

Mass Notification System Reports for Duty at Fort Knox

Fort Knox is not your stereotypical military base. This 170-square mile installation is a certified city in the state of Kentucky, with a population of over 23,000 soldiers, family members and civilians. With military roots dating back before the Civil War, an entire community has grown up around this particular U.S. Army post. Fort Knox is home to the Army Recruiting Command headquarters and its largest organization, the Armor Center and School. The U.S. Bullion Depository and Patton Museum of Armor and Calvary also attract hoards of visitors to the post daily.

A few years ago, Fort Knox embarked on the arduous task of implementing a mass notification system (MNS) within the purview of the Unified Facilities Criteria (document UFC 4-021-01) created by the U.S. Department of Defense. The primary challenges involved installation timing and an aging fire protection infrastructure, one in growing need of attention.

“We were [already] involved in the process of upgrading a lot of outdated and antiquated fire alarm systems for which it was increasingly difficult to obtain replacement parts,” says Marvin Gunderson, chief fire and emergency services officer at Fort Knox, Kentucky. “Many of these systems were not as serviceable and reliable as we would have liked. This, and an understanding of the UFC, led us to decide it was time to install a base-wide mass notification system.”

Solution Selection

The UFC specifically calls for traditional fire alarm technology to be utilized as the backbone for an MNS. Gunderson’s team needed a fire protection engineering company trained and certified in the technology. The same company also had to integrate other building subsystems throughout the post with the new MNS. The intent was to provide full interoperability across the board in a coordinated manner. According to Chief Gunderson, competitive bidding was used to find the best company at the best price.

The fire alarm systems integrator selected for the job was Freedom Communications of Louisville, Kentucky. The E3 Series® Expandable Emergency Evacuation system, manufactured by Gamewell-FCI, was chosen for the job.

“After some study, we decided to use the E3 Series system. The Gamewell-FCI engineers helped us adapt everything to the new UFC codes,” says Freedom Communications Vice President, Brian Banta.



According to Banta, large-capacity network and advanced intelligibility capabilities, along with the certified approval of a national testing authority such as Underwriters Laboratories (UL), are crucial elements every large-scale MNS should possess.

The Fort Knox system employs network technology run on one cable of unshielded, twisted-pair (UTP) wire. The single pair of wires carries all system status information from fire alarm sensors, command and control inputs as well as digitized live voice paging or recorded messages. All of this information can be simultaneously carried in a bi-directional manner at 625K bits per second for up to 3,000 feet of UTP wire or 6,000 feet of fiber-optic cable - twice that of most systems.

One of the most rigorous MNS standards detailed in the UFC document and National Fire Protection Association codes concerns intelligibility. Through a live demonstration for Chief Gunderson and other base personnel, Freedom Communications had to prove its MNS solution’s ability to dispense critical instructions in a measurably clear and concise manner.

Lastly, a listing from a National Testing Laboratory (NTL) is a significant element of a proven MNS solution. In the fire alarm/life safety industry, only three NTLs exist: UL, Factory Mutual and ETL. Considering these laboratories thoroughly analyze systems before granting an approved “listing,” most municipalities allow only systems possessing an NTL’s approval. Due to NTLs’ rigorous testing procedures, which can sometimes span more than a year, many so-called “mass notification solutions” do not carry these listings.

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System Components

Mass notification systems consist of three basic components, as outlined in the UFC:

- Individual Building MNS – includes notification within all structures as well as surrounding outdoor areas
- Wide Area MNS – applies to all outdoor areas
- Central Control Station – responsible for 24-hour monitoring of all MNS signals and emergency response communications

“The facility MNS side of the project was relatively easy as we were already installing fire alarm systems in all new and renovated buildings,” says Chief Gunderson. “These systems transmit alarm signals to a central receiving center (a.k.a. central monitoring station) located within the fire department. All we did was include the appropriate MNS specifications for voice evacuation systems in all contracts.”

The post’s individual building MNS was found to provide ample outdoor coverage. Consequently, officials decided not to implement the wide area component at this time.

“The facility’s 100-plus buildings’ mass notification systems have external speakers. This gives us good coverage within 100 feet of our critical buildings, which includes parking lots, walkways and smoking areas,” says Chief Gunderson. “We do have a high power speaker array, but it’s a separate, stand-alone system, as is the tornado warning system. We are working towards integrating these into our mass notification system so all systems integrate into one operating console.”

Radio Telemetry Network

Two-way communications between individual building MNS and the Central Control Station at Fort Knox is accomplished using an ultra-high frequency (UHF) radio system. Established radio links are capable of full supervision, which enables trouble alerts to be sent locally when a maintenance issue develops within any building’s MNS or the radio system itself.

Providing background design and programming support for the Fort Knox MNS was Gamewell-FCI Project Manager, Dick Aldrich. “We worked with Freedom Communications to ensure this system performed the required functions at the Fort Knox facility,” says Aldrich.

“Interfacing the facility’s radio network with our E3 Series system offered big benefits. This integration provides bi-directional status and control with one-way audio live voice paging and recorded message selection and control.”

At Fort Knox, integration with the E3 Series was accomplished using electromechanical relays, which allows totally dissimilar subsystems to communicate with one another. Integration can also be accomplished

through the development of firmware capable of interpreting the data from one system so it can be used by another.

According to Aldrich, the base wide radio network system issues various commands by means of relay contact closures. The E3 Series broadband system detects the individual relay commands and performs the required functions as programmed by Freedom Communications using the internal Boolean Logic or CAM (conditional action map) programming capability. The MNS functions include activation of visual indicators, pre-recorded audio tones and voice messages, and the most important of all, base-wide live voice communications.

Mike Tucker, a Fort Knox fire inspector and technician, indicated the radio system used was originally provided by the Department of the Army. Although more than 25 years old, Tucker affirms it provides a high-tech means of networked communications.

“We integrated it into our mass notification plans and procedures. We are using two systems to provide the same data simultaneously -- one for outside and another one for inside and close to each facility,” says Tucker.

The use of radio technology has its advantages, which was realized during a major ice storm in the Fort Knox area during January 2009. Throughout the region, many aerial power and telephone lines collapsed under the immense weight of several inches of ice. The use of radio technology helped to ensure critical information reached all personnel utilizing the local E3 Series systems’ MNS capability throughout the base.

“When the post initiated their relocation plan (during the ice storm) and set up shelters, we used the mass notification system to get out key messages, such as shelter locations, emergency numbers and the like,” says Chief Gunderson. “This was a key tool in getting out pertinent emergency information during this crisis.”



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