

**REVIEW OF SELECTED FIRE PROTECTION SYSTEMS
AT
THE US EMBASSY IN IRAQ
(DRAFT)**

NOTIFIER FIRE ALARM SYSTEMS

Prepared For:

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1.0 INTRODUCTION

The new US Embassy Compound in Baghdad, Iraq contains twenty six buildings including seven residential buildings (~680 units), five office buildings, two warehouses, a gym, a pool, a commissary, a power generation building, a water-treatment plant, VIP residences, and security buildings.

Hughes Associates, Inc. (HAI) was requested by First Kuwaiti Trading and Contracting Co. (FKTC) to provide 3rd party acceptance evaluation of selective fire alarm and suppression systems within the US Embassy compound in Iraq for compliance with applicable project specifications and codes. The reviews were limited to the following buildings:

Chief Mission Residence*	Recreation Facilities*
New Office Annex*	Water Treatment Plant
Deputy Chief Mission Residence*	New Office Building
Utility Building	Apartment A1 (SDA1)
GSO Annex	Apartment A2 (SDA2)
MSGQ*	Apartment A3 (SDA3)
Interim Office Building	Apartment A4 (SDA4)
Warehouse	Apartment A5 (SDA5)
Motor Pool (GMP)	Apartment A6 (SDA6)

* Contain kitchens

2.0 APPLICABLE CODES, STANDARDS, & SPECS

The following codes and standards are applicable to the project as defined by HAI's scope of work.

2.1 Applicable Project Specifications (13 May, 2005):

- SECTION 13921 - FIRE PUMP ASSEMBLIES
- SECTION 02510 - WATER DISTRIBUTION
- SECTION 13851 - FIRE ALARM SYSTEMS
- SECTION 13916 - FIRE SPRINKLER SYSTEMS

2.2 NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances (2002 ed.)

2.3 NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection (2003 ed.)

2.4 NFPA 13, Standard for the Installation of Sprinkler Systems (2002 ed.)

2.5 NFPA 72, National Fire Alarm Code (2002 ed.)

2.6 NFPA 17A, Standard for Wet Chemical Extinguishing Systems (2002 ed.)

- 2.7 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations (2004 ed.)

3.0 SCOPE OF SERVICES

The fire alarm and suppression system review is intended to determine if the system documentation and installation complies with the mandated codes/standards and contract specifications. The review is also intended to determine if the systems are ready for final turnover to the State Department.

HAI's review was strictly limited to the following systems:

- Underground Fire Water Supply System
- Sprinkler Systems.
- Notifier Fire Alarm Systems.
- Kitchen Suppression systems (Equipment, Hoods, Ducts, & Ansul Chemical Extinguishment).

HAI's review did not examine other life safety or fire protection related systems including:

- Egress components as described in chapter 7 of the Life Safety Code, NFPA 101.
- Stairwell pressurization.
- Atrium Smoke Control.
- Fire Barriers installation evaluation.
- Emergency Preparedness/Response.

HAI performed onsite evaluation of the fire protection systems during the period of 11/17 through 12/17/2007. Full access to all documentation, personnel, and facility locations (with the exception of secured portions of NOB building) was provided to HAI personnel during the conduct of this evaluation. At the time of the surveys, the systems installation had been mostly completed. In most cases, ceilings had been already installed and visual access to system components was conducted using ladders and removing portions of the ceiling panels. HAI's review was not intended to serve as a quality-assurance or quality-control (QA/QC) review, which is typically required during the system installation.

This report only addresses the fire alarm systems. Building specific punch list items are provided as an Annex to the report; reflecting status as of HAI's departure from the site. Reports for other systems are provided separately.

4.0 NOTIFIER FIRE ALARM SYSTEMS

4.1 System Description

All buildings reviewed by HAI are provided with a Notifier Fire Alarm system (either 3030 or 640 panels). Initiating devices include manual pull stations, flow switches, duct detectors, and smoke detectors in common areas. Notification appliances consist of bells and strobes.

The fire alarm systems are designed for interface with other building systems such as initiating atrium smoke control and stair pressurization systems, elevator recall, alarming upon activation of suppression systems, releasing secured egress doors, etc.

All fire alarm panels throughout the compound are networked through a fiber-optic link to two continuously occupied locations for monitoring purposes.

4.2 Scope of Review

HAI's site review/evaluation was conducted from 11/20–12/17/2007 and encompassed the following:

4.2.1 Review/evaluation of existing commissioning documentation and prior acknowledged issues.

4.2.2 Witnessing of testing for the building Notifier panels along with all the different system components – such as initiating devices, notification appliances, associated wiring power supply components, etc.

4.2.3 Witnessing the testing for the interface of the fire alarm systems with other building systems - such as initiating atrium smoke control and stair pressurization systems, elevator recall, alarming upon activation of suppression systems, releasing secured egress doors, etc

4.2.4 Shop drawing reviews conducted by home based HAI personnel.

4.3 System Evaluation

4.3.1 *Material* – Notifier Fire Alarm systems are UL listed/FM approved for the fire alarm applications. HAI verified that components used within the fire alarm systems are either Notifier, or specifically listed for use with the panels (bells, strobes, flow switches, etc.)

Wiring was field reviewed, although design drawings did not indicated proper wire sizing to facilitate the field review (see design review comments which FKTC is currently addressing).

4.3.2 *Device Location* - Spacing and location of audio/visual/signaling devices are noted to meet NFPA 72 requirements with a few exceptions in each building. Attached is a punch-list of

items discovered during HAI's field review. FKTC was in the process of addressing these punch-list items at the time of HAI's departure from the site.

Follow-up Item # 1: FKTC to correct remaining fire alarm Punch-list items for all buildings.

4.3.3 Sequence of Operation Matrix – Specification 13851 §3.2, requires general building evacuation upon individual smoke &/or duct detection. The current fire alarm sequence of operation does not evacuate the buildings upon activation of a duct detector. Furthermore, within apartment buildings, automatic evacuation occurs upon activation of two smoke detectors within separate apartment units. In discussion with FKTC and OBO project management, it is apparent that the sequence of operation matrix has been verbally agreed upon, however documentation of such direction needs to be formalized

Follow-up Item # 2: FKTC to document and obtain approval for the current sequence of operation matrix from the OBO, and incorporate it into the as-built drawings.

4.3.4 Installation of bells and strobes on the same circuit – Specification 13851 §3.4.E&F requires installation of audible & visual devices on separate NAC circuits. Currently, several buildings have both devices on the same circuit. Such installation would not allow for separate silencing of the bells as per Specification 13851 §1.5.10. FKTC was in the process of separating the circuits in question at the time of HAI's departure from the site.

Follow-up Item # 3: FKTC to reconfigure the bells and strobes to be on separate circuits.

4.4 Design Review – The design review was not complete due to inadequate documentation. Current shop drawings are inaccurate and do not contain the required information per NFPA 72 §4.5.1.1 & Specification 13851 §1.6.A-D. In each building, several devices are mislocated, and/or not installed per drawings. FKTC is currently working to provide updated drawings/documentation containing the following:

- Floor plans with locations of all fire alarm devices and device addresses/labels.
- Riser diagrams with the number of devices on each circuit and end-of-line devices.
- Point-to-point wiring diagram showing wiring to all devices with terminal numbers, including number, size, type of conductors and size and type of conduit.
- Battery power supply calculations that meet manufacturers and NFPA requirements (@130% per specification 13851 section 2.2.B.2.c).
- Voltage Drop Calculations (@10% safety factor).
- Drawing of any graphic annunciators and physical relationships of all panels.
- Sequence of operation in graphic form for all types of devices and circuits showing all system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- Number all junction/splice boxes.
- Product Submittals (Cut Sheets).
- Operation and Maintenance (O&M) Manuals.

Follow-up Item # 4: FKTC to provide updated drawings/documentation as per NFPA 72 §4.5.1.1 &/or Specification 13851 §1.6.A-D.

4.5 Acceptance Testing of Fire Alarm System

HAI witnessed acceptance testing activities for the different fire alarm system components per NFPA 72, chapter 10. The majority of individual devices (manual pull stations, relays, smoke/duct detectors, bells, strobes, circuits, etc.) functioned as designed. With the exception of few locations (see building specific punch-list), evacuation alarm sound levels could be clearly heard above ambient noise.

In each tested building, the fire alarm system had not been properly integrated for interface with other building systems. Such integration includes initiating atrium smoke control and stair pressurization systems, elevator recall, interface with kitchen suppression systems, releasing secured egress doors, etc. In many cases, the fire alarm relay had been installed, but programming to other systems had not been completed. FKTC is currently working to provide finalize the programming in preparation for the final testing.

Follow-up Item # 5: FKTC to finalize the integration of the fire alarm system with other building systems such as atrium smoke control and stair pressurization systems, elevator recall, kitchen suppression systems, secured egress doors, etc.

Follow-up Item # 6: FKTC to complete of the fiber optic link testing and verification of interconnection of panels.

Several general items requiring follow-up were also noted in multiple buildings during the fire alarm testing. These items, which FKTC is currently working on, include:

Follow-up Item # 7: FKTC to install correct battery sizes for the fire alarm panel within several buildings, and complete the Power Supply Test.

Follow-up Item # 8: FKTC to reconfigure panels to ensure that strobes are synchronized.

Follow-up Item # 9: FKTC to provide capability for documenting fire alarm panel event history - either electronically or with a printer.

Follow-up Item # 10: FKTC to provide smoke detector sensitivity report to verify the detectors are clean.

Follow-up Item # 11: FKTC to document the pressure differential reading at the Duct Detector tube (to ensure proper airflow).

4.6 Conclusion

FKTC should provide updated fire alarm system design documentation containing required information per NFPA 72 §4.5.1.1 &/or Specification 13851 §1.6.A-D.

Within each building, the majority of individual devices (manual pull stations, relays, smoke/duct detectors, bells, strobes, etc.) functioned as designed. Furthermore, with the exception of few locations (see building specific punch-list), evacuation alarm sound levels could be clearly heard above ambient noise.

At the time of HAI's departure from the site, FKTC was working to properly integrate the fire alarm system with other building systems. Such integration includes initiating atrium smoke control and stair pressurization systems, elevator recall, interface with kitchen suppression systems, releasing secured egress doors, etc.

Several issues remain to be addressed in order to ensure a fully integrated and functioning fire alarm system. These issues include:

- FKTC to correct remaining fire alarm Punch-list items for all buildings.
- FKTC to document and obtain approval for the current sequence of operation matrix from the OBO, and incorporate it into the as-built drawings.
- FKTC to reconfigure the bells and strobes to be on separate circuits..
- FKTC to provide updated drawings/documentation as per NFPA 72 §4.5.1.1 &/or Specification 13851 §1.6.A-D.
- FKTC to finalize the integration of the fire alarm system with other building systems such as atrium smoke control and stair pressurization systems, elevator recall, kitchen suppression systems, secured egress doors, etc.
- FKTC to complete the fiber optic link testing and verification of interconnection of panels.
- FKTC to install correct battery sizes for the fire alarm panel within several buildings, and complete the Power Supply Test.
- FKTC to reconfigure panels to ensure that strobes are synchronized.
- FKTC to provide capability for documenting fire alarm panel event history - either electronically or with a printer.
- FKTC to provide smoke detector sensitivity report to verify the detectors are clean.
- FKTC to document the pressure differential reading at the Duct Detector tube (to ensure proper airflow).