

**Office of Enterprise Assessments Review of the
Argonne National Laboratory
Fire Protection Program**



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Table of Contents

Acronyms	ii
Executive Summary	iii
1.0 Purpose.....	1
2.0 Scope.....	1
3.0 Background	1
4.0 Methodology	2
5.0 Results.....	2
5.1 Fire Protection Program.....	2
5.2 Fire and Related Safety Hazards Analyses	5
5.3 Fire Prevention and Protection SSCs and Controls	5
5.4 FHA/DSA Integration.....	7
5.5 TSR Surveillance and Testing and ITM	8
5.6 Fire Protection Self-Assessment Program	10
5.7 DOE Oversight.....	11
6.0 Conclusions.....	12
7.0 Findings.....	13
8.0 Opportunities for Improvement.....	13
9.0 Items for Follow-up.....	14
Appendix A: Supplemental Information.....	A-1
Appendix B: Key Documents Reviewed, Interviews, and Observations.....	B-1

Acronyms

AGHCF	Alpha Gamma Hot Cell Facility
AHJ	Authority Having Jurisdiction
ANL	Argonne National Laboratory
ASO	Argonne Site Office
BIO	Basis for Interim Operation
BNA	Baseline Needs Assessment
CAS	Contractor Assurance System
CFR	Code of Federal Regulations
CRAD	Criteria, Review, and Approach Document
CRD	Contractor Requirements Document
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
ESQ	Environmental, Safety and Quality
FHA	Fire Hazards Analysis
FMS	Facilities Management and Services Division
FMS-FTS	FMS Fire Technical Support Group
FP	Fire Protection
FPP	Fire Protection Program
FR	Facility Representative
FSS	Fire Suppression System
FY	Fiscal Year
IMTS	Issues Management Tracking System
ITM	Inspection, Testing, and Maintenance
LCO	Limiting Condition for Operation
MIG	Metal Inert Gas
NFPA	National Fire Protection Association
NWM	Nuclear Waste Management
OFI	Opportunity for Improvement
PIV	Post Indicating Valve
SME	Subject Matter Expert
SR	Surveillance Requirement
SS	Safety Significant
SSC	Structures, Systems, and Components
TSR	Technical Safety Requirement
WMOF	Waste Management Operations Facility

Office of Enterprise Assessments Review of the Argonne National Laboratory Fire Protection Program

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA) conducted an independent review of the Argonne National Laboratory (ANL) fire protection program (FPP). This review was one part of a targeted assessment of fire protection programs at nuclear facilities across the DOE complex.

Fire protection was identified as a targeted review area in a memorandum entitled *Independent Oversight of Nuclear Safety – Targeted Review Areas Starting in FY 2013*, dated November 6, 2012. Pursuant to this memorandum, EA reviewed and assessed the effectiveness of the ANL FPP, with specific attention to program implementation at the Alpha Gamma Hot Cell Facility and the Waste Management Operations Facility. The review included an evaluation of key program elements, including the adequacy and integration of the fire hazards analysis with the safety basis controls; the baseline needs assessments; fire pre-plans; the exemption and equivalency process; combustible controls; technical safety requirements surveillance and testing; and the inspection, testing, and maintenance of safety structures, systems, and components and supporting infrastructure for fire detection and prevention. The review also evaluated the Argonne Site Office's oversight processes that are intended to verify the adequacy of the ANL FPP.

EA found that the FPP implemented at ANL is generally adequate and capable of protecting the facilities from most potential fire hazards. ANL fire protection engineers and staff are qualified and knowledgeable and are actively engaged in evaluating and maintaining facility fire systems and supporting the program. The onsite fire department is appropriately staffed and equipped to respond to the emergency events evaluated in the base line needs assessment.

EA also identified some weaknesses in the FPP. Many of them are associated with uncompleted facility inspections and lack of procedures to ensure adequate implementation, as well as inadequacies in developing and executing testing and surveillance requirements for the fire suppression system.

In addition, like many sites across the DOE complex, ANL has aging infrastructure and component degradation issues that challenge the reliability and adequacy of the fire water supplies. ANL has not addressed these vulnerabilities or implemented compensatory measures to mitigate the risk of having a single source water supply configuration. Contributing to this vulnerability for the safety significant fire suppression systems are issues related to inadequate Technical Safety Requirements (TSR) controls, inadequacies in processes to demonstrate operability through adequate operational and surveillance requirements, and inadequate communication of some technical requirements, such as the operability requirements necessary to ensure a minimum available fire water supply and static pressure.

The Argonne Site Office's oversight processes conform to the Office of Science model for evaluating contractor and DOE programs and management systems and rely heavily on the contractor's assurance system. The Argonne Site Office's line oversight program includes adequate written plans and schedules for planned assessments, focus areas for operational oversight, and reviews of the contractor's self-assessment of processes and systems.

Office of Enterprise Assessments Review of the Argonne National Laboratory Fire Protection Program

1.0 PURPOSE

The U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA) conducted a review of the fire protection program (FPP) at Argonne National Laboratory (ANL). The purpose of the EA targeted review was to evaluate the implementation of program requirements and the adequacy of controls designed to reduce the risk resulting from a fire or explosion at nuclear facilities. This targeted review was designed to evaluate the selected core fire protection elements and to provide information to the site and responsible DOE line management organizations for benchmarking their program's effectiveness. This review was conducted within the broader context of an ongoing program of targeted assessments of FPPs across the DOE complex at hazard category 1, 2, and 3 nuclear facilities. EA performed this targeted review at ANL from March 23 to 26, 2015.

2.0 SCOPE

Fire protection was identified as an independent oversight program targeted review area for 2013 in a memorandum from the Chief Health, Safety and Security Officer to DOE senior line management, entitled *Independent Oversight of Nuclear Safety – Targeted Review Areas Starting in FY 2013*, dated November 6, 2012. As part of that continuing effort, EA reviewed and assessed the effectiveness and implementation of selected elements of the FPP at ANL, with specific attention to program implementation at the Alpha Gamma Hot Cell Facility (AGHCF, located in Building 212) and the Waste Management Operations Facility (WMOF, located in Building 306). EA evaluated key elements of the FPP, including: the program documentation; authority having jurisdiction (AHJ) determinations and exemption and equivalency processes; baseline needs assessments (BNAs); life safety assessments; pre-fire plans; ignition source and combustibles controls; fire system impairment process; inspection, testing, and maintenance (ITM) of suppression and alarm systems; and ITM of supporting infrastructure. EA also evaluated the integration of the fire hazards analysis (FHA) and the documented safety analysis (DSA), as well as the flowdown of the safety basis requirements into the FPP. EA also considered ANL's self-assessment program and the DOE field element's oversight of the FPP.

3.0 BACKGROUND

The EA independent oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, as well as the effectiveness of DOE and contractor line management performance in safety and security and other critical functions as directed by the Secretary of Energy. The EA independent assessment program is described in and governed by DOE Order 227.1, *Independent Oversight Program*, and a comprehensive set of internal protocols and criteria, review, and approach documents (CRADs).

ANL is managed by the University of Chicago under UChicago Argonne, LLC for the DOE Office of Science. EA selected the AGHCF and WMOF for this targeted review as an example of FPP implementation at ANL.

4.0 METHODOLOGY

EA reviewed FPP documentation, including the FHA, the safety analysis report, procedures, and records; conducted interviews with personnel responsible for program implementation and oversight; performed facility and system walkdowns; and observed performance of ITM activities and combustible loading weekly rounds. The review considered the requirements of Title 10 Code of Federal Regulations (CFR) Part 830, *Nuclear Safety Management*; 10 CFR 851, *Worker Safety and Health Program*; DOE Order 420.1C, *Facility Safety*; and National Fire Protection Association (NFPA) codes and standards.

EA assessed the FPP in five areas: FPP programmatic aspects; fire and related safety hazards analyses; fire prevention and protection structures, systems, and components (SSCs) and controls; FHA/DSA integration; technical safety requirement (TSR) surveillance and testing and ITM; the fire protection self-assessment program; and DOE oversight. The assessment in each area used criteria based on program elements from DOE Orders 420.1C and 226.1B.

EA also used selected applicable sections of CRAD 45-34, *Fire Protection*, Revision 1, for this targeted assessment, with particular emphasis on the following programmatic elements:

- Section I, Programmatic Elements, FP-1, Program Documentation
- Section I, Programmatic Elements, FP-2, Program Implementation - Fire and Related Safety Hazards and Self-Assessments
- Section I, Programmatic Elements, FP-3, Program Implementation - Fire Prevention and Protection
- Section II, FHA/DSA Integration, FP-4
- Section III, Engineered System Design Features
- Section IV, TSR Surveillance and Testing
- Section V, Configuration Management.

EA also used selected elements of CRAD 45-21, *Feedback and Continuous Improvement Inspection Criteria and Approach – DOE Field Element*, Revision 1, to collect and analyze data on Argonne Site Office (ASO) oversight activities for the FPP.

5.0 RESULTS

5.1 Fire Protection Program

Criteria:

A documented fire safety program exists as required by applicable safety criteria. (DOE Order 420.1C, DOE-STD-1066-2012)

A baseline needs assessment (BNA) of the fire protection emergency response organization has been documented and updated every 3 years. The plan should describe in sufficient detail fire-fighting operations for the respective facilities. (10 CFR 851, DOE Order 420.1C, DOE-STD-1066-2012)

Program Documentation

ANL has implemented an FPP designed to provide a level of fire protection consistent with industrial risks as required by DOE Order 420.1C, *Facility Safety*, and Title 10 CFR 851, *Worker Safety and Health Program*, Appendix A. The FPP includes fire protection policies, requirements, technical criteria, analyses, administrative procedures, systems and hardware, apparatus and equipment, plans, and

personnel that ensure the program achieves DOE objectives relating to fire safety. The FPP, as implemented in the AGHCF (Building 212) and the WMOF (Building 306), is intended to provide a level of fire protection that is sufficient to fulfill the requirements for the best-protected class of industrial risks (i.e., “Highly Protected Risk” or “Improved Risk”). Accordingly, the ANL FPP includes both active and passive fire protection SSCs classified as safety significant (SS) in the AGHCF and SSCs classified as “defense-in-depth” in Building 306, as well as administrative controls designed to limit the material at risk and combustible loading in the facilities.

Many groups share responsibility for ANL’s FPP. Key roles are held by the Laboratory Director, Associate Laboratory Directors, division directors, and the fire support group. The fire support group consists of the ANL onsite fire department and the Facilities Management and Services Division (FMS) Fire Technical Support (FMS-FTS) group. These groups report to the FMS associate director of protection programs and systems, who in turn reports to the division director of FMS. The FMS-FTS group is responsible for developing the FPP, serves as the site AHJ on fire protection matters, provides fire protection engineering/programmatic functions, and establishes and implements the fire protection ITM program for the AGHCF and the WMOF. Although the FPP describes the functions of the ANL onsite fire department, it does not incorporate the minimum required staffing levels to perform emergency response duties as defined in the BNA. (See **OFI-ANL-1**.)

EA identified some weaknesses in the implementation of the FPP. The AGHCF Surveillance Requirement (SR) 4.1.1.3 to verify water pressure quarterly following a main drain test is inadequate to demonstrate operability of the FSS on a daily basis. Individuals in the Utilities Department were unaware of the specific criteria for maintaining the water level in the elevated water storage tanks to provide the TSR-controlled static pressures for the sprinkler systems in Building 212 and ensure that facility safety is not adversely affected. (See **Finding F-ANL-1**.) This shortcoming indicates a lack of integration between FMS-FTS and Utilities and inadequate control of interrelated processes for shared support systems as required by DOE Order 422.1, *Conduct of Operations*, specific requirement 2.m. Additionally, ANL has not adequately identified and implemented an effective prioritization and coordination process for corrective maintenance and other ITM requirements.

Exemption and Equivalency Process

ANL’s FPP requires an equivalency or variance to be pursued when strict compliance with DOE orders or specified fire protection regulations, codes, and standards cannot be met or is not practical. If an alternate method of compliance is proposed, the FPP requires FMS-FTS to prepare an analysis clearly demonstrating that the proposed method provides a level of protection equivalent to the prescribed method, and to submit the document to the site AHJ for concurrence. The AHJ in turn submits the analysis and a request for equivalency concurrence to DOE for approval. If the alternative is not in compliance with DOE orders or fire safety codes and standards, nor able to achieve an acceptable level of equivalency, the FMS-FTS organization and AHJ prepare a variance request that includes a clear and justifiable reason for not being able to meet the requirement. The process is under the direction of the Environmental, Safety and Quality (ESQ) Assurance Division. If adequate justification is demonstrated, the AHJ grants approval to submit the variance request to the DOE Assistant Under Secretary for Environment, Health, Safety and Security for concurrence. Equivalency and variance requests that are programmatic in nature are generally consistent with and supported by the facility FHA.

The AGHCF, located in the F-Wing of Building 212, lacks complete sprinkler protection in rooms F-203 and F-204, which were previously granted an exemption under criticality safety analyses. They have not been adequately evaluated by fire protection engineering since the criticality concerns are no longer applicable. However, document NWM-056, *Fire Hazard Analysis for Building 212 AGHCF*, gives the building credit for being a fully sprinkler protected facility. Contrary to DOE Order 420.1C and FPP

requirements, ANL did not follow the process for developing and requesting the DOE head of field element's concurrence for an equivalency or variance with appropriate justification. ANL has not submitted a formal equivalency or variance to DOE for approval. (See **Finding F-ANL-2.**)

The FPP describes an equivalency and variance program but does not address exemptions. ANL uses a variance instead of an exemption when DOE order compliance cannot be achieved or when non-statutory codes and standards do not allow the use of an equivalency or alternate means to demonstrate compliance. ANL's approach to using variances is contrary to DOE guidance that variances do not apply to non-compliance with DOE orders and NFPA codes and standards. A variance, as defined in DOE-STD-1066-2012, is "A deviation from 10 CFR Part 851, *Worker Safety and Health Program*. The process for requesting and approving variances from provisions of 10 CFR Part 851 is delineated in the Rule and in supplemental guidance promulgated by DOE." ANL self-identified the inappropriate use of variances in report PMA-FY14-IA-05.

Pre-Fire Plans

NFPA 1620, *Standard for Pre-Incident Planning*, requires pre-incident strategies and plans to be established to enhance the effectiveness of manual firefighting efforts. The ANL fire department is responsible for developing pre-fire plans. These plans are carried on the emergency command vehicle, which is typically used as the incident command post, and are reviewed regularly to ensure that facility information remains current. Pre-fire plans are in place for Building 212 and Building 306 but do not adequately cover all information of value to emergency response groups (e.g., fire water runoff controls to prevent entry into nearby fallout systems). Additionally, the only documented guideline for developing pre-fire plans is Operational Bulletin OPR-5, which simply defines the review cycle for such plans. (See **OFI-ANL-2.**)

Fire Barrier Program

ANL has a fire barrier program, ESH-11.6 *Fire Barriers*, and a fire barrier inspection program, FMS-PROC-16, *Fire Barrier Inspection for Building 306*. These programs conform to the requirements of the *International Building Code for Area Limitations, Occupancy Separation or Hazard Separation*. In Building 306, EA noted that several Underwriters Laboratories-labeled fire doors (e.g., doors A-126, A-134, A-142, and A-150) lacked self-adhesive "Fire Door" stickers. (See **OFI-ANL-3.**)

Hot Work Program

The FPP includes a documented hot work program that requires a Permit Issuing Authority to issue a permit for all hot work activities. Neither the site program nor NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, requires that the actual permit be posted in the area where hot work will be performed; therefore, the area should be posted for hot work activities. A maintenance shop in Building 212 was equipped with a bench grinder, and a metal inert gas (MIG) welder but was not posted as a hot work area as required by NFPA 51B. (See **OFI-ANL-4.**)

Life Safety Inspection Program

EA accompanied facility inspector personnel during a monthly documented life safety walkthrough of the AGHCF area of Building 212. The inspector used a checklist to verify the condition/status of life safety systems and components but was not familiar with the use or requirements of NFPA 101, *Life Safety Code*, and had only been trained on how to complete the checklist. ANL has not evaluated the effectiveness of training on NFPA 101 requirements as they apply to the inspection program. (See **OFI-ANL-5.**)

5.2 Fire and Related Safety Hazards Analyses

Criteria:

Fire Hazard Analyses (FHA) have been prepared for each nuclear facility and the results coordinated and integrated into the Documented Safety Analysis as required. (DOE Order 420.1C, DOE-STD-1066-2012, DOE-HDBK-1163, NFPA 801)

Fire and related safety hazards on site (or within the facility) have been identified and evaluated in conjunction with a current and comprehensive FHA. (DOE Order 420.1C)

The FHA and self-assessments address all essential elements for a complete analysis as delineated in DOE Order 420.1 and its implementation guide. (DOE Order 420.1C)

The information contained in the FHA and assessment is accurate, as required by applicable fire safety criteria. (DOE Order 420.1C)

EA reviewed NWM-056, *Fire Hazards Analysis for Building 212, AGHCF*, and identified some inconsistencies and omissions in the FHA documents and processes. In some cases, the FHA did not provide references to documents that formed the bases for statements in the FHA, such as the design documents describing safety SSCs and their performance criteria. The FHA did not incorporate the BNA conclusions, including non-compliances associated with response times and emergency medical service capabilities, in accordance with FPP requirements.

In some cases, the heat release rate analyses of various fire scenarios were either not performed or not referenced in the facility FHA. In several cases, the methodology and empirical estimates were presented in the FHA without any formal analysis specific to the facility hazard being evaluated, taking into account the unique facility structural characteristics and nearby building materials. Also, the maximum possible fire loss estimation reference to 2005 data was not clear.

EA noted weaknesses in the procedure controls and in the consistency of the performance requirements for the fire suppression system (FSS) and the water supply. For example, the FHA states that the water supply requires 180,000 gallons over a two-hour period. This is a performance requirement for the FSS but is not identified in the AGHCF basis for interim operation (BIO). Furthermore, although the FHA states that the existing water distribution is in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, many of the NFPA 24 requirements have not been implemented, specifically for the single supply portion of the water supply and water storage tanks. (See **OFI-ANL-6**.) EA identified other weaknesses in the FHAs, including:

- The FHA states: “based on the fact that the site has its own looped domestic water supply system it is believed that the water supply is reliable.” ANL performed a reliability analysis of the water supply in 1994 and self-identified the need to update the analysis as a corrective action from the recent Performance Management and Assurance Assessments Program independent fire protection review.
- The Building 306 FHA does not describe the fire water supply systems for the Flammable Storage Room, A-142, which represents one of the highest risks associated with fire for that building.

5.3 Fire Prevention and Protection SSCs and Controls

Criteria:

A complete spectrum of fire prevention controls and procedures are in existence and have been implemented as required by applicable fire safety criteria. (DOE Order 420.1C, Site & Facility DSA)

Technical, functional, and performance requirements for the systems are specified in (or referenced in) the facility authorization basis documents consistent with the facility fire hazards analysis. Safety/authorization basis documents identify and describe the system safety functions, and these criteria are translated into design calculations and procedures.

All fixed fire protection features (appropriate construction types, fire barriers, fire alarm and signaling systems, manual and automatic fire suppression systems, etc.), that are required by authorization basis documents and fire hazards analyses, have been installed and are tested and maintained, as required by applicable fire safety criteria. (DOE Order 420.1C, Site & Facility DSA)

A reliable and adequate water supply and distribution system must be provided for fire suppression, as documented through appropriate analysis. (DOE Order 420.1C)

A means for collecting and containing a credible quantity of fire suppression water for a minimum of 30 minutes is provided to avoid the spread or release of radioactive material during a fire. (DOE-STD-1066-2012, NFPA 801)

Fire Protection Controls Implementation

EA reviewed fire protection systems in Buildings 212 and 306 to assess whether they are appropriate for the facility fire scenarios as described in the FHAs. At the time of the assessment, the FSS in Building 212 was credited in the AGHCF BIO as an SS SSC. EA identified several weaknesses, deficiencies, and/or vulnerabilities regarding certain fire protection design features. For example, the limiting condition for operation (LCO) action statement A.3.2 for losing the exhaust system in Building 306, room 142 is to establish temporary exhaust for the flammable storage cabinets (Action statement A.3.2 is not needed if action statement A.3.1 is satisfied. Action statement A.3.1 is “Reduce A-142 inventory to less than 25 gallons of Class IA or less than 120 gallon of Class IB, IC, II, or III of flammable liquid.”). This room has specific requirements for air changes, and the LCO action is time-limited. ANL has not demonstrated that this action can be performed in the allotted time. (See **OFI-ANL-7**.) EA also identified the following deficiencies (See **Finding F-ANL-3**.)

- ANL has not implemented necessary controls to address water runoff resulting from sprinkler discharge and fire hose streams for Building 306. Contrary to the requirement of NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, and DOE-STD-1066-2012, the curbing in room A-142 cannot adequately contain contaminated runoff. The FHA describes this condition but does not identify it as a finding. Further, the Building 306 fire pre-plan does not address how contaminated water would be controlled if it breaches the exterior doors to room A-142.
- ANL has not tested the Building 306 fire standpipe system, contrary to NFPA 25, which requires a standpipe system flow test every five years. This test includes a flow test and pressure measurement at the hydraulically most remote hose location to verify that the water supply still provides the initial design pressure at the required flow.
- The FHA and the AGHCF BIO describe a pyrophoric metal fire for the shielded cell and states that a Class D fire extinguishing agent is provided within the hot cell in red canisters. The extinguisher lance that is located in the Glove Repair area and intended to be used in the shielded cells is not Class D (i.e., not suitable for extinguishing metal fires), and there are no inspections to ensure that the Met-X agent (a powder suitable for extinguishing metal fires) located in the cell is maintained ready for use in case of a fire.

Infrastructure Water Supply

EA identified significant degraded conditions in the site water supply and distribution system; ANL has

not identified this degraded equipment and piping as critical for maintaining the site's water supply. In general, the ITM of water supply and distribution system components has not been consistent with NFPA standards. Hydrant curb valve boxes and some underground sectional control valves supporting the single supply main have not been tested as required by NFPA 25, and the Utilities department was not aware of these testing requirements.

Conditions that could affect the performance and reliability of the ANL site water supply and distribution system feeding the FSS include: (See **Finding F-ANL-4.**)

- EA's visual inspection showed that the above-ground 12-inch single feed portion of the water supply system (constructed largely of cast iron piping) was significantly degraded and aged. Neither ANL nor ASO has documented plans to replace the corroded piping with new piping material or to provide an acceptable method for bypassing this piping in case of a pipe failure. There is no formal procedure, supported by training, to ensure that the single supply portion of the system could be bypassed in the event of a failure or significant leak. Such a failure in this portion of the system represents a significant vulnerability to the entire site.
- The single Fire Storage Tank had visible corrosion on the exterior of the tank wall. ITM actions, including interior and exterior inspections and testing of water level alarms and drain-down of the tank, have not been performed in accordance with American Water Works Association or NFPA 25 requirements.

5.4 FHA/DSA Integration

Criteria:

Within the scope of the review, the FHA conclusions shall be incorporated into the safety authorization (preliminary safety design review, preliminary DSA, or DSA, as appropriate) and demonstrate the adequacy of controls provided by the system to eliminate, limit, or mitigate identified hazards, and define the process for maintaining the controls and controlling their use. (DOE Order 420.1C, DOE-STD-1066-2012)

The safety authorization basis is consistent with the fire hazards analysis; demonstrates the adequacy of controls provided by the system to eliminate, limit, or mitigate identified hazards; and defines the processes for maintaining the controls current at all times and controlling their use. (DOE Order 420.1C, DOE-STD-1066-2012)

Overall, the fire hazards at the AGHCF are adequately identified in the FHA and are generally consistent with those evaluated in the BIO. FHA NWM-056, *Fire Hazards Analysis for Building 212, AGHCF*, and the BIO are acceptably integrated. However, EA noted weaknesses in procedure controls and consistency with regard to the performance requirements for the FSS and the water supply. (See **OFI-ANL-8.**) For example:

- The FHA states that the water supply requires 180,000 gallons over a two-hour period. The FHA describes this as a performance requirement for the FSS, but it is not identified in the BIO, which is required to identify both functional and performance requirements for credited systems.
- The FHA and BIO do not adequately describe the system boundaries for the FSS. The description of the fire water supply in the BIO and associated diagram (Figure 2-10, Simplified Schematic of the AGHCF Sprinkler System) imply that the credited supply valves include the post indicating valves (PIVs) located outside the building, instead of the riser control valves inside the building. The BIO, Section 2.7.6, Fire Suppression System, refers to the PIVs but does not mention the riser control valves.

5.5 TSR Surveillance and Testing and ITM

Criteria:

Surveillance and testing of the system demonstrates that the system is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria. (DOE-STD-1066-2012, DOE-STD-3009-94, DOE-STD-3011-94)

Surveillance and test procedures confirm that key operating parameters for the overall system and its major components remain within safety basis, NFPA, and applicable consensus standards operating limits. (DOE-STD-1066-2012, DOE-STD-3009-94, DOE-STD-3011-94)

The acceptance criteria from the surveillance tests used to confirm system operability are consistent with the safety basis. (DOE-STD-1066-2012, DOE-STD-3009-94, DOE-STD-3011-94)

Instrumentation and test equipment for the system are calibrated and maintained. (DOE-STD-1066-2012, DOE-STD-3009-94, DOE-STD-3011-94)

Classifications of Safety Systems

The accident analyses in Chapter 3 of the AGHCF BIO conclude that the unprevented/unmitigated radiological consequence level for co-located workers is low (i.e., <25 rem total effective dose equivalent) and for facility workers is moderate (i.e., no distinguishable threshold). The FSS, credited as an SS SSC, could be more appropriately addressed as a defense-in-depth system for worker safety, primarily focusing on providing additional protection beyond safety systems credited in the hazard and accident analyses. However, the decision to designate the FSS as an SS SSC but to partially credit it only to the facility boundary (not including the site water distribution system), and only for some events (e.g., facility wide fire) and not others (e.g., seismic event), creates unnecessary confusion about the boundaries of the FSS as a credited system for nuclear facility safety. The FSS boundary identified in the BIO and LCO SRs are technically inadequate. (See **OFI-ANL-9**.)

Technical Bases for Surveillance Requirements

The AGHCF BIO (Section 2.7.6 and Table 3-6) defines the FSS as an SS SSC. Section 4.4.3 describes the FSS as an SS SSC because “it is credited to reduce the risk from additional exposure to workers during fire events in the AGHCF.” The FSS system description in Section 4.4.3.2 further describes the ANL site water distribution system. Table 4-7 lists the functional requirements for the FSS as a credited SS SSC – i.e., to provide flow rate and coverage capable of controlling or suppressing a fire, and to remain operational during and after a Performance Category 2 seismic event.

EA identified a number of concerns associated with various TSR SRs, including an inadequate analytical methodology for determining the basis for verifying the static pressure at the facility’s FSS riser. Specifically, the TSR control referenced in the BIO Operation for the Alpha Gamma Hot Cell Facility, NWM-ACHCF-NSB-201, for the FSS within the Building 212 facility is for the static pressure at the base of the sprinkler system riser to be equal to, or greater than, 55 psig to satisfy its operability; however, ANL does not provide an adequate technical basis or a sufficiently analyzed indication of system operability for the established pressure. Table 4-7, Fire Suppression System Performance Criteria, as referenced in the BIO requires a static water pressure of greater than 55 psig at the first floor riser, and greater than 49 psig at the second floor riser. These criteria are based on the hydraulic demands for the automatic wet pipe sprinkler systems, which are 54.3 psig (first floor) and 48.2 psig (second floor). The BIO states that there is a 5 psig margin between the TSR value and the operability of the first floor sprinkler system. This statement is technically inaccurate because the actual margin is equal to 0.7 psig

versus 5 psig, and the analysis is non-conservative because the pressure gauges have a $\pm 3\%$ margin of error. The lack of measurable criteria for indicating and documenting potential obstructions for the flow path of water to the sprinklers could compromise the performance of FSS as described by the functional requirements in the safety basis. (See **OFI-ANL-9.**) Other examples include:

- The TSR controls and supporting analysis do not account for the required static head to be satisfied by a specified minimum level of water in the site elevated water storage tanks.
- Table 4-7, Fire Suppression System Performance Criteria, as referenced in the BIO, requires an unobstructed flow path from the water supply service connections to the sprinklers. ANL has not met this criterion for the FSS components located upstream of the sprinkler control riser valves, because there are no TSR controls for any isolation valves from the single supply portion of the water supply to the riser control valve located in Building 212.

Most of the SRs for Building 212 are not sufficient to adequately demonstrate operability; (See **OFI-ANL-9.**) one example is failure to verify an unobstructed flow path from the water supply source to the end of the sprinkler piping with adequate pressure to meet the design requirements for an Ordinary Hazard Group 2 sprinkler system as described in the BIO. Other examples include:

- SR 4.1.1.2 requires a monthly inspection of the AGHCF first and second floor sprinkler systems. This specified frequency does not adequately satisfy the performance criteria for the FSS.
- SR 4.1.1.4 requires verification of the operability of the water flow switches. This action does not satisfy the performance criteria to verify flow discharges from the inspector's test connection for the FSS.
- EA observed the AGHCF inspectors' test and water flow alarm test (procedure NOD-AGHCF-SR-204, *AGHCF Inspectors Test and Waterflow Alarm Test*). Procedure step 8.2.3.4 is to determine whether an alarm had been received within five minutes of start of water flow. This step only verifies the operability of the water flow switch but does not adequately satisfy the performance criteria for an unobstructed flow path, which would involve water flow discharging from the inspector's test connection for the FSS. Procedure step 8.2.2.2 is to verify flow discharges from the inspector's test connection; the procedure does not recognize this as the appropriate SR step.
- The specified SRs for the FSS do not include all of the inspections and tests required by NFPA 25, and no technical justification is given for the exclusions. For example, inspection and testing of the backflow preventers were not included as requirements, even though Table 4-7 in the BIO clearly identifies the backflow preventer as a vulnerability that could isolate the system inside the building from a low pressure outside the building, without any indication inside the facility that the SS FSS was inoperable.

Technical Bases and Controls for the FSS

EA identified several other issues, inaccuracies, non-conservative assumptions, and quality issues with associated controlled documentation that compromised the performance of the FSS for Building 212 as required by the safety bases. (See **OFI-ANL-9.**) Failure to adequately define the operability and surveillance test requirements for a safety system can result in degraded operation of the system and facility beyond the conditions analyzed in the safety basis. Examples include:

- The BIO did not address the functional requirements, performance criteria, and SRs necessary to support the outside underground fire water supply system to ensure its operability. Specific criteria that were not analyzed or documented but are necessary to satisfy the performance of the FSS, as bounded by the safety bases, include (but are not limited to):
 - Ensure an available water capacity of 180,000 gallons to satisfy the two-hour fire criteria.

- Ensure and monitor the minimum level of water within the elevated storage tank to satisfy the TSR static pressure value of greater than 55 psig.
- Ensure that all isolating valves from the single source water supply to the sprinkler system remain in the open position to maintain an unobstructed flow path to the sprinklers.
- The hydrant flow data for the outside loop indicates a flow rate of approximately 300 gpm less than the inner loop as referenced in the FHA. The BIO states that either fire supply connection loop can supply the demands of the sprinkler systems. ANL has not adequately analyzed this hydrant flow data, and the BIO assumption may be non-conservative for analyzing the worst case hydraulic scenario for water flow paths serving Building 212, because the scenario was limited to the available hydraulic conditions adjacent to the facility and did not consist of a comprehensive evaluation that included the entire water flow path.
- The PIVs (FPV-14 and FPV-15) and Dry Pipe (DP)-12A, which control the FSS supply water to Building 212, are described in the BIO but are not shown on the Utilities water supply drawing (JO520-111-DD-00).

5.6 Fire Protection Self-Assessment Program

Criteria:

A documented comprehensive self-assessment of the fire protection program is performed by the DOE site office and the facility contractor at least every 3 years, or at a frequency with appropriate justification approved by the DOE head of field element. (DOE Order 420.1C)

Proper controls are incorporated to prioritize and monitor the status of the fire protection assessments and associated findings until final resolution. [DOE Order 420.1C, Chapter II, 3.b.(14)]

Processes are developed and implemented that prioritizes and monitors the status of fire protection assessment findings, recommendations, and corrective actions until final resolution. [(DOE Order 420.1C, CRD, Chapter II, 3.b.(15)]

Program issues identified during previous assessments or program reviews have been appropriately resolved, corrective actions have been completed, and are adequate, or a clear path to completion is indicated. (DOE Order 226.1B)

ANL has implemented a regular process for program oversight governed by procedures LMS-PROC-194, Rev. 0, *Integrated Assessments Program* and LMS-PROC-6, Rev. 4, *Independent Assessment*. The FPP description document describes a list of programmatic and facility assessments that are to be performed according to frequencies established in DOE orders. A joint ASO/ANL triennial functional area review of the FPP was conducted in February 23, 2012. Following this assessment, ANL separated the FPP triennial assessment into three separate annual reviews. ANL conducted the first review, FMS-FY14-MA-013 RPT-25835 *Fire Protection IT&M, Procedures, and Open Flame*, from October 2013 through March 2014; the FMS-FTS group led the review, with substantial input from the fire protection engineer team. The second review, *Fire Protection Design Review Process and Facility Fire Protection Appraisal/FHA Program*, was scheduled for completion in 2014. Instead of performing the second annual review to satisfy the triennial self-assessment requirements, ANL credited an independent assessment of the FPP, conducted in July and August 2014 and covering the required topical areas, as fulfilling that requirement.

ANL maintains the Issues Management Tracking System (IMTS) for recording, tracking, and trending issues identified during various forms of assessments as defined in procedure LMS-PROC-4, Rev. 6, *Issues Management and Corrective and Preventative Action*. Any findings identified during FPP assessments are entered into IMTS. In recent years, ANL has placed significant emphasis on fire

protection assessments, ITM of fire barriers, and fire protection system inspections, as noted in the document titled *Fire Protection Program Self-Assessment Related to Programmatic Deficiencies*, dated May 2012. IMTS RPT-24181, for example, tracked the completion of the 2014 self-assessment and noted it as being closed with the completion of the independent assessment described above.

5.7 DOE Oversight

Criteria:

DOE field element line management has established and implemented oversight processes that evaluate contractor and DOE programs and management systems, including site assurance systems, for effectiveness of performance (including compliance with requirements). [DOE Order 226.1B 4b.(1)]

DOE field element line oversight program includes written plans and schedules for planned assessments, focus areas for operational oversight, and reviews of the contractor's self-assessment of processes and systems. [DOE Order 226.1B 4b (2)]

Oversight processes are tailored according to the effectiveness of the laboratory assurance systems, the hazards at the site/activity, and the degree of risk, giving additional emphasis to potentially high consequence activities. [DOE Order 226.1.B 4b.(5)]

DOE field element staff are adequately trained and qualified to perform assigned oversight activities. (DOE Order 226.1B, DOE Order 360.1C, and DOE Order 426.1 Chg. 1)

ASO performs line management oversight according to a defined contractor assurance system (CAS) covering the full scope of laboratory operations. This comprehensive approach to oversight is conducted in accordance with an equivalency to DOE Order 226.1A approved by the Office of Science and granted in 2010. On behalf of the ANL Board of Governors, an external committee performed an independent review of the CAS in September 2014 to provide ANL with reasonable assurance that the CAS objectives of ANL's management system are being accomplished and that the systems and controls are effective and efficient. The review committee concluded that the three partners (University of Chicago, ANL, and ASO) continue to effectively implement the key attributes of the contractor requirements document. ASO credits these reviews with helping determine whether the CAS is operating effectively. Additionally, ASO has its own oversight processes for conducting various independent assessments and program reviews according to an integrated assessment schedule; 74 assessments are planned for the current FY 2015. ASO provides quarterly feedback to ANL through a Performance Evaluation and Management Plan process, which rolls up into the annual performance evaluation at the end of the year. Overall, ASO oversight processes are generally adequate and consistent with the expectations of the approved equivalency.

Specific to fire protection, ASO performs periodic functional area reviews of the ANL FPP. The last ASO review, completed in February 2012, was mostly adequate but did not review any nuclear facilities. As part of the CAS, and as discussed in the previous section, ANL's Performance Management and Assurance Department recently completed an assessment independent of line management of the Argonne FPP, which included the ASO fire protection Facility Representative (FR) and the Chicago Office fire protection engineer as active participants in the review. This was a comprehensive assessment, and it included the nuclear facilities; ASO is crediting this independent assessment as its functional area review for 2014. ANL's FMS-FTS performs separate annual assessments of the FPP to comply with the triennial self-assessment requirements of DOE Order 420.1C. The most recent FMS-FTS assessment was completed in May 2014. Overall, ASO oversight processes and ANL's implementation of the CAS for fire protection are mostly adequate but are not sufficiently focused on technical and safety basis issues, as evidenced by issues identified during this EA review.

ASO maintains an FR program and currently has four FRs trained and qualified in accordance with the FR Qualification Standard (DOE-STD-1151-201) as required by DOE Order 426.1; a fifth FR is in initial training and qualification. The FRs are generally well qualified and experienced in their assigned facilities. The FRs are also assigned functional areas, such as fire protection, based more on their personal interests and experience than on any training and qualifications beyond the standard FR requirements. Overall, the FRs are adequately conducting the oversight responsibilities described in the FR program and monitoring the facility issues documented in the contractor's IMTS. ASO also has convenient access to the Chicago Office subject matter experts (SMEs) in the same building, such as the FP engineer, but the interface between ASO and the Chicago Office is exercised more through judgment rather than by any formal process. Although DOE Order 420.1C does not require the DOE field element to provide counterparts to the contractor's required cognizant system engineers, many other DOE site offices have established programs for safety system oversight. (See **OFI-ASO-1**.) ASO is in the process of hiring a safety basis engineer, who could help provide additional technical and safety basis expertise to the FRs within the site office and more formally interface with the Chicago Office SMEs. The safety basis engineer could serve as a resource for FRs assigned to functional areas, in lieu of additional FR technical training and qualifications.

6.0 CONCLUSIONS

The FPP implemented at ANL is generally adequate and capable of protecting the facilities from most potential fire hazards. ANL fire protection engineers and staff are qualified and knowledgeable and are actively engaged in evaluating and maintaining facility fire systems and supporting the program. The onsite fire department is appropriately staffed and equipped to respond to the emergency events evaluated in the BNA.

Nevertheless, EA identified some weaknesses in the FPP. Many of these weaknesses are associated with uncompleted facility inspections and lack of procedures to ensure adequate implementation. EA also identified inadequacies in both the development and the execution of FSS testing and surveillance testing requirements.

ANL, like many sites across the DOE complex, has aging infrastructure and degraded components that challenge the reliability and adequacy of the fire water supplies. ANL has not addressed these vulnerabilities or implemented compensatory measures for their degraded supply piping and water storage tank or the isolating valves that contribute to the risk of the site's single source water supply configuration. Contributing to this vulnerability for the SS FSS were issues related to inadequate controls and inadequacies in processes to demonstrate operability through adequate LCOs and SRs. For example, the Utilities personnel responsible for maintaining the elevated water storage tanks and associated pumps were not informed of the operability requirements necessary to ensure a minimum available fire water supply and static pressure.

ASO has implemented oversight processes that conform to the Office of Science model for evaluating contractor and DOE programs and management systems. This oversight system relies heavily on CAS processes and assessments as an equivalency to DOE Order 226.1B. The ASO line oversight program also includes written plans and schedules for planned assessments, focus areas for operational oversight, and reviews of the contractor's self-assessment of processes and systems.

7.0 FINDINGS

This EA review identified four findings. As defined in DOE Order 227.1, *Independent Oversight Program*, findings are significant deficiencies or safety issues that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. Findings may identify aspects of a program that do not meet the intent of DOE policy or Federal regulation. DOE line management and contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

Argonne National Laboratory

F-ANL-1: ANL did not implement control of interrelated processes and coordination of activities among the AGHCF, FMS-FTS, and the Utilities Department to maintain facility safety, as required by DOE Order 422.1.

F-ANL-2: ANL did not develop and request an equivalency or variance with appropriate justification for areas within Building 212 that are not protected with automatic sprinklers, as required by DOE Order 420.1C and the FPP.

F-ANL-3: ANL did not implement certain fire protection design features and ITM requirements in order to meet NFPA 10, NFPA 25 and NFPA 801 requirements.

F-ANL-4: ANL did not demonstrate the reliability of the site water supply and distribution system for credited fire water systems as required by NFPA 25.

8.0 OPPORTUNITIES FOR IMPROVEMENT

This EA review identified ten opportunities for improvement (OFIs). These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are suggestions offered by the EA review team that may assist site management in implementing best practices, or provide potential solutions to minor issues identified during the conduct of the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. It is expected that the responsible line management organizations will evaluate these OFIs and accept, reject, or modify them as appropriate, in accordance with site-specific program objectives and priorities.

Argonne National Laboratory

OFI-ANL-1: Consider incorporating the minimum required staffing levels to perform emergency response duties, as defined in the BNA, into the FPP description of functions for the ANL onsite fire department.

OFI-ANL-2: Consider documenting guidelines for developing pre-fire plans other than Operational Bulletin OPR-5, which only defines the review cycle for such plans.

OFI-ANL-3: Consider adding fire door labels/placards to doors A-126, A-134, A-142, and A-150, for consistency throughout Building 306.

OFI-ANL-4: Consider posting the maintenance shop in Building 212 as a hot work area as required by NFPA 51B, since this shop is equipped with an oxygen/acetylene cutting and brazing unit, a bench grinder, and a MIG welder.

OFI-ANL-5: Consider evaluating the effectiveness of training on NFPA 101 requirements as they apply to the building inspection program.

OFI-ANL-6: Consider clarifying the FHAs for Buildings 306 and 212 to address the deficiencies related to NFPA 24 requirements.

OFI-ANL-7: Demonstrate that the temporary exhaust can be established in Building 306, room 142 in the time allotted for LCO action statement A.3.2.

OFI-ANL-8: Consider clarifying the functional requirements for the FSS and the water supply in the AGHCF BIO to be consistent with the documented FHA performance requirements.

OFI-ANL-9: Reconsider the designation of the FSS as an SS SSC instead of a defense-in-depth system, and clarify the AGHCF safety basis and TSR controls in a future update. Also, ANL should improve various TSR controls and SRs to demonstrate operability of the FSS in Building 212. Alternatively, the FSS could be clearly designated as only a defense-in-depth system and treated accordingly in the safety basis.

Argonne Site Office

OFI-ASO-1: Consider adding system engineering training or other resources to supplement the FR program with additional technical and safety basis expertise for fire protection and other functional areas beyond the minimum requirements of DOE Order 422.1 and DOE-STD-1063.

9.0 ITEMS FOR FOLLOW-UP

EA will monitor corrective actions and follow-up responses through operational awareness activities.

Appendix A Supplemental Information

Dates of Review

Onsite Review: March 23-26, 2015

Office of Enterprise Assessments (EA) Management

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Barry L. Snook

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- Argonne National Laboratory (ANL), *Argonne National Laboratory Fire Protection Program Description*, Revision 3, 2/18/2015
- Argonne National Laboratory, *Amendment Compliance Action Plan for Implementation of DOE O 420.1C, Facility Safety*, Rev. 1, 12/13/2013
- Performance Management and Assurance Assessments Program, PMA-FY14-IA-05, *Argonne National Laboratory Independent Assessment of the Argonne Fire Protection Program Final Report*, July - August, 2014
- Argonne National Laboratory - FMS-FTS Organization, FMS-FY14-MA-013 RPT-25835, *Fire Protection Program Annual Assessment*, 10/2013 – 3/2014
- Argonne National Laboratory, *Building 212 Facility Fire Protection Assessment*, 12/12/14
- Argonne National Laboratory, *Argonne Fire Department Facilities Management and Services Division Basic Needs Assessment*, May 2012 Update
- Nexus Engineering, Document No: NWM-058, *Fire Hazard Analysis for Building 306*, 4/30/2014
- Nexus Engineering, Document No: NWM-056, *Fire Hazard Analysis for Building 212, AGHCF*, 9/25/2014
- Argonne National Laboratory, NOD-306-SR-104, Rev. 0, *Building 306 Monthly Fire Suppression System Water Supply Manual Isolation Valve Visual Inspection*, 6/30/2010
- Argonne National Laboratory, NOD-306-SR-503, Rev. 1, *Building 306 Inspector's Test /Waterflow Alarm Test and FACP Battery Inspection*, 8/31/2010
- Argonne National Laboratory, NOD-306-SR-504, Rev. 1, *Building 306 Fire Detection and Alarm System Test and Visual Inspection*, 10/08/2012
- Argonne National Laboratory, NOD-306-SR-505, Rev. 0, *Building 306 Fire Protection System Visual Inspection*, 6/30/2010
- Argonne National Laboratory, NWM-306-SR-506, Rev. 2, *Building 306 Main Drain Test*, 11/6/2012
- Argonne National Laboratory, NWM-306-DS-013-03, *Building 306 Fire Barrier Test and Inspection Checklist*, 11/6/2012
- Argonne National Laboratory, NOD-AGHCF-SR-204, Rev. 3, *AGHCF Inspector's Test and Waterflow Alarm Test*, 09/02/2014
- Nuclear and Waste Management Division, NWM-PROC-015, Rev. 0, *Fire Patrol and Fire Watch*, 10/01/2013
- Nuclear and Waste Management Division, NWM-PROC-016, Rev. 0, *Combustible Loading Control and Inspection*, 6/20/14
- Facilities Management and Services, FMS-PROC-15, Rev. 1, *Facility Fire Protection Assessment*, 11/12/13
- Nuclear and Waste Management Division, NWM-PROC-023, Rev. 0, *Fire Hazards Analysis Development*, Not Approved
- Argonne National Laboratory, Form ANL-951, Rev. 2, *Emergency Egress Route Checklist*, 1/6/2015
- Argonne National Laboratory, LMS-PROC-159, Rev. 5, *Facility Safety and Health Inspections*, 4/27/2012
- Argonne Fire Department, Operational Bulletin I&TP-4, Revised 2/2015, *Portable Fire Extinguisher Inspection and Maintenance Procedures*
- Argonne Fire Department, Operational Bulletin OPR-5, Revised 6/2010, *Pre-Incident Plans Development and Maintenance*

- Argonne Fire Department, *Argonne Fire Department Pre-Incident Plan Building 306 Waste Management Operations*
- Argonne Fire Department, *Argonne Fire Department Pre-Incident Plan Building 212 NWM / ES/ NE/ NST/ ESQ*
- Argonne Fire Department, *Argonne Fire Department Annual Report, 2014*
- Fire Hazards Analysis for Building 212 Alpha Gamma Hot Cell, NWM-056, rev 4, 9/25/14
- Argonne National Laboratory, *Amendment Compliance Action Plan for Implementation of DOE O 420.1C, Facility Safety*, Rev. 1, 12/13/2013
- Argonne Site Office (ASO) Functional Area Review of the Argonne Fire Protection Program, U.S. Department of Energy (DOE) Office of Science, *Final Report Fire Protection Program Assessment at Argonne National Laboratory*, 2/23/2012
- Performance Management and Assurance Assessments Program, PMA-FY14-IA-05, *Argonne National Laboratory Independent Assessment of the Argonne Fire Protection Program Final Report*, July - August, 2014
- Argonne National Laboratory - FMS-FTS Organization, FMS-FY14-MA-013 RPT-25835, *Fire Protection Program Annual Assessment*, 10/2013 – 3/2014
- Argonne National Laboratory, *Argonne Fire Department Facilities Management and Services Division Basic Needs Assessment*, May 2012 Update
- Argonne National Laboratory, *Building 212 Facility Fire Protection Assessment*, 12/12/14
- Fire Protection Code Compliance Appraisal, Argonne National Laboratory, Project No. 09228-100, Building
- Building 212, F-Wing Including the Alpha-Gamma Hot Cell Facility, Report No. SL-008355, Rev. 0, October 1, 2004
- Sprinkler System Hydraulic Analysis, Building 212, A:\212F1AOH.SDF, “1st Floor Ordinary Hazard, Source A”, Dated 7/22/2003
- As-Built Sprinkler System Hydraulic Analysis, Building 212, Document No.: J212-162-32R2, Dated 2/1/07
- Argonne National Laboratory Drawings:
 - Building 212 AGHCF Fire Barrier Inventory, Documents J212-W- F001 through J212-W-F028, Dated 01/21/2009
 - Wing “F” Foundation Plan, 212-S-6501, Revision 2, Dated 01/22/1959
- Nuclear and Waste Management Division, Combustible Loading Control and Inspection, Doc. No. NWM-PROC-016, Revision 0
- AGHCF-DS-236-04, AGHCF Combustible Material Control and Inspection Checklist, dated June 2014
- J212-FPA-Q-T001, Fire Protection Assessment for Building 212, Rev 0, Dated 9/24/08
- Argonne Spill Prevention, Control and Countermeasure Plan
- Building 212 Fire Barrier Upgrade Project Dated January, 2010. J212-180-W- T001
- NOD-AGHCF-EMER-200, Emergency Response to an In-Cell Fire, Revision 2
- AGHCFR-EMER-200, Emergency Response to an In-Cell Fire, Revision 3
- NOD-AGHCF-SR-204, AGHCF Inspectors Test and Waterflow Alarm Test, 3/14/2011, rev 3
- Nexus Report No. 14-3002.1, Wildland Fire Risk and Hazard Analysis for Argonne National Laboratory, Revision
- Memorandum Malosh to Brinkman, “Action: Approval of Equivalency for Department of Energy (DOE) Order 226.1A, *Implementation of Department of Energy Oversight Policy Contractor Requirements Document*,” 5/6/2010
- *UChicago Argonne, LLC Board of Governors Contractor Assurance System Review Committee Report*, September 2-4, 2014

- FY 2015 Integrated Assessment Schedule for Argonne Site Office
- PMA-FY14-IA-05, *Independent Assessment of the Argonne Fire Protection Program*, 1/7/2015
- *Argonne Site Office (ASO) Functional Area Review of the Argonne Fire Protection Program*, 2/23/2012
- FMS-FY14-MA-013, *Fire Protection Program Annual Assessment*, 5/1/4/2014
- NWM-AGHCF-NSB-201, *Basis for Interim Operation for the Alpha Gamma Hot Cell Facility*, Rev. 5, 10/1/2014
- ASO SOP-26: *Facility Representative Program*, 5/12/2014

Interviews

- FMS-FTS Fire Protection/Alarm Systems Manager
- ANL Manager Nuclear Operations Department
- ANL Fire Chief
- AGHCF Facility Manager
- WMOF Facility Manager
- NWM Group Leader - Cognizant Systems Engineers
- FMS-FTS Fire Protection Engineer
- NWM Cognizant Systems Engineer – Fire Protection Engineer
- Utilities Supervisor
- Utilities Water Systems Engineer
- ASO Environment, Safety and Health Division Director
- ASO Facility Representatives (2)

Observations

- AGHCF (Building 212) daily rounds
- WMOF (Building 306) daily rounds
- Plan of The Day/Plan of the Week
- AGHCF (Building 212) life safety walkthrough and fire barrier inspections