STANDARD SPECIFICATIONS FOR THE DESIGN AND INSTALLATION OF AUTOMATIC FIRE ALARM SYSTEMS

THE UNIVERSITY OF ALABAMA
TUSCALOOSA, ALABAMA

[INSERT PROJECT NUMBER]

[INSERT PROJECT NAME]

Prepared For:

University of Alabama Facilities
1205 14th Street
Tuscaloosa, AL 35401

Prepared By:

[INSERT DESIGN PROFESSIONAL’S INFORMATION]

[INSERT DATE]
INSTRUCTIONS TO THE DESIGN PROFESSIONAL

The University of Alabama utilizes standardized specifications for the design and installation of automatic fire alarm systems on campus. The specifications have been written to be as specific as possible for the typical occupancy types and conditions on campus, although each project will have unique features that must be addressed in the design and installation. Areas of the stand specifications that are subject to change are highlighted in yellow for easy identification and provided with editing instructions in brackets to assist the design professional. The designer will need to include or delete the highlighted sections based on specific project requirements and conditions.

For example, a sprinkler system may not be provided, and the sections regarding sprinkler supervisory devices should be removed and may require section number changes. Alternatively, the design professional may select to include complete automatic detection based on the potential hazard to occupants, and those sections would therefore be included. Certain fire alarm system features may be requested by the University, although they may not be required by the applicable codes.

Upon completion, the design professional should verify that all highlighted sections have been appropriately addressed, all highlighting is removed, this page has been deleted, and the specification numbering is internally consistent. Please note that these are standard specifications and all sections should be thoroughly reviewed for each project condition whether or not it has been identified with highlighted text.

These standard specifications are the property of the University of Alabama and are only for use on official University projects within Tuscaloosa County. These specifications may not be utilized, referenced, or quoted, in whole or in part, in any way for any other reason.
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1.0 GENERAL

1.1 GENERAL DESCRIPTION

A. Provide all materials and labor for the engineering, design and installation of a new automatic fire detection and alarm system, hereafter referred to as the “System”, for the University of Alabama.

B. Where used throughout this specification, the term “provide” shall mean to furnish and install.

C. The work shall be subject to the terms and conditions of the University of Alabama Facilities Department.

D. All work shall be performed in accordance with these specifications and good practice. No modifications to these specifications will be accepted without the express written approval of the Owner. It is the Contractor's responsibility to document Owner's approval of any such modifications prior to the execution of work.

1.2 INTENT OF SPECIFICATIONS

A. Work performed pursuant to these specifications shall be complete in every respect, resulting in a system installed entirely in accordance with the specifications, applicable codes, standards, manufacturer's recommendations and Underwriters Laboratories Inc. (UL) listings.

B. It is further intended that upon completion of this work, the Owner be provided with:

1. Complete information and drawings describing and depicting the entire system as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system at a future date.

2. Complete documentation of system testing.

3. Certification that the entire system has been inspected and tested, is installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and UL listings, and is in proper working order. Contractor shall complete the "Fire Alarm System Certification and Description" as required by NFPA 72.

4. A copy of the final software program in each of written form, electronic media appropriate for technician downloading onto the system, and permanent electronic disk format.
5. All necessary owner-operator passwords.

6. All points of contact at the manufacturer and all site specific system information necessary to permit the complete access to and modification of the system programming by qualified technicians.

7. Provide executed “Release of Lien” forms from Contractor and each subcontractor.

8. A guarantee letter indicating the date of commencement and duration of the system guarantee and of the service and maintenance agreement.

C. All equipment, devices, appliances, conductors, raceway and other materials shall be new.

1.3 WORK INCLUDED

A. Provide and install a new UL Listed, addressable fire alarm system as described herein and as shown on the plans. The system shall be wired, connected, and left in first class operating condition. All wiring, including low voltage fire alarm system conductors and other cabling related to the fire alarm system such as fiber optic communications, shall be installed in conduit. The Contractor is to provide all devices, appliances, equipment, conduit, wiring and labor necessary to provide a completely operational fire alarm system consisting of but not limited to:

1. Fire alarm control unit(s) with an integral supervised RS-232 C output.

2. Manual fire alarm boxes at all exit stairways and at grade level exit doors and within 200 feet of any occupiable area in each building.

3. Addressable, spot type, photoelectric smoke detectors in rooms containing fire alarm panels, electrical and telephone closets, mechanical rooms, and other areas as required by local codes.

4. Complete area smoke detection or corridor smoke detection as warranted by the hazard to occupants in non-sprinklered buildings. [DELETE IF NOT PROVIDED]

5. Corridor smoke detection in dormitories and other residential buildings with enclosed, interior corridors. [DELETE IF NOT PROVIDED]

6. Duct type smoke detectors in supply and return air systems having a capacity greater than 2,000 CFM.
7. Duct type smoke detectors in supply air and exhaust air plenums of air conditioning systems having a capacity greater than 15,000 CFM, and at each connection to a vertical duct or riser serving two or more stories.

8. Heat detectors in elevator machine room and/or hoistway within 2 feet of each sprinkler for elevator shutdown where provided. [DELETE IF ELEVATOR MACHINE ROOMS AND HOISTWAYS ARE NOT SPRINKLERED]

9. Additional automatic heat or smoke detection as required for non-sprinklered buildings or based on an assessment of building/area hazards. [DELETE IF NOT PROVIDED]

10. Conventional (non-addressable) smoke and/or heat detection devices in spaces where the environment is unfavorable for addressable devices. Such conventional devices shall be provided in a zoned configuration which aids in the annunciation of the location installed. Annunciation on the addressable fire alarm system shall be via addressable monitor modules located in a conditioned space. [DELETE IF NOT PROVIDED]

11. Audible notification appliances shall be installed, spaced and tapped (when speakers are mandated by code) so as to produce a sound output on alarm that is clearly audible above the ambient noise level throughout the building. In no case shall the audible alarm be less than 15 dBA above the ambient room noise level or less than 5 dBA above the maximum ambient noise level in public and common areas. In no case should the fire alarm system produce sound in excess of 110 dBA.

12. Visible notification appliances in all public or general areas including but not limited to, public restrooms, meeting rooms, dining rooms, classrooms, copy rooms, conference rooms, assembly areas, common laboratories, common areas, corridors, and offices.

13. Firefighters’ telephone jacks and associated wiring in exit stairways, exit enclosures, fire pump room, emergency generator room, and elevator cabs and lobbies where required. [DELETE IF NOT PROVIDED]

14. Interface wiring to fan(s) and air handling unit(s) for start-up or shutdown of fans when smoke is detected and/or smoke control mode operation (where provided) is initiated. [DELETE IF NOT PROVIDED]
15. Devices, equipment, and wiring as necessary to monitor the activation of new or existing sprinkler and standpipe system alarm and supervisory devices. [DELETE IF NOT PROVIDED]

16. Devices, equipment, and wiring as necessary to monitor special fire or gas detection systems where provided in laboratory spaces. [DELETE IF NOT PROVIDED]

17. Devices, equipment, and wiring necessary to operate and control magnetic door holders, unlocking mechanisms, and automatic door assemblies associated with access-controlled rooms, smoke control systems (where provided), and etc. [DELETE IF NOT PROVIDED]

18. Relays necessary to initiate primary and alternate floor elevator recall and shunt trip (when sprinklers are provided in hoistways and machine rooms) on all existing elevators. All interfaces to elevator controllers shall be provided by a qualified elevator contractor that shall be a subcontractor to the fire alarm contractor to conduct this work. [DELETE IF NOT PROVIDED]

19. Devices, equipment and wiring necessary to monitor the fire pump controllers in accordance with NFPA 20 where provided. [DELETE IF NOT PROVIDED]

20. Devices, equipment, and wiring to monitor emergency generator in compliance with NFPA 110 where provided. [DELETE IF NOT PROVIDED]

21. Provide and install devices, equipment, and wiring necessary to monitor the activation of new or existing special hazard fire suppression systems including but not limited to kitchen hood suppression systems and clean agent suppression systems where provided. Final checkout of inter-connections shall be made by activating the special hazard fire suppression systems(s) detection circuits. Contractor shall include the services of the special hazard fire suppression systems(s) contractors(s), if needed, to test fully the interconnections. [DELETE IF NOT PROVIDED]

22. UL Listed electrical surge protection for all control equipment including primary power supplies.

23. Transient voltage surge suppression for all fire alarm system circuits upon entry and exit from each building. [DELETE WHERE NOT PROVIDED]
24. Keltron equipment and associated programming to annunciate the building fire alarm system signals to the campus proprietary supervising station system.

25. Fire Command Centers shall include the equipment identified in Section 911 of the *International Fire Code* and as further required by this Specification. [DELETE WHERE NOT PROVIDED]

B. Provide protection of smoke detectors during installation.

C. Test and adjust all new equipment and systems.

D. Prepare and submit shop drawings, contractor record drawings and other submittals required herein.

E. Guarantee all new equipment and systems for one year after final acceptance of the system by the Owner.

F. Obtain, secure, and pay for all permits, plan check approvals, and inspections necessary to perform the work.

G. Provide testing of all devices during normal working hours if unoccupied and after normal working hours if occupied, and repair as necessary of new equipment during the one-year guarantee period.

H. Provide a temporary system printer during the installation of the new fire alarm system to document testing and program changes.

I. Repair all damage to building finishes resulting from this work in accordance with the requirements of the University of Alabama.

J. Coordinate all work with other Contractors working in the building or concurrent construction/remodeling or installation of other systems (e.g., adjusting waterflow alarm switch retards by the Sprinkler Contractor).

K. Remove all existing fire alarm system components and all accessible conduits, conductors, backboxes, etc.

L. All devices installed outdoors or within areas exposed to weather or wet locations shall be installed as NEMA 3R enclosures. All devices installed in areas subject to directed water streams or potentially corrosive atmospheres shall be provided with NEMA 4 or 4X enclosures or as required. Electrical raceway and fittings shall be as required for connection to the NEMA 3R, 4, or 4X enclosures.
1.4 OWNER'S REPRESENTATIVE

All contacts with the new fire alarm projects for the University of Alabama shall be directed to the Owner's Representative, hereafter referred to as the Owner:

[COMPLETE TABLE AS REQUIRED]

The Owner will issue all approvals and instructions required for this work. No other person may issue an approval or instructions to the Contractor without the written permission of the Owner. Acceptance of unauthorized or oral approvals or instructions by the Contractor shall be entirely at the Contractor's risk and in no case shall such unauthorized or oral approvals or instructions constitute an oral contract or otherwise be binding upon the Owner.

1.5 WORKING CONDITIONS

A. It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner. Contractors are requested to inspect the building prior to the pre-bid meeting.

B. A pre-bid meeting will be held on site to familiarize the Contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the Contractor's bid.

C. Fire alarm system engineering drawings, including the location of devices and appliances, will be provided. It shall be the Contractor's responsibility to review the layout for the purpose of preparing his bid.

D. The Contractor will be responsible for attending a pre-construction meeting and weekly construction coordination meetings with the Owner, and preparing minutes of these meetings. Construction coordination meetings will be scheduled by the Owner. The frequency of required meetings may be decreased, at the Owner's option, if warranted by the progress of the project.

E. All work may be conducted during acceptable working hours, to be identified by the project manager, by properly coordinating the work with the Owner. Noise restrictions do apply. The core drilling, testing of evacuation signals, and other
work disruptive to occupants will be prohibited between 6:00 a.m. and 6:00 p.m., Monday through Friday, and will be explained at the pre-bid meeting.

F. The Contractor shall be responsible for prior coordination of all work and demolition with the Owner.

G. New fire alarm systems and devices/appliances shall be put into service as soon as they are functional. Once put into service, they shall not be removed from service without the Owner's written authorization.

H. In return for progress payments, less retention, made to the Contractor by the Owner during the course of the work, the Owner shall assume title to all new systems, equipment, and devices/appliances as they are delivered to the job site, installed and put into service.

1. Assumption of title for new systems, equipment, and devices by the Owner shall not imply acceptance of those systems, equipment, and devices by the Owner nor shall it relieve the Contractor from his obligation to meet all requirements of these Specifications.

2. The Owner reserves the right to make beneficial use of all new systems, equipment and devices/appliances, as those systems, equipment, and devices/appliances are put into service, throughout the installation period. Such beneficial use shall not imply acceptance of those systems, equipment, and devices/appliances by the Owner, nor shall it relieve the Contractor from his obligation to meet all requirements of these Specifications. Beneficial use of the system shall not cause the guarantee period to begin prior to the Owner's final acceptance as required by Section 1.8.A.

1.6 QUALITY ASSURANCE

A. Codes, Standards, Ordinances, and Permits

1. All work shall comply with the codes adopted and enforced by the following agencies: [Designer of Record, shall verify the edition of the applicable codes at the time of design and construction.]

   a. Alabama Building Commission


      2) International Mechanical Code, 2006 Edition

      3) NFPA 70, National Electrical Code, 2008 Edition


c. Tuscaloosa Fire and Rescue Service


2. All work and products shall also conform to the following nationally recognized standards:


3. All work and materials shall conform to all Federal, State and local codes and regulations governing the installation, including the current editions of the International Building and Fire Codes, and the codes, standards, guides and recommended practices included in the 2003 NFPA National Fire Codes.
4. If there is a conflict between the referenced NFPA standards, federal, state or local codes, and this specification, it is the Contractor's responsibility to immediately bring the conflict to the attention of the Owner for resolution. Where conflict arises between the *International Fire Code* and NFPA 101, *Life Safety Code*, the most stringent code requirement will be enforced.

5. All devices, appliances, systems, equipment, and materials furnished and installed shall be new and listed by Underwriters Laboratories Inc. (UL) for their intended use. All equipment shall be installed in accordance with the manufacturer's recommendations and the UL listing limitations. Listing requirements for separate voice, fire alarm systems, smoke control system equipment [DELETE IF NOT PROVIDED], and smoke detectors shall be met. The Contractor shall provide evidence with his submittal of listings for all proposed equipment and combinations of equipment.

6. All devices, appliances, systems, equipment, and materials furnished and installed shall be of types or models approved and required by NFPA Standards or UL listing for use in systems and occupancies of this type.

7. The Contractor shall be responsible for filing of all documents, paying all fees (including, but not limited to plan checking and permit) and securing all permits, inspections and approvals necessary for conducting this work. Upon receipt of approved drawings from the Authority Having Jurisdiction, the Contractor shall immediately forward two sets of drawings to the Owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.

B. Contractor Qualifications

The Contractor shall:

1. Provide a job site supervisor/foreman who is to be present on site each day that work is actively in progress, as appropriate. The jobsite supervisor/foreman shall be a minimum National Institute for Certification in Engineering Technologies (NICET) Level II in Fire Alarm Systems. A daily site visit is required as a minimum. This individual shall be the same person throughout the course of the project, unless otherwise approved in writing by the Owner.

2. System configuration, installation, programming, and testing shall be supervised by a technician who is NICET Level III or IV in Fire Alarm Systems, trained by the Contractor.
3. Hold all licenses and permits necessary to perform this work in Tuscaloosa, Alabama.

4. Have at least five years of experience in the installation of systems of this type and shall be familiar with all applicable local, state, and federal laws and regulations. Provide a project list representing projects of similar scope in the past three years including references.

5. Technicians, who shall be on-site or have a level of responsibility and involvement with this project, shall be submitted for review and acceptance. A copy of their NICET Certification (minimum Level III or IV, Fire Alarm Systems) shall be submitted with the submittal documents.

6. Be regularly engaged in the design, servicing, installation, and testing of fire detection, alarm, and emergency voice/alarm communication systems.

1.7 SUBMITTALS

A. General

1. The Owner's Consultant shall review and recommend approval/disapproval or take other appropriate action on the Contractor's submittals including shop drawings, samples, documentation, and record drawings. This review is to verify conformance to project specifications and design concepts expressed in the contract documents. This action shall be taken with all reasonable promptness as to cause no delay in the work, while allowing adequate time to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details (i.e., dimensions) or for substantiating installation or performance of equipment or systems designed by the Contractor, all of which remain the Contractor's responsibility to the extent required by the contract documents. The Owner's Consultant's review shall not constitute approval of safety precautions of construction, means, methods, techniques, sequences of procedures, or approval of a specific assembly of which the item is a part.

2. The Contractor shall submit 100% shop drawings to the Owner, Owner's Consultant, and all reviewing authorities. All comments received from these parties shall be incorporated into a 100% corrected final set of shop drawings. The Contractor will not be able to bill for preparation of shop drawings until all comments have been incorporated and the shop drawings have been approved by the Owner, Owner's Consultant, and all reviewing authorities.
3. If the 100% corrected submittal is found not to conform to the requirements of these specifications and incorporate all comments, the Contractor shall be required to resubmit with modifications. The Contractor shall be responsible for the Owner's extra expenses for subsequent review(s) of rejected submittals necessitated by the Contractor's failure to make the requested modifications. Such extra fees shall be deducted from payments by the Owner to the Contractor. Approval of the submittals by the Owner shall, in no case, relieve the Contractor of his responsibility to meet the requirements of this specification.

B. Subcontractors

1. Contractor shall submit with his bid, a list of all proposed subcontractors. All proposed subcontractors are subject to the approval of the Owner.

2. The installing electrical Subcontractor(s) shall:
   a. Hold all licenses and permits necessary to perform this work.
   b. Have at least five years of experience in the installation of systems of this type and be familiar with all applicable local, state and federal laws and regulations.
   c. Be regularly engaged in the servicing, installation and testing of fire detection, emergency voice communications, and alarm systems, as appropriate.

3. Subcontractors retained to interface the building fire alarm system with the campus-wide fire alarm network and reporting system shall be certified by the Keltron Corporation.

C. Equipment Lists

1. The Contractor shall submit with his bid a detailed equipment list, identifying types, models and quantities of all materials, devices, and equipment proposed. This submittal shall include manufacturers' data sheets showing the types and models of all equipment, devices, material and wire proposed. Evidence of UL listings and local approvals shall be submitted with the data sheets. The submittal shall include, but not be limited to, the following:
   a. Conduit, raceway, junction boxes, terminal cabinets, device backboxes, fittings, hangers, and mounting hardware.
   b. Wire, cable, connectors, terminal strips, and electrical tape.
c. Fire alarm control equipment and annunciators, including all components, modules, surge suppression, and enclosures.

d. All components of voice evacuation and firefighters' communication equipment. [DELETE COMPONENTS NOT PROVIDED]

e. Manual fire alarm boxes, detectors, auxiliary function relays and solenoids, and notification appliances.

f. Power supplies and standby batteries.

g. Keltron equipment necessary for interface to the campus active network radio signaling system (e.g. wireless transceiver).

h. Any other materials, devices, or equipment to be provided.

i. Fire alarm schematic riser diagram supplemented with narrative descriptions as necessary for clarity and completeness.

2. When a data sheet shows more than one product, the proposed product shall be clearly indicated by arrows or other suitable means.

D. Work Schedule

1. The Contractor shall submit with his bid a proposed work schedule and representative chart (such as a Gantt chart). This schedule shall indicate the time necessary for:

   a. Project start-up.

   b. Property survey.

   c. Shop drawing submittals.

   d. Installation.

   e. Contractor testing.

   f. Final acceptance tests and commissioning.

2. The proposed work schedule will be reviewed and finalized during the pre-construction meeting and will be updated at each weekly construction coordination meeting.
E. Samples

Within 30 days of authorization to proceed, the Contractor shall submit samples of all proposed alarm initiating devices, audible/visible notification appliances, wire, and cable to the Owner for approval.

F. Permits, Licenses, and Certificates

Prior to start of installation, the Contractor shall obtain and submit copies of all permits, licenses, certificates and approvals necessary to conduct this work.

G. Shop Drawings

1. Prior to installation, but within 30 days after awarding of the contract, the Contractor shall submit two full sets of plotted shop drawings, a copy of the AutoCAD files, two full sets of data sheets as required in Specification Section 1.7.C, updated to reflect any changes, and installation manuals/instructions detailing the manufacturer's installation recommendations for all equipment to be installed to the Owner for approval. Installation prior to receipt of approved shop drawings shall be at the risk of the Contractor.

2. The shop drawings shall consist of the following:

   a. A drawing legend sheet identifying:

      1) All symbols used on the drawings, by type of device or equipment, manufacturer, and manufacturers part number. This information shall correspond to the manufacturer's catalog data sheets required elsewhere in this section.

      2) All conventions, abbreviations, and specialized terminology used on the drawings, as necessary to understand and interpret the information contained therein.

      3) All color codes and conduit, conductor/circuit, and device numbering systems.

      4) A complete drawing list/index identifying all drawings in the shop drawing package by title, drawing number, and Specification cross-reference.

   b. Clean architectural floor plans drawn to 1/8" = 1'-0" scale on ‘D’ size sheets and a system riser diagram with a title block on each drawing. Floor plan drawings required for this submittal
shall be generated using the bid drawings as background in AutoCAD Release Version 2007 format. Drawings shall comply with the University of Alabama CAD Standards.

1) The floor plan drawings shall indicate:

a) Location of all devices, circuits, end-of-line resistors (EOL), equipment, risers, and electrical power connections. Indicate the digital address or sequential zone/device number of all alarm initiating devices and notification appliances on each drawing.

b) Schedule outlining the number, size, and type of conductor and conduit used.

c) Point-to-point wiring connections showing individual circuits and circuit/conduit routing. This information shall be depicted in sufficient detail to locate readily specific conduits, raceways and circuits in the field and to identify the specific conductors/circuits contained therein. All penetrations of fire rated barriers shall be individually noted. French curve routing is not acceptable for depicting new conduits, raceways and circuits, or for depicting existing conduits, raceways and circuits whose detailed routing can be determined without demolition of existing construction.

d) Typical wiring diagrams for all alarm initiating devices and notification appliances, showing the size and type of conductors, wiring terminations, and terminal identifications.

e) Show wire routing and point of connection (location) to the building power circuit including identification of the circuit breaker for all fire alarm equipment.

f) Conduit fill calculations, in chart form, indicating the cross-section area percent fill for each type of wire/cable in each size of conduit used in the system. A maximum of 40% fill is allowed.

2) The riser diagram shall indicate:
a) Number, size, and type of riser conduits/raceways.

b) Number, size, and type of conductors in each riser.

c) Number of each type of device on each circuit on each floor.

c. Detailed wiring diagrams for all alarm control panels, voice evacuation panels, public address panels, firefighters' telephone panels [DELETE IF NOT PROVIDED], control panel modules, power supplies, electrical power connections, auxiliary function relays and solenoids, remote signaling equipment, video display units, and remote annunciators identifying all required terminations including terminal identifications. All unsupervised connections and terminations shall be noted "unsupervised."

1) These diagrams shall depict and identify all circuit boards, modules, power supplies, standby batteries, wiring harnesses, terminal strips and connections thereto, including spare zones and circuits. Where multiple components of a similar type are provided, each shall be identified by a unique component number.

2) These diagrams shall include front-view details of all control panels and annunciators, depicting and identifying all indicators, controls and zone labels, including proposed nomenclature.

3) These diagrams shall depict the required information to relative scale, actual size or larger, showing proper spatial relationships between components, and shall reflect the corresponding system components as they are to be installed.

d. Standby battery capacity calculations. Battery calculations shall list the type of devices (UPS, detection, monitoring, and control), notification appliances, and modules; quantities, unit and extended amperage draw for quiescent and alarm conditions, total amperage draw and battery amp/hour rating. For design criteria, the calculated load shall be the design load, including the required 20% spare capacity. In addition, the battery capacity used to meet the calculated load shall be a maximum of 80% of the amp/hour rating listed by the manufacturer.

1) Amplifier capacity calculations showing sizing capable of powering all speakers simultaneously while operating at 80% of their rated capacity. Power supply capacity calculations
showing that the power supplies are capable of powering all modules and devices shall be provided.

2) Power supplies for audible/visible notification shall be sized to support 120% of the number of appliances provided.

e. Voltage drop calculations shall be provided for all notification appliance circuits. Voltage drop at the last appliance shall not exceed 15% from the starting voltage.

g. A complete zone/address list identifying each signal initiating zone, annunciator zone, notification signaling zone, remote signaling and auxiliary function zone and the specific devices associated with each zone.

h. A Cause and Effects Matrix, or a sequence of operations section defining the system operation. This matrix or sequence shall cross-reference each signal initiating zone to its corresponding annunciator zones, notification signaling zones, remote signaling zones, auxiliary function zones, and indicate system operation in the event of each type of trouble condition recognized by the system.

i. A list of typical notification signaling voice messages acceptable with the local authorities for the Owner’s review and approval. [DELETE WHERE NOT PROVIDED]

3. Each drawing shall be cross-referenced to all related drawings and specific drawing details as necessary for the submittal as a whole to depict clearly the proposed installation. Each drawing shall show revision number and date indicated in the title block. Revisions shall be clouded or otherwise highlighted between submissions. Revisions made without clouding or other highlights will not be reviewed and any approval of the revised drawings will not apply to those unnoted revisions.

4. The Contractor will not be authorized to start installation until all of the shop drawings and data sheets are received, reviewed and approved in writing by the Owner, the Owner’s Consultant, the Alabama Building Commission, and the Tuscaloosa Fire and Rescue Service.

H. Operation and Maintenance Manual

1. The Contractor shall provide the Owner with a loose-leaf manual containing:

   a. A detailed description of the system and its operation including operator responses. The approved sequence of operation shall be placed in, or adjacent to, the operator's control panel.
b. A detailed description of routine maintenance required (by manufacturer and/or NFPA), recommended, or as would be provided under a maintenance contract including a testing and maintenance schedule and detailed testing and maintenance instructions for each type of device installed.

c. Manufacturer’s data sheets and installation manuals/instructions for all equipment installed.

d. A list of spare parts provided including type of device and model number.

e. Service directory which includes the main 24-hour emergency service number and at least three alternate numbers which are monitored on a 24-hour basis. Also include the names of at least three (3) NICET Level II technicians qualified to provide emergency service during the guarantee period.

f. Small scale (11 inches by 17 inches) Contractor record drawings of the system (submit in accordance with Section 1.6.M).

g. The Cause and Effect matrix as provided on the shop drawings and modified for installed conditions.

2. Within 90 days of authorization to proceed, the Contractor shall submit to the Owner four (4) copies of the draft manual for approval.

3. Thirty (30) days prior to completion of the work, four (4) copies of the approved manual shall be delivered to the Owner.

4. This manual shall be written, compiled and edited specifically for this project and the system installed. Unedited manufacturer's catalog data sheets and/or equipment manuals are unacceptable as content for this submittal.

5. Provide Operation and Maintenance Manual contents on a properly formatted and indexed Compact Disk (CD).

I. Contractor Record Drawings

1. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawing prints (red line) which shall be marked to show each and every change made to the fire alarm system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by the Owner without written instruction.
from the Owner in each case. This set of drawings shall be used only as a record set.

2. Upon completion of the work, the record set of prints shall be used to prepare complete, accurate final record drawings reflecting any and all changes and deviations made to the fire alarm system.

3. Upon completion of the work, two sets of record drawings shall be submitted to the Owner’s Consultant for review.

4. Following Owner’s review and acceptance of the record drawings, and before final approval, one (1) set of reproducible record drawings and four (4) additional sets of record drawings shall be delivered to the Owner.

5. The contractor record drawings are required to show and to identify quantities of junction boxes, spare conductors, color coding of conductors, splices, device back boxes, and terminal strips. These drawings shall include a schedule of all connections/terminations, indexed by junction box, device back box and terminal strip and shall reference wire identification taped numbers as installed.

6. Provide contractor record drawings on index compact disk (CD) in AutoCAD Release 2007 format.

J. Software Documentation

1. Documentation of Software Modifications shall include:
   
   a. A complete printout of the system program prior to the change.

   b. A complete printout of the system program subsequent to the change, with all modifications highlighted.

2. A copy of all software documentation required by this section shall be maintained on-site by the Contractor, in a binder, arranged in chronological order. This binder shall be turned over to the Owner at the completion of the project.

3. Once the fire alarm system is put into service, in whole or in part, and the associated building(s) partially or wholly occupied, no software changes shall be performed without the prior written permission of the Owner.

4. All software changes to the fire alarm system, once it is in service, shall be performed by a certified manufacturer’s representative,
trained in the execution of such changes. A complete printout of the system program changes shall be provided.

5. Each revision to the software shall be identified by a unique version number and date.

6. The Contractor shall maintain a copy of the program changes in electronic format at the job site and shall include all passwords/codes to access the program. Acceptable storage media shall be floppy disk, CD, or USB drive.

7. A copy of the final system program shall be provided to the Owner on a Compact Disk (CD) at the completion of the project and shall include all passwords/code to access the program.

K. Drawing and Approval by Code Authority

1. The Contractor shall provide the Owner’s Representative with two copies of all documents that are reviewed and approved by the local code authority. These documents shall include, but not be limited to, the following:
   
   a. Site inspection forms.
   
   b. Permit/Shop drawings.
   
   c. Final inspection/test forms or reports.

2. All documents must include all required approval stamps; signatures or other information necessary to properly certify the design, installation and system performance has been reviewed and accepted by the Alabama Building Commission, Tuscaloosa Fire and Rescue Service, and the University of Alabama Facilities.

3. Prior to installation, the contractor shall submit complete shop drawings to the Alabama Building Commission, Tuscaloosa Fire and Rescue Service, and the University of Alabama Facilities for review and approval. Allow two (2) weeks for review by the University of Alabama. Upon approval, a copy of the submittal shall be forwarded to the Owner.

L. Test Record

System certification and documentation of system testing required by Specification Sections 3.4.A and 3.4.B shall be submitted to the Owner’s Consultant for review and approval at least 14 days prior to the final acceptance test.
1.8 GUARANTEE

A. Guarantee Period

The Contractor shall guarantee all materials and workmanship during the installation period and for a period of one year, beginning with the date of final acceptance by the Owner. The Contractor shall be responsible during the design, installation, testing and guarantee periods for any damage caused by him or his subcontractors or by defects in his or his subcontractors' work, materials, or equipment.

B. Emergency Service

The Contractor shall provide emergency repair service for the system, at no cost to the Owner, within four hours of a request for such service by the Owner during both the installation and the guarantee periods. This service shall be provided on a 24-hour per day, seven days per week basis.

C. The Contractor shall provide all required service, maintenance, and testing of the system during the guarantee period. This shall include testing, inspection and maintenance required of the system in the conformance with the University of Alabama, Tuscaloosa Fire and Rescue Service, and NFPA 72. The guarantee period shall include the first annual inspection and test as well as the periodic maintenance and testing requirements of the local Code and NFPA standards until the end of the guarantee period.

D. Spurious Alarms

1. If the Owner experiences an unacceptable number of spurious or unexplained false alarms during the installation and guarantee periods, the Contractor shall be responsible for providing the necessary labor, material, and technical expertise to correct the problem to the satisfaction of the Owner.

2. The following number of spurious alarms, calculated as a ratio of false alarms to number of initiating devices, shall be considered unacceptable:

   a. **Automatic (system connected) smoke detectors** - More than two spurious alarms per 100 detectors per six months during the system installation and guarantee period. Any calculated number shall be rounded up.

   b. **Automatic duct type smoke detectors** - More than two spurious alarms per 50 detectors per six months during the system installation and guarantee periods. Any calculated number shall be rounded up.
3. For systems with less than 100 automatic (system connected) smoke detectors and/or less than 50 automatic duct-type smoke detectors, any two spurious alarms during the installation and guarantee periods shall be considered unacceptable.

4. Any spurious alarms shall be considered unacceptable for the following types of equipment:
   

   b. Heat detectors. [DELETE IF NOT PROVIDED]

   c. Sprinkler or standpipe system water-flow devices. [DELETE IF NOT PROVIDED]

   d. Kitchen hood or special fire suppression system monitoring devices. [DELETE IF NOT PROVIDED]

1.9 TRAINING

A. Timing

The Contractor shall submit a proposed training agenda for the Owner’s review within 60 days of authorization to proceed. The final, approved training agenda shall be submitted 14 days prior to the final system acceptance test. Not less than three (3) 2-hour training sessions shall be provided by the Contractor after coordination with the Owner’s Representative.

B. Agenda

Training shall include all system operational functions needed by building and security personnel. This shall include, but will not be limited to:

1. Alarm acknowledgment.

2. Interpretation of the scheme used to provide identifiers.

3. Voice system operation.

4. System reset.

5. Basic troubleshooting.

1.10 SPECIAL TOOLS
The Contractor shall supply as a part of the contract, three (3) complete sets of any special tools or keys necessary for normal operation and maintenance of the system.

1.11 FINAL APPROVAL AND ACCEPTANCE

Final approval and acceptance of the work will be given by the Owner when:

1. The complete system has been inspected, tested, and approved in writing by the Owner’s Consultant and the Authority Having Jurisdiction.

2. All required submittals, including system operation and maintenance manuals, contractor record drawings, test reports, spare parts, special tools and training have been provided to, reviewed by, and accepted in writing by the Owner’s Consultant.

2.0 DESCRIPTION OF THE SYSTEM

2.1 GENERAL

A. The system shall be of the addressable type.

B. All equipment and system components furnished and installed shall be new and listed by UL for their intended use. The equipment and system components shall be installed in accordance with the applicable codes and standards, the manufacturers' recommendations, and within the limitations of the UL listings. All equipment and system components shall be the standard product of a single manufacturer (unless approved by Owner’s Consultant). Evidence of UL listing is required. All systems shall be UL-864 9th edition listed.

C. System components shall be modular in design to ensure future expansion capability of the system. Spare capacity shall pertain to quantities of devices, circuits, power supplies, amplifiers, conductor ampacities (size) and lengths.

D. The system shall have spare installed capacity enabling it to support a 20% increase in the number of initiating devices, and in the number of control and notification appliance circuits. Control cabinets, power supplies and amplifier capacities installed as a part of this work shall be sized accordingly. Spare cabinet and power supply capacity shall be evenly distributed throughout the system.

E. Alarm Verification

1. The system shall incorporate an alarm verification function in the control panel for system type smoke detectors, provided the retard
duration of the verification procedure is not more than 15 seconds. Alarm verification shall not be provided for manual fire alarm boxes or water-flow alarm switches.

2. Appropriate "warning" signage as shown in UL 864 shall be placed on the inside face of all control panels, remote transmitting panels, and fireman's command panels. [DELETE COMPONENTS NOT PROVIDED]

F. Electromagnetic Interference

1. All fire alarm control equipment, devices, and wiring shall be protected against unwanted radiated electromagnetic interference (EMI) and radio frequency interference (RFI) which can interfere with normal system processing and possibly cause unwanted alarms.

2. The system shall be designed and installed to be unaffected by the operation of a hand-held portable radio (walkie-talkie) of 5 watts power generating capability, or cellular telephone, within 12 inches of any system device with all appropriate covers installed.

2.2 SYSTEM CONFIGURATION

A. Initiating Device Circuits shall be Class B, supervised with an end-of-line (EOL) resistor.

B. Signaling Line Circuits

1. Circuits connecting only remote annunciation devices with the control panel or circuits only on one floor or zone shall be Class B Style 4 as described in NFPA 72.

2. Circuit risers or circuits serving more than one floor or zone shall be Class A Style 7 and described in NFPA 72. Provide isolation such that a fault on an individual circuit will not affect normal operation of the circuit riser.

C. Notification Appliance Circuits

1. Notification appliance circuits shall be Class B Style Y, 2-conductor circuits when serving only one floor or zone as described by NFPA 72.

2. Circuit risers shall be Class A Style Z as described in NFPA 72.

D. Firefighters' Telephone Circuits, where required, shall be Class B, supervised with end-of-line resistors. [DELETE WHERE NOT PROVIDED]
2.3 POWER SUPPLIES

A. All AC power connections shall meet the requirements of NFPA 72. The Contractor shall connect to the building electrical power panels and shall provide all necessary circuit breakers in the existing electrical distribution panels to serve all new remote control panels and power supply panels. Whenever possible, connections shall be to the building’s designated emergency electrical power circuit.

B. Provide Power Conditioners/Voltage Regulators (PC/VR) for the main and remote fire alarm panels. The PC/VR kVA capacity (rating) shall be capable of supporting the fire alarm equipment. The PC/VR shall have Automatic Voltage Regulation capable of maintaining output voltage to within 5% of its nominal voltage rating with an input voltage variation of +15% to -25%. The conditioner shall meet ANSI/IEEE standard C62.41, 1991 (IEEE 587 category A and B), IEC 1000-4 and 1000-5 for surge suppression and noise attenuation. The units shall be UL listed and shall provide Power Conditioning, Automatic Voltage Regulation and Transient Protection. The units shall be integral to the panels whenever offered by or acceptable to the system manufacturer.

C. All portions of the system, including notification power supplies shall be designed and equipped on standby (rechargeable) battery power, either directly or by provision of an uninterruptible power supply.

D. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any alarm, trouble or operator acknowledgment signals.

D. Operation of any portion of the system on secondary power shall annunciate as a trouble signal, identifying the inoperable power supply(ies).

E. Standby batteries shall have sufficient capacity to maintain all portions of the system in a normal, non-alarm condition for a minimum of 4 hours with an emergency generator or 24 hours without an emergency generator, after which it shall be capable of operating all notification appliances simultaneously for a minimum of 5 minutes for horn alarm systems or 15 minutes for voice alarm systems.

F. All standby batteries shall be continuously monitored by the system. Low battery and disconnection of battery power supply conditions shall immediately annunciate as a trouble signal, identifying the deficient batteries.

G. All power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 24 hours.
maximum. Standby battery capacity may be increased to meet this requirement.

H. All batteries shall be maintenance-free type. Wet cell lead acid standby batteries are prohibited.

I. Design load connected to any power supply, amplifier [DELETE WHEN NOT PROVIDED], and batteries shall not exceed 80% of its rated capacity.

2.4 ANNUNCIATION

A. General

1. The system shall be designed and equipped to receive, monitor, and announce signals from devices and circuits installed throughout the building.

2. Receipt of alarm, supervisory, and trouble signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device.

   a. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet, but not greater than 110 dBA.

   b. Alarm, supervisory, and trouble signals shall initiate recognizably different audible outputs. Supervisory and trouble signals may initiate the same audible output if distinction is by visible annunciation.

   c. Integral audible devices shall continue to sound until silenced by a system operator actuating a switch designated for that purpose.

   d. Receipt of subsequent alarm, supervisory, or trouble signals shall cause the integral audible devices to resound.

3. The system shall be designed and equipped to provide inputs and outputs as described in the Cause and Effect Matrix.

4. The system shall recognize, announce, and store in a memory log each and every instance of the following signals by time and date:

   a. Fire alarms.

   b. Supervisory alarms.

   c. Trouble conditions.
d. Operator acknowledgment of annunciated signals.

e. System reset.

5. All alarm signals, supervisory alarm signals and trouble conditions shall be annunciated by the control panel(s) and by each remote annunciation device. Operator acknowledgment of smoke detection signals and system reset shall be annunciated by the control panel(s).

B. Fire Alarm Signals

Activation of the following devices shall be recognized and annunciated by the system as fire alarms:


2. Open area system type smoke detectors, including spot-type, and beam-type. [DELETE COMPONENTS WHERE NOT PROVIDED]

3. Heat detectors. [DELETE WHERE NOT PROVIDED]

4. Sprinkler waterflow alarm switches. [DELETE WHERE NOT PROVIDED]

5. Dry-pipe sprinkler system alarm pressure switches. [DELETE WHERE NOT PROVIDED]

6. Devices monitoring actuation of kitchen hood or special suppression systems. [DELETE WHERE NOT PROVIDED]

7. Module input – zone of conventional initiating devices. [DELETE WHERE NOT PROVIDED]

C. Supervisory Alarm Signals

The following conditions shall be recognized and annunciated by the system as supervisory alarms:

1. Valve supervisory (tamper) switch actuation. [DELETE WHERE NOT PROVIDED]

2. Duct-type smoke detector activation (latching condition).

3. Fire pump status per NFPA 20 based on the controller provided. [DELETE WHERE NOT PROVIDED]
D. Trouble Signals

1. The system shall recognize and annunciate initiating device circuit (IDC), signaling line circuit (SLC), and notification appliance circuit (NAC) trouble conditions as required by NFPA 72 for the style of circuits utilized.

2. The system shall also recognize and annunciate the following trouble conditions:
   a. Power supply trouble conditions as required by Specification Section 2.3.
   b. Remote annunciation device trouble conditions as required by Specification Section 2.7.
   c. Addressable detector off base, failure to report, dirty device, and so forth.

3. A smoke detector with automatic drift compensation feature requiring maintenance when it reaches 80% of its threshold limit for a period of 24 hours, or equivalent UL listed performance.

E. Operator Acknowledgment Signals

Silencing of integral audible devices required by Specification Section 2.4.A.2 shall be recognized and annunciated by the system as operator acknowledgment of the signal displayed.

2.5 FIRE ALARM CONTROL PANEL(S)

A. Description of Equipment

The fire alarm control panels shall be designed and equipped to provide the following:

1. A fire alarm control panel (FACP) of one of the following manufacturer and model number shall be provided:
   a. Simplex 4100U
   b. Notifier: NFS2-3030
2. The FACP shall function as the system monitor and control points panel and provide manual control switches for control and selection of all control points. The Fire Alarm Control Panel shall include required modules (including microphone and handset) for voice (1-way) and firefighters' telephone system (2-way). [DELETE COMPONENTS NOT PROVIDED]

3. A visible alpha/numeric LCD display indicating current status of the entire system.

4. Standby power supplies capable of supporting all dependent devices and equipment as required by Specification Section 2.3.

5. The system control unit shall have provision for an alarm verification feature for alarm signals received from smoke detectors.

6. Auxiliary relays to affect the following functions:
   a. Shut down air handling units upon detection of smoke.
   b. Elevator recall and elevator shunt trip. [DELETE WHERE NOT PROVIDED]
   c. Stair pressurization fans. [DELETE WHERE NOT PROVIDED]
   d. Smoke control fans. [DELETE WHERE NOT PROVIDED]
   e. Opening of doors for make-up air. [DELETE WHERE NOT PROVIDED]
   f. Damper operation. [DELETE WHERE NOT PROVIDED]
   g. Release of magnetic door hold-open devices. [DELETE WHERE NOT PROVIDED]
   h. Unlocking of access-controlled doors. [DELETE WHERE NOT PROVIDED]

7. Devices or controls to effect reset of the system. The control panel(s) shall not be capable of being reset until all alarm conditions have been cleared.

8. A backup evacuation signal tone generator shall be provided. At the manufacturer’s option, this shall be either an auxiliary circuit board in the master control unit, a second source of auxiliary tone, or other
backup means of tone generation as provided by the manufacturer, and in a UL listed arrangement.

9. One backup amplifier shall be provided for each set of primary amplifiers, and shall be equal to the highest rated (wattage) primary amplifier provided. The backup amplifier shall automatically transfer in place of the defective amplifier in a UL listed arrangement. [DELETE COMPONENTS WHERE NOT PROVIDED]

10. Two pre-recorded field programmable digitized voice messages, alert and evacuation type, as selected by the Owner for emergency voice/alarm communication systems. Evacuation message shall comply with ANSI S3.41 in accordance with NFPA 72. [DELETE COMPONENTS WHERE NOT PROVIDED]

11. Horns shall be temporal pattern complying with ANSI S3.41 in accordance with NFPA 72. [DELETE COMPONENTS WHERE NOT PROVIDED]

12. The control panel shall have a switch for silencing the visible and audible alarm notification appliances. The switch shall be key-operated or located within a locked cabinet. Upon activation, any existing alarm will be transferred to a visible indicator. Any subsequent alarms from other zones will operate the alarm notification appliances. If there is no alarm and the switch is in the "silence" position, a visible alarm indicator shall be lit and a trouble signal shall sound until the switch is restored to "normal." The panel shall also provide a common switch to disable audible and visible signaling appliances for test purposes. When activated ("silence" position) a system trouble signal shall be activated until the switch is returned to the "normal" position.

13. The data communication rate between the system CPU and associated annunciators, remote transmitting panels and addressable initiating devices shall be such that the time delay between activation of an alarm initiating device (excluding retarded workflow switches [DELETE WHERE NOT PROVIDED] and smoke detector circuits arranged for automatic alarm verification) and activation of the associated automatic notification appliance signaling and automatic auxiliary control functions shall not exceed 10 seconds.

B. Emergency Voice/Alarm Communication System [DELETE WHERE NOT PROVIDED]

The fire alarm control panel shall also contain controls for the building’s emergency voice/alarm communication system consisting of:
1. Dual channel, one-way emergency communication ("public-address") evacuation tone capability on an automatic or operator selectable zone-by-zone or "all-call" basis via the fire alarm speakers.

2. The public address system shall be installed using manufacturer-recommended cable and shall be provided for selective communication to any individual floor, zone, combinations of floors or zones, or for general emergency public address announcements throughout the building.

3. The system shall be electrically supervised against faults in speaker circuits and interface wiring, loss of power, module removal, or amplifier, tone generator or pre-amp failure.

4. Electrical failures shall be annunciated audibly and visually at the fire alarm control panels.

5. Amplifiers shall be sized to power all speakers simultaneously, while operating at a maximum of 80% of their rated capacity. Calculations of amplifier capacity shall be provided.

6. One backup amplifier shall be provided for each set of primary amplifiers and shall be equal to the highest rated (wattage) primary amplifier provided.

7. The backup amplifier set shall automatically transfer in place of the defective primary amplifier.

8. Floor or stair speaker zones to be addressed shall be manually connected to the system using speaker zone switches or an "All-Call" switch located at the fire alarm control panel.

9. Emergency public address voice messages shall have priority over all other audible signals on the selected floors.

10. Single, 2-channel, or 3-channel 1-way emergency communication capability on either an automatic or operator selectable zone-by-zone or "all-call" basis via the fire alarm speakers. Equipment shall be arranged so that speaker zones can be selectively addressed, individually, in any combination of individual zones or on "all-call" basis for "public address" paging, digitized voice message, or tone generator signals. For multi-channel requirements, it should be specified that this requirement is for simultaneous operation.

C. Two-way telephone communication system for use by the fire service with capability on a zoned, operator selectable basis via the firefighters' telephone system as follows: [DELETE WHERE NOT PROVIDED]
1. The system shall be electrically supervised against faults in telephone circuits and interface wiring, and loss of power.

2. A LED identifying the zone shall light, and an audible signal shall sound at the central control panel when either a remote telephone is plugged into a remote telephone jack, or a remote telephone is lifted from its cradle in a circuit.

3. The remote telephone shall receive a standby indication signal until the telephone is accessed by the central control panel.

4. Operation of the respective telephone select switch shall establish communications between the selected telephone zone(s) and the central control panel.

4. A cabinet with five handsets shall be provided near the control panel.

D. Coordinate the location of the fire alarm control panel and associated appurtenances with the University of Alabama and the Tuscaloosa Fire and Rescue Department.

2.6 REMOTE CONTROL EQUIPMENT [DELETE WHERE NOT PROVIDED]

A. Description of Equipment

Remote transmitting panels shall:

1. Interface local initiating device and notification appliance circuits or addressable devices with the control panel(s) via the signaling line circuit riser(s).

2. Be provided primary and secondary power in accordance with Specification Section 2.3.

3. Contain amplifiers for speaker circuits, visible notification appliance circuit controls, addressable interface device boards, manual controls, firefighters' master handset, and microphone for speaker circuits, and secondary power supplies for all its associated interconnected equipment.

4. Upon loss of communications to the main control panel or peer control panels, the remote transmitting panel shall operate as a standalone fire alarm control panel.
2.7 ANNUNCIATION DEVICES

A. Description of Equipment

1. Printers

   a. The Contractor shall provide a temporary printer to document system testing during installation.

   b. The printout shall include a clear description of the specific type of signal received during testing, the origin of that signal and the time and date at which the signal was received.

2. Fire Command Center Video Display Unit(s) [DELETE WHERE NOT PROVIDED]

   a. Video Display Unit(s) shall have a minimum 8 x 10 inch viewing area and shall be capable of displaying a minimum of 24 lines of data simultaneously with a minimum of 80 alpha/numeric characters per line.

   b. Display unit(s) shall display all signals received, in the order in which they are received, up to the capacity of the screen. Fire and supervisory signals shall be displayed until the condition is cleared and the control panel has been reset. Trouble signals shall be displayed until the condition is cleared. Subsequent signals shall be stored and shall be displayed sequentially as the preceding signals are acknowledged.

   b. The display unit(s) shall include a clear description of the specific type of signal received, the origin of that signal, and the time and date at which the signal was received.

   c. Operating (electrical) power and standby power shall be provided in accordance with the manufacturer's recommendations.

   d. Power supplied to video display unit(s) shall be continuous and uninterrupted by the loss of the primary source system operating power.

   e. Video display unit(s) in the fire command center shall derive power from the same source as the main control unit, see Specification Section 2.3.

   f. Video display unit(s) shall provide annunciation of signals in accordance with Specification Section 2.4 and shall provide
command and control of fire alarm control panel functions described in Specification Section 2.5.A.

g. Video display unit(s) shall include graphic floor plan representations using imported AutoCAD files to indicate visibly the location of received signals.

3. System Annunciators [DELETE WHERE NOT PROVIDED]

a. Provide a remote LCD annunciator panel. The remote LCD annunciator shall be capable of displaying alarm supervisory, and trouble conditions on a device-by-device basis to replicate device descriptions at the control panel LCD display. The LCD display shall be capable of displaying a minimum of 80 alphanumeric characters over 2 lines.

b. LCD annunciator panel shall be programmed to display a clear description of the specific type of signals received, in the order and the time and date at which they are received, up to the capacity of the screen. Fire and supervisory alarm signals shall be displayed until the condition is cleared and the control panel reset. Trouble signals shall be displayed until the condition is cleared. Subsequent signals shall be stored and shall be displayed sequentially as the preceding signals are acknowledged.

c. The LCD annunciator panel shall not allow system resetting or silencing of the building initiating devices or notification appliances without the use of a key.

B. Coordinate the location of annunciation devices with the University of Alabama and the Tuscaloosa Fire and Rescue Department.

C. Annunciation device faults shall be annunciated as trouble conditions at the fire alarm control panel.

2.8 MANUAL FIRE ALARM BOXES

A. Description of Equipment

1. Manual fire alarm boxes shall be of the double-action, non-coded type. They shall consist of a housing, fitted with a pull-down lever, which when operated, locks in position to effect activation of an initiating or signaling line circuit. The body of the manual fire alarm box shall be permanently attached to the back plate assembly. Resetting the station after operation shall require the use of a key or
special tool. The manual fire alarm box shall be suitable for either surface or semi-flush mounting.

2. Addressable manual fire alarm boxes shall be factory assembled with the addressable module an integral part of the UL listed product.

3. Manual fire alarm boxes shall be installed so that the handle is 48 inches from the finished floor.

2. Manual fire alarm boxes installed outside or in unconditioned building spaces shall be UL listed for such use and shall be so marked. They shall be installed using minimum NEMA Type 3R enclosures with appropriate fittings and raceways.

3. Manual fire alarm boxes installed in areas subject to physical damage shall be provided with UL listed protective wire or polycarbonate covers.

4. Manual fire alarm boxes installed in areas where false alarms are a concern, such as residential buildings, shall be provided with alarmed polycarbonate covers, such as those manufactured by Safety Technology International, Inc. (STI).

2.9 SMOKE DETECTORS

A. Description of Equipment

1. Spot Type Smoke Detectors

These detectors shall be:

a. System-operated, photoelectric type plug-in detectors that mount to a twist lock base shall be provided with a tamper-resistant feature to prevent unauthorized removal. The detectors shall contain an alarm initiating LED which will illuminate to signal activation of the detector. Detectors shall be listed by UL as "Smoke-Automatic Fire Detectors," tested according to UL 268. Detectors listed as "Single and Multiple Station Smoke Detectors," tested according to UL 217 shall not be used.

b. Each smoke detector shall be monitored individually, via an integral, analog addressable element.

c. Spot type smoke detectors shall be located such that they are not affected by airflow from the building’s heating, ventilating, and air conditioning (HVAC) system. In no case shall spot
type smoke detectors be located within 3 feet of supply or return diffusers.

2. Projected Beam Type Smoke Detectors

   a. Projected beam type smoke detectors shall monitor continuously over a given distance and shall consist of an integral transmitter and receiver units with a separate reflective plate. These detectors shall employ an obscuration detection principle using a projected, invisible, infra-red light beam.

   b. Projected beam type smoke detectors shall be 4-wire type, powered from a separate, supervised 2-wire power circuit. Detector power circuits shall be supervised using an end-of-line power supervisory relay monitored by a dedicated, addressable monitor module.

   c. Beam type smoke detectors shall incorporate automatic gain control to compensate for gradual signal deterioration resulting from dirt accumulation on lenses.

3. Duct Smoke Detectors

   a. Duct photoelectric type smoke detectors shall be installed on both the supply and return in all new and existing air handling systems over 2,000 CFM in accordance with the requirements of NFPA 72, NFPA 90A, the International Mechanical Code, local requirements, and the detector manufacturer’s installation instructions. Duct smoke detectors shall be suitable for the full range of air velocity conditions in the air handling systems in which they are installed. Calculations or measurements of air velocities shall be provided to ensure duct detectors are installed within their UL listed range of air flow. Duct smoke detectors shall be installed in supply and return sides of air distribution systems. On the supply side duct detectors shall be provided on the common duct upstream of any branch connections or common plenums.

   b. Duct smoke detectors shall be of the analog, addressable type, consisting of a plug-in detector head in a duct mounted housing equipped with metal air sampling tubes providing air flow through the detector housing. Duct smoke detectors shall be listed or approved for that application including temperature and humidity listings. Duct smoke detector operating voltage shall be (nominal) 24 VDC supplied by the fire alarm system.
c. Each duct smoke detector shall be monitored individually via an integral, analog addressable element.

d. These detectors shall be arranged to initiate shutdown of their associated fan and air handling unit on alarm from their associated addressable control relays.

e. Provide necessary interlock wiring to fan and air handling unit starters and motor control centers for shutdown of fans when smoke is detected.

f. Smoke detectors used solely for closing dampers shall not be required to activate the building evacuation alarm.

g. Sampling tubes shall extend across the full width of the duct. The ends of the sampling tubes shall be accessible from outside the duct and shall be sealed with removable plugs (to facilitate detector testing). Access hatches shall be provided to inspect sampling tubes.

h. Sampling tubes shall be metal and of the perforated type. Slot type sampling tubes shall not be acceptable. A short pick-up tube not extending across the widest dimension of the duct shall not be acceptable.

i. Each duct smoke detector located more than 5 feet above the floor, shall be provided with a magnetically operated remote test station, incorporating a remote alarm LED. Test stations shall be labeled with engraved, laminated plastic labels identifying the type of detector.

2.10 HEAT DETECTORS [DELETE WHERE NOT PROVIDED]

A. Description of Equipment

1. Heat detectors shall be low profile, combination rate-of-rise and fixed temperature type.

2. Heat detectors shall actuate when the temperature either increases at a rate exceeding 15°F per minute or reaches 135°F except where otherwise required by NFPA 72. (180°F where ambient temperature exceeds 100°F).

3. Addressable elements shall be integral to the detector.

4. Heat detectors for elevator power interrupt shall be provided and installed in sprinkler protected elevator machine rooms and
hoistways in accordance with ANSI A17.1. Signals from the elevator machine room and hoistway heat detectors shall be annunciated on the building fire alarm system as "elevator heat detectors." Where heat detectors are used to shutdown elevator power prior to sprinkler operation, the detector shall have both a lower temperature rating and a higher sensitivity as compared to the sprinkler.

2.11 SPRINKLER SUPERVISORY AND ALARM EQUIPMENT

A. All sprinkler alarm and supervisory devices are either existing or shall be installed by others. These devices will be located as indicated on the drawings and include:

1. Waterflow alarm switches.
2. Dry-pipe sprinkler system alarm pressure switches.
3. Valve supervisory (tamper) switches.
4. High-Low supervisory air pressure switches (on dry or pre-action sprinkler systems only).
5. Fire pump status as required by NFPA 20.

B. Sprinkler supervisory devices shall be connected to the fire alarm system and monitored.

C. Waterflow alarm switches and alarm pressure switches shall be monitored as fire alarm signals. All other sprinkler supervisory devices shall be monitored as supervisory signals.

D. The Contractor shall make all terminations necessary to monitor sprinkler supervisory devices, except for terminations between the fire pump controller and the fire alarm system terminal interface, which shall be provided by others and will depend on the capabilities of the existing controller.

E. The Contractor shall coordinate with the Sprinkler Contractor and the Owner’s Representative for testing these devices. Documentation of sprinkler supervisory device testing shall be a part of this contract.

2.12 DOOR HOLDERS (NEW)

A. Magnetic door holders shall have an approximate holding force of 25 pounds.
B. The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing.

C. Unit shall be capable of being either surface, flush, semi-flush, or floor mounted as required.

D. Door holders shall be UL listed for their intended purpose.

E. Door holders shall be either 24VDC or 120VAC.

2.13 ADDRESSABLE CIRCUIT INTERFACE MODULES

A. The Contractor shall provide, install, and test addressable circuit interfaces as necessary to comply with the cause and effects matrix, whether shown on the engineering drawings or not.

B. All circuit interfaces used for supervisory or control functions shall be mounted within 3 feet of this monitored switch or circuit. The control relay shall not be required to be within 3 feet of the circuit when failure results in the operation of devices in a “Fail-safe” mode.

2.14 AUDIBLE/VISIBLE NOTIFICATION APPLIANCES

A. Description of Equipment

1. Notification appliances shall consist of an audible component (fire alarm speaker or horn), a visible component (strobe), or a combination of the two appliances. Ceiling-mounted appliances shall be white. The color of wall-mounted appliances shall be selected by the University of Alabama.

2. Notification appliances installed in areas subject to physical damage shall be installed with protective covers as recommended by the manufacturer.

3. Audible notification appliances shall be installed, spaced and tapped (when speakers are provided) so as to produce a sound output on alarm which is clearly audible above the ambient noise level throughout the building. In no case shall the audible alarm be less than 15 dBA above the ambient room noise level or less than 5 dBA above the maximum ambient noise level. In no case shall the audible sound output exceed 110 dBA.

   a. Fire Alarm Speakers shall:

      1) Be listed in accordance with UL 1480.
2) Have multi-taps with a minimum range from ¼-watt to 2 watts. Speakers shall be sized, spaced and tapped to provide a sound output, on alarm, of no less than 15 dBA above ambient sound levels.

3) Speakers shall be located throughout to provide a minimum of 15 dBA above ambient in all areas designated as public mode notification zones. Speakers shall also be provided in all exit stairways. Each exit stairway shall be zoned individually and be capable of manual control. Speaker zones for individual floors shall not include exit stairways.

b. Fire Alarm Horns shall: [DELETE WHERE NOT PROVIDED]

1) Be listed in accordance with UL 464.

2) In no case produce a sound output, on alarm, of less than 90 dBA at 10 feet.

3) Be electronic type providing the temporal pattern distinctive evacuation signal in accordance with ANSI S3.41.

4) Wall mounted horns (when not provided with a visible component) shall be mounted not less than 90 inches above the finished floor, and not less than 6 inches below the finished ceiling.

5) Horns shall be synchronizable with all audible notification appliances with the zone.

c. Visible Notification Appliances

1) Visible notification appliances shall be a minimum of 15 and maximum of 185 candela.

2) Visible notification appliances shall consist of a Xenon flash tube, high intensity strobe lamp, with clear (nominal white) light having a flash rate of 1 to 3 flashes per second. The maximum pulse duration shall be 2/10’s of one second (0.2 seconds), with a maximum duty cycle of 40%. The pulse duration is defined as the time interval between initial and final points of 10% of maximum signal.

3) Visible notification appliances shall be listed for the
specific application of wall mounted or ceiling mounted. When mounted on the wall, the word “Fire” shall read from top to bottom. When mounted on the ceiling, the word “Fire” shall read left to right.

4) Wall mounted visible notification appliances shall be mounted not less than 80 inches above the finished floor, or 6 inches below the ceiling, whichever is lower.

5) Ceiling mounted visible notification appliances shall be located in accordance with NFPA 72.

6) Placement of visible notification appliances in rooms and corridors more than 20 feet wide shall be in accordance with NFPA 72 for room configurations.

7) Placement of visible notification appliances in corridors 20 feet or less in width shall be in accordance with NFPA 72 for corridor spacing.

8) Placement of visible notification appliances in accessible sleeping rooms shall be in accordance with NFPA 72 Table 7.5.4.4.2 for sleeping rooms.

   a. For installation of visible notification appliances equal to or greater than 24 inches from the ceiling, the intensity shall be 110 cd.

   b. For installation of visible notification appliances less than 24 inches from the ceiling, the intensity shall be 177 cd.

9) Shall be installed in all public or general areas including but not limited to, public restrooms, meeting rooms, dining rooms, classrooms, copy rooms, conference rooms, assembly areas, common laboratories, common areas, corridors, and offices. Spacing and layout shall be as required by ADAAG and NFPA 72.

10) Visible notification appliances shall be listed in accordance with UL 1971.

11) Visible appliances shall activate anytime audible appliances are activated. This activation shall occur when an audible notification appliance circuit is activated manually or automatically without operating additional switches.
12) More than two strobes within the same view (135°) shall be synchronized in accordance with NFPA 72.

2.15 FIREFIGHTERS’ TELEPHONE EQUIPMENT [DELETE WHERE NOT PROVIDED]

A. Telephone Jacks

4. Where required, telephone jack stations shall be provided at stair entrances, elevator lobbies, elevator cars, and the fire pump room where provided.

5. Telephone jack stations shall be a single gang, stainless steel plate with engraved identification as "Fire Emergency Phone Jack".

B. Telephone Cabinets

6. Telephone cabinets shall be provided in enclosed stairs at every fifth level, exit corridors, elevator lobbies, and the fire pump room, where provided, as indicated on the drawings.

7. Telephone cabinets shall be provided with key locked (keyed alike with fire alarm control panel key and manual fire alarm station key) and break glass panel.

8. Cabinets shall be flush, semi-surface, or surface mounted as approved by the Owner.

9. Cabinets shall have a polished stainless steel or painted red finish with silk screened identification as "Emergency Telephone".

10. Telephone connected cable shall be a security type armored cable.

11. Cabinet shall be provided with an LED call indication light, which lights when the station is connected to the communication control panel.

2.16 CONDUCTORS AND RACEWAY

A. Except as otherwise required by Code and/or these Specifications, the installation of fire alarm circuits shall conform to the requirements of Article 760 and raceway installation to the applicable sections NFPA 70, National Electrical Code. Fire alarm circuit wiring shall include all circuits described in Section 760.1 including Fine Print Note No. 1 (FPN No. 1).
B. Non power-limited fire alarm (NPLFA) circuits shall have overcurrent protection and be installed in conformance with Parts I and II of Article 760 and the applicable requirements of NFPA 70.

C. Power-limited fire alarm (PLFA) circuits shall be installed in conformance with Parts I and III of Article 760. The power sources for PLFA circuits shall meet the requirements of Section 760.121 and the equipment supplying power shall be durably marked as required by Section 760.124.

D. Power-limited circuits which are reclassified as non-power-limited circuits shall meet the requirements of Part II of Article 760, including overcurrent protection, and shall have the marking required by Section 760.124 eliminated. Reclassified circuits shall remain non-power-limited throughout their entirety.

E. Fire alarm circuits installed in locations other than ordinary indoor, dry locations shall be in conformance with Sections 760.3 and 760.32 with conductor or cable types suitable for the installation conditions.

F. Separation of circuits shall be in conformance with Section 760.48 for NPLFA circuits and Section 760.133 for PLFA circuits.

G. Nonpower-limited circuit (NPLFA) conductor sizes, insulation types and installation methods shall be as limited by Sections 760.49, 760.51 and 760.53.

H. Power-limited circuit (PLFA) wiring material and installation methods shall be cable listed and marked in accordance with Section 760.179.

I. All fire alarm circuits shall be installed in conduit by methods permissible in NFPA 70.

J. All circuit runs shall be continuous between devices, without splices, wherever feasible. Where a continuous run is not feasible, connections shall be made in a UL listed metal electrical box. Wire nuts shall not be permitted on low voltage circuits. All other connections shall be to terminal blocks in metal enclosures conforming to the requirements of NFPA 70, National Electrical Code. Conductors connected together shall have the same color insulation. All connections shall be accessible for inspection and servicing and shall be clearly identified on the contractor record drawings.

K. Wire and cable shall be sized, twisted and shielded as recommended by the fire alarm system manufacturer, and shall meet the requirements of Article 760 of NFPA 70, National Electrical Code.

L. All conduit shall be grounded by approved ground clamps or other means in conformance with the National Electrical Code.
M. Where conduit is imbedded in plaster, the Contractor shall use a type approved by the National Electrical Code for this use. All joints in such imbedded conduit shall be liquid and gas-tight.

N. Continuous run of conduit without joints is preferred for imbedding.

O. All electrical enclosures, raceways and conduits shall contain only those electrical circuits associated with the fire alarm system and shall not contain any circuits that are unrelated to the system.

P. Cables and conductors having scrapes, nicks, gouges, or crushed insulation shall not be used.

Q. The use of aluminum wire is prohibited.

R. All electrical circuits shall be numerically identified at both ends with machine-generated labels.

S. All system conductors, except grounding conductors, shall be solid copper.

T. All end-of-line resistors shall be mounted on terminal blocks.

U. All underground wiring shall be fire alarm listed suitable for direct burial, such as West Penn Aquaseal or Belden equivalent. All wiring shall be installed in liquid-tight PVC conduit with no splicing below ground. Provide additional ground wire within conduit to maintain reference ground on system between buildings.

V. All conduit, junction boxes, and enclosures subjected to moisture shall be weatherproof (NEMA 3, 4, or 4X) as required.

W. All conductor shielding shall be continuous (with splices) for the length of the circuit and shall be grounded at the associated control panel only.

X. Shield drain conductors and foil shall be trimmed and taped at each splice to prevent grounding of the shield at any location other than the associated control panel.

2.17 RETRANSMISSION OF FIRE ALARMS SIGNALS

A. Provide, install, and program a supervised RS-232C output.

B. Provide and install a Keltron radio frequency transceiver with the Data tap RS-232C interface.

C. Coordinate programming of the point annunciation at the University of Alabama’s proprietary supervising station system located at the University
of Alabama Police Department (UAPD) in New Hall and the redundant system at Security Resources.

2.18 BOX LOCATION

A. All device backboxes, junction boxes and pull boxes shall be accessible for inspection and maintenance.

B. Junction pull boxes shall be installed on 100 foot centers maximum.

C. Terminal cabinets installed outdoors or in areas subjected to moisture shall be weatherproof (NEMA 3R) and shall be installed no less than 18-inches above grade. In areas subject to lightning, terminal strips shall be isolated from the enclosure by non-metallic base plates to prevent arcing of contacts to enclosure. Boxes shall also be grounded using approved grounding rods.

2.19 SPARE PARTS

The Contractor shall supply as part of this contract, the following spare parts:

A. Automatic detection devices – Two percent of the installed quantity of each type, but not less than two.

B. Manual fire alarm boxes - One percent of the installed quantity of each type, but not less than one.

C. Audible and visible appliances - Two percent of the installed quantity of each type, but no less than two.

D. Fuses - Five of each for each type, rating and size of fuse used in the system.

E. Keys - A minimum of three sets of keys shall be provided and appropriately identified.

2.20 TRANSIENT SUPPRESSION [DELETE WHERE NOT PROVIDED]

A. Transient suppression shall be provided for each circuit connected to the Fire Alarm System that enters or exits the building housing the fire alarm control panel. Provide and install in accordance with NFPA 780.

B. Catalog data sheets for the transient devices installed shall be included in the submittal. Each device shall be noted on the data sheets as UL listed to operate on the circuit (120V, SLC, NAC, IDC, etc.) for which it is being employed.
C. The installation of transient suppression shall be at a location that facilitates maintenance and inspection and is adjacent to the point of exit or entry to the building for all low voltage circuits. The suppression devices shall be installed in junction boxes that are sized to house the suppression module and the terminal blocks which interconnect them to the fire alarm circuits.

D. Surge arrestors on surge suppression devices which are integral to FACP components or circuit boards shall not be considered “as-equal” to this requirement for individual dedicated circuit protection.

3.0 EXECUTION

3.1 STARTING AND COMPLETION DATES

The starting and completion dates for this work will be established at the pre-bid meeting.

3.2 INSPECTION

The job site supervisor shall examine daily all areas in which the work will be performed on the day prior to beginning work. The supervisor shall immediately report unsatisfactory working conditions to the Owner for resolution. The supervisor shall not proceed with the work until all unsatisfactory working conditions have been corrected.

3.3 INSTALLATION

A. General

1. All wires and cable shall be installed in conduit to include electrical metallic tubing (EMT), flexible metallic conduit (FMC), or surface metal raceway. Conduit installed in areas subject to physical damage shall be rigid metal conduit (RMC). PVC conduit shall be used in areas subject to moisture or other areas where corrosion is a concern.

2. All holes made by the Contractor in any wall, ceiling or floor shall be patched by the Contractor, restoring the walls, ceilings, and floors to their original condition, fire resistance and integrity.

3. Removal and repair of all finished surfaces shall be coordinated with the Owner and is subject to his approval. Repair of surfaces will be evaluated by the university architect on a case-by-case basis.

4. All piping and conduit shall be installed at a height so as not to obstruct any portion of a window, doorway, stairway or passageway,
and shall not interfere with the operation of any existing mechanical or electrical equipment.

5. System riser(s) shall be installed in mechanical raceways or conduit, located to avoid physical harm. They shall be routed through protected spaces, such as electrical closets. Locations such as loading docks and less than 7 feet above the floor in elevator lobbies shall be avoided.

6. Locations of all equipment, controls and system components are subject to the approval of the Owner.

7. Contractor is responsible for protecting both new and existing smoke detectors during construction. These detectors shall be covered during construction. All such covers shall be removed upon completion of work.

8. All work shall be carefully scheduled with all departments of the University of Alabama that utilize the specific building to avoid disruption to daily operations or scheduled events.

9. All systems, components, equipment, devices, conductors, and other fire protection appurtenances shall be installed and dressed in a workman-like manner, so as to maintain such equipment readily identifiable, accessible and serviceable. Any equipment not installed in this manner will be replaced and reinstalled at the Contractor’s expense and to the satisfaction of the Owner.

10. Provide machine-generated labels on all devices to identify clearly the associated device address. The label appearance and proposed placement on devices shall be coordinated in advance with the Owner.

B. Concealment

1. All conduit, raceways, junction boxes and device backboxes shall be concealed in walls, ceiling spaces, electrical shafts or closets in all finished areas. Conduit, raceways, junction boxes and device backboxes may be exposed in unfinished back-of-house areas or mechanical equipment rooms.

2. Surface metal raceway (i.e., wire mold, conduit) is permitted in finished areas where approved by the Owner on a case-by-case basis. Locations where metal raceway is proposed shall be clearly identified on the contractor’s shop drawings.

3. Exposed conduit, raceways, junction boxes and equipment backboxes permitted to be install by the owner shall be painted to be
as inconspicuous as possible. The Owner shall approve the paint color selected. The Contractor shall prepare color samples for inspection by the Owner prior to painting.

4. Accessible conduit, raceways, junction boxes, and other associated items related to the conduit network shall be provided with red bands every 10 feet with junction box covers labeled as fire alarm, unless specifically instructed otherwise.

3.4 TESTING

A. System Tests

1. The Contractor shall provide the Owner with written certification that all equipment:
   a. Has been inspected and tested by a manufacturer's certified representative.
   b. Is installed in accordance with the manufacturer's recommendations and UL listings.
   c. Is in proper working order.
   d. The Contractor shall provide completed Inspection and Testing forms as outlined in NFPA 72.

B. Acceptance Testing

Upon completion of the installation or each installation phase where applicable, the Contractor shall perform and document on an approved format, system tests as required herein. All acceptance tests shall be performed in the presence of the Owner or his designated representatives.

1. All conductors, including shielding conductors, shall be tested for continuity, shorts to ground and shorts between pairs.

2. All remote transmitting panel monitor points shall be functionally tested and monitor point identifications verified. [DELETE COMPONENTS WHERE NOT PROVIDED]

3. All alarm initiating devices shall be functionally tested. This includes all smoke detectors, heat detectors [DELETE WHERE NOT PROVIDED], and manual fire alarm boxes.

4. All supervisory functions of each initiating device circuit, signaling line circuit, and notification appliance circuit shall be functionally tested.
5. All notification appliances shall be checked for proper operation with the voltage measured at the last appliance on each of the notification appliance circuits.

6. The strobe intensity (candela rating) and synchronization of all visible notification appliances shall be verified.

7. All fire safety functions (e.g., elevator recall, smoke control, door unlocking) [DELETE EXAMPLES WHEN FEATURES ARE NOT PROVIDED] initiated by the fire alarm control panel shall be tested.

8. Receipt of all alarm, supervisory, and trouble signals, initiated during the course of the testing shall be verified at each annunciation device.

9. Correct labeling of all annunciation device LED's shall be verified.

10. Sound level tests shall be performed in at least 10% of rooms on each floor and all corridors to verify minimum conformance with NFPA 72 and ADA requirements.

11. Correct annunciation of all points shall be verified.

12. Standby batteries shall be load tested to confirm compliance with the approved design capacity.

13. The system CPU and annunciators [DELETE WHERE NOT PROVIDED] shall be load tested for 4 hours on standby battery power.

14. All remote transmitting panels shall be load tested to demonstrate the required standby battery power has been provided. [DELETE WHERE NOT PROVIDED]

15. Any additional tests, required by the referenced codes, standards, or criteria, or by the Owner, shall be performed.

16. Documentation of such tests shall include:
   a. The date and time of each test.
   b. A reference set of contractor record drawings, numerically identifying the individual components and circuits tested, test locations, and indicating the measured sound level in each location.
   c. A description of each test performed.
d. A checklist of each device and circuit tested, indicating the results of each test.

e. The names and signatures of the individuals conducting and witnessing each test.

f. A complete printout of the system program produced by the temporary system printer provided for documentation purposes during the installation. This printout shall be produced and dated upon completion of all required contractor testing/verification, including any modifications necessary prior to final acceptance testing.

17. The Contractor shall post suitable signs the day prior to, and shall maintain during testing which indicate the date and time fire alarm testing is to occur. The signs shall be located in suitable locations so as to notify occupants of the testing.

C. Final Inspection and Tests

1. The Contractor shall make arrangements with the Owner’s Representative for final inspection and witnessing of the final acceptance tests. The Owner’s Representative and The Owner’s Consultant will witness the final acceptance test.

   a. When local code authorities are required to witness tests, the Contractor shall be responsible for making all necessary arrangements with the code authorities and coordinating the work with the Owner’s Representative and Owner’s Consultant.

   b. The Contractor shall be responsible for obtaining all test documents with necessary approval stamps and signatures of the code authorities. The Contractor shall submit copies of each of these documents to the Owner’s Consultant.

2. If after being advised by the Contractor that the work is completed and ready for test, the work has not been completed or the final acceptance tests are unsatisfactory, the Contractor shall be responsible for the Owner’s extra expenses for re-inspection and witnessing the retesting of the work and additional reporting documentation. Such extra fees shall be deducted from the payments made by the Owner to the Contractor.

3. The Contractor shall provide at least five working days notice for all tests.
3.5 MATERIAL HANDLING

A. Storage

1. The Owner will provide the Contractor with a lockable storage space for the Contractor's use during this project. The Contractor shall be responsible for the security of this space.

2. Overnight storage of materials is limited to the assigned storage area. Materials brought to the work area shall be installed the same day, or returned to the assigned storage area unless previously approved by the Owner.

B. Receiving and Handling

1. The Contractor shall be responsible for all receiving, handling, and storage of his materials at the job site.

2. Use of loading docks, service driveways, and freight elevators shall be closely coordinated with the Owner.

C. Rubbish Removal

1. The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Owner and back-charged to the Contractor.

2. Removal of debris and rubbish from the premises shall be coordinated with the Owner.

END OF SECTION