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ENGINEERING DATA TRANSMITTAL

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1	1	Safety JB LEVINE	<i>JB Levine</i>	8-24-94	6-25								
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RELEASE AUTHORIZATION

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Document Title: TECHNICAL EVALUATION OF EQUIPMENT MAINTENANCE ON
FIRE ALARM DETECTION, SUPPRESSION, AND SIGNALING

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

APPROVED FOR PUBLIC RELEASE

* * * * *

WHC Information Release Administration Specialist:

Kara Broz
(Signature)

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7. Abstract This document delineates the application of WHC-CM-4-3, Program E-2 to Fire Systems on the Hanford Site.		
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TITLE and APPROVAL PAGE

TECHNICAL EVALUATION OF EQUIPMENT MAINTENANCE

ON FIRE ALARM DETECTION, SUPPRESSION,

AND SIGNALING SYSTEMS.

ON THE HANFORD SITE

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1.0 PURPOSE

The purpose of this document is to provide a reference for the implementation and application of WHC-CM-4-3, Program E-2, Rev.3, Electrical Safety Practices; to corrective, predictive, and preventative maintenance and related testing on fire detection, suppression, and signaling systems on the Hanford Site.

2.0 SCOPE

This document covers all maintenance and testing performed on fire detection, signaling, and suppression systems in use on the Hanford Site, serviced by the Hanford Fire Department Fire Systems Maintenance and Testing division.

3.0 GENERAL DESCRIPTION

3-1 Procedures

The Hanford Fire Department Fire Systems Testing and Maintenance (HFD/FSTM) division authors and maintains electric-related site wide testing and preventative maintenance procedures in accordance with NFPA 72, the National Fire Alarm Code. These procedures and the performance thereof, satisfies the requirements of the NFPA standards for testing criteria and frequency, as ordered by the Department of Energy and documented in WHC-CM-4-41.

3-2 Work Control

Corrective and predictive maintenance is performed and controlled in accordance with WHC-CM-1-8 and WHC-CM-8-8.

4.0 PREVENTATIVE MAINTENANCE AND TESTING REQUIREMENTS

Testing requirements are NFPA driven and are performance based tests. The system must be tested while operating under full electrical power to comply with the intent and requirements of the tests. Power supply measurements (24 vdc) must be taken under actual load to ensure compliance with backup emergency power capacity requirements. Interface equipment that processes and transfers initiation, notification, and alarm signals must be tested under actual operation by definition.

5.0 INSTRUMENTS AND CALIBRATION

All electrical test equipment used by fire systems maintenance personnel is calibrated and certified by the Hanford Standards Laboratory.

6.0 FIRE ALARM EQUIPMENT DESCRIPTION

Fire alarm equipment, with noted exceptions, operates at 24 vdc. This voltage is not referenced to ground, but is ground fault detected by the FCP. General applications of other voltages that may be found are described in Sections 6-1 through 6-4. Specific uses of higher voltages have been identified as to building, system and location on approved engineering documents, including site controlled drawings and Certified Vendor Information. As applicable these higher voltage conditions are specifically addressed and accounted for in JCS work package resolutions.

6-1 Notification Circuits (bells)

120 vac bell circuits, where they exist, are normally de-energized and can be electrically isolated from power sources within the FCP. Efforts continue to remove these 120 vac appliances from service and replace them with 24 vdc appliances. Building still using the higher voltage appliances are identified on drawings and HFD testing documents.

6-2 High voltage FCP's (220 vdc initiation circuits)

The voltages encountered on the 220 vdc circuits are not dangerous to the point of causing serious injury or death by themselves. They are current limited to maximum of 22 milliamps. Also the circuit is not referenced to ground. In other words, one must be touching both circuit conductors to receive an electrical shock. The risk associated with performing maintenance tasks on this equipment is minimal. Procedure S-FS-0010 provides electrical tests to verify the absence of unintentional ground faults on circuit conductors. An unintentional ground fault on a circuit conductor can cause a painful shock. The formal documentation of these systems that are available, lock and tag procedures, and zero energy tests in accordance with WHC-CM-4-3, Program G-1, protective gloves, and the floating, current limited circuit precludes dangerous shock hazards developing from the performance of testing on these fire systems. Procedures (S-FS-0010) verify the absence of unintentional ground faults, which could constitute a shock hazard in some cases.

6-3 Interlocks

HVAC, computer interface, or other electrical interlock circuits extending within the FCP may be 120 vac in some cases.

6-4 Power Supplies

Fire Control Panel power supply assemblies (transformer/ rectifier /regulator) operate from a 120 vac primary power source. All other circuits, devices and appliances are powered by the 24 vdc secondary power supply. 120 vac terminals on the primary power supply are not normally accessible or near¹ a work area. See table 11-1 for FCP specific information on accessibility of 120 vac power sources.

7.0 SAFETY

FSTM employs a full complement of electrical plant engineers to identify and resolve electrical power concerns within the JCS system. Lock and tag applicability is determined on a task specific basis, and the proper boundaries are specified within the JCS work steps or arranged by the facility lock and tag personnel prior to release of the work package. Current revision drawings, ECN's, and field verifications are used to develop proper safety boundaries for energy control. FSTM work packages are reviewed and approved by a safety professional.

8.0 ENGINEERING DOCUMENT CONTROL

An Information Print File (IPF #10) is maintained on site at the FSTM engineering offices to provide approved engineering document support for electrical worker safety. Drawings are included in the work package as necessary.

9.0 PERSONNEL REQUIREMENTS

9-1 Safety Training

All FSTM electrical workers require and receive High Risk Electrical Safety Training.

9-1.1] 120 vac power sources must be dealt with on some tasks.

9-1.2] 220 vdc panels must apply E-2 (Electrical Safety Practices) requirements.

9-2 Qualifications

All electrical workers in FSTM are qualified, (as defined in E-2, 3.3 and NFPA 70, NEC 100, NFPA 72 7-1.2.2, and NFPA 70E). The following is a list of qualifying media, applicable to FSTM electrical workers.

9-2.1] electrical apprenticeship training.

9-2.2] state licensed as journeyman.

9-2.3] equipment specific training supplied by system vendors.

9-2.4] NEC trained by NPFA seminars.

9-2.5] experience on voltages up to 600 vac.

9-2.6] safety training (facility specific)

9-2.7] first aid/CPR trained.

9-3 Documentation

Specific training records for each individual are maintained by FSTM management and are available for review and audit.

10.0 PREVENTATIVE MAINTENANCE

10-1

WHC-CM-4-3, E-2 requires that a justification be provided in cases where electrical circuits greater than 50 volts and capable of supplying greater than 1 milliamp of current must be worked while energized. Preventative maintenance and testing must be worked while the circuits are energized. Fire systems preventative maintenance and testing procedures do not require that work be performed on the 120 vac power supply.

The preventative maintenance and testing work is performed on the portion of the system that is powered by 24 vdc. The accompanying table (11-1) can be used to determine the safety of the AC power feed location, for the sake of conservatism, but should not be used to determine the applicability of E-2 requirements to preventative maintenance and testing of fire systems and related components.

10-2

With the exceptions noted in Section 6.0, E-2 does not directly control preventative maintenance and testing work performed on fire control panels, input devices, output devices, or interface devices, due to the inherit voltage level of 24 vdc. This section of this document satisfies the requirements of WHC-CM-4-3, E-2, Section 3.4 (1 and 2) for preventative maintenance and testing on fire systems.

11.0 CORRECTIVE AND PREDICTIVE MAINTENANCE

11-1 GENERAL APPLICATION TABLE

Table 11-1 documents for the record the applicability of WHC-CM-4-3, E-2; to corrective maintenance work performed on Fire Alarm Control panels by model as determined by technical review. The table can be used by work package preparers to determine safe working boundaries for corrective and predictive maintenance work on these systems.

11-2 PARTS REPLACEMENT

- 11-2.1] Circuit board replacement requires that power be removed from the effected part to protect the FCP from damage. This removal of electrical power is not expressly for personnel protection. Power can be removed from the effected FCP in a variety of ways. The JCS work package controlling the work shall identify the means for removal of power for equipment protection.
- 11-2.2] Field located input and output devices and appliances do not normally require isolation from power for replacement. See section 6.0 for exceptions.
- 11-2.3] Replacement of primary power supply parts (transformer/rectifier/regulator) must be performed under lock and tag controls.

11-3 ADDITIONAL NOTES AND GUIDANCE

- 11-3.1] Fire Control Panels not listed should be field verified and should specifically address energy control measures within the JCS work packages.
- 11-3.2] Auxiliary control circuits, such as HVAC and Computer shutdowns must be addressed specifically by energy control measures within the work packages.

- 11-3.3] 120 vac bell circuits are normally de-energized and fall under NFPA 70E, Part 2, chapter 1, B. (2). Circuits must be considered energized. Bell disconnect (bypass) switches are incorporated into most systems and can be used to isolate notification circuits.
- 11-3.4] Near¹: Something is defined as near if, under a reasonable scenario, it can be inadvertently touched with any part of the body.

Table 11-1

FCP MODEL	E2	NOTES
System 3 (all)	NO	Power is shielded. 24 vdc in/out
Gamewell 300/3000	NO	Power is not near. 24 vdc in/out
Zans 200	YES	Power is near. 24 vdc in/out Pull plug A1-J2 to remove AC power from door mounted lamps.
CP-400	NO	Power is shielded. 24 vdc in/out
Zans 400	NO	Power is shielded. 24 vdc in/out
Gamewell 401/404	NO	Power is not near. 24 vdc in/out
Fenwal (various)	YES	Steps must be taken to isolate A.C.
Gamewell Flex II/III/5Z,B	YES	Steps must be taken to isolate A.C.
Pyrotronics FIU, CB, CTZ, CSZ	YES	All circuits are applicable for E2
RFAR	NO	Power is shielded.
XL3	NO	Power is shielded
Gamewell 500	NO	Power is shielded. 24 vdc in/out
CR-7	YES	24 vdc in/out
CP-70	YES	24 vdc in/out
Simplex 2001, 4002	NO	Power is shielded. 24 vdc in/out
Notifier 4800, 4812	YES	Power must be secured, 24 vdc in/out
Potter 4000	NO	Power is not near. 24 vdc in/out
Notifier MD-740	NO	Power in separate cabinet. 24 vdc in/out
MXL	NO	Power is shielded

12.0 ABBREVIATIONS and ACRONYMS

FCP	FIRE CONTROL PANEL
vdc	volts direct current
vac	volts alternating current
Rev.	revision
NFPA	National Fire Protection Association
HVAC	Heating, Ventilation, Air Conditioning
JCS	Job Control System
ECN	Engineering Change Notice
NEC	National Electrical Code (NFPA 70)
CPR	Cardio-Pulmonary Resuscitation
FSTM	Fire System Testing and Maintenance
HFD	Hanford Fire Department
AC	Alternating Current (see vac)
CVI	Certified Vendor Information

13-0 REFERENCES

WHC-CM-1-8
WHC-CM-4-3, (E-2 & G-1)
WHC-CM-4-41
WHC-CM-8-8
NFPA Codes and Standards
70
72
70E

APPENDIX I

List of preventative maintenance and testing procedures covered by this
Technical Evaluation:

<u>ID Number</u>	<u>Rev. #</u>
SFS-0010	1
SFS-0012	0
SFS-0013	0
SFS-0014	0
SFS-0015	0
SFS-0016	0
SFS-0021	0
SFS-0028	0
SFS-0037	0
SFS-0048	0
SFS-0049	0
SFS-0067	0
SFS-0068	0
SFS-0068	0
SFS-0075	0
SFS-0076	0
SFS-0078	0
SFS-0079	0
SFS-0080	0
SFS-0081	0
SFS-0082	0
SFS-0083	0
SFS-0084	0
SFS-0085	0
SFS-0087	0
SFS-0088	0
SFS-0089	0
SFS-0090	0
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SFS-0092	0
SFS-0093	0
SFS-0094	0
SFS-0095	0
SFS-0096	0
SFS-0097	0
SFS-0098	0
SFS-0098	0
SFS-0099	0
SFS-0100	0
SFS-0102	0
SFS-0103	0
SFS-0106	0