

Criteria, Review, and Approach Document for the Assessment of Operational Readiness of Vital Safety Systems Response

Site: Y-12 Complex

Facility: 9204-2/2E

System: Fire Suppression Systems Wet Pipe System (WPS): 9204-2: 5, 11; 9204-2E: 2
Fire Suppression Systems Fire Cycle System (FCS): 9204-2: 6; 9204-2E: 1, 4
(Referred to in Surveillance Procedures as: 9204-002-WPS-005,
9204-002-WPS-011, 9204-02E-WPS-002, 9204-002-FCS-006,
9204-02E-FCS-001, 9204-02E-FCS-004)

System Classification: Safety Significant

System Safety Function (list):

The building Fire Protection System will help to limit the size and spread of large fires. It summons assistance and enables suppression of fires to continue if other hazards force workers/firefighters to evacuate.

(Document Y/ENG/BIO-003, Rev. 2, March 1999, *The Basis for Interim Operation of Building 9204-2E*, Section 2.5.1)

OBJECTIVES:

VSS-1.1 VSS safety functions are defined and understood by responsible line managers and supporting information/documentation is available and adequate. System testing is adequate to ensure operability. (Review Approach Items 1,2,3 and 7)

Criterion VSS-1.1 was met. The safety function of the Fire Suppression systems and the normal and abnormal conditions under which it must perform these functions are defined in Document Y/ENG/BIO-003, Rev. 2, *The Basis for Interim Operation of Building 9204-2E*, March 1999. Review of the orientation given the line managers in Fire Protection Operations who are responsible for overseeing the operation of 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 demonstrated that the safety functions of this vital safety system are addressed. Interviews with these line managers confirmed their understanding of the safety functions of the 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4. Interviews with randomly selected personnel within Fire Department Operations indicated a basic understanding of the safety functions of 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 and where to obtain further information. Although these reviews showed basic knowledge, a review of general Vital Safety System information is warranted. The available drawings that document the system configuration included system riser and flow diagrams and are maintained at Y12 Facility Records. Comparison of the system testing requirements, including the specified acceptance criteria and test frequencies mandated by Y52-54-FDO-021, Rev. 0.2, *Wet Pipe Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex*, Y52-54-FDO-022, Rev. 0.2 *Wet Pipe Sprinkler System Semi-Annual Surveillance for the Building 9204-2/2E*

Complex and Y52-54-FDO-025, Rev. 0.3, *Firecycle Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex*, Y52-54-005 and Y52-54-006 with the testing required to ensure operability defined of Y/TS-1314 Revision 7, *Operational Safety Requirements for 9204-2E Facility*, verified that the testing of the 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 is adequate to ensure operability. The most recent annual testing conducted on the FCS was done prior to alarm transition to the EST system in accordance with Y52-54-005 and 006. These procedures are no longer valid and are being updated. The expected completion date is prior to the due dates of the next annual test.

No necessary documentation was unavailable or inadequate.

Details of the assessment verifying compliance with this criterion follow.

1.1.1 (Approach Item 1): Using the DOE-approved facility safety analysis (i.e., SAR, BIO, etc.) identify: a) the system safety function(s); b) the normal, abnormal, and accident conditions under which the system is intended to perform its safety function(s); and c) relevant system functional requirements and performance criteria.

1.1.1.a Identify the system safety functions:

The building Fire Protection System will help to limit the size and spread of large fires. It summons assistance and enables suppression of fires to continue if other hazards force workers/firefighters to evacuate.

(Document Y/ENG/BIO-003, Rev. 2, March 1999, *The Basis for Interim Operation of Building 9204-2E*, Section 2.5.1)

1.1.1.b The normal, abnormal and accident conditions under which the system is intended to perform its safety function(s):

Normal Conditions. Fire suppression systems must be operable during facility operating and warm standby modes Y/TS-1314 Rev. 7, Section 3.2.1)

Abnormal/Accident Conditions. The following are the dominant accident conditions for the relevant suppression systems:

The dominant accident scenario for the relevant fire suppression systems is identified in Section 5.3.3 of Y/ENG/BIO-003 as a Uranium Fire Hazard. The fire suppression system (9204-2E: FireCycle System 1 and 4 and Wet Pipe System 2 and 9204-2: FireCycle System 6 and Wet Pipe Systems 5 and 11) is identified as one of a number of mitigating factors for fire accidents in the facility.

1.1.1.c Relevant system functional requirements and performance criteria

Functional requirements for the sprinkler systems are identified in LCO 3.2.1 of Y/TS-1314 Revision 7, Operational Safety Requirements for 9204-2E Facility. Required water pressures, per LCO 3.2.1, for the credited sprinkler systems are as follows:

Sprinkler System Number	Required Water Supply Pressure (psig) per LCO 3.2.1
9204-002-WPS-005	≥ 45.0
9204-002-FCS-006	≥ 30.0
9204-002-WPS-011	≥ 40.0
9204-02E-FCS-001	≥ 50.0
9204-02E-WPS-002	≥ 40.0
9204-02E-FCS-004	≥ 40.0

During the review it was noted that the water supply pressures specified in the OSR met or exceed the requirements specified in the associated Fire Hazard Analysis.

Relevant system performance criteria are identified in Section 4.2.1 of Y/TS-1314 Revision 7, Operational Safety Requirements for 9204-2E Facility.

Acceptance criteria include the following:

- Pressure drop, as indicated by the water supply gage, shall be less or equal to 10 psig during the 2-in. main drain test
- Visual verification that main control valves/post-indicator valves are open
- Water shall flow through the system piping when an inspector's test valve (ITV) for an associated wet pipe sprinkler system is opened
- Perform a full flow system trip test on FireCycle Systems. Heat shall be applied to a heat detector, and the detector shall operate within 60 seconds, and water shall flow through system piping
- Heat detectors shall trip within 60 seconds when tested. 10% of the heat detectors shall be tested on an ANNUAL basis. All detectors will be tested within a 10-year period

1.1.2 (Approach Item 2) Identify the acceptance criteria from the surveillance tests used to verify that the system is capable of accomplishing its safety function(s). Review the acceptance criteria against the function(s), conditions, requirements and performance criteria identified in section 1.1.1 above.

Requirement	Implementation
OSR Section 4.2.1	
9204-002-WPS-005	
System water pressure \geq 45.0 psig	Y52-54-FDO-021, Rev. 0.2, Step 5.1[5]
2-in main drain test results \leq 10 psig	Y52-54-FDO-022, Rev. 0.2, Step 5.4[8]
Main control valve or PIV is open	Y52-54-FDO-021, Rev. 0.2, Step 5.1[3]
ITV test indicates water flow	Y52-54-FDO-022, Rev. 0.2, Step 5.2.1[9] or .5.2.2[11]
9204-002-FCS-006	
System water pressure \geq 30.0 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.5[4]
2-in main drain test results \leq 10 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.2[8]
Main control valve or PIV is open	Y52-54-FDO-025, Rev. 0.3, Step 5.5[2]
Full flow trip test	Being updated for EST conversion
Test 10% of heat detectors	Being updated for EST* conversion
9204-002-WPS-011	
System water pressure \geq 40.0 psig	Y52-54-FDO-021, Rev. 0.2, Step 5.1[5]
2-in main drain test results \leq 10 psig	Y52-54-FDO-022, Rev. 0.2, Step 5.4[8]
Main control valve or PIV is open	Y52-54-FDO-021, Rev. 0.2, Step 5.1[3]
ITV test indicates water flow	Y52-54-FDO-022, Rev. 0.2, Step 5.2.1[9] or 5.2.2[11]
9204-02E-FCS-001	
system water pressure \geq 50.0 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.5[4]
2-in main drain test results \leq 10 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.2[8]
Main control valve or PIV is open	Y52-54-FDO-025, Rev. 0.3, Step 5.5[2]
Full flow trip test	Being updated for EST* conversion
Test 10% of heat detectors	Being updated for EST* conversion
9204-02E-WPS-002	
system water pressure \geq 40.0 psig	Y52-54-FDO-021, Rev. 0.2, Step 5.1[5]
2-in main drain test results \leq 10 psig	Y52-54-FDO-022, Rev. 0.2, Step 5.4[8]
Main control valve or PIV is open	Y52-54-FDO-021, Rev. 0.2, Step 5.1[3]
ITV test indicates water flow	Y52-54-FDO-022, Rev. 0.2, Step 5.2.1[9] or 5.2.2[11]
9204-02E-FCS-004	
system water pressure \geq 40.0 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.5[4]
2-in main drain test results \leq 10 psig	Y52-54-FDO-025, Rev. 0.3, Step 5.2[8]
Main control valve or PIV is open	Y52-54-FDO-025, Rev. 0.3, Step 5.5[2]
Full flow trip test	Being updated for EST* conversion
Test 10% of heat detectors	Being updated for EST* conversion

*Edwards System Technology Fire Alarm System

The most recent annual testing conducted on the FCS was done prior to alarm transition to the EST system in accordance with Y52-54-005 and 006. These procedures are no longer valid and are being updated. The expected completion date is prior to the due dates of the next annual test.

- 1.1.3. (Approach Item 3) At what frequency are the tests identified in Question 1.1.2 above performed? Determine whether these tests and inspections are required by Technical Safety Requirements, Operational Safety Requirements (OSRs), or other Authorization Basis or Authorization Agreement requirements.

Surveillance Requirement	Frequency	Implementation
Y/TS-1314 Rev. 7 SR 4.2.1.1 – Open an ITV in each wet pipe sprinkler system and verify water flow through the associated system.	Semi-Annual	Y52-54-FDO-022, Rev. 0.2 Wet Pipe Sprinkler System Semi-Annual Surveillance for the Building 9204-2/2E Complex - Step 5.2.1[9] or 5.2.2[11]
Y/TS-1314 Rev. 7 SR 4.2.1.2 – A 2-inch main drain test shall be conducted on each sprinkler system to verify the water supply pressure reduction is less than or equal to 10 psig from a static condition.	Semi-Annual	Y52-54-FDO-022, Rev. 0.2 Wet Pipe Sprinkler System Semi-Annual Surveillance for the Building 9204-2/2E Complex - Step 5.4 [8] AND Y52-54-FDO-025, Rev. 0.3, Firecycle Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex - Step 5.2[8]
Y/TS-1314 Rev. 7 SR 4.2.1.3 – Visual verification of the sprinkler water main control/post indicator valve(s). The valve(s) shall be open.	Monthly	Y52-54-FDO-021, Rev. 0.2, Wet Pipe Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex - Step 5.1 [3] AND Y52-54-FDO-025, Rev. 0.3, Firecycle Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex - Step 5.5[2]
Y/TS-1314 Rev. 7 SR 4.2.1.4 – Visual verification of the water supply gauge pressure. The pressure in the required system shall be greater than or equal to the pressures identified in Task 1c above.	Monthly	Y52-54-FDO-021, Rev. 0.2, Wet Pipe Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex - Step 5.1 [5] AND Y52-54-FDO-025, Rev. 0.3, Firecycle Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex - Step 5.5 [4]
Y/TS-1314 SR 4.2.1.5 – Perform a full flow system trip test on the FireCycle systems by applying heat to a heat detector. The heat detector shall operate within 1 minute.	Annual	Being updated for EST conversion
Y/TS-1314 SR 4.2.1.6 – Heat detectors shall trip within 60 seconds when tested. 10% of the heat detectors shall be tested on an ANNUAL basis. All detectors will be tested within a 10-year period.	Annual	Being updated for EST conversion

The most recent annual testing conducted on the FCS was done prior to alarm transition to the EST system in accordance with Y52-54-005 and 006. These procedures are no longer valid and are being updated. The expected completion date is prior to the due dates of the next annual test

1.1.4 (Approach Item 7). Are drawings that document the system configuration available? If so, identify the types of drawings (e.g., piping and

instrumentation diagrams, electrical one-line, wiring, or schematic diagrams, installation drawings).

Response: System riser and flow diagrams (piping) are available for the 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 and are maintained at Y12 Facility Records.

VSS-1.2 The backlog for surveillances, tests, inspections, maintenance, repair, upgrades, or other work on the system is managed and kept to an appropriate minimum. (See Review Approach item 6.)

Criterion VSS-1.2 was met. The processes for assigning priorities to surveillances, tests, inspections, maintenance, repair, upgrades, and other work on 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 are not formally documented. The process for prioritizing test, maintenance and inspection was promulgated as a part of Fire Protection Operations RFA 166. The process is installed in the FireBase scheduler and provides a ranking number for each system dependent of system grade, Authorization Basis assignment, building importance and system type. Review of these processes showed that the 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 have been assigned a priority for surveillances tests and inspections that is commensurate with their importance to safety. 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 are subject to the requirements of Y/TS-1314 Revision 7, Operational Safety Requirements for 9204-2E Facility which requires that surveillances, tests, and inspections be conducted on a specific schedule. The backlog for surveillances, tests, and inspections on 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 is managed to keep it at an appropriate minimum. A review of the FireBase database records for the last three years showed that there is some discontinuity between hard copy and electronic maintenance records. Had these maintenance items been actually missed the facility would have initiated an occurrence report. Due to the fact that there are no supporting occurrence reports, it is probable that all of the required surveillances, tests, and inspections have been conducted on schedule and that a documentation problem exists. Subsequent information from the facility indicated no surveillances missed or late. All surveillances are currently up to date.

The process for prioritizing corrective maintenance is documented on the Test, Maintenance and Inspection web site. It is used by TM&I schedulers to prioritize work. In general, TM&I support personnel have been able to care only for those items that directly affect operability of the VSS. Remaining maintenance is backlogged. Of note, the inability of Fire Department Operations to conduct all test, maintenance and inspection throughout the Y12 plant has been the focus of several recent inspections both internal and external. The deficiencies have been targeted at the balance of plant systems. A review of the current backlog of maintenance, repair, upgrades, and other work in the EIS deficiency database was reviewed. A backlog of 24 maintenance job requests affect 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4. None affect the operability of 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4.

The corrective actions necessary to remedy the problems identified in the TM&I program are identified as a part of ESAMS action item I 39665 when funding is authorized to support these issues.

Details of the assessment verifying compliance with this criterion follow:

- 1.2.1 (Approach Item 6) Identify the current backlog for the system for items such as preventive maintenance, corrective maintenance, modifications, surveillances, tests, inspections, and corrective actions.

Response: There is a backlog of 24 maintenance job requests affecting 9204-2 WPS 5, 11 or FCS 6, and 9204-2E WPS 2 or FCS 1, 4. None affect the operability of 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4. Although the plant-wide backlog of over 600 items has been identified by internal assessments and commented on by various outside agencies, VSS have priority in this regard per the prioritization scheme used by TM&I. Recent reviews and audits conducted internally (March 2000) and externally (DOE HQ Integrated Safety Management Verification, Phase II, FP 2.3 August 2000 and DNFSB Review of the Y-12 Fire Program July 2000) identified the large backlog of general maintenance items for fire systems as a program weakness. The corrective actions necessary to remedy these problems are identified as a part of ESAMS action items I 31820 and I 39665 when funding is authorized to support these issues.

VSS-1.3 Configuration Management and Maintenance programs effectively ensure operational availability of the system. (See Review Approach Items 5, 8, and 9)

Criterion VSS-1.3 was met. The Configuration Management and Maintenance programs covering 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 were reviewed. Modifications and changes are evaluated and controlled in accordance with Y15-187, *Integrated Safety and Change Control Process*. Modifications important to safety are reviewed by appropriate technical personnel and presented to the facility Operational Safety Board (OSB) for concurrence prior to implementation. The process also requires USQ screening. As part of the change control process, impacted procedures and drawings are required to be identified and updated.

Maintenance activities on 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 are performed in accordance with formal work packages developed in accordance with Y10-35-008, *Planners Guide*, Y15-204, *Work Instruction Process and Development*, and work instructions are provided by system engineers as part of the work package development. As part of the Y-12 Complex Integrated Safety Management Program, reviews by the Operational Safety Boards, including representatives of the facility to ensure appropriate requirements are captured. Post maintenance testing of the system for proper service and closure of the work package prior to return-to-service authorization is required. Maintenance personnel, work planners, and supervisors have been trained in the applicable authorization basis and NFPA requirements. Thus, the Configuration Management and Maintenance Programs effectively ensure operational fire suppression systems.

The responsibility for maintenance and operation of these VSS and all fire systems is assigned to Y-12 Fire Protection Operations as described in Y79-001INS, *Y-12 Fire Protection Program Manual* and Y14-001INS, *Conduct of Operations Manual*. Fire Protection line management receive awareness training for the various AB (VSS) systems for which they are responsible. The training is in the form of Web training and Required Reading.

Details of the assessment verifying compliance with this criterion follow.

- 1.3.1 (Approach Item 5) Identify formally scheduled activities, in addition to those addressed in item 1.1.2 above that are intended to help ensure reliable performance of the system. Include preventive maintenance, walkdowns, inspections, and assessments as appropriate.

Response: All testing, inspection and maintenance of VSS systems are specified by the National Fire Protection Association consensus codes as modified by a DOE authorized equivalency, including those items specified in the Authorization Basis. Additional testing of 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 beyond the Authorization Basis are specified in Y-FPO-017, *Wet Pipe Sprinkler System Technical Basis* and Y-FPO-24, *Fire Cycle Sprinkler System Technical Basis*. Many of these items (inspections and preventative maintenance items) are written into the various procedures supporting Wet Pipe Sprinkler test, maintenance and inspection and are scheduled for conduct in the FireBase scheduler. Those that are not yet included in procedures are scheduled to be included in the future. Additional activities that are conducted to support health of fire systems include periodic building inspections conducted with operations that assess the fire prevention activities of the building and monthly trending reviews of suppression parametric values for untoward trends or out of specification readings.

Maintenance is performed using formalized work packages developed per Y10-35-008, *Planners Guide*, Y15-204, *Work Instruction Process and Development*, and work instructions provided by system engineers as part of the work package development. OSB review, including fire and facility representatives, is required to ensure all fire watch and restoration requirements are captured. Post maintenance testing of the system for proper service and closure of the work package prior to return-to-service authorization is required as part of the maintenance package development.

- 1.3.2 (Approach Item 8) Review the processes used to ensure that work on the system and changes to the system are properly controlled (i.e., formally reviewed, approved, implemented, tested, USQ review performed if required, documents updated, and work/change accepted).

Response: Modifications/changes are evaluated and controlled per Y15-187, *Integrated Safety and Change Control Process*. Modifications important to safety are reviewed by appropriate technical personnel and presented to the facility Operational Safety Board for concurrence. The process requires evaluation by the USQ process. As part of the change control process, impacted procedures and drawings are identified and updated. The August

2000 management assessment of the FPO configuration control process indicated a maturing process with few deficiencies.

- 1.3.3 (Approach Item 9) Determine whether the procedures identified in Items 1.1.2 and 1.3.1 above, and the drawings identified in Item 1.1.4 above, are controlled under formal document control process(es), and indicate whether the process requires that documents be updated as necessary to maintain their accuracy.

Response: Modifications/changes are evaluated and controlled per Y15-187, *Integrated Safety and Change Control Process*. Modifications important to safety are reviewed by appropriate technical personnel and presented to the facility Operational Safety Board (OSB) for concurrence. The process requires evaluation by the USQ process. As part of the change control process, impacted procedures and drawings are identified and updated. The August 2000 management assessment of the FPO configuration control process indicated a maturing process with few deficiencies.

Modifications made to Authorization Basis documents are controlled by Y74-802, *Authorization Basis Documents for Nuclear, PSM/RMP, and Specified Chemically Hazardous Facilities* and Y74-804, *Preparation and Performance of Implementation Plans for Authorization Basis Documents*. Changes created by modifications to Fire Hazard Analysis are reviewed by the affected facility and the USQD process is executed as necessary and then implemented into the Authorization Basis. All of these documents are controlled within the Y-12 Document Control System. If the change to the Authorization Basis affects roll-down procedures, the requirement is captured in the implementation plan and procedure are modified per Y15-202, *Technical Procedure Control* which requires USQD and OSB interaction.

- VSS-1.4 The system is operable and available to fulfill its safety function when required. (See approach Items 4 and 10)

Criterion VSS-1.4 was met. Surveillance and testing records developed in accordance with Y52-54-FDO-021, Rev. 0.2, *Wet Pipe Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex*, Y52-54-FDO-022, Rev. 0.2 *Wet Pipe Sprinkler System Semi-Annual Surveillance for the Building 9204-2/2E Complex* and Y52-54-FDO-025, Rev. 0.3, *Firecycle Sprinkler System Monthly Surveillance for the Building 9204-2/2E Complex*, covering the last three years were reviewed. This review demonstrated that 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 had never failed to meet test and surveillance acceptance criteria or experienced demand failures in operation. The only periods of system non-availability were identified to be at times of system maintenance or at times where human error was involved. These time frames were excluded from this calculation. Therefore, the best estimate is that these fire suppression systems have always been operable during this period. Thus, the operating history of 9204-2 WPS 5, 11 and

FCS 6, and 9204-2E WPS 2 and FCS 1, 4 provides evidence that it is operable and available to fulfill its safety function when required.

Details of the assessment verifying compliance with this criterion follow.

- 1.4.1 (Approach Item 4) For each of the past three years: a) identify the number of times that the system has failed to meet its test acceptance criteria; b) identify the number of times that the system has failed in response to facility operating conditions (i.e., failed on demand); and c) estimate the percentage of time that the system was not capable of accomplishing its safety function(s) when required to be operable.

Response: Based upon review of surveillance results documented in the FireBase scheduler for the last three years there were no instances of where the system failed to meet its acceptance criteria. Similarly, a review of occurrence reports identified no instances where the systems failed in response to facility operating conditions. Therefore, the system has been available 100 per cent of the time while operating to accomplish its safety functions.

- 1.4.2 (Approach Item 10) Identify any systems and equipment (e.g., electric power, instrument or control air, diesel fuel transfer, vacuum, heat tracing, etc.) that directly support the operation of the vital safety system being assessed (i.e., where the support systems/equipment are essential for the safety system to perform its safety functions) that are not included within the defined system boundary).

Response: The following systems, which support the operation of the 9204-2/2E VSS, were also examined: electric power system, steam supply system, and water supply system. As discussed below, this examination demonstrated that the short-term loss of electric power, steam supply, or off-site water supply would not prevent these systems from performing their safety function. This examination also demonstrated that 9204-2/2E has LCO compensatory measures to ensure that the VSS would be able to perform their safety function in the event of a longer-term loss of electric power, steam supply, or off-site water supply or that operations in the facility would be curtailed. Of note, the FCS suppression system will fail to a more conservative state on the loss of electrical power in that the normally empty sprinkler piping will fill with water similar to if a heat detector associated with the system had sensed a fire. The system then remains in this condition until action is taken by the Fire Department to drain the water.

▪ **Electrical:**

The electrical system provides power to the excess pressure pumps located on some WPS and power to the heating systems in valve houses throughout the plant, power to the air compressors for both the FCS and DPS, and power for the heat detection and solenoid circuits of the FCS. In general the short-term loss of electrical power is not limiting to the ability of any of these systems to suppress a fire.

- The purpose of the excess pressure pump is to reduce the effect of plant water surges on the fire suppression systems and the failure of the pump to operate will at most result in some additional fire alarm activity. The function of the excess pressure pump is not taken credit for in any Authorization Basis document.
- Valve house heat ensures that no portion of the suppression system riser assembly freezes during cold weather. Frozen pipes could adversely affect the operation of a suppression system either by pipe breakage or plugging. Temperatures in valve houses are monitored by fire system low temperature devices, which alert the Fire Department to a loss of heat in the valve house. Loss of heat to a valve house in excess of 2 hours generally results in either the installation of portable heat or frequent checks by Fire Department Operations or as determined by Fire Protection Engineering. The function of valve house heat is not taken credit for in any Authorization Basis document.
- The function of the air compressors is to supply supervisory air pressure to both FCS and DPS. The air fills the suppression piping and holds closed the system water supply valve. Failure of the compressor to operate may result in eventual bleed-off of air pressure due to minor system leakage and subsequent filling of the system with water. A similar event occurs if power is lost to the FCS solenoid, except the solenoid (as designed) fails open causing air to bleed off and the system to fill with water. The sprinklers do not operate because they have not yet been fused by a heat source. In this situation both systems are operating in a manner similar to a WPS. The primary difference is the continuous receipt of a fire alarm due to system pressurization.

Steam:

- Steam provides heat to many facilities at Y12. The function of steam heat is not taken credit for in any Authorization Basis document. Facility steam heat ensures that no portion of the suppression system piping freezes during cold weather. Frozen pipes will adversely affect the operation of a suppression system either by breakage of piping or plugging of piping. Loss of heat to a facility in excess of 2 hours generally results in frequent checks by either facility operations or Fire Department Operations or as determined by Fire Protection Engineering.

Water:

The source of water to the Y-12 fire suppression systems is the plant potable water system. The normal potable water supply to the entire Y-12 plant is provided from the Pine Ridge water plant, located North of the Y-12 plant. The normal potable water supply to Y-12 is a gravity fed system that consists of three main supply lines (two 16" and one 24" feed lines) that provide seven connections to the Y-12 plant. They are capable of supplying approximately 7 million gallons per day through an underground common grid water supply system for the entire Y-12 plant. In addition to the normal potable water supply from the Pine Ridge water plant, Y-12 maintains a secondary supply of three 2-million gallon water tanks located on Chestnut Ridge that can supply water to the Y-12 plant in the event that the primary water supply is lost. Two

million gallons of this secondary water supply has been dedicated for firefighting activities. A third source of water is available to the Y-12 plant from two 1 ½ million gallon tanks just north of the plant. The water from these tanks is not always available on a full time basis and is therefore not considered available for fire protection purposes. Testing of the underground water system is accomplished periodically by Y-12 Plant Utilities. This testing includes monthly cycling of electrically operated valves and quarterly placement of the emergency water system on line.

Due to the common grid supply, water is capable of reaching all fire suppression system via multiple paths. The vulnerability is a supply failure (rupture/blockage) at or near the fire system tap off from the underground supply. A situation such as this could result in a loss of water to the suppression system and since a supply of water is credited in the Authorization Basis entry into the LCO action steps is necessary. Back up water can be supplied using another source attached to the fire department connection.

Recently control of the water filtration plant, which supplies water to Y-12, was transferred to the city of Oak Ridge. Additionally, several isolation valves exist outside the confines of Y-12 which, if shut, could potentially affect water supplies/pressures in Y-12. The current controls on these valves are administrative and based on interfaces between the city of Oak Ridge and Y-12.

Conclusion

This assessment demonstrates that 9204-2 WPS 5, 11 and FCS 6, and 9204-2E WPS 2 and FCS 1, 4 are operational and that processes are in place to ensure their continued operational readiness. The fire suppression safety functions and their corresponding functional requirements are defined, implemented, and maintained through mature programs and procedures that have resulted in achieving on-time surveillances. The resultant monitoring through these surveillances and operating procedures indicate that the vital safety systems have been operable and available to fulfill their function as required.

Additional Information

On February 2, 2001, BWXT Y-12 submitted a Price Anderson Amendments Act (PAAA) Noncompliance Tracking System (NTS) report identifying deficiencies in the Y-12 fire protection program that were outside the scope of the fire protection vital safety systems. To evaluate the ability to continue operating, a team of Operations, Environment, Safety, and Health, and Fire Protection representatives met to determine what additional actions or compensatory measures were needed, and concluded as follows:

- There were no immediate actions needed beyond those compensatory measures already in effect. The deficiencies in the fire protection program do not represent any known imminent danger conditions.

- There were no Limiting Conditions for Operations action steps needed as a result of the deficiencies identified in the NTS report. Each nuclear facility is assessing the deficiencies with respect to the impact on their safety authorization basis.
- With respect to all Safety Class and Safety Significant fire systems (i.e., the fire protection vital safety systems) in the Y-12 Complex nuclear facilities, all test, maintenance, and inspection requirements for operability, as specified by the applicable authorization bases, are being met.

It was determined that no additional compensatory measures were needed because as fire protection deficiencies have been identified, they have been evaluated for compensatory measures and compensatory measures have been implemented where needed. The fire protection program has overlapping echelons of protection as part of protection-in-depth that compensate for deficiencies, including a capable, trained, and equipped emergency response force that is on-site 24 hours per day.

These deficiencies are being addressed as a part of the comprehensive site-wide action plan for the improvement of Fire Protection at the Y-12 Complex [Comprehensive Fire Protection Correction Action Plan (ESAMS S4637/139665)]. A project task team is being established to address all fire protection deficiencies (programmatic, hardware, infrastructure, project, etc.) at the Y-12 Complex, and this team will develop a comprehensive corrective action plan.

BWXT Y-12 Assessor: _____
Signature Date

BWXT Y-12 Reviewer: _____
Signature Date

BWXT Y-12 Reviewer: _____
Signature Date

DOE employee who reviewed this assessment:

Signature Date

Estimated Hours (BWXT Y-12 and DOE) for data gathering, assessment, and documentation:

DOE: _____

BWXT: FSM 64; Procedures 1.5; FCM 3; FDO 1; TMI 14; FPO 3;
Eng 116; Management Review 15.