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SUMMARY
OF
FIRE PROTECTION PROGRAMS
OF THE
UNITED STATES DEPARTMENT OF ENERGY
CALENDAR YEAR 1990

OFFICE OF
THE DEPUTY ASSISTANT SECRETARY
SAFETY AND QUALITY ASSURANCE

October, 1991

MASTER

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FIRE PROTECTION

**FOR THE
DEPARTMENT OF ENERGY**

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FOREWORD

This edition of the Annual Summary of DOE Fire Protection Programs continues the series started in 1972. Since May 1950, an annual report has been required from each field organization. The content has varied through the years and most of the accident data reporting requirements have been superseded by the Computerized Accident/Incident Reporting System administered by EG&G, Idaho. However, this report is the sole source of information relating to fire protection programs, and to the actions of the field offices and to headquarters that are of general fire protection interest.

TABLE OF ACRONYMS

AL	Albuquerque Operations Office
ANL-E	Argonne National Laboratory, East
ANL-W	Argonne National Laboratory, West
AP	Alaska Power Administration
BPA	Bonneville Power Administration
CH	Chicago Operations Office
ID	Idaho Operations Office
INEL	Idaho National Engineering Laboratory
ITRI	Inhalation Toxicology Research Institute
LANL	Los Alamos National Laboratories
LBL	Lawrence Berkeley Laboratories
LLNL	Lawrence Livermore National Laboratories
METC	Morgantown Energy Technology Center
NPR	Naval Petroleum Reserve in California
NRF	Naval Reactor Facility
NPO	Naval Petroleum & Oil Shale Reserves
NV	Nevada Operations Office
OR	Oak Ridge Operations Office
ORNL	Oak Ridge National Laboratories
PETC	Pittsburgh Energy Technology Center
PNR	Pittsburgh Naval Reactor Office
REECO	Reynolds Electrical & Engineering Company
RFO	Rocky Flats Operations Office
RL	Richland Operations Office
SE	Southern Power Administration
SF	San Francisco Operations Office
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SNR	Schenectady Naval Reactors Office
SR	Savannah River Operations Office
SSC	Superconducting Super Collider Project
STL	Special Technologies Laboratory
SW	Southwestern Power Administration
WAPA	Western Area Power Administration
WIPP	Waste Isolation Pilot Project

EXECUTIVE SUMMARY

The Department of Energy (DOE) experienced no fatalities resulting from fire in Calendar Year (CY) 1990.

The DOE fire record for CY 1990 is evidence of the continuing downward trend in loss ratios. The fire loss ratio for 1990 was 0.06 cents per \$100 of value protected. This compares with the loss ratio for the highly protected risk insurance companies of about 3 cents per \$100 of property at risk.

The upgrading of DOE facilities continued at a substantial level. This has been an ongoing effort for the past many years. The success of the program is demonstrated by the continuing low loss ratio, the avoidance of major fire losses and the improved assessments from the Independent Fire Protection Survey program. The performance of sprinkler systems continues at a near perfect (99.1%) level. Halon systems also have an excellent record, when actuated by a fire. However, during this time period there were 22 accidental discharges of Halon.

Organizational changes, delineated in SEN 6, have resulted in an increase of personnel in oversight programs and an enhanced commitment to reduce the risk from fire to the public and to operating personnel.

LOSS NOTES

80 fire incidents with losses greater than \$1,000 were reported in CY 1990. The sum of reported losses was \$592,746 which is a 6% reduction from 1989. Total non-fire reported losses for CY 1990 were \$2,995,661.

A review of the loss data continues to indicate that a small number of fire losses constitute the majority of the dollar losses experienced by DOE. Five fire losses (6% of the total) accounted for about 80% of the dollar lost. This is consistent with general industry experience and the fire loss data generated by the National Fire Protection Association (NFPA) and Factory Mutual Systems. DOE experience again shows the importance of adequate protection and the keeping the fire protection systems in a state of readiness.

The largest fire and non-fire losses for CY 1990 are noted below:

1. RFO suffer a \$376,000 loss when a fire of electrical origin spread through the ventilation system to the roof.
2. RL suffered site wide damage due to a January wind storm which resulted in loss of \$181,206.
3. Freeze-up of the fire protection systems including clean-up and repair costs were:

SF/SLAC	\$165,000
AL/SNLA	\$110,000
SF/LBL	\$97,000
RL	\$82,000
AL/Pantex	\$43,000
AL/SNLL	\$25,000
AL/ITRI	\$25,000
AL/LANL	<u>\$10,000</u>
Total	\$557,000

4. ID had six automatic sprinkler systems that froze, but a dollar loss to repair was not included.

The following is the loss data as reported from 1947 to the present. The fire and total ratios are losses in cents per \$100 of property values.

YEARS	VALUE MILLIONS	FIRE LOSSES	OTHER LOSSES	FIRE RATIO	TOTAL RATIO
47	\$366.10	\$121,489	\$12,000	3.32	3.65
48	\$617.80	\$50,049	\$16,351	0.82	1.08
49	\$1,849.80	\$48,096	\$149,435	0.26	1.07
50	\$1,800.00	\$486,389	\$10,050	2.70	2.76
51	\$2,177.10	\$38,318	\$317,797	0.18	1.64
52	\$3,055.10	\$449,107	\$356,600	1.47	2.64
53	\$4,081.00	\$148,142	\$427,430	0.36	1.52
54	\$6,095.90	\$185,438	\$190,436	0.30	0.62
55	\$6,954.20	\$125,685	\$330,103	0.18	0.66
56	\$7,364.10	\$2,206,478	\$940,945	3.00	4.27
57	\$7,973.20	\$590,663	\$885,936	0.74	1.85
58	\$8,102.50	\$275,560	\$476,265	0.34	0.93
59	\$10,301.80	\$199,841	\$998,060	0.19	1.16
60	\$10,708.60	\$636,228	\$764,823	0.59	1.31
61	\$11,929.90	\$325,489	\$5,530,566	0.27	7.54
62	\$12,108.80	\$3,020,023	\$293,341	2.49	2.74
63	\$13,288.90	\$599,056	\$776,998	0.45	1.04
64	\$14,582.80	\$480,519	\$870,516	0.33	0.93
65	\$15,679.30	\$1,743,448	\$2,106,621	1.11	2.46
66	\$16,669.00	\$158,220	\$698,753	0.10	0.51
67	\$17,450.90	\$359,584	\$2,423,350	0.21	1.59
68	\$18,611.90	\$155,986	\$713,097	0.08	0.43
69	\$20,068.30	\$27,144,809	\$909,525	13.53	13.98
70	\$22,004.30	\$89,456	\$1,611,336	0.04	0.77
71	\$24,155.80	\$78,483	\$1,857,566	0.03	0.80
72	\$26,383.50	\$222,590	\$698,061	0.08	0.35
73	\$27,166.70	\$117,447	\$2,258,241	0.04	0.87
74	\$28,255.50	\$249,111	\$930,766	0.09	0.41
75	\$31,658.30	\$766,868	\$4,485,481	0.24	1.66
76	\$35,512.70	\$251,849	\$2,040,727	0.07	0.65
77	\$39,856.10	\$1,084,823	\$2,529,161	0.27	0.91
78	\$47,027.10	\$12,976,036	\$4,501,943	2.76	3.72
79	\$50,340.80	\$654,716	\$1,886,307	0.13	0.51
80	\$54,654.70	\$1,385,686	\$7,160,249	0.24	1.56
81	\$59,988.80	\$2,042,633	\$2,600,855	0.34	0.77
82	\$65,360.40	\$948,691	\$3,252,277	0.15	0.64
83	\$70,484.40	\$731,234	\$9,765,828	0.10	1.49
84	\$82,166.90	\$1,549,807	\$4,917,513	0.19	0.79
85	\$86,321.84	\$1,145,975	\$2,983,322	0.13	0.48
86	\$82,787.52	\$805,030	\$4,490,262	0.10	0.64
87	\$91,927.20	\$1,500,000	-NA-	0.16	-NA-
88	\$94,668.10	\$466,120	\$6,687,613	0.05	0.76
89	\$100,142.30	\$615,551	\$5,016,760	0.06	0.56
90	\$104,832.80	\$592,746	\$2,995,661	0.06	0.34

AEC/ERDA/DOE Value: 1947-1990

(billions of dollars)

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Figure No. 1

AEC/ERDA/DOE Losses: 1947-1990

(millions of dollars)

Figure No. 2

LOSSES OF INTEREST

In 1990, 80 fires and 143 other types of losses were reported with five fire losses greater than \$10,000 and one greater than \$100,000. The following is a review of the largest fire losses:

1. RFO - A \$376,000 loss was suffered when a fire of electrical origin spread through the ventilation system to the roof.
2. AL\SNLA - A fire in an electronic test panel did \$34,318 in damage and was extinguished by employees using a fire extinguisher.
3. SR - A fire in the hydraulic oil system in the self-loader pan at the Burial Ground did \$37,000 in damage.
4. SR - A \$10,000 fire loss occurred in the Tracking Radioactive Atmosphere Contaminants Vehicle due an electrical short.
5. RL - A fire caused by the failure of a light ballast in the unsprinklered trailer did \$10,000 damage to the unit and the storage.

Other losses of interest are in the following table:

<u>Loss Type</u>	<u>Location</u>	<u>Description</u>	<u>Dollar Loss</u>
Water	PNR\NRF	Broken fire main	\$12,000
Water	RL	Water from a cleaning operation entered alarm panel and discharged foam system	\$4,000
Misc.	SF\SLAC	Drilling operation damaged underground utilities	\$42,000
Fire	SR	Electrical problem in the Central Shop caused a fire	\$7,238
Fire	WAPA	An unprotected Materials Storage Building was damaged by fire that may have been started by careless smoking	\$7,250

ITEMS OF INTEREST

One of the items requested from each operations office in their annual summary are any items which might be of interest to other in how we do our jobs.

For CY 1990 these include:

1. The opening of an employee's children facility at Pinellas with a building meets or exceeds codes for fire, windstorm, and personal injury protection.
2. The Hanford Fire Protection Engineers Forum (RL) was re-established and meets on a quarterly basis. Members are Fire Protection personnel from DOE and the Contractors. They are involved in the reviews site wide problems or concerns and provides input to RL on possible solutions.

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 Professionals 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 (as presently known) of personnel that are involved in these types of activities:

National Affiliations

<u>Location</u>	<u>Name</u>	<u>Membership or Others</u>
AL\SNLA	Vernon Duke	Member of NFPA 45
	Charles Girard	Member of NFPA 91
	Dennis Kirson	Member of NFPA Committee on Clean Rooms
AL\SNLL	Carol Caldwell	Member of NFPA 101 and Chairman of the new Laser Committee

AL\LANL	Donald Davidson	Chairman of NFPA 78 and Member of 232
	Walter Maybee	Chairman of NFPA 803
	Albro Rile	Member of NFPA Education Section and Member of Fire Marshal Assoc. of North America
	Luke Bartlein	Serves on the ICBO committee which provides the Uniform Building Code (UBC) and Uniform Fire Code (UFC)
NV	Pat Phillips	Chairman of the Signaling Systems Correlating Committee Member of the UL Fire Council
RL	Dale Eggen	Member of NFPA 241

INDEPENDENT SURVEY PROGRAM

Factory Mutual Research Corporation continued the independent fire protection survey program. Surveys were made at the following locations during this reporting period:

<u>Site Visited</u>	<u>Survey Start</u>	<u>Report Issued</u>
Portsmouth Gaseous Diffusion Plant	1/22/90	6/90
Westinghouse Idaho Nuclear Company	4/24/90	10/90
Rockwell-INEL	4/23/90	11/90
Rocky Flats	6/18/90	11/90
Strategic Petroleum Reserve	2/90	12/90
Stanford Linear Accelerator Center	9/10/90	12/90
Naval Reactor Facility	11/5/90	11/90
Inhalation Toxicology Research Institute	12/3/90	2/91
Ross Aviation	12/3/90	2/91

During CY 1991, surveys are expected to be conducted at about five locations.

EXTINGUISHING SYSTEM INSTALLATIONS

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

About 117 systems were installed in new or existing structures in 1990. Sprinkler systems continue to be the predominate type of system with about 109 being installed. The majority of the other installations were Halon. However, the number of installations of carbon dioxide, dry chemical, or foam systems are expected to increase as the use of Halon is reduced.

AUTOMATIC SPRINKLER SYSTEMS PERFORMANCE

There are two reported incidents where sprinkler heads operated during fires in CY 1990. Three sprinkler heads were fused, two heads in one fire and one head in the other. The excellent performance of the systems limited the total damage to \$3,000.

There are now 211 reported incidents in the AEC/ERDA/DOE records where sprinkler systems operated due a fire. The satisfactory rate of performance is 99.1% or 209 times out of 211 incidents. The two failures were a shut cold weather valve in 1958 which controlled a single head in a wood dust collector and a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

Eleven of the fire incidents involved deluge systems, this give a satisfactory performance rate for deluge systems of 90.9%. There are too few incidents to be of significant statistical importance.

HALON SYSTEMS UPDATE

There were five incidents involving Halon systems where a fire was detected and extinguished. There were no reports of system failures. However, there were 22 reported cases where Halon systems were accidentally discharged with more than 3,400 pounds of Halon being released.

FIRE PROTECTION IMPROVEMENTS

The following is a summary of the fire protection upgrading projects as reported by the Operational Offices. As with past reports, this summary is intended not only to indicate the number of projects that have occurred over the year, but also to serve as a source of information to those planning similar upgrades. The following are some of the projects that have been done:

Automatic Sprinkler Systems

<u>Location</u>	<u>Installation</u>
AL\SNLA	Installed automatic sprinklers in Buildings 963 and 965.
AL\WIPP	Installed automatic sprinklers in seven trailers.
AL\Pantex	Installed automatic sprinklers in Building 16-3.
AL\Kansas City Plant	Upgraded the existing system to a foam-water type with in-rack sprinklers in the Chemical Storage Building 74 and upgraded the roof level sprinkler system and the reactor's deluge system in the Polymer Building 15.
AL\LANL	Five sprinkler systems were installed in various Laboratory Buildings including buildings on the high potential fire loss list.
AL\Pinellas	A automatic sprinkler system was replaced due to the many pin hole leaks that had devolved in the piping.
CH\ANL-E	Automatic sprinklers and fire alarms, as needed, were installed in Building 202 Q Wing, 340, 375 High Bay, and several trailers.
CH\ANL-W	An automatic sprinkler system was installed in Building 752.
CH\Batavia	Automatic sprinkler systems were installed in the NWA Experimental Hall, D-Zero Collision Hall and Facilities Management Building.

CH\Brookhaven	Automatic sprinkler systems were installed in Buildings 918, Basement of 901 East, and 97.
METC	Installed automatic protection system as part of the modification to the B6 Combustion Research Facility which included wet sprinklers, deluge, carbon dioxide, and a fire alarm and detection system.
NV\REECo	Automatic sprinkler systems with alarms were installed in one building in Area 2, three buildings in Area 6, two buildings in Area 12, one building in Area 22, and five buildings in Area 23.
OR\ORNL	Automatic Sprinkler systems with alarm systems and new fire mains, as needed, were provided in Buildings 6026 A - F, 2652 A - C, 7039, 7879, and 7917.
OR\Y-12	Buildings 9720 to 25, Kathabar 5, and Trailers 9983-62 through 9983-65, 9983-71 and 9983-72 had automatic sprinklers systems with alarm installed. In addition, about 13 existing sprinkler systems were expanded to cover new addition or upgraded area.
PNR\Bettis	Sprinkler systems were installed in Steam Generator Performance Experiment's Heat Source Shelter and six permanently located trailers.
PNR\NRF	The ECF Receiving Station was provided with an automatic sprinkler system.
SF\LBL	Building 51 was provided with an automatic sprinkler and alarm system.
SF\SLAC	Automatic sprinkler and alarm system, as needed, were provided in three buildings and a cooling tower.
SF\LLNL	Buildings 165,175,392,324,323,2175,3175,405, and 5975 had automatic sprinkler systems installed.
SNR\Windsor	A sprinkler system was installed in Building No.2.

Special Extinguishing Systems

<u>Location</u>	<u>Installation</u>
AL\LANL	A Halon system was installed in the LDCC computer room. This is the last planned installation of a Halon system.
CH\ANL-W	A Halon system was installed in the instrument rooms of Reactor Building 767.
NV\STL	A Halon system was installed in an anechoic chamber.
NV\REECO	Six portable buildings (skids and trailers) were provided with Halon systems.
PNR\Bettis	The control room and the data processing room for the Steam Generator Performance Experiment were provided with Halon protection.
PNR\NRF	A carbon dioxide system was installed to provide protection in the cable trench in the AlW Circulating Water System Building.

Fire Alarm and Detection Systems

<u>Location</u>	<u>Installation</u>
AL\SNLL	The Pyrotronics XL3 fire alarm systems were connected to the CXL unit.
AL\Kansas City Plant	An automatic notification systems were installed in nine hazardous areas per the NFPA 101.
CH\Batavia	Fire alarm and detection systems were installed in the Old Materials Development Lab and AP30 Portakamps.
ID\INEL	The computer update for the site wide fire alarm system was completed.
NV\REECO	Fire detection systems were installed in Buildings 5-20, 26-2203 and 15 dormitories in Area 23.
OR\ORNL	A major upgrade of the fire alarm system was completed with the installation of master fire alarm and auxiliary boxes and associated equipment.

Water Distribution Systems

<u>Location</u>	<u>Installation</u>
AL\Kansas City Plant	Fourteen underground control valves and 24 divisional valves were installed to replace existing ones.
CH\Batavia	Installed a backup fire pump at C4.
NV\REECo	Fire mains, supply mains and fire hydrants were installed in Area 6 at the Construction Camp, Sandia Complex, and the Heavy Equipment Storage Area and in Area 23 at the WSI Training Area.

FIRE DEPARTMENT ACTIVES

Each year the various fire departments are involved in many actives, training, and replacement or purchasing of new equipment. CY 1990 also saw the approval of a on-site department at Paducah, giving the fire department to the county at Los Alamos, and the construction of a new fire station at Savannah River. The following is a brief summary of some of other items:

EMERGENCY VEHICLES

There are about 26 DOE Fire Departments with more than 100 vehicles other type of apparatus with yearly replacements or additions. Any site considering equipment purchases or modification should consult with locations that have completed such a project as noted below:

<u>Location</u>	<u>Type of Equipment</u>
AL\Pinellas	A 1000 gpm pumper was purchased to replace an existing 250 gpm mini-pumper.
CH\ANL-E	A mobil tactical command vehicle was placed into operation.
CH\Batavia	A pumper and a grass fire trucks were purchased.
NV\REEC	A 4-wheel drive rescue truck was purchased to replace an existing unit.
OR\Paducah	A Wheel Coach Ambulance was placed into service replacing an existing van type unit.
OR\Fernald	New equipment that was purchased includes a Pierce Arrow Class A Pumper, Spill Response Vehicle and a Service Vehicle.
RL	A mobile respiratory training trailer was purchased.
SNR\Knolls	A 1500 gpm KME Pumper was purchased to replace a 24 year old unit. A fire truck from excess was re-built as a 1000 gpm pumper.
SR	A 1500 gpm Central Pump Fire Truck and a 95 ft. aerial platform ladder truck were purchased.

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 and other equipment. This equipment is required to meet various NFPA Standards.

<u>Location</u>	<u>Type of Equipment or Program</u>
AL\Mound	A bar code inspection systems was instituted for the inspection of fire extinguishers.
AL\Kansas City Plant	New radios were purchased for the Fire Department and the Fire Protection Engineering Department.
OR\Portsmouth	Radio communications capability was procured as an accessory for the new SCBA equipment and integrated into the existing radio capabilities. Additionally, chemical protective suits were purchased.

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 and fires were extinguished. There were also many reports of Fire Department personnel serving as instructors in the various communities or collages.

PLANNED FIRE PROTECTION PROJECTS

FOR CY 1991

Most of the locations reported that plans for CY 1991 include additional training for Fire Department or Brigade personnel, Fire protection Engineering staff members, and training of other as needed. In addition, a number of sites are expecting to hire new personnel. Required fire protection systems are to be provided in new buildings or facilities. Most locations also report that they are planning to upgrade many existing system and to provide needed fire protection systems in areas that have written-up as part of an audit or appraisals report. The following is a list of planned projects that may be of interest to others:

AL\SNLA	Upgrade the Fire Protection Staff to meet the requirements as noted in the New Corporate Fire Protection Program.
AL\Pantex	A "burn pit" that will meet EPA requirements be constructed for training fire fighters.
AL\Kansas City Plant	A fire wall penetration permit system will be established to control penetrations. The Maximum Foreseeable Loss (MFL) risk assessment, design, and fix process will continue, and 18 of the 78 identified MFL areas will be completed.
AL\LANL	Additional study and investigations will be conducted on methods to assure that hearing impaired or deaf workers will be made aware of plant alarms.
BPA	Fire barriers separations are planned in the cable tunnel and cable spreading room at Celilo along with sprinkler protection in the cable spreading room.
CH\Batavia	A second water supply connection from the City water supply is planned to be installed. In addition, a large section of the raised floor in Wilson Hall is planned to be removed. This will allow the removal of part of the Halon system.

Headquarters Issuance of revision to DOE 5480.7 and 6430.1A, develop FIRAC as a DOE wide sanctioned fire model, and develop a model fire protection program.

NV\REEC0 Automatic sprinkler systems are planned for 19 buildings along with detection systems in six buildings. A 500,000 gallon water supply is planned in Area 6. Existing Halon systems are planned to be removed from six buildings and nine skids. A total of 8,185 pounds of Halon is expected to be recovered.

OR\Portsmouth A bar coding systems is planned and will be used to improve record keeping of inspections done.

END

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