

SECTION 28 00 01
ELECTRONIC SAFETY BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

- A. Work included in 28 00 01 applies to Division 28, Electronic Safety work to provide materials, labor, tools, permits and incidentals to make electronic safety systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

- A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete Electronic Safety system for this project.
- B. Alternates to this Document may be offered as a separate proposal.

1.03 DESIGN-BUILD DESIGN APPROACH

- A. Use this Specification as a guide for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.
- B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by AHJ.
- C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD DESIGN CRITERIA/CALCULATIONS

- A. Related Work Specified Elsewhere:
 - 1. Contents of Section apply to Division 28, Electronic Safety Specifications.
 - 2. Requirements of Section are a minimum for Division 28, Electronic Safety Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.
- B. Fire Alarm Design Criteria: Refer to Section 28 31 00, Fire Detection and Alarm, for fire alarm system design criteria.
- C. Fire Alarm Equipment: Refer to Section 28 31 00, Fire Detection and Alarm, for fire alarm equipment requirements.

1.05 SECTION INCLUDES

- A. Work included in 28 00 01, Electronic Safety Basic Requirements applies to Division 28, Electronic Safety work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electronic safety systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
 - 1. Provide: To furnish and install, complete and ready for intended use.
 - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
 - 3. Install: Includes unloading, unpacking, assembling, erecting, installing, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
 - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01,

General Requirements, and approved by the Engineer prior to submitting bids for substituted items.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities having jurisdiction, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

- A. Contents of Section apply to Division 28, Electronic Safety Contract Documents.
- B. Related Work:
 1. Additional conditions apply to this Division including, but not limited to:
 - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
 - b. Drawings
 - c. Addenda
 - d. Owner/Architect Agreement
 - e. Owner/Contractor Agreement
 - f. Codes, Standards, Public Ordinances and Permits
- C. Contents of Division 26, Electrical apply to this Section.

1.07 REFERENCES AND STANDARDS

- A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 28, Electronic Safety Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
 1. State of Washington:
 - a. IBC - International Building Code
 - b. IFC - International Fire Code
 - c. IMC - International Mechanical Code
 - d. NEC - National Electrical Code
 - e. UPC - Uniform Plumbing Code
 - f. WAC - Washington Administrative Code
 - g. WSEC - Washington State Energy Code
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
 1. ABA - Architectural Barriers Act
 2. ADA - Americans with Disabilities Act
 3. ANSI - American National Standards Institute
 4. ASCE - American Society of Civil Engineers
 5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
 6. ASHRAE Guideline 0, the Commissioning Process
 7. ASME - American Society of Mechanical Engineers
 8. ASTM - ASTM International
 9. CFR - Code of Federal Regulations

10. EPA - Environmental Protection Agency
 11. ETL - Electrical Testing Laboratories
 12. FM - FM Global
 13. ISO - International Organization for Standardization
 14. NEC - National Electric Code
 15. NEMA - National Electrical Manufacturers Association
 16. NFPA - National Fire Protection Association
 17. OSHA - Occupational Safety and Health Administration
 18. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association
 19. UL - Underwriters Laboratories Inc.
- D. See Division 28, Electronic Safety individual Sections for additional references.

1.08 SUBMITTALS

- A. See Division 01, General Requirements for Submittal Procedures.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
- D. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.
- E. Product Data: Provide manufacturer's descriptive literature for products specified in Division 28, Electronic Safety Sections.
- F. Identify/mark each submittal in detail. Note what difference, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and drawings.
 1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
 2. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference individual Division 28, Electronic Safety specification Sections for specific items required in product data submittal outside of these requirements.
 3. See Division 28, Electronic Safety individual Sections for additional submittal requirements outside of these requirements.
- G. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

- H. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer's comments. Identify Engineer's comments and provide an individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.
- I. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
- J. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 28, Electronic Safety Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety submittals.
- K. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
- L. Substitutions and Variation from Basis of Design:
 - 1. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
 - 2. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor are required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
 - 3. Where manufacturer equipment or model numbers are indicated with no exceptions, substitutions will be rejected.
- M. Shop Drawings:
 - 1. Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 28, Electronic Safety specification Sections for additional requirements for shop drawings outside of these requirements.
 - 2. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
- N. Samples: Provide samples when requested by individual Sections.
- O. Resubmission Requirements:
 - 1. Make any corrections or change in submittals when required by Architect/Engineer review comments. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
 - 2. Resubmit for review until review indicates no exception taken or "make corrections noted."
 - 3. When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.

P. Operation and Maintenance Manuals, Owner's Instructions:

1. Reference individual Division 28, Electronic Safety Specification Sections for additional requirements for operations and maintenance manuals.
2. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
 - a. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
 - b. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes and quantities relevant to each piece of equipment.
 - c. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
 - d. Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Sections.
 - e. Include product certificates of warranties and guarantees.
 - f. Include copy of start-up and test reports specific to each piece of equipment.
 - g. Include commissioning reports.
 - h. Engineer will return incomplete documentation without review.
 - i. Engineer will provide one set of review comments in Submittal Review format. Arrange for additional reviews; Bear costs for additional reviews at Engineer's hourly rates.
3. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 28 00 01, Electronic Safety Basic Requirements Article titled "Demonstration."
4. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

Q. Record Drawings:

1. Maintain at site at least one set of drawings for recording "as-constructed" conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements and location of concealed items. Include items changed by addenda, field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment locations, calculations, and schedules that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.
4. See Division 28, Electronic Safety individual Sections for additional items to include in Record Drawings.

1.09 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at

variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (e.g. cable tray, panels, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Provide products that are UL listed.

1.10 WARRANTY

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.11 COORDINATION DOCUMENTS

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence. Unless otherwise required by Division 00, Procurement and Contracting Requirements and/or Division 01, General Requirements, Division 28, Electronic Safety to combine information furnished by other trades onto master coordination documents.
- B. Prepare Drawings as follows:
 - 1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
 - 2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
 - 3. Indicate fittings, hangers, access panels, and elevation of bottom of cable tray above finished floor.

4. Drawings to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork.
5. Incorporate Addenda items and change orders.
6. Provide additional coordination as requested by other trades.
- C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- D. Verify in field exact size, location, and clearances of existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.
- E. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacture, including but not limited to panels, devices and equipment unless otherwise specified in individual Division 28, Electronic Safety Sections.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or FM approved or have adequate approval or be acceptable by state, county, and city authorities.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:
 1. Comply with local, State of Washington, and Federal regulations relating to hazardous materials.
 2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
 3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

2.03 ACCESS PANELS

- A. See Division 01, General Requirements and Division 08, Openings for products and installation requirements.
- B. Confirm Access Panel requirements in Division 01, General Requirements, Division 08, Openings and individual Division 28, Electronic Safety Sections. In absence of specific requirements, comply with the following:
 1. Provide flush mounting access panels for systems and individual components, service of electronic safety systems equipment and junction boxes requiring maintenance, inspection or servicing. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
 - a. Ceiling access panels to be minimum of 24-inch by 24-inch required and approved size.
 - b. Wall access panels to be minimum of 12-inch by 12-inch required and approved size.
 - c. Provide screwdriver operated catch.
 - d. Manufacturers and Model:
 - 1) Drywall: Karp KDW.

- 2) Plaster: Karp DSC-214PL.
- 3) Masonry: Karp DSC-214M.
- 4) 2 hour rated: Karp KPF-350FR.
- 5) Manufacturers: Karp, Milco, Elmdor, Acudor, or approved equivalent.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- B. Install equipment having components requiring access (i.e., devices, equipment, electrical boxes, panels, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.
- D. Earthwork:
 1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
 - b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
 - c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.
- E. Firestopping:
 1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection.
 2. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around conduit, raceway and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- F. Plenums: In plenums, provide plenum rated materials that meet the requirements to be installed in plenums.

3.02 SEISMIC CONTROL

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 28 Electronic Safety Sections.
- B. Earthquake resistant designs for Electronic Safety (Division 28) systems and equipment to conform to regulations of jurisdiction having authority.

- C. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
- D. Provide means to prohibit excessive motion of safety equipment during earthquake.

3.03 REVIEW AND OBSERVATION

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
 - 1. Underground conduit and wire installation prior to backfilling.
 - 2. Prior to covering walls when electronic safety systems installation is started.
 - 3. Prior to ceiling cover/installation.
 - 4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements in Division 01, General Requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
 - 2. Prior to changing over to new system, verify that every item is thoroughly prepared. Install new wiring to point of connection.
 - 3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
 - 4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

- A. Confirm Cutting and Patching Requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
 - 2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, repair, refinish and leave in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with the individual Division 28, Electronic Safety Sections and the following:
 1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust.
 2. Protect equipment and pipe to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
 3. Protect devices, panels and similar items until in service.
 4. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

3.08 DEMONSTRATION

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- B. Upon completion of work and adjustment of equipment, test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Staff as specified in Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- C. Manufacturer's Field Services: Furnish services of a qualified factory certified instructor at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

- A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28 Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

- A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 01, Electronic Safety Basic Requirements and individual Division 28, Electronic Safety Sections.
- B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to building structure. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- D. Provide miscellaneous supports required for installation of equipment, conduit and wiring.

3.11 PAINTING

- A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e. hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
 - 2. In electrical and mechanical room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
 - 3. See individual equipment Specifications for other painting.
 - 4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
 - 5. Conduit: Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.

3.12 ACCESS PANELS

- A. Confirm Access Panel requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. Provide access panels for access to concealed equipment, junction boxes and controls. Quantity and location of access panels is the responsibility of the contractor to coordinate with as-built conditions and may not be indicated on Drawings. Submit proposed access panel layout to architect for confirmation of design intent.

3.13 ACCEPTANCE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
 - a. Cleaning
 - b. Operation and Maintenance Manuals
 - c. Training of Operating Personnel
 - d. Record Drawings
 - e. Warranty and Guaranty Certificates

f. Start-up/test Documents and Commissioning Reports

3.14 FIELD QUALITY CONTROL

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Safety Sections and the following:
 - 1. Tests:
 - a. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Closeout Documents.
 - b. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.15 LETTER OF CONFORMANCE

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement in letter that electronic safety systems were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in operating and maintenance manuals.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Fire Alarm Control Units
2. Notification Appliance Circuit Panels
3. Fire Alarm Transmitters
4. Fire Alarm Annunciators
5. Fire Alarm Emergency Voice/Alarm Communications System Control Units
6. Manual Pull Stations
7. Fixed Temperature Heat Detectors
8. Rate-of-Rise and Fixed Temperature Heat Detectors
9. Photoelectric Type Detectors
10. Carbon Monoxide and Photoelectric Type Detectors
11. Projected Beam Type Smoke Detectors
12. Duct-Mounted Smoke Detectors
13. Relay Modules
14. Control Modules
15. Input Modules
16. Fault Isolation Modules
17. Speakers
18. Combination Speaker/Strobes
19. Strobes
20. Sounder Bases
21. Miscellaneous Accessories

B. Scope:

1. Provide a new fire alarm system.
2. Provide a new fire alarm transmitter communication system.
3. Provide a new emergency voice alarm communication system.
4. Provide new building carbon monoxide detection and alarm.

C. In addition, provide design for the following as required in these Contract Documents:

1. Fire Alarm System
2. Fire Alarm Transmitter Communication System
3. Emergency Voice Alarm Communication System
4. Building Carbon Monoxide detection and alarms.

D. System Design:

1. Design Criteria: These are Contractor designed systems. Contact AHJ prior to bid to verify systems' requirements. Design systems in compliance with code as interpreted by the AHJ.
2. Design of Fire Alarm System:
 - a. Provide design of the fire alarm system as required by code.

- b. Fire Alarm Sequence of Operation: Activation of manual fire alarm box, automatic fire detector, or fire extinguishing system causes system to enter "alarm" mode including the following operations:
 - 1) Local English language annunciation of device location, address and condition and audible and visual alarm signal at control panel and remote annunciators.
 - 2) Manual "acknowledge" function at control panel and remote annunciators to silence audible alarm signal, visual signal remains displayed until initiating alarm is cleared.
 - 3) Transmit "alarm" signal to off-premises equipment, i.e., to local fire department or Owner's selected vendor. Provide necessary connections to transmitter.
 - 4) Activate fire alarm notification appliances.
 - 5) Activate Emergency Control Functions as required by code.
 - a) Transmit signal to fire/smoke dampers.
 - b) Transmit signal to initiate shutdown of air handling equipment.
 - c) Transmit signal to release fire doors.
- c. Supervisory Sequence of Operation: Fire sprinkler tamper or supervisory pressure switch activation, or duct-mounted smoke detector activation causes system to enter "supervisory" mode including the following operations:
 - 1) Local English language annunciation of device location, address and condition and audible and visual supervisory signal at control panel and remote annunciators.
 - 2) Manual "acknowledge" function at control panel and remote annunciators to silence audible supervisory signal, visual signal remains displayed until initiating supervisory is cleared.
 - 3) Transmit "supervisory" signal to off-premises equipment.
 - 4) Transmit signal to fire/smoke dampers (duct detector only).
 - 5) Transmit signal to initiate shutdown of air handling equipment (duct detector only).
 - 6) Operate building carbon monoxide notification appliances (building carbon monoxide detector only).
- d. Trouble Sequence of Operation: System trouble, including single ground or open of supervised circuit, or power or system failure, causes system to enter "trouble" mode including the following operations:
 - 1) Local English language annunciation of device location, address and condition and audible and visual trouble signal at control panel and remote annunciators.
 - 2) Manual "acknowledge" function at control panel and remote annunciators to silence audible trouble signal, visual signal remains displayed until initiating trouble is cleared.
 - 3) Transmit "trouble" signal to off-premises equipment.
- 3. Design of Fire Alarm Transmitter Communication System: Provide design of the fire alarm transmitter communication system as required by code.
- 4. Design of the Emergency Voice Alarm Communication System: Provide design of the emergency voice alarm communication system as required by code.
- 5. Design of Building Carbon Monoxide Detection and Alarm System:
 - a. Provide design of the building carbon monoxide detection and alarm system as required by code.
 - b. Carbon Monoxide Detector Sequence of Operation: Where the carbon monoxide detector is located in a building common space, the individual detector will activate.

1.02 RELATED SECTIONS

- A. Contents of Division 28, Electronic Safety and Division 01, General Requirements apply to this Section.
- B. Division 26, Electrical requirements apply to this section.

1.03 REFERENCES AND STANDARDS

- A. References and Standards as required by Division 28, Electronic Safety and Division 01, General Requirements.
- B. In addition, meet the following:
 - 1. NFPA 72, National Fire Alarm and Signaling Code, adopted edition.
 - 2. NFPA 70, National Electrical Code, adopted edition.

1.04 SUBMITTALS

- A. Submittals as required by Division 28, Electronic Safety and Division 01, General Requirements.
- B. In addition, provide:
 - 1. Shop drawings to include the following:
 - a. Provide system designer NICET certification number or Engineer's signature and seal on shop drawings.
 - b. Identification of system designer and evidence of qualification or certification of designer as required by AHJ.
 - c. Floor plans indicating walls, doors, partitions, room descriptions, device/component locations.
 - d. Ceiling height and ceiling construction details.
 - e. A symbol legend with device catalog number, description, back box size and mounting requirements.
 - f. Detailed riser diagram.
 - g. Device address adjacent to each device symbol. Notification appliance circuit and number adjacent to each notification appliance symbol.
 - h. Point to point wiring indicating the quantity and gauge of the conductors and size of conduit/raceway used.
 - i. Wiring connection diagrams for control equipment, annunciators, power supplies, chargers, initiating devices, notification appliances, components being connected to the system and interfaces to associated equipment.
 - j. Battery calculations for each battery backed fire alarm control unit.
 - k. Voltage drop calculations for each notification appliance circuit, indicating individual appliance current draw, conductor run length and size.
 - l. Complete sequence of operation.
 - 2. Prior to final acceptance, submit a letter confirming that inspections have been completed and system is installed and functioning in accordance with Specifications. Include manufacturer representative's certification of installation and letter of warranty.
 - 3. Operation and Maintenance Manuals. Provide manuals containing the following:
 - a. Catalog Cut Sheets
 - b. System Components, Initiating Devices and Notification Appliances' Installation Sheets
 - c. Manufacturer's Installation, Operation and Maintenance Manual
 - d. Program Data File Printout

- e. Program Data File on Electronic Storage Media
- f. Record Drawings
- g. Record Drawings on Electronic Storage Media
- h. One year warranty agreement including parts and labor. Warranty period begins upon date of completion.
- i. Record of Completion
- j. Test Reports
- k. Instruction Chart

1.05 QUALITY ASSURANCE

- A. Quality assurance as required by Division 28, Electronic Safety and Division 01, General Requirements.
- B. In addition, meet City of Vancouver, Washington requirements, ordinances and amendments.

1.06 WARRANTY

- A. Warranty of materials and workmanship as required by Division 28, Electronic Safety and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units:
 - 1. EST
 - 2. Farenhyt
 - 3. Gamewell-FCI
 - 4. Johnson Controls
 - 5. Notifier
 - 6. Potter
 - 7. Siemens
 - 8. Silent Knight
 - 9. Simplex
 - 10. Or approved equivalent.
- B. Notification Appliance Circuit Panels:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. Alarmsaf
 - 3. Altronix
 - 4. Federal Signal
 - 5. Wheelock
 - 6. Or approved equivalent.
- C. Fire Alarm Transmitters:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. Or approved equivalent.
- D. Fire Alarm Annunciators:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. Or approved equivalent.

- E. Fire Alarm Emergency Voice/Alarm Communications System Control Units:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. EVACS
 - 3. Wheelock
 - 4. Or approved equivalent.
- F. Manual Pull Stations:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- G. Fixed Temperature Heat Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- H. Rate-of-Rise and Fixed Temperature Heat Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- I. Photoelectric Type Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- J. Carbon Monoxide and Photoelectric Type Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. Or approved equivalent.
- K. Projected Beam Type Smoke Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. System Sensor
 - 3. Xtralis
 - 4. Fireray
 - 5. Or approved equivalent.
- L. Duct-Mounted Smoke Detectors:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- M. Relay Modules:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- N. Control Modules:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- O. Input Modules:
 - 1. Same manufacturer as fire alarm control equipment.
 - 2. No substitutions permitted.
- P. Fault Isolation Modules:
 - 1. Same manufacturer as fire alarm control equipment.

2. No substitutions permitted.

Q. Speakers:

1. Must be compatible with control equipment and notification appliance circuit panels.
2. Same manufacturer as fire alarm control equipment.
3. Atlas Sound
4. Federal Signal
5. Gentex
6. System Sensor
7. Wheelock
8. Or approved equivalent.

R. Combination Speaker/Strobes:

1. Must be compatible with fire alarm control equipment and notification appliance circuit panels.
2. Same manufacturer as fire alarm control equipment.
3. Federal Signal
4. Gentex
5. System Sensor
6. Wheelock
7. Or approved equivalent.

S. Strobes:

1. Must be compatible with fire alarm control equipment and notification appliance circuit panels.
2. Same manufacturer as fire alarm control equipment.
3. Federal Signal
4. Gentex
5. System Sensor
6. Wheelock
7. Or approved equivalent.

T. Sounder Bases:

1. Same manufacturer as fire alarm control equipment.
2. No substitutions permitted.

U. Miscellaneous Accessories:

1. Weatherproof/Surface Backboxes:
 - a. Same manufacturer as fire alarm detection devices or notification appliances.
 - b. Or approved equivalent.
2. Protective Guard:
 - a. Wire Guard:
 - 1) Same manufacturer as fire alarm control equipment.
 - 2) American Wire Guards
 - 3) Chase Security Systems
 - 4) Safety Technology International

- 5) Shaw-Perkins
- 6) Or approved equivalent.
- b. Protective Cover:
 - 1) Safety Technology International
 - 2) Or approved equivalent.
- 3. Circuit Conductors:
 - a. Allied Wire and Cable
 - b. Belden
 - c. CCI
 - d. West Penn Wire
 - e. Or approved equivalent.
- 4. Surge Protection:
 - a. Ditek
 - b. Transtector
 - c. Or approved equivalent.
- 5. Batteries:
 - a. Same manufacturer as fire alarm control equipment.
 - b. Power-Sonic
 - c. Werker
 - d. Or approved equivalent.
- 6. Locks and Keys:
 - a. Same manufacturer as fire alarm control equipment.
 - b. Or approved equivalent.
- 7. Document Storage Cabinet:
 - a. Same manufacturer as fire alarm control equipment.
 - b. Meir Products
 - c. Space Age
 - d. Or approved equivalent.
- 8. Instruction Charts: Confirm make and model with architect prior to ordering.
- 9. Framed Floor Map: Confirm make and model with architect prior to ordering.
- V. Substitutions:
 - 1. For other acceptable manufacturers of specified control units, submit product data showing equivalent features and compliance with Contract Documents.
 - 2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with contract documents.
- W. Equipment to be supplied by a certified manufacturer representative.

2.02 FIRE ALARM CONTROL UNITS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Multiprocessor Based: Configurable as an addressable, point identified system.
- C. Central Processing Unit (CPU):

1. CPU continuously monitors the communications and data processing cycles of microprocessor. CPU failure generates an audible and visual trouble signal on control panel and remote annunciators.
 2. House the CPU in fire alarm cabinet with sufficient space to allow maximum system expansion and to enclose alphanumeric display.
 3. Retain basic life safety software in field programmable non-volatile memory. Provide CPU with capacity of minimum of 50 addressable points.
 4. Equip CPU with software to provide a control-by-event feature, whereby receipt of an alarm point is programmed to operate control points within system. Provide control-by-event actions for life safety functions in programmable non-volatile memory. CPU software programming for control of systems defined in this Section is installed as part of this Section.
- D. System Capabilities:
1. System capable of addressing and operating smoke detectors, manual pull stations, open contact devices and addressable auxiliary control relays on the same communication loop.
 2. System capable of displaying value of each smoke detector, address and condition of fire alarm monitoring points.
- E. Program Software:
1. Field configuration program provides programmable operating instructions for system. Store resident program in non-volatile memory.
 2. Programmed control point activation includes selective control of HVAC, fire door release, and other fire safety and auxiliary functions.
 3. Devices meet criterion specified under materials.
 4. Verification and display of sensitivity of each addressable smoke detector can be read using the operating software. Replace devices with readings outside of allowed value at time of system check out.
- F. Control Panel Display Modules:
1. Provide keyboard display module 80-character backlit LCD. Each alarm/trouble condition appears in English language with description and location of alarm/supervisory/trouble.
 2. Alarm/supervisory/trouble may be acknowledged, silenced and system reset from control panel or remote annunciator(s).
- G. Power Supply: Provide power supply(s), adequate to serve control panel modules, remote annunciators, addressable devices, notification appliances and other connected devices.
- H. Power Requirements:
1. Loss of 120VAC power automatically causes system to transfer to battery power. Indicate battery power operation by yellow lamp and audible annunciation at control panel and remote annunciator panels. Upon return of 120VAC power, unit recharges batteries to full capacity and maintains battery on float charge. Provide trickle charge adequate capacity to maintain battery fully charged with automatic rate charge.
 2. Provide batteries in locking cabinet manufactured for purpose.
- I. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each function in this portion of the Specifications and for equipment interconnections required under electrical and mechanical specifications.
- J. Auxiliary Switches: Provide auxiliary equipment control switches with labeled status indicating lights for each switch.
- K. System Reset:

1. Key-accessible control function returns system to normal, non-alarm state, if initiating circuits have cleared.
 2. Provide reset on both main fire alarm control panel and remote annunciators.
- L. Lamp Test: Manual "lamp test" function causes the annunciation lamps to illuminate at fire alarm control and remote annunciator panels. Provide "lamp test" function at each annunciator panel.
- M. Addressing: Provide each initiating device with its own discrete address.

2.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

- A. Provide power supply(s), adequate to serve modules, remote annunciators, addressable devices, notification appliances and other connected devices or appliances.
- B. Loss of normal and emergency power automatically causes system to transfer to battery power. Indicate battery power operation by yellow lamp and audible annunciation at control panel and remote annunciator panels. Upon return of 120VAC power, unit recharges batteries to full capacity and maintains battery on float charge. Provide trickle charge adequate capacity to maintain battery fully charged with automatic rate charge.
- C. Provide batteries in locking cabinet manufactured for purpose.

2.04 FIRE ALARM TRANSMITTERS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Electrically supervised, capable of transmitting alarm, supervisory and trouble signals over RF, GSM, Cellular, or Ethernet lines to off-premises receiver. Signal transmitter interfaces fully with receiver station of local fire department or Owner's selected vendor.
- C. Verify requirements and provide call sequence and message as directed by Owner and the AHJ.

2.05 FIRE ALARM ANNUNCIATORS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Alphanumeric Remote Annunciator with Controls: Back lit LCD alphanumeric annunciator 80 characters long. Provide under locking cover test switch, alarm and trouble buzzer, buzzer silence switch and buzzer silence message and reset switch, flush mount with finished cover, vandal-resistant UV stabilized Lexan (or approved equivalent) overlay and required modules, control panel, etc., to drive annunciator. Self-contained, suitable for wet location where located exterior. Verify location with AHJ before installation.

2.06 FIRE ALARM EMERGENCY VOICE/ALARM COMMUNICATIONS SYSTEM CONTROL UNITS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Multi-channeled system. Each channel operates independently. Faults on one channel will not impede operation of other.
- C. UL 864 listed.
- D. LED indicators for power trouble, ground trouble and signal trouble in each NAC. Also, LED indicators for manual evacuation status, clear status and "ready to talk" status for manual microphone paging.
- E. Selectable audio tones (at least four different tone patterns) and voice message generation via digital recorded messages (either Owner supplied, from professionally recorded tapes or manufacturer provided library).

- F. Operator controls at panel include manual evacuation (alarm signal from momentary switch activation), manual clear from momentary switch activation, local microphone manual paging, remote microphone manual paging option.
- G. Integrated within fire alarm control panel.
- H. Include audio amplifiers.
- I. Built-in spoken diagnostic system testing program, permitting testing of individual speakers by one unassisted person.

2.07 MANUAL PULL STATIONS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Semi-flush, red finish, nongrasping operation; maximum pull strength as allowed per ADA criteria.
- C. Stations do not allow closure without keyed reset.

2.08 FIXED TEMPERATURE HEAT DETECTORS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Rated 135 degrees F or 190 degrees F as required by space use.
- C. Provide off-white, low-profile detectors.

2.09 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Responding to 15 degrees F temperature rise per minute and to 135 degrees F fixed temperature as required by space use.
- C. Provide off-white, low-profile detectors.

2.10 PHOTOELECTRIC TYPE DETECTORS

- A. Provide flush mounted units where installed in finished areas; in unfinished areas, surface mounted units are acceptable, unless otherwise noted.
- B. Panel adjustable sensitivity, LED source, multiple cell, 360 degree smoke entry, visual latching operation indicator, insect screen, functional test switch, two-wire operation and vandal-resistant locking feature.

2.11 CARBON MONOXIDE AND PHOTOELECTRIC TYPE DETECTORS

- A. Smoke Element: Analog, panel adjustable sensitivity, LED source, multiple cell, 360 degree smoke entry.
- B. CO Element: Electrochemical carbon monoxide detector.
- C. Visual latching operation indicator, insect screen, functional test switch, two-wire operation and vandal resistant locking feature.

2.12 PROJECTED BEAM TYPE SMOKE DETECTORS

- A. Infrared emitter and receiver, adjustable reception threshold, microprocessor self-adjusting compensation for optic contamination, acrylic anti threshold, fog infrared filter, green power indicating LED, red alarm LED and yellow trouble LED. Voltage and RF suppression, compensating circuitry for vibration and temporary obscuration. Auxiliary contacts. Integral sensitivity test feature.
- B. Provide each detector with an addressable module and a remote LED/test switch.

2.13 DUCT-MOUNTED SMOKE DETECTORS

- A. Photoelectric type. Duct sampling tubes extending width of duct, visual indication of detector actuation, direct housing mount. Detector powered from control panel, power on indicator light. Detector rated for air velocity, humidity and temperature of duct and environment where installed.

2.14 RELAY MODULES

- A. Signaling line circuit interface module that connects to other building systems for control of fire/life safety functions, e.g., air-handler shutdown, fire/smoke damper closure.
- B. Module powered from control panel.

2.15 CONTROL MODULES

- A. Signaling line circuit interface module that provides notification appliance circuits or system control outputs.
- B. Module powered from control panel.

2.16 INPUT MODULES

- A. Signaling line circuit interface module that provides initiating device circuits for connection to contact closure initiating devices.
- B. Module powered from control panel.

2.17 FAULT ISOLATION MODULES

- A. Signaling line circuit interface modules that provide isolation of wire-to-wire shorts on a signaling line circuit with automatic reconnection upon correction of short circuit.
- B. Provide module with status indicator LED.

2.18 SPEAKERS

- A. Flush wall and ceiling mount, white finish. Insect-proof, 4-inch multitap to 1/4, 1/2, 1 and 2 watts with back box and trim grill.
- B. Provide speaker capable of transmitting tone or voice.

2.19 COMBINATION SPEAKER/STROBES

- A. Multi-candela, flush wall and ceiling mount, white finish. Insect-proof, 4-inch multitap to 1/4, 1/2, 1 and 2 watts with backbox and trim grill. Provide speaker capable of transmitting tone or voice.
- B. Provide with integral ANSI 117.1 and UL 1971 approved strobe light. Provide strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

2.20 STROBES

- A. Multi-candela, flush wall and ceiling mount, white finish, insect-proof.
- B. Provide strobes that meet the latest requirements of NFPA 72, ANSI 117.1 and UL 1971. Candela rating as required by NFPA 72.

2.21 SOUNDER BASES

- A. Compatible with detector; 85dBA minimum output.
- B. Provide low frequency appliance in sleeping areas.

2.22 MISCELLANEOUS ACCESSORIES

- A. Protective Guard:
 - 1. Wire Guard: Steel wire guard.
 - 2. Protective Cover: Polycarbonate construction.
- B. Circuit Conductors: Copper or optical fiber; color code and label. Type FPL, FPLR and FPLP as required by NEC. Minimum signaling line circuit and initiating device circuit wire size: AWG18.

Minimum notification appliance circuit wire size: AWG14, or as approved by Engineer. Fiber optic cable as required by manufacturer.

- C. Surge Protection: In accordance with IEEE C62.41 B3 combination waveform and NFPA 70; except for optical fiber conductors.
- D. Batteries: Sealed lead acid type. Provide additional cabinet, if required due to space limitations in control panels.
- E. Locks and Keys:
 - 1. Deliver keys to Owner.
 - 2. Provide same standard lock and key for each key operated switch and lockable panel and cabinet; provide five keys of each type.
- F. Document Storage Cabinet:
 - 1. Suitable for as-built drawings, operation and maintenance manual, system data file disk and tools.
 - 2. Constructed from steel with baked enamel finish; size adequate for full size drawings, operation and maintenance manual, spare parts and tools.
- G. Instruction Charts:
 - 1. Printed instruction chart for operators, showing steps to be taken when signal is received (normal, alarm, supervisory and trouble); easily readable from normal operator's station.
 - 2. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
- H. Framed Floor Map:
 - 1. Provide framed floor plan of facility.
 - 2. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Obtain Architect's approval of locations of devices, appliances and annunciators before installation.
- B. Circuits:
 - 1. Signaling Line Circuits (SLC): Class B
 - 2. Notification Appliance Circuits (NAC): Class B.
- C. Spare Capacity:
 - 1. Notification Appliance Circuits: Minimum 25 percent spare current capacity. Utilize UL maximum current draw values for notification appliances. Maximum 10 percent voltage drop.
 - 2. Speaker Amplifiers: Minimum 25 percent spare capacity.
 - 3. Signaling Line Circuit: Minimum 25 percent spare capacity.
- D. Power Sources:
 - 1. Primary: Dedicated branch circuits of facility power distribution system.
 - 2. Secondary: Storage batteries.
 - 3. Capacity: Sufficient to operate fire alarm system under normal supervisory condition for 24 hours and operate alarm signals for 15 minutes at end of standby period.
- E. Obtain approval of system design from AHJ prior to installation. Do not begin installation without approval from AHJ and submittal review comments from Engineer.
- F. Install in accordance with applicable codes, NFPA 72, NFPA 70 and the Contract Documents.

- G. In accordance with manufacturer's instructions, provide wiring, conduit and outlet boxes required for the erection of a complete system as described in these specifications, as shown on Drawings and as required by AHJ.
- H. Conceal wiring, conduit, boxes and supports where installed in finished areas.
- I. Provide raceway system for cabling concealed in walls and hard ceilings and in locations where cabling is exposed. Where exposed, provide surface raceway in finished areas and surface mounted EMT in non-finished areas.
- J. Provide cabling and conduits system suitable for wet locations for below grade systems.
- K. At junction boxes and termination points, provide identification tags on wires and cables.
- L. Route wiring to avoid blocking access to equipment requiring service, access, or adjustment.
- M. Fire Safety Systems Interfaces:
 - 1. Provide conduit, wiring, boxes and terminations from fire alarm system to monitored components.
 - a. Alarm Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
 - 1) Fire sprinkler water flow switches.
 - 2) Fire sprinkler dry-pipe alarm pressure switches.
 - 3) Kitchen hood fire suppression activation.
 - 4) Other alarm inputs.
 - b. Supervisory Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
 - 1) Fire sprinkler water control valve tamper switches.
 - 2) Fire sprinkler dry-pipe system low air pressure switches.
 - 3) Other supervisory inputs.
 - c. Trouble Inputs: Provide connection in accordance with NFPA 72 for the following systems and components:
 - 1) Other trouble inputs.
 - 2. Fire Safety Functions: Provide power and control conduit, wiring, boxes and terminations to power devices and interface to fire alarm system.
 - a. Doors:
 - 1) Provide smoke detectors and addressable control relays to release magnetic hold open devices and roll-down fire doors and door locks. Verify requirements and quantities prior to bidding.
 - 2) Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door.
 - 3) Electronic Locks or Electromagnetic Door Locks on Egress Doors: Unlock smoke zone egress doors upon activation of any alarm initiating device or suppression system in smoke zone.
 - 4) Overhead Coiling Fire Doors: Release upon activation of smoke detectors on either side of door.
 - b. HVAC Systems:
 - 1) Fire/Smoke Dampers and Smoke Dampers:
 - a) Provide required smoke detectors, relays, wiring and the like.
 - b) Connect control and power wiring to dampers per manufacturer's instructions.

- c) Verify quantities, location and requirements of dampers with Division 23, HVAC Drawings and Specifications and mechanical system installer.
 - d) If damper is installed within a duct, provide smoke detector within 5-feet of damper with no air inlets or outlets between the damper and detector.
 - e) If damper is installed within an unducted opening, provide smoke detector located within a 5-foot horizontal radius of the damper to control the damper.
- 2) Air Moving Systems:
- a) Provide duct-mounted smoke detectors on air systems with air flow rates exceeding 2000 CFM. Coordinate with Division 23, HVAC.
 - b) Install duct-mounted smoke detector(s) on return side of air system.
 - c) Provide control wiring from addressable relay contacts to air handling equipment controller. Connect to controller so that when duct-mounted smoke detector is activated, the air handling equipment is shut down.
 - d) Provide duct-mounted smoke detectors rated for air velocity, temperature and humidity of duct. Verify quantities, locations and requirements with Division 23, HVAC Drawings and mechanical system installer.
 - e) Where duct-mounted smoke detectors are mounted in inaccessible building void spaces provide access hatch. Provide access hatch with fire rating equivalent to rating of wall, ceiling, or shaft being penetrated.
- N. Inspection and Testing for Completion:
- 1. System testing and commissioning to be performed by a certified manufacturer representative.
 - 2. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
 - 3. Document audibility measurements and verify intelligibility for each space on record drawings.
 - 4. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction and adjustments.
 - 5. Provide tools, software and supplies required to accomplish inspection and testing.
 - 6. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required to test system.
 - 7. Correct defective work, adjust for proper operation and retest until entire system complies with Contract Documents.
 - 8. Notify Owner seven days prior to beginning completion inspections and tests.
 - 9. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
 - 10. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - a. Record all system operations and malfunctions.
 - b. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - c. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
 - d. At end of successful diagnostic period, complete and submit NFPA 72 "Inspection and Testing Form."
- O. Owner Personnel Instruction:
- 1. Provide the following instruction to designated Owner personnel:

- a. Hands-On Instruction: On-site, using operational system.
 - b. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
 2. Basic Operation: One-hour sessions for attendant personnel, security officers and engineering staff; combination of classroom and hands-on:
 - a. Initial Training: One session pre-closeout.
 - b. Refresher Training: One session post-occupancy.
 3. Detailed Operation: Two-hour sessions for engineering and maintenance staff; combination of classroom and hands-on:
 - a. Initial Training: One session pre-closeout.
 - b. Refresher Training: One session post-occupancy.
 4. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data and record drawings available during instruction.
 5. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.
- P. Closeout:
1. Closeout Demonstration:
 - a. Demonstrate proper operation of functions to Owner.
 - b. Be prepared to conduct any of the required tests.
 - c. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix and operator instruction chart(s) available during demonstration.
 - d. Have authorized technical representative of control unit manufacturer present during demonstration.
 - e. Demonstration may be combined with inspection and testing required by AHJ. Notify AHJ in time to schedule demonstration.
 - f. Repeat demonstration until successful.
 2. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
 - a. Specified diagnostic period without malfunction has been completed.
 - b. Approved operating and maintenance data has been delivered.
 - c. Spare parts, extra materials and tools have been delivered.
 - d. All aspects of operation have been demonstrated to Architect.
 - e. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 - f. Occupancy permit has been granted.
 - g. Specified pre-closeout instruction is complete.
 3. Perform post-occupancy instruction within three months after date of occupancy.

3.02 FIRE ALARM CONTROL UNITS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide control units with 120VAC dedicated circuit from emergency power source per NFPA requirements.

- D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.
- E. Provide instruction charts at each control unit where system operations are performed. Obtain approval from the Architect prior to mounting.
- F. Perform system programming at the fire alarm control panel. Program the system without shutting the system down. Programming is done off line. Update and maintain hard copy and CD-ROM copy of program at the site.
- G. Room Name Labeling: Control unit schedules, programming and labeling for electrical equipment, to use the room names and room numbers that the Architect adopts at the date of substantial completion of construction. This work is to be done at no added cost to the Owner.
- H. Programmable Function Keys: Provide control panel accessible function keys for the notification bypass, fire drill, fire door bypass, and supervising station bypass.

3.03 NOTIFICATION APPLIANCE CIRCUIT PANELS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide notification appliance circuit panel power supplies with 120VAC dedicated circuit from emergency power source per NFPA requirements.
- D. Do not install cabinets or equipment below the battery cabinet. Do not locate battery and charging system cabinets in ceiling space.

3.04 FIRE ALARM TRANSMITTERS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide conduit and wiring for connections to the transmitter as required for fire alarm system off site supervision.

3.05 FIRE ALARM ANNUNCIATORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

3.06 FIRE ALARM EMERGENCY VOICE/ALARM COMMUNICATIONS SYSTEM CONTROL UNITS

- A. Install instruction cards in or adjacent to control units.
- B. Reference 3.01, General Installation Requirements.
- C. Install per manufacturer's instructions and recommendations.

3.07 MANUAL PULL STATIONS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.08 FIXED TEMPERATURE HEAT DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.09 RATE-OF-RISE AND FIXED TEMPERATURE HEAT DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.10 PHOTOELECTRIC TYPE DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.11 CARBON MONOXIDE AND PHOTOELECTRIC TYPE DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.12 PROJECTED BEAM TYPE SMOKE DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.13 DUCT-MOUNTED SMOKE DETECTORS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.14 RELAY MODULES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.15 CONTROL MODULES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.16 INPUT MODULES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.

3.17 FAULT ISOLATION MODULES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed address labels on addressable devices. Labels to be visible from the floor without magnification.
- D. Provide Fault Isolator Modules for signaling line circuit per code requirements and manufacturer instructions.

3.18 SPEAKERS

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.19 COMBINATION SPEAKER/STROBES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
- D. Provide protective guard where device is subject to abuse and where required by AHJ.

3.20 STROBES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.
- D. Provide wire guards or protective covers where device is subject to abuse and where required by AHJ.

3.21 SOUNDER BASES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide machine printed labels on notification appliances with appliance circuit number and sequence. Labels to be visible from the floor without magnification.

3.22 MISCELLANEOUS ACCESSORIES

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Weatherproof/Surface Backboxes: Provide manufacturer's weatherproof backbox listed for use in areas where the device or appliance is subject to humidity in excess of listed rating. Provide manufacturer surface backboxes where devices cannot be installed recessed.
- D. Protective Guard:
 - 1. Wire Guard.
 - 2. Protective Cover.
- E. Circuit Conductors: Provide wiring to meet the requirements of national, state and local electrical codes. Provide color coded wiring as recommended and specified by the fire alarm

and detection system manufacturer. Provide Type FPLR cable when in a riser application or FPLP cable when installed in plenums.

- F. Surge Protection; Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral and 350 V(ac), line-to-line; do not use fuses.
- G. Document Storage Cabinet: Provide document storage cabinet adjacent to fire alarm control panel.
- H. Instruction Charts: Install chart adjacent to fire control unit.
- I. Framed Floor Map: Provide framed floor plan of facility adjacent to the annunciator panel identifying room names/numbers, device/addresses or fire zone number and description as utilized on the annunciator panel, as required by local AHJ. Check with the local fire department for size and approved mounting location.

END OF SECTION