SUMMARY

OF

FIRE PROTECTION PROGRAMS

OF THE

UNITED STATES DEPARTMENT OF ENERGY

CALENDAR YEAR 1992

OFFICE OF

THE DEPUTY ASSISTANT SECRETARY

SAFETY AND QUALITY ASSURANCE

November 1993

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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) continues the series started in 1972.

Since May 1950, an annual property loss summary has been submitted from each field organization under the requirements of two predecessor government agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). These requirements are currently promulgated in DOE Orders 5480.7, "Fire Protection," and 5484.1, "Environmental Protection, Safety and Health Reporting Requirements."

Beginning in 1981, all individual accident reports required by DOE Order 5484.1 have been compiled by the Computerized Accident Incident Reporting System (CAIRS) administered by EG&G, Idaho. Each quarter year CAIRS issues the Occupational Injury and Property Damage Summary (CAIRS Summary), which statistically reports on DOE loss topics such as: injuries and illness, fatalities, non-fire, and fire losses. The Annual Fire Protection Program Summary (AFPR), however, is based on annual summaries from field organizations that includes a more comprehensive look at the DOE fire protection program. Both fire and non-fire loss statistics are reported, as are reports on a broad range of fire protection activities including: descriptions of fire protection construction projects; suppression system performance; and actions of DOE that are of general fire protection interest. Loss statistics from the AFPR are then backfed into the CAIRS system to validate the official DOE database.

The report for calendar year (CY) 1992 was summarized from information sent to Headquarters by 21 out of 25 field organizations representing approximately 99.8 percent of the total DOE Complex. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 18 categories represented. Abbreviations are identified in the Glossary, as are the DOE site and Management and Operations (M&O) contractors and major definitions.

GLOSSARY

Field Organization abbreviations

AL Albuquerque Operations Office
CH Chicago Operations Office
ETC Energy Technology Centers[1]
FFO Fernald Field Office
HQ Headquarters (DOE)
ID Idaho Operations Office
NPR Naval Petroleum Reserves[2]
NV Nevada Operations Office
OR Oak Ridge Operations Office
PA Power Administrations[3]
PNR Pittsburgh Naval Reactor Office
RF Rocky Flats Operations Office
RL Richland Operations Office
SF San Francisco Operations Office
SNR Schenectady Naval Reactors Office
SPR Strategic Petroleum Reserve Project Office
SR Savannah River Operations Office
SSC Superconducting Super Collider Project Office

Site or M&O Contractor abbreviations

ANL-W Argonne National Laboratory, West
BM Bryan Mound Crude Oil Storage Site
BNL Brookhaven National Laboratory
EG&G-ID EG&G, Idaho Division
EG&G-RF EG&G, Rocky Flats Division
ETEC Energy Technology Engineering Center
FA Fermi National Accelerator Laboratory

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[1] Energy Technology Center organizations are comprised of: the Bartlesville Project Office (BPO); the Pittsburgh Energy Technology Center (PETC); and the Morgantown Energy Technology Center (METC).

[2] Naval Petroleum Reserve organizations are comprised of: the Naval Petroleum Reserves in California (NPR-1), and the Naval Petroleum & Oil Shale Reserves in CO, UT, and WY (NPR-2,3).

[3] Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

Fire Protection Summary
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HANHanford Site
INELIdaho National Engineering Laboratory
ITRIInhalation Toxicology Research Institute
K-25 Oak Ridge's K-25 Site
KAPLKnolls Atomic Power Laboratory
KCPKansas City Plant
KSOKesserling Site
LANLLos Alamos National Laboratories
LLNLLawrence Livermore National Laboratories
MIT Massachusetts Institute of Technology
MMES Martin Marietta Energy Systems
MPO Mound Site
NDU Notre Dame University
NTS Nevada Test Site
ORNLOak Ridge National Laboratories
PAN Pantex Site
PI Pinnellas Site
PNL Pacific Northwest Laboratory
POR Portsmouth Gaseous Diffusion Plant
PPPLPrinceton Plasma Physics Laboratory
REECo Reynolds Electrical and Engineering Company
SLACStanford Linear Accelerator Center
SNLASandia National Laboratories, Albuquerque
SNLLSandia National Laboratories, Livermore
SRSSavannah River Site
WHWest Hackenberry
WHCWestinghouse Hanford Company
WIWeeks Island Site
WS Windsor Site
WSRCWestinghouse Savannah River Company
Y-12 Oak Ridge's Y-12 Plant

The following key is used throughout the report to identify the various DOE elements: DOE Field Organization/Site or M&O Contractor.

Definitions

The following terms are defined in the text of DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements." Section references are made at the end of the definition.

1. **Property Value:** The approximate replacement value of all DOE-owned buildings and equipment. The replacement value shall be calculated by applying to the original cost (or most recent appraised value) an appropriate cost index ratio (cost index published by "Engineering News Record" shall be used). Include the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Exclude the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (CHAPTER 5.1)

2. **Loss Estimation:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is done in fact. Estimation costs include: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage; and (3) any reductions for salvage value. Estimation costs exclude: (1) down time; and (2) any outside agency payments. Losses sustained in privately-owned property is not reportable, even if DOE is liable
for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and non-fire loss events. (CHAPTER 5.2)

3. **Fire Loss:** All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off; (2) vehicle losses (including aircraft, marine and railroad equipment) shall be included in the fire loss category only if determined that the loss was sustained as a direct consequence of fire (fire damage resulting from other consequences of the vehicle loss shall be classified within the respective vehicle loss category); and (3) fire losses involving cargo during transportation should be treated as a transportation loss. (CHAPTER 4.2.c.(1).c) (CHAPTER 5.2.c.(3))

4. **Non-Fire Loss:** All damage or loss sustained as a consequence of the following events: (1) explosions; (2) natural cause events (such as earthquakes and hurricanes); (3) electrical malfunctions; (4) transportation (cargo) losses; (5) mechanical malfunctions; (6) radiation releases or other nuclear accidents; and (7) miscellaneous accidents (such as thermal, chemical or corrosion related accidents). (CHAPTER 4.2.c)

5. **Loss Rate:** Unit of comparison in cents loss per $100 of property value.

EXECUTIVE SUMMARY

The DOE experienced no fatalities, injuries, or significant program delays resulting from fire in CY 1992. There were, however, 131 reported fire incidents within DOE producing a total fire loss of approximately $1,260,950.

The fire loss rate for CY 1992 is approximately 0.11 cents loss per $100 of value protected; an increase of about 220 percent over last year's figure. This compares with the loss experience for the Highly Protected Risk (HPR) insurance industry of about 0.39 cents per $100 value. DOE's recurring fire protection costs to attain this loss rate approached $74 million for the year. Approximately 87 percent of the total was attributed to fire department and system maintenance activities, with the remaining amount spent on engineering fees.

Fire protection construction continued at a substantial rate in CY 1992. Most of these activities centered on the installation of automatic fire detection and suppression systems. These construction enhancements are indications of DOE's commitment towards maintaining its objectives stated in DOE 5480.7 by protecting high risk areas, and improving upon employee life safety considerations.

The performance of automatic suppression systems in CY 1992 highlights the importance of installing and maintaining these systems. During the year, nine fires were controlled by automatic suppression systems, thus minimizing significant damage and program interruption. Two of these fires were contained by wet pipe sprinkler systems, continuing the DOE track record on sprinkler effectiveness at a 99.1 percent rate. Automatic control of the remaining fires was achieved by Halon automatic suppression systems. These systems, however, resulted in the accidental release of approximately 7,800 pounds of agent to the environment and DOE is currently examining alternative protection measures.

Future activities of the fire protection community center on reducing the fire risk at DOE sites, optimizing costs associated with fire protection, and providing support for mission advances within the Department.

DOE FIRE LOSS STATISTICS

Property value estimates were taken from the CAIRS database. As reported last year, this information is more accurate to serve as the common denominator for comparing AFPR loss rates to the CAIRS Summary. Reports from the CAIRS database show that DOE property values rose by less than 0.05 percent in CY 1992. Factors offsetting increased construction and inflation costs include decommissioning and decontamination operations at RL and RF.

In CY 1992, DOE experienced no fatalities, injuries, or significant program delays resulting from fire. A total of 131 fire incidents were reported in field organization annual reports to include fire losses of $1,260,950 for the year. The CY 1992 CAIRS Summary reports that 16 fire incidents caused losses totaling $1,110,577; approximately $150,000 less than field reports. Field organizations did not consistently report on the number of non-fire incidents, but did identify property loss amounts at $3,467,805. The CY 1992 CAIRS Summary reports that 68 non-fire incidents caused losses totaling $2,479,415; approximately $988,000 less than field reports.

Due to these differences, a comparison was made between field organization reports and the CAIRS Summary. Where necessary, corrections were made to field reports. Discrepancies in the above loss figures are, however, primarily due to exclusion of data from the CAIRS reporting period. When additional incident reports are received, they will be added to the CAIRS database, with the more accurate figures presented in future CAIRS summaries.

The CAIRS Summary has added a disclaimer cautioning the use of its data for statistical analysis. For example, a significant correction was made in the fire loss category for CY 1990 as reported in the CY 1992 CAIRS Summary. In 1991, the CY 1990 fire loss rate was set at 0.04 cents per $100 value. The CAIRS 1992 Summary corrected this period to indicate a new loss rate of 0.72 cents per $100 value; an increase of 1,800 percent in the CY 1990 fire loss statistic. The CAIRS Summary corrections were based on the final report of a BPA transformer bank fire resulting in a loss of over $7.8 million.

The BPA incident was additionally not reported in the CY 1990 AFPR since it was originally classified as an equipment or machinery loss. Losses in this category were excluded from the non-fire loss category for that year due to a misdirection by HQ. Nevertheless, loss statistics in both reports have been updated and indicate that CY 1990 had the third highest total property loss in the history of the Complex.

The DOE fire loss rate for CY 1992, as summarized from field organization annual reports, is approximately 0.11 cents loss per $100 value, an increase

of about 220 percent over last year's figure. Current figures are, however, 52 percent lower than the 1987-1991 DOE average of 0.21 cents per $100 value. In comparison, loss ratio for the highly protected risk insurance industry for CY 1992 was about 0.39 cents per $100 value[4].

The largest fire and non-fire losses for CY 1992 are noted below:

1. FFO experienced a $987,000 fire loss (approximately 78 percent of the total fire loss for the year) when a hot spot and ensuing fire in a coal bunker caused structural damage to the enclosure, severely damaging the tripper room and coal conveying equipment located above.

2. NV experienced a $1,000,000 non-fire loss (approximately 29 percent of the total non-fire loss for CY 1992) when an earthquake and its aftershocks caused major damage to stairwells and firewalls of the Area 25 Field Operations Center.

A review of the loss data continues to indicate that a small number of incidents constitute the majority of the dollar value in fire losses experienced by DOE. The 5 largest incidents (4 percent of the total) accounted for approximately 86 percent of the total dollar loss by fire. In contrast, 4 percent of the total non-fire incidents reported to CAIRS amounted to less than 69 percent of the total non-fire dollar loss.

The following table characterizes DOE's loss history. New information has been added to this year's data to include a non-fire loss rate category, along with a 5-year rate averaging (numbers shown in parentheses) for all groups. Comparison of CY 1992 data with the CAIRS Summary also indicated that a record review and loss update was necessary to incorporate any new information. Subsequently, Annual Fire Protection Reports from 1980 to present were reviewed against the CAIRS data and the table was revised accordingly.

[4] Factory Mutual Research Corporation (FMRC) reports that the following is the combined fire and explosion loss ratios in the HPR category from 1988 to 1992: 1988-0.73; 1989-0.83; 1990-0.90; 1991-0.64; and 1992-0.39. The average loss ratio over this 5-year period was 0.70 cents per $100 of insured value.

TABLE 1: DOE LOSS HISTORY FROM 1950 TO PRESENT

Fire Protection Summary
For Calendar Year 1992

SIGNIFICANT FIRE LOSS DATA

The following is a brief review of the five largest DOE fire losses. The FFO loss was the only incident classified as a Type A investigation according to DOE 5484.1.

1.FFO - A fire in a coal bunker and tripper room at the Power Plant resulted in a $987,000 loss. The loss occurred when a coal hot spot was discovered in the poorly designed bunker and efforts to remove the burning fuel were impeded by mechanical equipment failure. Damage escalated when the decision to apply water was delayed because of the potential for an explosion. Water was used approximately 2 1/2 hours later which successfully extinguished the blaze.

2.BPA - A Coles Crane suffered an estimated $43,000 in damage while in transport. Investigations determined that fire damage to the crane cab had originated from an electrical short in a wiring harness. (CAIRS Summary has this loss estimated at $20,000.)

3.NV/NTS - A line truck vehicle fire caused an estimated $25,200 in damage when the truck made contact with an energized power line. (Reported in CAIRS Summary.)

4.SF/ETEC - A sodium fire caused an estimated $20,000 damage when an attempt to rejuvenate the sodium cold trap failed. (CAIRS Summary has no record of this loss.)

5.NPR-1 - Fire from an unknown source caused fire damage to a pickup truck during transport, resulting in a $15,000 loss.

Other losses of interest are included in the following table.

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Vehicle Fire	OR/Y-12	OR reports on two separate incidents where faulty ignition switches caused a fire.	$14,500. $13,525.
Fire	CH/FA	Trevatron Power Amplifier No. 3 blocking Capacitor failure in the Main Ring RF building causing fire loss in the structure.	$10,000.*
Fire	ID/INEL	Transformer failure due to improper ground. Fire was manually extinguished using a hand-held extinguisher.	$12,200.*
Brush Fire	NV/NTS	Bird caught fire on transformer and was blown into field, causing fire damage to 150 acres.	$1,500

* No CAIRS report

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 31 incidents were reported where water-based suppression systems operated in CY 1992: 16 were wet-pipe systems, 7 dry-pipe, 7 deluge, and 1 foam system. Of the 16 wet-pipe system activations, 2 were directly and 1 indirectly related to fire. All other activations were the result of non-fire events: 9 were considered human error, 9 mechanical failure, 4 acts of nature (freezing), and 6 miscellaneous causal factors. A review of the CAIRS Summary indicates that only two non-fire activations were reported for a cumulative damage estimate of $16,425.

One interesting non-fire event involved the activation of a flow control (on-off) automatic sprinkler head installed in a Tape Storage Library at SNR/KA. This type of sprinkler applies water only on an as-needed basis, which is particularly useful in reducing water damage and run-off. The incident occurred when the sprinkler head discharged water (5 to 10 gallons) after being brought back on line following servicing. The head was a Grinnell Aquamatic sprinkler head which opens or closes based on the action of a bimetallic sensor operated pilot valve. Inspection of the sprinkler head revealed a significant amount of corrosion products in the valve's pilot port and under the valve seat. The probable cause of failure was determined as either: (1) mechanical failure of the valve, or (2) a design flaw that allowed built-up corrosion products to initiate valve operation under reduced or changed pressure differentials; ie., when the system was isolated for maintenance. The decision was made to replace all similar type sprinklers with standard fusible link operated heads.

This defect is characteristic of most flow control sprinklers during the early stages of development. The 1983 Factory Mutual (FM) Approval Guide identified this limitation in its listing. Grinnell eventually scrapped the sprinkler line and is currently excluded from FM literature and the Underwriters Laboratory (UL) Fire Protection Equipment Directory.

The only other manufacturer of on-off heads (Central Sprinkler Corporation) originally developed the Wax-Motor on-off head, but also experienced design flaws, and was subsequently scrapped from further design. Their current model utilizes a standard Omega style operating element that is coupled with a bimetallic sensor activated control valve. It is UL listed, but not FM approved (FM does not like the Omega style operating element).

Other system activations of interest are shown in the following table. The designation NR indicates that this report was not included in the CAIRS Summary and mentioned (without a dollar loss report) in the field organization's annual fire protection report.

LOSS TYPE	LOC.	DESCRIPTION	DOLLAR LOSS

LOSS TYPE	LOC.	DESCRIPTION	DOLLAR LOSS
Non-Fire Other	AL/PAN	Use of PBX powder generated static discharge, causing deluge system dump.	$6,925.
Non-Fire Other	RL/PNL	Personnel repairing a steam coil leak exposed wet-pipe sprinkler to increased temperature.	$9,500.
Fire Direct	OR/Y-12	Fire in an electrophoresis gel DNA sequencer activated 1 wet-pipe sprinkler causing successful extinguishment.	$4,800.*
Fire Direct	OR/K-25	Food cooking overheated and activated one wet-pipe sprinkler causing successful extinguishment.	NR
Fire Indirect	SF/LBL	Four wet-pipe sprinkler heads were activated during manual suppression of a Lithium fire.	$1,000.*
Non-Fire Mec.	RL/PNL	A plain-end-pipe coupling failed on a 2-In. wet-pipe sprinkler line.	NR
Non-Fire Mec.	NV	An HVAC duct wet-pipe sprinkler failed from head corrosion	NR

* No CAIRS Report

There are now 217 incidents in DOE records where sprinkler systems operated in a fire. The satisfactory rate of performance is 99.1 percent, or 215 times out of 217 incidents. The two failures were a shut cold weather valve in 1958, controlling a single sprinkler in a wood dust collector, and a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

To date, the DOE has experienced 92 fires that were controlled or extinguished by wet-pipe automatic sprinkler systems. As shown in the table below, approximately 93 percent of the fires were controlled with 3 or less sprinklers activating. This is 37 percent more effective than the insurance industry statistics provided in Table 5-9A of the NFPA Handbook, Seventeenth Edition.

DOE Wet-Pipe Automatic Sprinkler Performance
1955 to 1992

Sprinklers Operating	No. of Fires	Cumulative Total	Percent of Total	Cumulative Percent
1	66	66	72	72
2	16	82	17	89
3	3	85	4	93
4	2	87	2	95
5	1	88	1	96
6	1	89	1	97
7	2	91	2	99

8	0	91	0	99
9+	1	92	1	100

HALON SUPPRESSION SYSTEM PERFORMANCE

Current DOE policy regarding Halon installations are contained in a recent HQ memorandum. This policy eliminates the installation of new Halon systems at DOE sites and provides guidelines for the treatment of existing Halon installations. The following report is provided to describe the extent of Halon use throughout the DOE. This report summarizes data on fixed Halon 1301 systems, since these are considered the most impacted by the guidance.

DOE has approximately 1,250 fixed Halon 1301 systems in operation containing 358,906 pounds of agent. In addition, the DOE has a Halon inventory of approximately 30,924 pounds. Field Organizations additionally reported that about 70 Halon systems have been either disconnected or converted to an alternative extinguishing system.

The top ten Halon use and storage sites are identified in the following table:

Standing	Location	Percent of DOE Total	Fixed System Inventory (Lbs.)	Storage Inventory (Lbs.)
1	SRS	16.4	58,955	6,000
2	LANL	7.7	27,797	NR
3	BNL	5.3	19,200	2,200
4	HAN	5.3	19,164	3,000
5	FA	4.4	15,846	2,278
6	NTS	4.3	15,541	10,657
7	INEL	4.3	15,456	NR
8	WI	4.2	15,231	NR
9	PPPL	3.9	14,103	NR
10	RF	2.8	10,000	NR

NR- Not Reported

A total of 45 incidents were reported where Halon-based suppression systems operated in CY 1992: 44 were fixed Halon 1301 systems and 1 was reported as a fixed Halon 1211 system. No sites reported any Halon system failures during a

fire event. Of the 44 Halon 1301 system activations, 7 were directly related to fire[5] with all events successfully extinguished by the system. Other Halon activations were the result of non-fire events: 12 were considered human error, 2 mechanical failure, 8 electrical, and 16 miscellaneous (smoke or dust) causal factors. Approximately 7,800[6] pounds of Halon were discharged in these non-fire events.

A review of the CAIRS Summary indicates that only two non-fire activations were reported for a cumulative damage estimate of $19,144.

On September 5, 1992, a fire occurred in a motor control center at the Weeks Island Crude Oil Storage Site. The cause was determined as an insulation failure on a 4160 volt B phase feeder cable causing an arc and electrical fire within the cabinet. Smoke was detected and the Halon system activated releasing 400 pounds of agent into the cabinet and extinguishing the blaze. The fire loss was estimated at $2,000. After the fire, the main Halon system was isolated for recharge. When the system was switched to the reserve system, it was discovered that one bottle was empty. Analysis showed that the cylinder head seal was defective. The reserve Halon system was placed into service anyway with repair procedures initiated on the deficient Halon system (building was also sprinklered).

On September 15, 1992, a second fire was detected within the same motor control center cabinet. This fire was extinguished by the deficient Halon system, which was still on reserve, for a loss of $2,000. Both main and reserve bottles were serviced the next day.

The following table lists major Halon 1301 system activations in CY 1992. The designation NR indicates that this report was not included in the CAIRS Summary and mentioned (without a dollar loss report) in the field organization's annual fire protection report.

[5] Some reports described situations where a fire may have occurred, but no visible fire damage was present. These usually relate to burned out electrical components that may have otherwise self-extinguished had the Halon system not been present. Because a Halon system was present, however, it is considered a fire event.

[6] The above figure does not consider system leakage, normal maintenance activities, or actuation from seven non-fire incidents where no report was given on Halon quantities or dollar loss amounts.

LOSS TYPE	LOCATION	DESCRIPTION	AGENT RELEASED	DOLLAR LOSS
Fire	CH/FA	Repeated attempts to light heating furnace resulted in a minor flashback which activated Halon systems in Trailers 140 & 141.	980 Lbs.	$11,600.*
Non-Fire	CH/FA	Site-wide power outage	980 Lbs.	NR
Non-Fire	CH/FA	System leak	460 Lbs.	NR
Non-Fire	CH/FA	Fumes generated when lighting furnace	460 Lbs.	NR
Fire	CH/FA	Responding personnel claimed a slight odor of burnt electronic parts, but none could be determined.	65 Lbs.	NR
Non-Fire	CH/FA	Panel failure	450 Lbs.	NR
Non-Fire	CH/FA	Exhaust from emergency generators	165 Lbs.	NR
Non-Fire	CH/BNL	Panel failure	100 Lbs.	NR
Non-Fire	NV	Possible failure of air-sampling detector	100 Lbs.	NR
Non-Fire	OR/POR	Hot work in area	430 Lbs.	$550.*
Non-Fire	RL/HAN	Grinding work in area	244 Lbs.	NR
Fire	SNR/WS	A large capacitor in the room's air conditioner burned up causing the cross-zoned system to activate.	47 Lbs.	NR
Fire	SPR/WI	Frog caused fire in transformer	250 Lbs.	$2,500.*
Non-Fire	SPR/BM	Technician improperly re-connected wires to module	1,360 Lbs.	$16,645.
Non-Fire	SPR/WH	Defective circuit board (obsolete equipment)	600 Lbs.	$2,500.
Non-Fire	SR/SRS	An employee accidentally bumped the manual discharge switch while closing an air conditioning vent	128 Lbs.	NR
Non-Fire	SR/SRS	Construction paint fumes activated system	415 Lbs.	NR
Fire	SR/SRS	Fire in a Health Physics impactor motor	58 Lbs.	
Non-fire	SR/SRS	Suspected bad smoke detector	175 Lbs.	NR
Non-Fire	SR/SRS	Faulty control panel	583 Lbs.	NR
Non-Fire	SR/SRS	Panel short	261 Lbs.	NR

* No CAIRS Report

FIRE PROTECTION INSTALLATIONS

Yearly totals of fire extinguishing systems installed in DOE facilities are compiled with data supplied by the field offices and thus the totals may not be exact. They do, however, serve as an indication of the installation and upgrading programs.

About 167 fire protection systems were installed in new or existing structures in 1991. Sprinkler upgrades continue to be the predominate type of installation with about 119 being installed. The majority of the other installations were either infrastructure oriented (water supplies, base fire alarms), or maintenance oriented (minor sprinkler installations, alarm panel replacements). No new Halon system installations were identified in field office reports.

The following is a summary of the fire protection upgrading projects. The list does not include current design projects, unless it was identified that the installation was completed within the calendar year. As with past reports, the summary is intended not only to indicate the number of projects that have occurred, but also to serve as a source of information to those planning similar upgrades.

One project of particular interest, which does not fit into the categories listed below, involves an extensive lightning protection upgrade to over 42 buildings at LANL.

AUTOMATIC SPRINKLER SYSTEMS COMPLETED IN CY 1992

Location Installation

ALA new shipping and receiving building, with a dry-pipe sprinkler system, was completed.

ALA new employee center, that includes a cafeteria, was completed. This building has a wet-pipe sprinkler system.

AL/SNLCAn acceptance test of fire protection systems in Buildings 940 and 941 of the Integrated Materials Testing Laboratory was completed.

AL/PANConstruction was completed on the Weapons Special Purpose Bay Replacement Complex, Bldg. 12-104A, (Total Estimated Cost (TEC) $30,000,000). Fire protection features include noncombustible construction, automatic sprinkler protection, fire alarm systems and other systems.

AUTOMATIC SPRINKLER SYSTEMS (continued)

LocationInstallation

AL/PANConstruction was completed on the High Explosives Machining Facility, Bldg. 12-121, (TEC $34,200,000). Fire protection features include noncombustible construction, automatic sprinkler protection, alarm and other systems.

AL/LANLA new tritium facility finally began operations. This sprinklered and alarmed facility replaces the unprotected Building 86 at TA-33.

AL/LANLENG-3 designed and overviewed 34 modifications and additions to sprinkler systems.

CH/ANLWInstallation of automatic fire sprinklers in the Fuel Cycle Facility (Bldg. 765).

CH/BNLSprinkler protection installed in Buildings 120M, 129, 184, 211, 326, 462, 477, 479, 488, 912, 935, and 936.

CH/FACompleted sprinkler installations in the D-Zero Facility New Portakamps and Wilson Hall's ground floor mezzanine addition.

CH/MITA new sprinkler system was installed in room 118A of Building NW21 to replace pre-existing Halon system.

CH/PPPLThe following areas were provided with sprinkler protection: first floor Laboratory Bldg.; Administrative Bldg. and Administrative Wing; and the TTFR basement.

PETCSprinkler systems installed in Bldgs. 900 (west), 903, 907, and 920.

FFOSprinkler protection was completed in the Plant 8-Rotary Kiln, Drum Reconditioning Facility.

ID/INELThe Fire Protection Line Item Project completed the Fire/Raw Water separation, new underground fire mains, new fire water tanks, new fire pumps, and the upgrading of numerous building sprinkler and alarm systems.

NV/NTSAutomatic sprinkler and fire alarm systems were installed in the following buildings: Sandia Assembly Bldg.; Metalworkers Shop; Lineman/Wireman Shop; Housing & Revenue Office Building; Engineering & QA Office Building; and FOD, Safety & QA Office Building.

AUTOMATIC SPRINKLER SYSTEMS (continued)

Location	Installation
OR/Y-12	A two-story addition was constructed on the east side of Building 9769. The addition is completely sprinklered.
OR/K-25	Automatic sprinkler systems were installed in the five newly constructed K-1065 RCRA storage facilities.
OR/ORNL	Automatic sprinklers were added in the Robotics and Process Systems Complex (Bldg. 7601) upgrading the building to "completely sprinklered" status.
SF/LLNL	Automatic sprinkler systems were installed in 14 buildings. Significant improvements were made to automatic sprinkler systems in 13 other buildings.
SNR/KSO	Automatic sprinkler protection was added to the KSO Boilerhouse and a Plant Support Facility.
SSC	Completed major renovations and associated occupancy reviews for Central Facility at Waxahachie, TX, which was formally a distribution warehouse. SSCL office, laboratory and warehouse operations, as well as the DOE/SSCPO offices are located in this facility. Conditions of occupancy included modification, installation, and acceptance testing of: wet pipe automatic sprinkler systems; local detection and systems; two onsite fire pumps and ponds; and associated underground fire mains and hydrants.

SPECIAL EXTINGUISHING SYSTEMS COMPLETED IN CY 1992

Location	Installation
AL/LANL	A deluge-protected liquid hydrogen tank was installed and tested for the GTA project. Additional sprinkler, deluge, detection, and gas detectors protect auxiliary piping and equipment.
AL/LANL	foam system and glove box CO_2 system were designed and installed in facilities at TA-50.

SPECIAL EXTINGUISHING SYSTEMS (continued)

Location	Installation
CH/ANLW	Completed installation of an automatic foam/water deluge system over the Sodium Components Maintenance Shop alcohol storage tanks.
CH/BNL	Provided 10,000 gallon dedicated fire protection water tank and three dry-chemical systems for the Hazardous Waste Material Facility.
OR/POR	An acceptance test was conducted for an underfloor CO_2 system in a computer/communication room addition. This system is intended to be an alternative to Halon.
OR/Y-12	A preaction sprinkler system, actuated by heat detectors, was installed to protect the hydrogen facility at Building 9805-1.
OR/Y-12	A dry chemical system, actuated by heat detectors was installed to protect the 250 square foot oil pumping structure at Elza 1 switchyard.
SNR/KSO	A new wet chemical fire saponification system was installed in the cafeteria's grill & deep-fat fry areas.
SF/LLNL	Three automatic CO_2 systems were installed. Two systems protect automatic information storage systems and one protects an underfloor space.

FIRE DETECTION AND ALARM SYSTEMS COMPLETED IN CY 1992

Location	Installation
APA	Completed installation of security and fire alarm system at the Eklutna Project.
CH/BNL	Completed upgrades to the Site Fire Alarm System to improve reliability of the communication lines (improved cross connect at central office, lightning protection, upgraded primary and backup computers). Made a site-wide replacement of defective Gamewell manual fire alarm boxes.

FIRE DETECTION AND ALARM SYSTEMS (continued)

LocationInstallation

CH/BNLReplaced several obsolete fire alarm panels. Started installation of a VESDA air sampling detection system for a portion of the AGS Target Halls.

CH/FAReplaced obsolete high voltage fire alarm systems in the Proton Beam Line Buildings, and the Main Ring Service Bldg. Installed a VESDA smoke detection system in the D-Zero facility. Upgraded 36 VESDA smoke detection systems with new laser technology to reduce maintenance costs.

CH/NDUA Pyrotronics MXL intelligent addressable fire alarm system was installed and became operational 2/92.

PETCInstalled fire alarm systems in Buildings 900, 901, 902, and 903.

FFONumerous upgrades and additions were made on the Plant-wide Honeywell Alarm System. A total of six new FS-90 Data Gathering Panels were installed on site. In addition, a replacement power source was installed for the Honeywell Delta 1000 central fire alarm computer.

OR/ORNLA high level of notification and systems status information was maintained by continued upgrading of fire alarm and supervisory networks. New equipment included 4 master fire alarm boxes, 8 auxiliary pull boxes, 4 fire alarm control panels, 15 heat actuating devices, 94 smoke detectors, and 5 evacuation horns. Multiple supervisory alarm points were added to the central station supervisory panel to monitor the integrity of protective systems/devices.

SNR/KSOAn Incipient Fire Detection System (air sampling type) was installed in an area where high value computer equipment is maintained.

SR/LLNLNew fire alarm systems were installed in two structures.

SR/SLACCompleted phase one of a three phase program to upgrade the site fire alarm system. The Pyrotronics CXL system is being installed. Each device is addressable and will provide the fire department with the exact location of the device in alarm.

WATER DISTRIBUTION SYSTEMS COMPLETED IN CY 1992

LocationInstallation

AL/ITRIThree underground water main valves were replaced.

AL/SNLCObsolete fire pumps and underground check valves isolating the original fire water main from the domestic main were removed.

AL/KCPTwenty-two underground fire main valves have been replaced, completing the valve replacement project as scheduled.

AL/PIAdditional Fire Main Loop and Hydrant was added at Building 1400.

CH/ANLWCompleted seismic hardening of the site 400,000 gallon water storage tank.

NPRSix additional fire hydrants were installed and the fire pump was modified at the 18G LACT to further enhance fire protection at this important oil production facility. Total cost was approximately $200,000. Also, completed project to improve the diesel and electric fire pumps located at LTS-1 and LTS-2 and 35R facilities. Total cost was approximately $400,000.

PNRApproximately 2900 feet of underground piping was installed in the system, including new fire hydrants and post indicator valves.

SR/SRSTwenty-five thousand, seven hundred and twenty-one feet of new fire line were hydrostatically tested.

FIRE DEPARTMENT ACTIVITIES

Each year the various fire departments are involved in many activities, including training, and replacement or purchasing of new equipment. The following is a brief summary of some of these activities:

EMERGENCY VEHICLES

There are about 26 DOE fire departments with more than 100 vehicles and other types of apparatus. Any site considering equipment purchases or modifications should consult with locations that have completed such projects as noted below:

Location	Type of Equipment
AL/PI	Engines No. 2 and 4 were upgraded.
CH/BNL	Purchased one 1500 GPM pumper to replace an existing unserviceable unit.
CH/PPPL	The Emergency Service's 1962 Light Rescue Vehicle was replaced.
OR/POR	Two new ambulances were procured and placed into service.
OR/Y-12	The fire department placed into service a new command vehicle, a pumper/ladder truck, and a hazardous materials response support unit.
RF	Two new Emergency One, Class A fire engines were placed into service.

OTHER FIRE DEPARTMENT EQUIPMENT

Most of the fire departments have purchased new or up-dated their existing self-contained breathing apparatus (SCBA), purchased fire extinguishers, new turn-out gear and other equipment. This new or upgraded equipment is required to meet various NFPA Standards. The OR/Y-12 site additionally mentioned the purchase of a new SCBA air compressor.

IN-HOUSE TRAINING

A large number of training activities are reported annually which cover the fire fighting and emergency medical training typical of DOE fire departments or brigades. Most locations reported that training was given to employees on the use of fire extinguishers. Several locations reported that hands-on training was conducted where building fires were extinguished. There were also many reports of fire department personnel serving as instructors in the various communities or colleges.

One particular training instance involved the completion of a propane training area at the OR/Y-12 Training Facility. The training area consists of three separate concrete pads supplied by propane from a remote compressed propane header shed. The facility will allow the future addition of mock-ups to permit realistic training on live fire situations.

INSPECTION & FIRE PREVENTION

Location	Type of Equipment or Program
AL/SNLCA	bar code tracking system for monthly sprinkler valve inspection was initiated.
AL/PANA	project to remove 101 hose rack stations and replacing these with fire department access connections was completed.
Al/MPOA	bar code tracking system for inspection of fire doors and pull stations was initiated.
CH/FAA	bar code system for inventory and maintenance of fire extinguishers was initiated.
NV/NTSA	Annual Fire Hose Service Tests were conducted on all fire hoses except house lines. All fire hose test records continue to be maintained on a computerized database for easy access.
RF	Full scale fire tests were conducted on gloveboxes to determine the effect of combustible solvents on the glovebox. Approximately 15 fire tests were conducted under a contract with a university testing laboratory. The test program and report were completed by an outside consultant and coordinated by the Fire Protection Engineering group.

FIRE PROTECTION PROGRAM HIGHLIGHTS

The following list includes major highlights experienced within the DOE fire protection program for CY 1992:

1. Recurring fire protection costs for CY 1992 approached $73.5 million for the DOE complex. On a ratio of cost to replacement value, the DOE spent approximately 6.2 cents per $100 replacement value for recurring fire protection activities. Approximately 12 percent of this cost is attributed to fire protection engineering operations. These costs do not include design and installation costs for fire protection upgrades.
2. EH undertook a number of fire safety initiatives in CY 1992 related to fire safety research, training, oversight activities and criteria development. In research, EH sponsored fire testing which investigated the effectiveness of sprinkler protection to mitigate the fire hazards of plastic overpacks and confirmed the hypothesis that fire can induce spurious signals in electrical cable. The Office initiated an effort with LANL to further develop the FIRAC Computer Code for use in fire hazards analyses and as a supplemental tool in fire safety decisionmaking.

The Office sponsored 2-week Basic Fire Protection Engineering Courses at Factory Mutual and continued the program of Life Safety Code Courses at select DOE Sites. EH sponsored the DOE/Contractor Annual Fire Protection Conference in Las Vegas, Nevada, and co-sponsored a coal fire symposium in Washington, DC.

To facilitate information exchange within the Department, the Office expanded the distribution of the fire protection newsletter, disseminated a number of safety notes and bulletins and included fire safety information in the Safety Connection as a regular feature.

Within the realm of safety oversight, EH participated in a number of Operational Readiness Reviews, performed a number of fire safety assessments through its resident program and initiated a technical assistance program in fire protection.

CY 1992 featured further development of the revised draft of the Fire Protection Order as well as the DOE Model Fire Protection Program. Work was begun on glove box and filter plenum fire protection standards and a fire protection assessment guide.

PERSONNEL ACTIONS

One of the strongest points of the DOE fire protection program has been the professionalism of the fire protection staff. Many of the fire protection specialists are involved in national code making organizations such as the National Fire Protection Association (NFPA), International Conference of Building Officials (ICBO), or Underwriters Laboratory (UL). The following is a list of personnel that are involved in these types of activities. This list was compiled from the DOE Fire Protection Directory, and includes both Federal and M&O contract employees.

NAME	LOC.	PHONE NO.	AFFILIATION
Joseph Andrews	WSRC		Principal-NFPA National Electrical Code Panel 10; NFPA Pub. No. 70
Robert Arvedlund	HQ		Principal-NFPA Technical Committee on Liquefied Natural Gas; NFPA Pub. No. 59A
Mike Bahr	EGG-ID		Principal-NFPA Technical Committee on Electrical Safety Requirements for Employee Workplaces; NFPA Pub.No. 70E
Peter Barbadoro	WSRC	803 644-5087	Principal-NFPA Technical Committee on Fire Tests; NFPA Pub. Nos. 251,252,253,255,256,257,258,259 260,261,262,263, 264A,701 Principal-NFPA Technical Committee on Exposure Protection; NFPA Pub. No. 80A
Don Beason	LLNL		Principal-NFPA Technical Committee on Fire Service Protective Clothing and Equipment (Helmets Subcommittee); NFPA Pub. No. 1972
Jim Bisker	HQ	301 903-6542	Alternate-NFPA Technical Committee on Fundamentals of Fire Alarm Systems; NFPA Pub. No. 72 Alternate-NFPA Technical Committee on Water Mist Systems; NFPA Pub. No. TBD
Ward Bower	SNLA		Principal-NFPA National Electrical Code Panel 10; NFPA Pub. No. 70
Bill Boyce	HQ	301 903-5169	Principal-NFPA Technical Committee on Atomic Energy; NFPA Pub. Nos. 801,802,& 803
Randall Bradley	LLNL	510 422-3980	Principal-NFPA Technical Committee on Forest and Rural Fire Protection; NFPA Pub.Nos. 224,295,296,297,298,1141, & 1231
Bud Bucci	WHC	509 376-1735	Principal-NFPA Safety to Life Technical Committee on Industrial Storage and Miscellaneous Occupancies; NFPA Pub. No. 101
Ford Burgess	WSRC	803 725-8900	Principal-NFPA Technical Committee on Atomic Energy; NFPA Pub.Nos. 801,802,& 803
Carol Caldwell	SNLL	510 294-2934	Principal-NFPA Safety to Life Technical Committee on Industrial Storage and Miscellaneous Occupancies; NFPA Pub. No. 101 Chairman-NFPA Technical Committee on Laser Fire Protection; NFPA Pub. No. TBD

NAME	LOC.	PHONE NO.	AFFILIATION
Carl Caves	HQ	301 903-5606	Principal-NFPA Technical Committee on Electronic Computer Systems; NFPA Pub. Nos. 75 Principal-NFPA Technical Committee on Clean Rooms; NFPA Pub. No. 318 Principal-NFPA Technical Committee on Industrial and Medical Gases; NFPA Pub. No. 99
John Clatworthy	LLNL		Principal-NFPA Technical Committee on Industrial and Medical Gases; NFPA Pub. No. 99
Edward Connell	HQ	301 903-9831	Principal-NFPA Technical Committee on Alternative Protection Options to Halon NFPA Pub.Nos. 2001, 2002 Alternate-NFPA Technical Committee on Atomic Energy; NFPA Pub.Nos. 801,802 & 803
Donald Davidson	LANL	505 667-2089	Chairman-NFPA Technical Committee on Lightning Protection; NFPA Pub.No. 78 Principal-NFPA Technical Committee on Record Protection; NFPA Pub. Nos. 232 & 232AM
John Deitz	BNL	516 282-4225	Principal-NFPA Technical Committee on Fire Service Occupational Safety and Health; NFPA Pub. Nos. 1500,1521,1561 & 1581
Vernon Duke	SNLA	505 844-1768	Principal-NFPA Technical Committee on Chemistry Laboratories; NFPA Pub. No. 45
Mark Dumais	FA	708 840-4888	Principal-NFPA Technical Committee on Fundamentals of Fire Alarm Systems; NFPA Pub. No. 72
Bill Froh	HQ	301 903-4093	Alternate-NFPA Technical Committee on Alternative Protection Options to Halon NFPA Pub.Nos. 2001, 2002 Principal-NFPA Technical Committee on Water Mist Systems; NFPA Pub. No. TBD
Joe Galaska	EGG/RF	303 966-6304	Principal-NFPA Technical Committee on Record Protection; NFPA Pub.232,232AM
Charles Girard	SNLA	702 295-8164	Principal-NFPA Technical Committee on Blower Systems; NFPA Pub. No. 91
R. Greene	MMES		Principal-NFPA Technical Committee on Ovens and Furnaces; NFPA Pub. No. 86,86C,86D Principal-NFPA Technical Committee on Ovens and Furnaces (Industrial Furnaces Using Vacuum as an Atmosphere Subcommittee); NFPA Pub. No. 86,86C,86D
R. Huckfeldt	WHC		Principal-NFPA Technical Committee on Fire Prevention (Hazardous Materials Safeguards Subcommittee); NFPA Pub. No. 1
James Johnson	LLNL	510 422-5165	Principal-NFPA Technical Committee on Fire Service Protective Clothing and Equipment (Hazardous Chemicals Protective Clothing Subcommittee); NFPA Pub. No. 1991,1992 & 1993 Principal-NFPA Technical Committee on Fire Service Protective Clothing and Equipment (SCBA Subcommittee); NFPA Pub. No. 1981
Dennis Kirson	AL	505	Chairman-NFPA Technical Committee on Clean Rooms; NFPA Pub. No. 318

NAME	LOC.	PHONE NO.	AFFILIATION
		845-4879	
Richard Krajewski	BNL		Principal-NFPA Technical Committee on Liquid Fuel Burning Equipment ; NFPA Pub. No. 31
Stephen Leeds	LLNL	510 422-5148	Principal-NFPA Technical Committee on Electronic Computer Systems; NFPA Pub. Nos. 75 Principal-NFPA Technical Committee on Construction and Demolition; NFPA Pub. Nos. 241
Robert Lichfield	WHC	509 376-3070	Principal-NFPA Technical Committee on Atomic Energy; NFPA Pub.Nos.801,802,& 803 Principal-NFPA Technical Committee on Fire Doors and Windows; NFPA Pub.Nos.80,105
John Loverin	LLNL		Principal-NFPA Technical Committee on Fire Service Training; NFPA Pub.Nos. 1401,1402,1403,1404,1405,13E,1410, & 1452
Jesse Lum	LLNL	510 423-6314	Principal-NFPA Technical Committee on Laser Fire Protection; NFPA Pub. No. TBD
Walter Maybee	LANL	505 667-9044	Chairman-NFPA Technical Committee on Atomic Energy;NFPA Pub.Nos.801,802,& 803
Earl McCarthy	REECO		Alternate-NFPA Technical Committee on Halogenated Fire Extinguishing Systems; NFPA Pub.No. 12A & 12B
Ken Phillips	EGG-ID	208 526-2538	Principal-NFPA Technical Committee on Halogenated Fire Extinguishing Systems; NFPA Pub.No. 12A & 12B
John Saidi	LLNL	510 422-1039	Principal-NFPA Technical Committee on Inspection, Maintenance and Testing of Water Based Extinguishing Systems; NFPA Pub. No. 25
John Sharry	LLNL	510 423-2481	Chairman-NFPA Safety to Life Technical Committee on Residential Occupancies; NFPA Pub. No. 101 Member-NFPA Standards Council
Robert Smith	WSRC	803 725-8899	Principal-NFPA Safety to Life Technical Committee on Industrial Storage and Miscellaneous Occupancies; NFPA Pub. No. 101
Lawrence Stoddard	EGG-RF	303 966-5308	Principal-NFPA Technical Committee on Public Fire Service Communications; NFPA Pub. No. 1221

Fire Protection Summary
For Calendar Year 1992

PLANNED ACTIVITIES FOR CY 1993

Most of the locations reported that plans for CY 1993 include: continued development of building appraisals/fire hazards analysis, advanced training for fire protection personnel, additional fire protection staff support, and additional equipment, including bar code inventory equipment. Required fire protection systems will continue to be provided in new buildings, as well as the continuation of multi-year infrastructural upgrades to fire protection systems. Most locations report plans to upgrade or replace many existing building systems, or provide necessary protection in areas that were written-up as part of an audit or appraisal report. The following is a list of planned activities that may be of interest to others:

Location	Type of Equipment or Program
AL/PI	All Halon 1211 fire extinguishers will be replaced and removed from the site.
OR/Y-12	To promote the development of a model Fire Hazard Analysis Report by the DOE through support to Defense Programs.
OR/Y-12	To develop "As-Built Drawings" for the Halon system and the sprinkler water flow interlock, at Building 9212, that are designated as safety class systems. Also, develop drawings for smoke and heat detector systems to facilitate testing and inspection programs.
NPR-1	Complete computerized project for "NPR-1 Fire Pre-Plans" for all major facilities.
SR/SRS	Receive and place in service three new fire engines that meet National Fire Protection Association requirements.