartons to 16 ft high in double row racks. Sprinkler protection is on 100 ft² spacing using 165°F heads.

Building 666

This building is three stories above ground and two levels below grade. It is constructed of reinforced concrete and insulated metal panel wall construction. Roof construction is steel deck-on-steel beams.

The Fuel Storage section (00 level) is occupied by fuel received from Naval Reactor Facilities (NRF). It is stored in preparation for processing. The 00 elevation consists of a truck unloading station provided with automatic sprinkler protection on a dry pipe system. The floors below (-17 and -27.6 ft elevation) contain air conditioning systems for building supply air and exhaust air, motor control centers, and chemical makeup.

The supply air system contains a prefilter section two levels high of plastic filter media to filter incoming air. No protection is provided within the supply air plenum.

Air from various areas of the building is ducted to an air washer. Air is then ducted to banks of HEPA filters and exhausted to outside. A heat detector, located in the duct between the air washer and HEPA filter, is arranged to operate a water spray system at air temperatures of 200°F.

The process area contains a hot cell with service corridors on either side of the cell. Spent fuel is transferred from fuel storage, the uranium content is determined and it is then dissolved in acid solutions and piped to Building 601 for further processing. At the time of this visit, no processing was taking place. Clean-up and repair activities were being carried out within the cell. There were low levels of combustibles within the cell in the form of used boots on manipulator arms and plastic hose. The size of the cell and quantity of combustibles would probably not present a hazard to the cell or exhaust filter system.

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Access areas around the cell are protected by a wet pipe automatic sprinkler system with approximately 110 ft² spacing using 165°F rated heads.

Building 669

This building is of reinforced concrete wall and roof construction. The building is occupied as the 505 Guard Post and contains a security control room and a relay room. The relay room has cabinets containing wiring from security posts throughout the plant and equipment advising of accountability of nuclear material. The annex is protected by automatic sprinklers and a total flooding halon system actuated by a cross-zoned smoke detection system. The control room is constantly manned.

Building 687

This insulated metal panel wall and corrugated metal-on-steel beam roof houses two fluidized bed boilers that provide process steam and building heat. The boilers are rated at 67,500 lbs/hr steam at 150 psi. The bed itself is of calcine limestone and coal kept in turbulent motion by air introduced through nozzles in the grid plate. Bed temperature is 1550°F under normal operation. Feed is from limestone and coal bunkers. During a scheduled shutdown coal is run out of the bunker. In an unscheduled shutdown attempts are made to get back on line within 30 days. If fire develops within a coal bunker, contents can be run out of the building.

The control room is protected with automatic sprinkler protection. Cable penetrations through the floor into the control cabinets have not been sealed.

The switchgear room containing 480 and 2400 V switchgear is provided with smoke detection only. Cable penetrations are properly sealed. This is satisfactory.

The room containing the 1600 Kw emergency diesel generator contains a 300 gal day tank. Heat detection is provided, but no sprinkler protection is provided. Protection is needed due to the fuel and lube oil systems on the generator.

The maintenance shop has four cable trays containing high voltage cable for the switchgear room. No protection is provided.

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Building 688

This is the coal unloading building. The building has automatic sprinklers on a dry pipe system in the unloading area and control room on the first floor. A manually operated deluge system protects the bucket elevator, crusher and feeder area in the basement. A heat detection system is used to signal operators in the control room to trip the system. The system should be arranged to operate automatically.

Building 690

This is a small storage building. Protection is not provided or needed due to low value of building and contents.

Building 692

This is a one-story high insulated metal structure used to monitor gases exhausted up the stack. Loss of this facility would result in plant shutdown within four hours. The building is protected with a total flooding halon system actuated by cross zoned smoke detection system. Protection is satisfactory.

Building 697

This building is of reinforced concrete walls and roof with an outside bay of corrugated metal-on-steel beams. The building serves as a security checkpoint with the outside bay used for vehicle inspection.

The building is protected with a wet pipe system using 165°F heads. The outside bay is protected with an antifreeze system off the wet pipe system in the building.

Building 699

This is a one-story building with concrete block walls and metal deck roof with suspended ceiling. The building is occupied by offices and a TV studio. Walls of the control room and TV studio are lined with Sonex 94 HF-1 foam. This material has reportedly passed the UL 94 test. There are two Lektreiver Series 88 files located in this building. One is 4 x 8 x 8 ft high; the second is 4 x 8 x 10 ft high. One unit contains hard copies of training records of all personnel at CPP; the second unit contains lesson plans and teaching aids for courses given. Neither cabinet is of fire resistant construction. Test score data and results are kept on file in Building 1631.

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It is planned to microfilm test results this summer and file results in a separate fire area. It is also planned to provide halon protection for both Lektrelvers.

The building is protected by a wet pipe sprinkler system designed for 0.16 gpm/ft² over 1596 ft².

Building 741

This building is a one-story high building with metal deck-on-wood joist roof construction. It is occupied as a waste pumping station. No protection is provided; none is needed due to low values.

Building 776

This building is of metal-on-steel frame wall and roof construction. It was designed as a thaw shed to heat incoming railcars to facilitate unloading coal. The gas burners used have no combustion safeguards. The building is not in use since coal is shipped by truck. If the building were to be used, a complete set of combustion controls would be needed.

Buildings 1604 and 1605

These buildings are of insulated metal panel wall and roof construction. The buildings are occupied as offices by Engineering Support, Plant Projects and Human Resources. Automatic sprinkler protection is 90 ft² spacing, 165 °F rated on wet pipe system.

Building 1606

This is an insulated metal wall and steel deck roof construction. It is occupied by Ebasco for storage of equipment to be used in the FPR project. The storage consists of general suppliers such as blue print paper and janitorial supplies in one half; the other half is temperature controlled for storage of frames and oil filtered windows for hot cells. Automatic sprinkler protection 0.21 gpm/ft² over 31,000 ft² on a dry system has been provided and is adequate for this type of storage.

Building 1608

This building has exterior metal siding with interior dry walls with metal-on-steel beam roof construction. The building is used for maintenance activities on manipulators for hot cells. An enclosed room is maintained at negative pressure where maintenance is performed. There is a storage area for

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repaired manipulators and a storage area for equipment with low level radioactive contamination. The building is protected by a dry pipe system about 80 ft² per head ordinary hazard pipe schedule. Protection is adequate.

Building 1617

This is a one-story 800 ft² building of uninsulated metal panel wall and roof construction. Low level radioactive waste is brought into this building from various areas of the plant and placed in cardboard boxes for transfer to boxes, barrels or dumpsters for transfer to CFA. Under worse case conditions 25% of the building could be occupied by bags containing low level radioactive waste.

The building is not provided with an automatic sprinkler system. Protection is needed due to the type of material handled and the fact that low level radioactive waste is involved.

Building 1618

This is a three-story building presently under construction. It contains two fractionators. Each fractionator is within a reinforced concrete cell with reinforced concrete roof. The building itself is insulated metal panel and steel deck roof in other areas. HVAC and power distribution equipment is located on the first floor. Other utilities such as steam, air and treated water are on the second floor. Exhaust filtration (HEPA) is located on the third floor.

Automatic sprinkler protection will be provided off a 4 in. connection to the 6 in. lead-in. Both levels will be provided with sprinkler protection within the fractionator cells. The three levels in support areas will be protected. The system is designed for 0.16 gpm/ft² over 950 ft² of floor area with a 500 gpm allowance for hose stream. This should be satisfactory.

Building 1619

This hazardous waste storage building is one story high of part reinforced concrete wall and insulated metal panel construction with metal deck roof. The building is divided into bays by 4 ft high reinforced concrete walls. The bays are used for storage of: 1) combustible liquids in 55 gal drums, one drum high, 2) radioactive waste one drum high, 3) solid hazardous waste, 4) acid waste storage, one drum high. Also included is a truck unloading

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station. Trailers are backed into the unloading station, uncoupled from the tractor and left until unloading is completed.

Automatic sprinkler protection is provided for all areas except the truck unloading station. The design of the sprinkler system is based on 0.60 gpm/ft² density for combustible liquid storage and 0.19 gpm/ft² for other storage areas.

Building 1631

This office building of insulated metal walls and roof is occupied as a computer support facility. There are three computer rooms protected with automatic sprinklers and halon actuated by cross-zoned smoke detection in the room and below the raised floor. The rest of the building is occupied as offices. It is protected by a wet pipe sprinkler system 90 ft² spacing, 165 °F rated sprinkler heads.

Building T-5

This is an 1,800 ft² one-story high building used as a contractor lunch room and change room. No fixed protection has been provided; none is needed. The building is low value and does not expose other structures so protection is not presently needed.

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IV

NEW CONSTRUCTION

Recommendations

90-40 Automatic sprinkler protection systems should be placed in service as soon as the system is functional and inspection responsibility should be assigned at this time.

Reason: Buildings TR-10 and TR-24 were found with sprinkler control valves closed. Both sprinkler systems had been hydrostatically tested and ready for service with the exception of an alarm to the Fire Department. These buildings were without protection for a minimum of 3 months because sprinkler control valves were left shut.

General Description

Future Water Supply Improvements

Improvements are planned in fire protection water supply which, when completed, should result in a satisfactory fire protection water supply. It is planned to install two 1,000,000 gal insulated suction tanks. In addition, two 3,000 gpm at 125 psi diesel driven centrifugal fire pumps dedicated to fire protection will be provided. The tanks will be heated by water pumped from deep well pumps into fire protection tanks with overflow to process water tanks. There will be two 12 in. diameter ties to the 10 in. main around the plant. Valve and piping arrangements will be arranged to allow either tank to be used by either pump. Also, either tie-in can be used by either pump. The only non fire protection water demands will be heat exchangers for Buildings 697, 1604, 1605 and 1631. The demands for these units are reportedly low and can be easily handled by one jockey pump. Two 200 gpm jockey pumps will be provided to maintain system pressure at 135 to 140 psi.

Building 629

This is an office building used by MK Construction for the FPR project. It is constructed of metal sided walls with metal-on-wood frame roof and a false ceiling. Sprinklers are 212°F above the ceiling and 165°F below the ceiling on 120 ft² spacing.

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Building 698

This is a part one- and part two-story building of steel deck-on-steel beam roof and insulated metal-on-steel frame wall construction. It is occupied as an office and warehouse basically by M.K. Ferguson Construction for support activities at INEL. The warehouse is used for storage of records, general job materials, office supplies, tools, etc. Automatic sprinkler protection of approximately 100 ft² spacing is provided. A paint storage room has been provided in a concrete block walled enclosure with a 3 hr rated fire door. The room has low level ventilation, automatic sprinkler protection on 65 ft² spacing, explosion proof light fixtures and a 6 in. high ramp to contain spills. Automatic sprinkler protection is approximately 100 ft² in office areas. A hydraulically designed system has been provided for the warehouse area.

Buildings 1637, 1638, and 1640

All are one-story insulated metal-on-steel beam buildings, 1,600 ft² to 7,000 ft² in area, used by EBASCO for welding, pipe fitting and carpentry shops. Interior partitions are plywood. These buildings are not provided with automatic sprinkler protection because they are "temporary buildings". It is apparent, due to type of construction, that these buildings will remain after construction. Frequency of ignition is higher during construction. They will most probably be protected at this time. Protection should be provided for these buildings now.

TR-10

This is a trailer containing medical equipment for FPR site support. It is protected by an automatic sprinkler system. The valve to the system controlling eight automatic sprinklers was found shut. The system had been successfully pressure tested five months previously but the alarms had not been connected. This system should be placed in service.

TR-24

This trailer is owned by WINCO and occupied by M. K. Ferguson for document control for the FPR project. Automatic sprinkler protection is provided above and below the ceiling on 90 ft² spacing.

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The valve controlling the sprinkler system for this building was found shut. The system was reportedly successfully pressure tested and the piping connected to the underground main in December 1989. No one appears to be responsible for maintaining this system.

The property loss potential is low but it would result in loss of records for the FPR project which would take an extensive period of time to replace. This incident and the shut valve at TR-10 is an indication there is a breakdown in responsibility for turnover of systems.

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APPENDIX A

ABBREVIATIONS

CFA	-	Central Facilities Area
FAST	-	Fluorine and Storage Facility
FMRC	-	Factory Mutual Research Corporation
FPR	-	Fuel Processing Restoration
HVAC	-	Heating, Ventilating and Air Conditioning
MIG	-	Metal Inert Gas
NRF	-	Naval Reactor Facilities
NWCF	-	New Waste Calciner Facility
PPS	-	Plant Protective System
SNM	-	Special Nuclear Material
TIG	-	Tungsten Inert Gas

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APPENDIX B

MAJOR RECOMMENDATIONS

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APPENDIX B

MAJOR RECOMMENDATIONS

<u>Page</u>	<u>Rec</u>	<u>Area</u>	<u>Deficiency</u>	<u>Loss Expectancy</u>
2	90-1	Water supply	Dedicated water supply for fire protection	Reliability
4	90-3	Power supply	Lack of transformer oil testing program	Interruption to production
5	90-4	Sprinkler control valve supervision	Frequency of inspection	Reliability
12	90-15	Bldgs 601, 602, 627, 637, 640	Combustible exterior insulation	Excess \$1,000,000
13	90-16	Bldg 601 exhaust system	Possible combustible deposits in duct and on filters	Excess \$1,000,000
13	90-17	Bldg 601	Protection needed for control and PPS system enclosures	Continued operation
13	90-18	Bldg 601	AS or WS protection needed for process cells	More than \$10,000,000
14	90-20, 90-21	Bldg 604	AS protection needed for building. Gas agent protection for process controllers	Excess of \$1,000,000 high program impact
14	90-22	Bldg 637	Solvent pump not interlocked to stop in event of fire	Excess \$1,000,000
15	90-25	Bldg 649	Manual water spray for prefilters	Excess \$1,000,000

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MAJOR RECOMMENDATIONS (cont.)

<u>Page</u>	<u>Rec</u>	<u>Area</u>	<u>Deficiency</u>	<u>Loss Expectancy</u>
15	90-26	Bldg 654	AS inadequate for rack storage	\$2,000,000
15	90-27	Bldg 659	Manual water spray for calciner hot cell	Excess \$1,000,000
16	90-28	Bldg 659	Manual water spray for calciner and decon exhaust filtration system	Excess \$1,000,000
35	90-40	New Construction	Delay in placing fire protection system in service	Varies

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APPENDIX C

WATER FLOW TEST RESULTS

"C" FACTOR DETERMINATION

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APPENDIX C-1

WATER TEST FLOW RESULTS

Water flow tests were carried out with service water pumps 502 and 503 in operation. Valving was arranged so that one way flow could be achieved through all major sections of underground main. All sections of underground flowed free and unobstructed.

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APPENDIX C-1 (Cont.)

WATER FLOW TEST RESULTS

Test No.	Pressure			Flow(1)			Valves Closed
	Location	Static (psi)	Residual (psi)	Location	Pitot (psi)	Flow (gpm)	
1.	Hydt 1003	114	94	Hydt 1505	32	990 ⁽²⁾	1007, 1012, 6001
	Hydt 1009	112	60		32	990 ⁽²⁾	
	Riser Bldg 626	110	55			1980 gpm	
2.	Hydt 1047	112	77	Hydt 1505	46	1190 ⁽²⁾	1012, 1037, 6001
	Riser Bldg 626	109	70		48	1210 ⁽²⁾ 2400 gpm	
3.	Riser Bldg 626	110	64	Hydt 1505	40	1110 ⁽²⁾	1011, 1051, 2402 2502, 6002, 6006
					38	1080 ⁽²⁾ 2190	
4.	Riser Bldg 626	110	80	Hydt 1505	52	1260 ⁽²⁾	None
					54	1290 ⁽²⁾ 2550	
5.	Riser Bldg 614	115	99	Hydt 6518	36	1050 ⁽²⁾	6512, 7005
	Hydt 4500	118	91		40	1110 ⁽²⁾	
	Hydt 6511	117	64			2160	
6.	Riser Bldg 614	115	98	Hydt 6518	42	1140 ⁽²⁾	6508, 7005
	Hydt 4500	117	89		44	1160 ⁽²⁾	
	Hydt 6511	117	66			2300	
7.	Riser Bldg 614	115	91	Hydt 6518	54	1290 ⁽²⁾	6517
	Riser Bldg 654	116	93		60	1360 ⁽²⁾ 2650	

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APPENDIX C-1 (Cont.)

Test No.	Pressure			Flow(1)			Valves Closed
	Location	Static (psi)	Residual (psi)	Location	Pitot (psi)	Flow (gpm)	
8.	Riser Bldg 614	116	93	Hydt 6518	60 64	1360 ⁽²⁾ <u>1400</u> ⁽²⁾ 2760	None
	Riser Bldg 654	116	93				
	Hydt 6511	117	92				
9.	Hydt 5031	116	86	Hydt 7010	42 48	1140 ⁽²⁾ <u>1110</u> ⁽²⁾ 2250	6525, 6527
	Hydt 7012	115	83				
	Riser Bldg 698	115	76				
10.	Hydt 5031	116	87	Hydt 7010	40 44	1110 ⁽²⁾ <u>1160</u> ⁽²⁾ 2270	7006, 6527
	Hydt 7012	115	78				
	Riser Bldg 698	115	72				
11.	Hydt 5031	116	90	Hydt 7010	44 46	1160 ⁽²⁾ <u>1190</u> ⁽²⁾ 2350	None
	Hydt 7012	115	90				
	Riser Bldg 698	115	82				
12.	Hydt 6007	115	62	Hydt 6014	40 40	1060 ⁽³⁾ <u>1060</u> ⁽³⁾ 2120	2506, 6001, 6530
	Hydt 6008	115	57				
13.	Hydt 6007	115	68	Hydt 6014	44 46	1110 ⁽³⁾ <u>1140</u> ⁽³⁾ 2250	6006, 6528
	Hydt 6008	115	65				
14.	Hydt 6007	115	74	Hydt 6014	50 50	1190 ⁽³⁾ <u>1190</u> ⁽³⁾ 2380	None
	6008	115	74				

1. All measurements were made with Pumps 502 and 503 in operation. Flows rounded to nearest 10 gpm.
2. Measurements made using two L.N. Curtis flowmeters. Before testing, comparative flow measurements were made with a Western Fire Equipment flow nozzle of known coefficient. Based on these tests the coefficient of the Curtis flowmeters was determined to be 0.94.
3. Flow measured from two 2-1/2 in. hydrant butts. A coefficient of 0.9 was used.

APPENDIX C-2

C FACTOR DETERMINATION

The Hazen-Williams pipe coefficient is otherwise known as the C value. The C value is a measurement of condition of a pipe and reflects the extent of corrosion or tuberculation present. The values indicated in these tests show underground main to be essentially free of corrosion and tuberculation.

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APPENDIX C-2 (Cont)

C FACTOR DETERMINATION

Test No.	Length (ft)	Diameter (in.)	Location	Static (psi)	Resid (psi)	ΔP (psi)	P Station (psi)	psi/ft	C=100	f	C
1 (2,110 gpm)	1,075	8 in.	Hydt 1003 Hydt 1009	114 112	94 60	20 52	32	0.030	0.048	1.6	150
5 (2,160 gpm)		8 in. 10 in.	Hydt 4500 Hydt 6511	118 117	91 64	27 53	26	0.030	0.046	1.5	150
7 (2,650 gpm)	690	10 in.	Bldg 614 Riser Bldg 654	115 117	98 89	17 28	11	0.016	0.024	1.5	150
9 (2,250 gpm) N side FFR		12 in.	Hydt 5031 Hydt 7012	116 115	86 83	30 32	2(1)				
12 (2,120 gpm) Coal Plant		12 in.	Hydt 6007 Hydt 6008	115 115	62 57	53 58	5(1)				

(1) Pressure drop too low to accurately determine "C" Factor.

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APPENDIX D

FIRE PUMP TEST RESULTS

PUMP ACCEPTANCE TEST DATA

Refer to P&P F(A) - 512.12 & DS 3-7N

PROPERTY OF <u>Westinghouse Idaho Nuclear Co.</u>		INDEX NO.	DIST. OFFICE
ADDRESS <u>608 Fire Pump</u>		TESTED BY <u>P. Dobson</u>	DATE <u>6-13-90</u>
CITY	STATE	PLACO	CODE

SUBJECT _____ CONFERRED WITH _____

PUMP	SHAFT ☒ HORIZONTAL ☐ VERTICAL		MANUFACTURER <u>Aurora</u>		APPROVED ☒ YES ☐ NO		SHOP OR SERIAL NO. <u>83-66025</u>		MODEL OR TYPE <u>6-481-20</u>	
	RATED GPM <u>2,000</u>		RATED HEAD-FT. (PSI) <u>289</u>		RATED RPM <u>1750</u>		SUCTION FROM <u>Tank</u>		TANK SIZE <u>37</u>	
IF VERTICAL TYPE	VERTICAL DIST. DISCH. GAUGE TO WATER LEVEL	STATIC FT.		RIGHT ANGLE GEAR DRIVE	MANUFACTURER		SHOP OR SERIAL NO.		APPROVED ☐ YES ☐ NO	
		PUMPING FT.			MODEL OR TYPE		PERFORMANCE ☐ SMOOTH ☐ ROUGH			
DRIVER	MANUFACTURER <u>Cummins</u>		APPROVED ☒ YES ☐ NO		SHOP OR SERIAL NO. <u>18105582</u>		MODEL OR TYPE <u>NT-855-F3</u>		RATED H.P. <u>340</u>	
	☐ ELECTRIC MOTOR		RATED VOLT.		OPERATING VOLT.		RATED F.L. AMPS		AMPS AT 150%	
	☒ DIESEL ENGINE		☐ GASOLINE ENGINE		☐ GAS ENGINE		☐ STEAM TURBINE		☐ PRESS. GOVERNOR BUILT IN	
CONTROLLER	MANUFACTURER <u>Master</u>		APPROVED ☒ YES ☐ NO		START <u>60</u> PSI		STOP <u> </u> PSI		JOCKEY PUMP	
	SHOP OR SERIAL NO. <u>33375</u>		MODEL OR TYPE		☐ MANUAL ☒ PRESS DROP		☒ MANUAL		☐ YES ON <u> </u>	
					☒ AUTO ☐ WATER FLW		☐ AUTO		☐ NO OFF <u> </u>	

SPEED R. P. M.	DISCHARGE PRESSURE P. S. I.	SUCTION PRESSURE P. S. I.	NET HEAD P. S. I.	STREAMS			GALLONS PER MINUTE	PERCENT OF RATED CAPACITY	VOLTS	AMPS	STEAM PRESS.	
				NO.	SIZE	PITOT PRESSURE					THROTTLE	CH.
1650	162	10	152	Flow	Meter		0	0				
1650	158	10	148				1100	55				
1650	150	10	140				1500	75				
1650	136	10	126				2000	100				
1650	120	9	111				2500	125				
1650	100	9	91				3000	150				

Readings marked + in suction column are heads above atmosphere, those marked - are lifts. For vertical shaft pumps, convert distance from pumping water level to discharge gage to psi and treat as negative (-) suction pressure.

Plot disch. press. and net head curves. For electric-driven pump, plot ampere curve also.

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APPENDIX E

ENTRANCE CONFERENCE JUNE 4, 1990

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APPENDIX E

ENTRANCE CONFERENCE JUNE 4, 1990

<u>Name</u>	<u>Organization</u>
D. Barefoot	FACTORY MUTUAL
P. Dobson	FACTORY MUTUAL
C. Howley	EG&G-ID
R. McCuskey	DOE-ID
K. Phillips	EG&G-ID

EXIT CONFERENCE JUNE 14, 1990

<u>Name</u>	<u>Organization</u>
L. H. Anderson, Jr.	DOE-ID
D. B. Barefoot	FACTORY MUTUAL
J. H. Barry	DOE-ID
R. Caumisar	EG&G - RMMC (WM)
D. I. Cooper	WINCO/IND. FIRE PROTECTION
J. T. Cranefield	FACTORY MUTUAL
B. L. Diehl	EG&G
P. H. Dobson	FACTORY MUTUAL
W. R. George	EG&G - LSS
G. W. Homu	EG&G - IND. SAFETY
C. A. Howley	EG&G - F&M DEPT.
W. D. Jensen	DOE-ID
K. Johnson	EG&G - IRC SAFETY
J. E. King	FACTORY MUTUAL
T. Kraft	EG&G
D. Kubicki	DOE/HQ/EH-321
R. J. Marcinko	WINCO/IND. SAFETY
B. H. Marler	EG&G - TELECOM
R. McCuskey	DOE-ID
C. W. McKnight	WINCO
R. Ohman	WINCO UTILITY GROUP
B. Owens	EG&G
K. Phillips	EG&G - ES&Q
S. D. Ramsey	FACTORY MUTUAL
K. R. Russell	ROCKWELL
P. N. Smith	WINCO/SYSTEMS

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APPENDIX F

STATUS OF PREVIOUS RECOMMENDATIONS

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APPENDIX F

STATUS OF PREVIOUS RECOMMENDATIONS

Recommendations which have been completed or no longer apply are listed below. Previous recommendations which still apply are contained in Section II.

- Pg 10 (Rec 3.a and b) The electrical power supply to the 2,000 gpm fire pump has not been upgraded. Plans are well along to install two 3,000 gpm at 125 psi diesel driven fire pumps.
- Pg 16 (Rec 2 in part) Sprinkler control located in stairwells are protecting areas of relatively light combustibile loading and the valves are electrically supervised. A recommendation has been made for nonbreakable shackle locks for sprinkler control valves.
- Pg 18 [Rec 4 (78-7)] Automatic sprinkler protection has been provided on less than 90 ft² spacing using 165°F sprinkler heads.

END

DATE FILMED

02 / 05 / 91