Windors Lock Readiness Center

Poole Fire Protection was retained by the Design-Build Team as the Fire Protection Engineer of Record. This project is a Design-Build Project which required Poole Fire Protection to be involved throughout the entire design and construction process. Poole Fire Protection worked very closely with the design team by performing the code analysis and developing the Fire Protection-Life Safety Design Analysis as required by UFC 3-600-01. In addition to the development of the FP-LSDA, Poole Fire Protection developed the fire protection design documents (design drawings, preliminary calculations and specifications) for the automatic suppression systems and the fire alarm/mass notification system.

The project was a multi-story facility that included 110,165 square feet of Readiness Center including many different occupancies, and an 9,345 square foot unheated storage building. The Project Architect and the Air National Guard wanted to include some unique building construction features which required Poole Fire Protection to be innovative and utilize performance-based engineered alternatives. These performance-based alternatives primarily dealt with the assembly hall that was open to the level above to resolve smoke control issues for fan size and location and means of egress concerns dealing with egress components and capacity for the facility. Additionally, EASE modeling was used to achieve an optimized and intelligible voice / mass notification system for the facility.

The primary fire protection/life safety criteria used for the project included the following codes and standards:

- CTARNG DG, *Planning and Design Standards Manual*, Connecticut Army National Guard, 03 December 2010
- DG 415-1, Design Guide for Readiness Centers, Army National Guard, November 1999
- DG 415-5, General Facilities Information Design Guide, Army National Guard, 01 June 2011
- International Building Code, 2009 Edition
- UFC 1-200-01 General Building Requirements, 16 August 2010 with Change 1, 19 July 2011
- UFC 3-600-01 Fire Protection Engineering for Facilities, 26 September 2006 with Change 1, 14 Jul 2009.
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings, 8 October 2003 with Change 1, 22 January 2007
- UFC 4-021-01 Design and O&M: Mass Notification Systems
- NFPA 10 *Standard for Portable Fire Extinguishers*, 2010
- NFPA 13 *Standard for the Installation of Sprinkler Systems*, 2010

- NFPA 24 *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2010
- NFPA 70 *National Electrical Code*, 2011
- NFPA 72 *National Fire Alarm and Signaling Code*, 2010
- NFPA 90A *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2009
- NFPA 92, *Standard for Smoke Control Systems*, 2009
- NFPA 101 *Life Safety Code*, 2009
- NFPA 220 *Standard of Type of Building Construction*, 2009

Computer fire and egress modeling (FDS) was utilized to model the Assembly Hall since it is open to the second floor area. The computer fire modeling was used to determine the temperatures and smoke movement throughout the facility and to determine the smoke control fan size for the Assembly Hall area. The fire modeling was performed in conjunction with the egress analysis to ensure tenable conditions could be maintained for egress purposes of the occupancies. The exit capacity challenges from the second floor were also addressed using the egress modeling.

An addressable, integrated fire alarm and mass notification system (FA/MNS) was provided for the Readiness Center. The fire alarm and mass notification system was designed and installed per the RFP, UFC 3-600-01, UFC 4-021-01, NFPA 72 and the CTARNG DG. The system utilized for the facility is a **Siemens Fire Finder XLS System**, that was provided with complete voice / mass notification capabilities and included local operator consoles and many different pre-record voice messages as well as live voice messaging capabilities.

Poole Fire Protection utilized the Enhanced Acoustic Simulator for Engineers (EASE) software as a tool to support and validate the audibility and intelligibly of the system. Many different rooms and areas of the facility were modeled based upon speakers provided by Siemens for the project to ensure the spacing and tap setting of the speakers would achieve the required audibility and intelligibility for each respective Acoustically Distinguishable Space (ADS). Utilizing this EASE software allowed the system to be designed to achieve an intelligible voice message, yet reducing the total number of speakers to be used.

A remote annunciator was provided at the main entrance and local operating consoles (LOCs) were provided at the following locations:

- At facility entrances/exits that are be used when building access is limited because of elevated terrorism threat levels.
- So that occupants do not have to travel more than 200 feet horizontally or to another floor to access an LOC.

- Since the mass notification system control panel will be located adjacent to the fire alarm control panel, an additional LOC will not be provided adjacent to the fire alarm control panel.

The LOCs are non-lockable cabinets for use by the building occupants and emergency responders to provide real-time information and instructions.

Notification appliance circuit extender panels were located in electrical rooms where possible. The Notification Appliance Circuits are Class A, the Signaling Line Circuits are Class A, and Initiation Device Circuits are Class A, as required by the Project RFP.

A fire alarm signal is initiated by the following devices:

- Waterflow switches – located on each sprinkler system riser and at the control valve assemblies serving sprinklers in the elevator hoistway and machine room.
- Manual pull stations – semi-flush mounted, located within 5 feet of each exit and located so that occupants do not have to travel more than 200 feet to reach the nearest pull station.
- Smoke detectors – located above the fire alarm control panel, above remote power supplies, at the rolling smoke door, elevator lobbies, elevator hoistway, and elevator machine room.
- Wet Chemical Kitchen Hood Extinguishing System – located in the kitchen serving the assembly hall.

A supervisory signal is initiated by the following devices:

- Duct-type smoke detector – located in air handling duct work in accordance with the requirements of NFPA 90A *Standard for the Installation of Air-Conditioning and Ventilating Systems* (2009 Edition). The duct-type smoke detectors are to be programmed to only shutdown each respective HVAC unit.
- Tamper switches – provided at each control valve capable of controlling water to the sprinklers.

Fire / Mass notification speakers are provided throughout the interior of the Readiness Center as required by UFC 4-021-01 to achieve audibility and intelligibility. The Fire Alarm System utilizes the same audible notification appliance network as the Mass Notification System to deliver a voice message and distinct tone to the building occupants. In addition, mass notification speakers have been placed on the exterior of the building at gathering places and main entrances/exits to notify those that might be outside the facility.

Smoke detectors were provided in the elevator lobbies, top of the elevator hoistway and in the elevator machine room. These smoke detectors are used to initiate primary recall, secondary recall, and hat light functions in accordance with ASME A17.1. The fire alarm system monitors the waterflow switches provided at the control valve

assemblies serving sprinklers at the top of the elevator hoistway and elevator machine room and initiate shunt trip for the elevator as required by UFC 3-600-01 and ASME A17.1.

The fire alarm / mass notification system also interfaces with other building systems as follows:

- Emergency Eyewash and Shower Stations – activation of the emergency eyewash or shower stations will initiate a supervisory signal.
- Fire and/or Smoke Dampers – as coordinated with the mechanical drawings for locations of dampers.
- Magnetically Held-Open Doors – Upon activation of a fire alarm signal, all magnetically held-open doors in fire or smoke rated separations are released.
- Smoke Control – The required controls and system functions required per NFPA 92 are integral to the main fire alarm/mass notification control panel.

Poole Fire Protection worked closely with Siemens and reviewed and approved the fire alarm / mass notification system shop drawing submittal. Upon completion of the system installation by Siemens, Poole Fire Protection provided construction administration services including construction inspections and witnessing the commissioning and acceptance testing of the system. These construction administration services consisted of verifying that all life safety and fire protection features were constructed, applied, and installed in accordance with the approved design documents, approved construction submittals, and manufacturer's requirements.

These performance-based alternatives include innovation and creativeness for the fire protection features of the project. These alternatives allowed the Owner (Air National Guard) and Project Architect to obtain the look and feel of the Assembly Hall as desired. The smoke control design and enhancements made to the egress components increased the effectiveness of the facility and allowed the design team to overcome some of the code challenges of the project. The EASE modeling reduced the number of speakers originally planned for the design, ultimately increasing the efficiency of the fire alarm and mass notification system design. Utilizing the EASE model allowed the Poole Fire Protection to overcome some of the challenges encountered with the hard surfaces which create non-acoustically-friendly environments for a voice / mass notification system validate system intelligibility to enhance the safety of the occupants. This also allow us to reduce the number of devices and equipment which saved construction costs for the project.

Through the good working relationship with Siemens, Poole Fire Protection considers this Windsor Lock Readiness Center as an impressive and quality project – one to be very proud of by both Poole Fire Protection and Siemens.

Supplemental Information:

Poole Fire Protection has performed EASE modeling to determine the ideal speaker placement and tap setting to provide intelligible voice notification throughout the Readiness Center. This EASE modeling was performed based upon the used of an industry standard fire alarm speaker that provided equivalent acoustical characteristics of the speaker provided by Siemens. This innovative design approach allowed the number, placement and tap settings of the speakers to be optimized to reduce construction and equipment costs yet achieve intelligible voice messaging. The results of the EASE modeling was provided as part of the project design documentation to clarify the anticipated performance of the Siemen speakers.

Through EASE modeling we were able to predict the audibility and intelligibility results in many challenging spaces throughout the Readiness Center prior to shop drawing development. This allowed Siemens to develop shop drawings based on a design that was proven to achieve the required audibility and intelligibility. Additionally, the EASE modeling allowed us to keep the speaker tap settings as low as possible, yet achieving the required audibility; which afforded us the opportunity to reduce the size and number of amplifiers required. By approaching the project in this manner the design-build team did not have to modify speaker locations or tap settings during the pre-final or final testing. This ultimately saved time and resources during testing, which allowed the project to be completed as expected. Our innovation by utilizing the EASE computer modeling software enabled Siemens as well as other engineers and designers to understand and acknowledge the benefit of performing modeling up front early in the design phase. By providing speakers with consistent characteristics to the speakers used in the modeling, ensured that the system would pass testing without having to add speakers, relocate speakers or change to speaker tap settings to achieve the required audibility and intelligibility.