King County Housing Authority
CAPITAL CONSTRUCTION DEPARTMENT
700 ANDOVER PARK WEST - SUITE C * SEATTLE, WA 98188

ADDENDUM:	4	TODAY'S DATE:	4/26/24

PROJECT NAME: Burndale TI & Envelope

CONTACT / TITLE:	Carl Frankel	PROJECT MANAGER
PHONE / EMAIL:	206.574.1249	carlf@kcha.org

This Addendum is used to Identify Items in the Original Documents with Action as Follows:

☑ **BID** ☐ **RFQ** ☐ **RFP**

☑ **CLARIFY** ☑ **CHANGE** ☐ **DELETE** ☑ **ADD** ☐ **SUBSTITUTE**

56 **Page(s) Total for this Addenda including this page.**

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1. **ADD: Contractor to run 1" code compliant conduit from the new electrical panel through the Attic or crawl space and terminating at the east side (See sketch) of the building for Auxiliary use done by others. Conduit to have pull string installed and be securely attached To building framing.**

2. **ADD: Contractor to remove and dispose of large hedge at front center side of office including roots. Backfill holes and smooth surface with existing soils.**

3. **ADD: Contractor to replace hose bid on the eastside of the building in addition to the hose bib at the west side of the building. Specifications to be the same.**

4. **ADD: 10" Hardi skirt board to be installed around perimeter of building and include flashing. (see included diagram ASK-01)**

5. **ADD: Specification Section 072100 Thermal Insulation bid specifications and Table of contents are included in addendum 4.**

6. **CHANCE: Contractor to replace existing electrical panel with new and include all new wiring and electrical components for an all new electrical system. All other electrical components in plan, specifications and scope of work to be included in bid.**

7. **CHANGE: Table of Contents Section in bid book and Scope of Work from 085413 to read: Section 085313. "Vinyl Windows**

8. CHANGE: Gutters and Downspouts to be fabricated from coil aluminum, .027 gauge, Kynar 500 (PVDF) finish. Color TBD.

9. ADD: Contractor to slope grade at perimeter of building away from building with 6" of clearance at bottom of skirt board. Grading to be at least 3' positive slope (away) from building.

10. ADD; This project is considered to be a commercial building. All building elements to be code compliant for a commercial building.

11. ADD: Wage rates for this project are HUD Non-Routine Maintenance wage rates. See NRM wages included with addendum 4.

12. CHANGE: The fire monitoring system has been changed from Silent Knight to Potter. See new specifications included with addendum. Contractor is responsible for design-build and all permits. Shop drawings are required for approval from KCHA consultant and AHJ. All elements on the drawings to be included in bid.

13. CLARIFY: Contractor to bid project using updated door hardware specifications included with addendum 4.

14. CLARIFY: See sheet "Electrical Symbols" for updated version of select symbols.

15. ADD: Contractor to modify existing conditions to connect new downspouts to <u>all</u> existing drainage leaders. This includes saw cutting, demo and pour back at concrete locations at front and back of building and locations in the landscaping and paved areas.

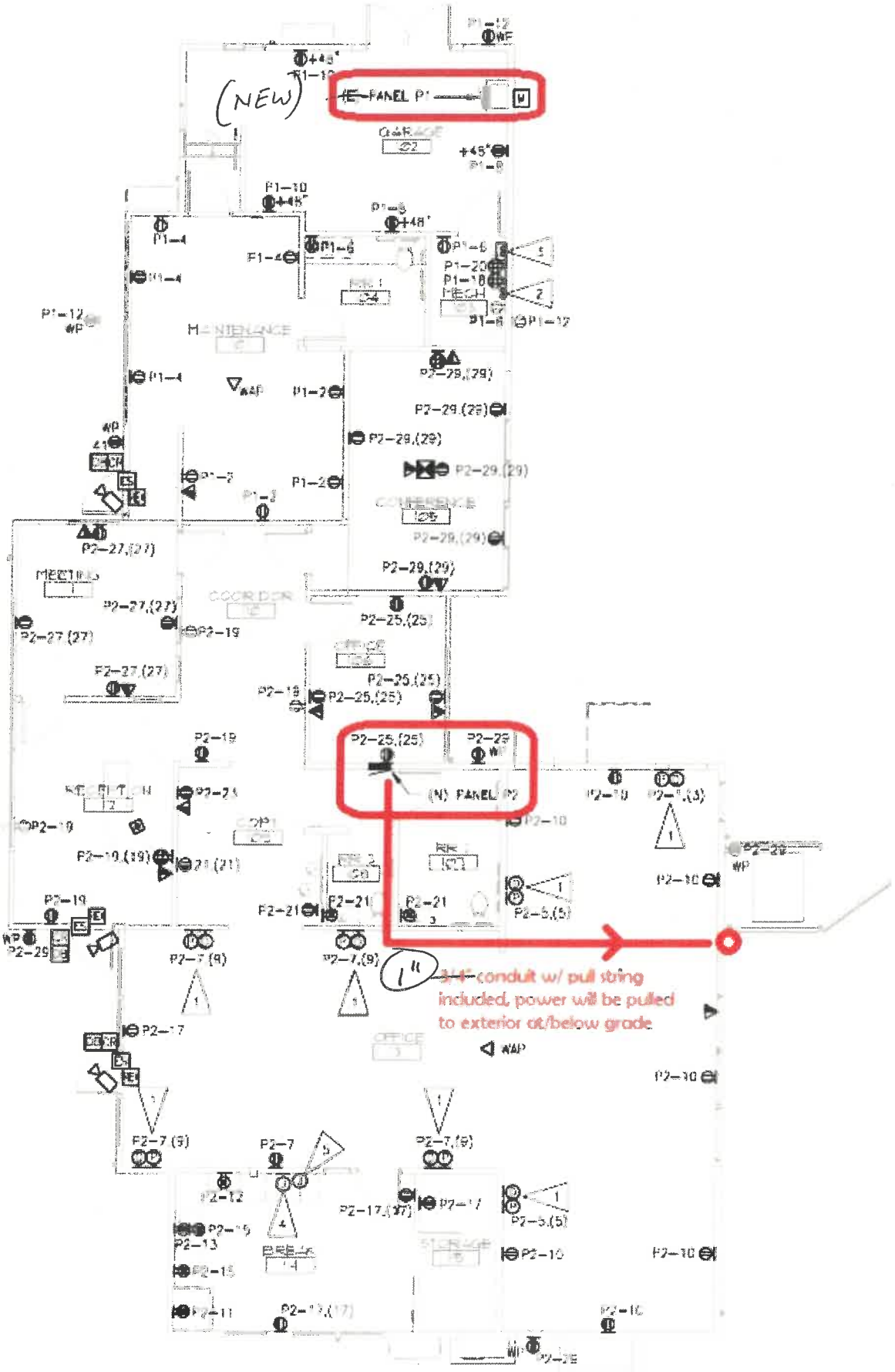
16: ADD: Contractor is responsible to modify railing system at ramps and slabs to accommodate new siding profile. Once clearance has been achieved, restore pipe ends to existing conditions.

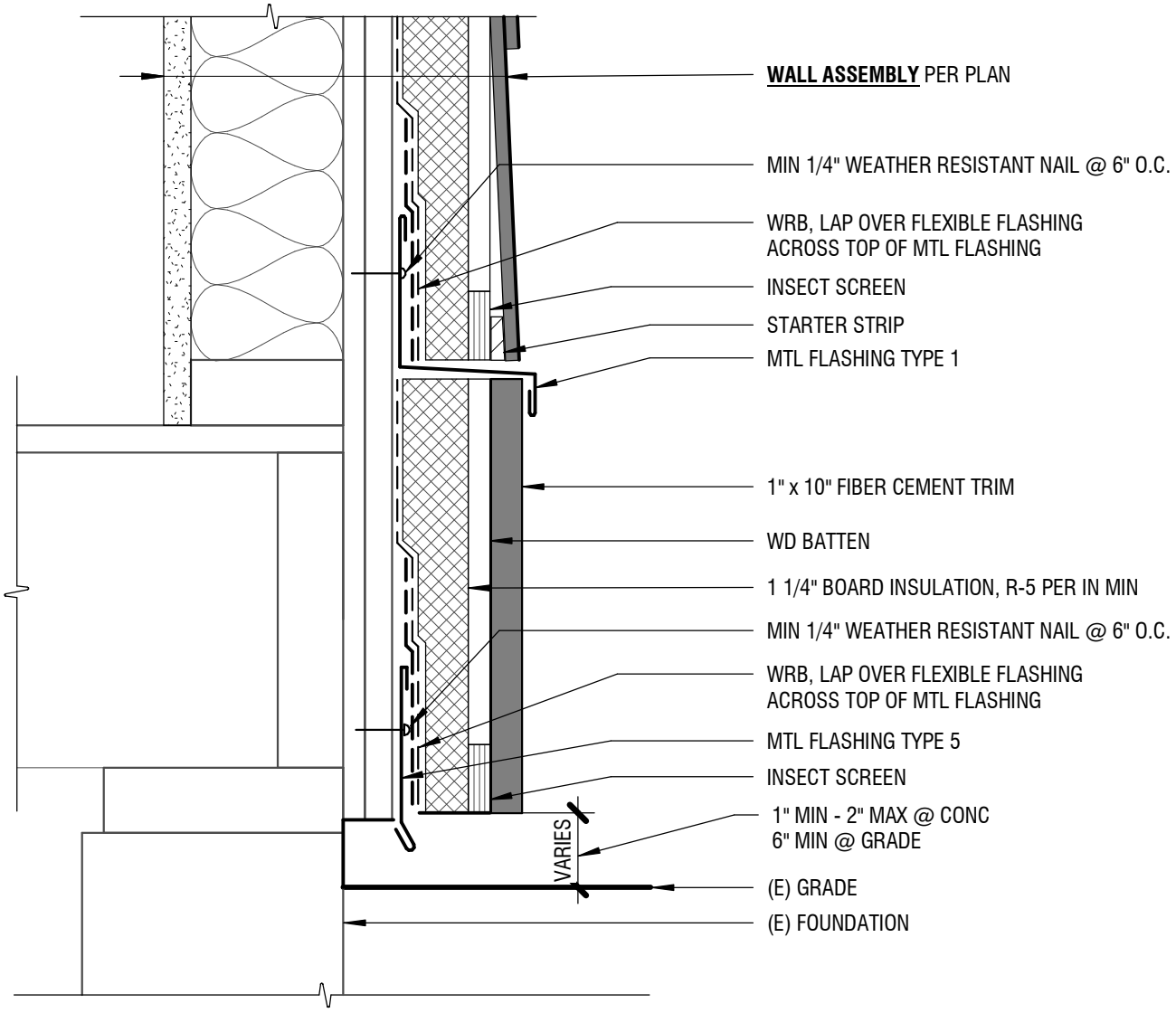
17: ADD: Contractor to abate moldy GWB throughout building and old food bank freezer location.

18. ADD: The door schedule general note #3 revised to note the entrance door glazing U-Factor is 0.60.

19. ADD: See Table C402.4 for Window U-Factor and SHGC requirements. Milgard V400 Tuscany Series Thermal Chart included for reference.

END OF ADDENDUM #4


(NEW)
PANEL P1
(N) PANEL P2
conduit w/ pull string
included, power will be pulled
to exterior at/below grade



11/7/2023 8:52:49 AM

SHKS ARCHITECTS

1050 N. 38th St.
Seattle, WA 98103
PH: 206.675.9151
www.shksarchitects.com

KCHA BURNDALE MANAGEMENT BLDG

WALL TO BASE WITH TRIM
Scale: 3" = 1'-0"
Date: 11/7/2023

ASK-01

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at exterior wall behind wall finish.

B. Batt insulation in exterior wall and ceiling construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

2.02 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Wool Block and Board Thermal Insulation: Complying with ASTM C612.
   1. Facing: None, unfaced.
   2. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
   3. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
   4. Board Thickness: 1-1/2 inches.
   5. Thermal Conductivity (k-factor): Btu inch/hr sq ft degrees F of 0.26 per inch, minimum, at 75 degrees F when tested in accordance with ASTM C518.
   6. Products:
      a. Owens Corning Corporation; Versa Board: www.ocbuildingspec.com/#sle.
      b. ROCKWOOL; COMFORTBOARD 80: www.rockwool.com/#sle.
      c. Or approved equal.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Products:
      a. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
      b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
      c. Or approved equal..

2.04 ACCESSORIES

A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: As required for application.

B. Insulation Fasteners: Impaling clip of galvanized steelwith washer retainerand clips, to be adheredto surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and protrusions.

B. Extend boards over expansion joints, unbonded to wall on one side of joint.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Tape insulation board joints.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Staple or nail facing flanges in place at maximum 6 inches on center.

F. Pack insulation in spaces at perimeter of window assembly to maintain continuity of thermal barrier

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

Maintenance Wage Rate Determination	U.S. Department of Housing and Urban Development Office of Labor Relations	

Agency Name:	LR 2000 Agency ID No:	Wage Decision Type:
King County Housing Authority **600 Andover Park W.** **Tukwila, WA 98188** **(Sedro Woolley, King County HA)**	**WA23-ALL**	☐ **Routine Maintenance** ☑ **Nonroutine Maintenance**
	Effective Date: **February 1, 2023**	Expiration Date: **December 31, 2025**

The following wage rate determination is made pursuant to Section 12(a) of the U.S. Housing Act of 1937, as amended, (public housing agencies), or pursuant to Section 104(b) of the Native American Housing Assistance and Self-determination Act of 1996, as amended, (Indian housing agencies). The agency and its contractors may pay to maintenance laborers and mechanics no less than the wage rate(s) indicated for the type of work they actually perform.

Melanie Hertel
HUD Labor Relations
(Name, Title, Signature)

revised 1.23.2023
Date

WORK CLASSIFICATION(S)	HOURLY WAGE RATES	
	BASIC WAGE	FRINGE BENEFIT(S) (if any)
Asphalt Painter	$23.57	$6.30
Asphalt Raker	$23.57	$6.30
Asphalt Roller/Cement Mixer over 16yds.	$32.24	$10.49
Backhoe Operator	$30.52	$8.85
Carpenter	$32.24	$10.49
Cement Mason - Finisher	$32.24	$10.49
Concrete Saw Operator	$30.52	$8.85
Drywaller	$30.52	$8.85
Electrician	$32.24	$10.49
Elevator Mechanic	$56.22	$39.76
Fence Erector	$23.57	$6.30
Glazier	$30.52	$8.85
HVAC/Furnace Mechanic	$32.24	$10.49
Ironworker	$46.76	$31.00
Laborer	$30.10	$8.27
Landscape/Cleaner	$23.57	$6.30
Low Voltage Technician	$32.24	$10.49
Motor Grader	$30.52	$8.85
Nozzleman for Cement Mixer	$30.52	$8.85

☐ The agency employee benefit program has been determined by HUD to be acceptable for meeting the prevailing fringe benefit requirements.

(HUD Labor Relations: If applicable, check box and initial below.)

_____
LR Staff Initial

FOR HUD USE ONLY
LR2000:

Log in:

Log Out:

Maintenance Wage Rate Determination	U.S. Department of Housing and Urban Development Office of Labor Relations	

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/s/ Melanie Hertel
HUD Labor Relations
(Name, Title, Signature)

Revised 1.23.2023
Date

WORK CLASSIFICATION(S)	HOURLY WAGE RATES	
	BASIC WAGE	FRINGE BENEFIT(S) (if any)
Painter	$30.52	$8.85
Paver/Roller/(Sakai Roller)	$32.24	$10.49
Paving Machine Operator – Self Propelled	$30.52	$8.85
Pipefitter	$23.57	$6.30
Pipe Reliner	$32.24	$10.49
Plumber	$32.24	$10.49
Pressure Washer	$23.57	$6.30
Refrigeration Mechanic	$32.24	$10.49
Roofer	$30.52	$8.85
Roto-mill/Roto-grinder Operator	$30.52	$8.85
Screedman	$30.52	$8.85
Sheet Metal Worker	$32.24	$10.49
Soft Floor Layer	$30.52	$8.85
Sprinkler Fitter (Fire Sprinklers – Class 1 & 2)	$25.17	$11.89
Tree Trimmer/Tree Climber	$23.57	$6.30
Truck Driver – All Yardage	$30.52	$8.85
Welder	$56.68	$28.02

☐ The agency employee benefit program has been determined by HUD to be acceptable for meeting the prevailing fringe benefit requirements.

(HUD Labor Relations: If applicable, check box and initial below.)

_____
LR Staff Initial

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LR2000:

Log in:

Log Out:

PART 1 GENERAL

1.1 SUMMARY

A. The Fire Alarm System for this project shall be a Potter Electric Signal Brand System.

B. KCHA standard will not allow any substitutions of the specified Fire Alarm equipment.

C. Pre-bid site walk is mandatory to bid on this project.

D. This specification and fire alarm drawings are the basis of the design. KCHA will require all the additional detectors and devices above the current codes and the requirements in the specification and fire alarm drawings. Provide a complete bidder design addressable fire alarm system complete but not limited to the following: fire alarm control panel, fire alarm NAC panels, remote annunciator, graphic map, smoke detectors, CO Detectors, duct detectors, heat detectors, manual pull dual stations, audio/visual notification devices including each dwelling unit, control of fire/smoke dampers, mechanical HVAC unit, fan, door closers, door holders, and all conduit and cabling. The contractor is responsible for all costs to have a complete operational system and any requirements of the AHJ.

E. The scope of this project Includes, but not limited to, the following:
   1. Replace the existing fire alarm system in its entirety. All panels, devices, and cabling shall be completely demolished and replaced. This includes all common area devices, devices within a dwelling unit ie: 120vac smoke alarms, smoke detectors of any kind, strobes of any kind, and heat detectors of any kind.
   2. The existing system is to remain operational at all times until the new system is installed, tested, and approved by the authority having jurisdiction. Once the new system is approved, the existing system shall be demolished. At no time shall any existing wires be connected to the new fire alarm control panel.
   3. Read the accompanying documents which include the KCHA Burndale Fire Alarm Code Analysis and the KCHA Burndale Site Assessment Report.
   4. Provide all material, labor, equipment, design, and services necessary to perform the installation of a complete, fully operational, intelligent (analog) and addressable (digital), low voltage 24 Volts D.C., point identification, microprocessor-based Fire Alarm System, in accordance with the required and advisory provisions of the latest edition of N.F.P.A. #72 accepted by the Authority Having Jurisdiction (AHJ), project specifications, property Alarm Code Analysis Property Site Assessment Report, except as modified herein.
   5. The Contractor is to obtain a permit and final approval from AHJ, for the Fire Alarm System. All permits, fees for plan review, inspections, testing, etc. shall be included in the bid proposal.
   6. The Fire Alarm System Contractor shall simultaneously submit "Shop Drawings", Back-up Battery Calculations, Voltage Drop Calculations, Manufacturers Data Sheets, and a bound copy of each proposed Graphic Map to the local Authority Having Jurisdiction and Owner for review that shall be approved by the Owner prior to the purchase, fabrication, or installation of any system components as detailed in Paragraph 1.18 of Specification Section 283100.

F. By submitting a bid, the Fire Alarm System Contractor is acknowledging that they have made a thorough examination of the Contract Documents, existing site, and building conditions. By submitting a bid, the Fire Alarm System Contractor is acknowledging that they have determined that these documents do sufficiently describe the scope of construction work and have included all items required under this Contract.

G. All contract requirements that exceed the minimum requirements of IBC, IFC, and NFPA 72 shall be incorporated into the bid, design, and construction.

1.2 RELATED DOCUMENTS

A. Drawings, General Conditions, and Supplementary Conditions of the Contract, including the Scope of Work and Division 1 Specification Sections apply to the work of this Division.

1.3 CODES AND STANDARDS

A. Codes and agencies having jurisdictional authority over Fire Alarm System installations.
   1. International Building Code – Latest Adopted Edition.
   2. International Mechanical Code – Latest Adopted Edition.
   3. International Fire Code – Latest Adopted Edition.
   4. Authority Having Jurisdiction (Local Fire Marshal).
   5. Occupational Safety and Health Administration (OSHA).
   6. Washington Industrial Safety and Health Act (WISHA).
   7. National Fire Protection Association (N.F.P.A.).
   8. ANSI-J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications.
   9. Americans with Disabilities Act (ADA).
   10. State of Washington Electrical Code.
   11. State of Washington Administrative Code (WAC).
   12. State of Washington Labor & Industry (L&I).
   13. City of Auburn Fire Code.
   14. Auburn City Code 15.36A.
   15. Revised Code of Washington (RCW).
   16. American Society for Testing and Materials.
   17. National Board of Fire Underwriters.
   18. National Electrical Safety Code.
   19. National Electrical Manufacturers Association.
   20. Electrical Testing Laboratories.
   21. U.L. Fire Protection Equipment Directory.
   22. Underwriters Laboratories Incorporated (U.L.):
      a. UL #5 Standard for Surface Metal Raceways and Fittings
      b. UL #38 Standard for Manual Signaling Boxes for Fire Alarm Systems
      c. UL #50 Enclosures for Electrical Equipment, Non-Environmental Considerations
      d. UL #228 Standard for Door Closers-Holders, With or Without Integral Smoke Detectors
      e. UL #268 Smoke Detectors for Fire Alarm Systems
      f. UL #268 A Standard for Smoke Detectors for Duct Application
      g. UL #346 Standard for Waterflow Indicators for Fire Protective Signaling Systems
      h. UL #464 Standard for Audible Signal Appliances
      i. UL #497 A Standard for Secondary Protectors for Communications Circuits
      j. UL #521 Standard for Heat Detectors for Fire Protective Signaling Systems
      k. UL #827 Standard for Central-Station Alarm Services
      l. UL #864 Standard for Control Units and Accessories for Fire Alarm Systems
      m. UL #1449 Standard for Surge Protective Devices
      n. UL #1481 Standard for Power Supplies for Fire-Protective Signaling Systems
      o. UL #1971 Standard for Signaling Devices for the Hearing Impaired
      p. UL #2075 Standard for Gas and Vapor Detectors and Sensors

B. In the event of a conflict between this statement of work and the drawings or specifications, the statement of work shall govern over specifications and drawings, and the specifications shall govern over the drawings.

1.4 DEFINITIONS

A. Thermal Envelope: The heat flow control layer (insulation for example) that separates the interior conditioned space from the exterior unconditioned space.

B. Cold Space: Spaces outside of the building's thermal envelope in which ambient temperatures are expected to be below 40°F.

C. Warm Space: Spaces within the building's thermal envelope in which ambient temperatures are not expected to be below 40°F.

D. Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are patched and painted to match existing adjacent surfaces and finishes.

E. Unfinished Spaces: Spaces used for storage or work areas, such as mechanical rooms, electrical rooms, etc., where appearance is not a factor.

F. Exposed: Open to view i.e. a room that is not covered by other construction.

G. Concealed Spaces: Spaces out of sight i.e. above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.

H. Trades: Design documents or work performed by architectural, civil, electrical, fire protection, landscape, mechanical, plumbing, electrical, and structural.

I. Soffit: A ceiling that is secondary to the primary ceiling elevation that is at a lower elevation and is finished with gypsum wallboard or other construction materials.

J. Provide: It shall be interpreted as "furnishing and installing complete in operating condition".

K. Drawings: It shall be interpreted as "all Contract Drawings for all Disciplines".

1.5 GENERAL SYSTEM REQUIREMENTS

A. It is the intention of this division of the specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices and necessary appurtenances to provide a complete electrical & fire alarm system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown in the plans and analysis. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the plans, but which are necessary to make a complete working installation of all electrical systems shown on the plans or described herein.

B. Provide and install a new complete, fully operational, intelligent (analog) and addressable (digital), low voltage 24 Volts D.C., "Class B", point identification, microprocessor-based Fire Alarm System that will transmit a signal to the monitoring entity as described herein and as shown on the contract documents.

C. The Fire Alarm System shall include, but not be limited to a control panel, remote power supplies, peripherals, initiating devices, notification appliances, new cabling, conduit, junction boxes, finish cover plates for the abandoned dwelling unit 120VAC smoke detectors, fittings, raceways, termination at field devices and panels, etc. required for a complete operating system even though each item may not be specifically mentioned or described in this specification section or on the contract documents.

D. Devices and equipment for Fire Alarm System service shall be U.L. listed or Factory Mutual Global approved for use in Fire Alarm Systems and of the manufacturer's current model.

E. The Fire Alarm Control Panel shall be listed under U.L. Category UOJZ as a single control unit and shall be U.L. Listed for Power Limited Applications per Article 760 of N.F.P.A. #70 (National Electrical Code).

F. The Fire Alarm Control Panel shall electrically supervise and monitor the integrity of all conductors of all circuits.

G. The Fire Alarm System Control Panel and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

H. The Fire Alarm shall be of modular design to facilitate both expansion and service.

I. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the Fire Alarm control panel indicating that each device, and associated circuit cabling, is functional.

J. All power or system shutdowns shall be coordinated with the Owner or Owner's representative with a minimum of (7) days advanced notice not exceeding four (4) hours. Provide temporary provisions for periods greater than four (4) hours with Lockout / Tagout procedures being used.

K. Equipment in compliance with U.L. standards but not bearing their label is not acceptable.

1.6 PROTECTION OF NEW FIRE ALARM EQUIPMENT

A. The Fire Alarm System Contractor shall store and guard all equipment before installation and shall protect same, and replace any equipment that has been damaged prior to final acceptance.

1.7 HOUSEKEEPING

A. All electrical materials shall be kept stored in an orderly fashion and protected from heat, cold, and the weather.

B. All marred surfaces shall be refinished and painted after installation.

C. All debris shall be removed from the premises during work, as directed, and at the completion of the job.

1.8 COORDINATION

A. The work covered by this Specification Section shall be coordinated with the related work as specified elsewhere on the contract documents or in the project specifications.

B. The Fire Alarm System Contractor shall participate in the on-site coordination meetings to coordinate the Fire Alarm System installation with the Architectural features, HVAC grilles, electrical lights, and/or existing conditions.

C. Coordination meetings shall consider elevations, required clearances, and routings of all trades to assure that all trades can be installed without conflict.

D. The outcome of this coordination shall allow each system (Electrical, Mechanical, Fire Protection, etc.) to be installed without further conflicts for space or locations.

E. Failure to coordinate with other trades and/or existing conditions that result in the removal and re-installation of systems shall not be charged as additional costs.

F. The contractor will suspend work immediately and notify the owner if materials suspected of being hazardous, and not previously identified, are encountered in the course of the contractor's work.

G. Coordinate all operations with the owner, such as areas used for material storage, access to and from the site, timing of work, cutting, patching, finish work, and requirements of noise ordinance. install dust and noise barriers as required to protect existing adjacent areas and occupants and to maintain an environment suitable to permit continued occupancy.

1.9 PENETRATIONS

A. Fire Resistance Rated Penetrations:
   1. Where Fire Alarm System conduit penetrates a fire resistance-rated wall or floor assembly, the Fire Alarm System Contractor shall provide a fire-rated penetration that maintains the integrity and fire resistance rating of the assembly being penetrated.

B. Non-Fire Resistance Rated Penetrations:
   1. The Non-fire resistance-rated penetrations of walls or floor assemblies shall consist of one of the following:

a. Cabling in Conduit: Fire Alarm System cabling installed in conduit shall not require additional sealant between the conduit and the wall or floor penetration.
b. Core Drilled Holes shall not penetrate through any structural beams, rebar concrete slabs, and/or walls that may compromise the structural integrity of the building.

C. Smoke Barrier/Partition Penetrations:
1. Where Fire Alarm System conduit penetrates a smoke barrier/partition wall or floor assembly, the Fire Alarm System Contractor shall provide a smoke barrier/partition penetration that prevents the passage of smoke through the assembly being penetrated.
2. Smoke barrier/partition penetrations of walls or floor assemblies shall consist of Cabling in Conduit: Fire Alarm System cabling installed in conduit shall be provided with sealant between the conduit and the wall or floor penetration.

D. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local authorities prior to cabling system acceptance.

E. Refer to Division 07 for requirements on sealing of penetrations.

F. The Fire Alarm System Contractor shall minimize the quantity of penetrations through the air barrier. All penetrations shall be filled with a spray type foam insulation or other approved means to maintain the integrity of the air barrier. The ends of seismic brace members that penetrate the air barrier shall also be filled with a spray type foam insulation of other approved means to maintain the integrity of the air barrier.

G. The Fire Alarm System and Electrical drawings do not specifically identify penetrations through walls, floors, platforms, and foundations.

H. The Fire Alarm System Contractor shall review all architectural and structural drawings to determine all penetration locations.

I. All penetration locations through walls, floors, platforms, and foundations shall be coordinated with the General Contractor and all other trades.

J. All penetrations through walls, floors, platforms, and foundations are the responsibility of the Fire Alarm System Contractor.

1.10 CUTTING AND PATCHING

A. Obtain permission from the General Contractor and Owner's Representative prior to cutting. Locate cut locations so they will not weaken structural components the minimum amount necessary. See Division 01 specifications for further requirements and limitations.

B. All construction materials damaged or cut into during the installation of the Fire Alarm System shall be repaired or replaced with materials of like kind and quality by skilled labor experienced a minimum of three years in that particular building trade.

1.11 SYSTEM/DEVICE INTERFACE CONNECTIONS

A. The following system/device interfaces shall be connected to the Fire Alarm System for auxiliary functions initiated by the Fire Alarm System Control Panel and includes, but is not limited to:
1. Smoke and Fire/Smoke Dampers
2. Duct Smoke Detectors
3. HVAC Systems

1.12 SITE INSPECTIONS OF EXISTING BUILDINGS OR SITE CONDITIONS PRIOR TO BIDDING

A. The Fire Alarm System Contractor shall examine the structure, building, and existing conditions under which Division's 28 work is to be installed for conditions detrimental to proper and timely completion of the work before submitting proposals and/or bids for this work.

B. No subsequent allowance for time or costs will be considered for any consequence related to failure to examine site conditions.

1.13 CONTRACT DOCUMENTS

A. Fire Alarm system contract specification and Electrical drawings are the basis of the design. KCHA will require all the additional detectors and devices above the current codes in the specification and fire alarm drawings. This layout identifies the proposed locations of panels and key critical aspects of the fire alarm system. They are to provide for coordination with architectural, electrical, and mechanical features of the building design and to aid the NICET IV designer in creating shop drawings and adding any items that are required by NFPA 72, state & local AHJ requirements. The contractors and the fire alarm system designer shall coordinate the exact quantities and locations of all system components between trades and/or existing conditions. The contractor is responsible for all costs to have a complete operational system and any requirements of the AHJ.

B. The Electrical contract documents are not intended to serve as working drawings. They are diagrammatic and unless specifically dimensioned or detailed, does not indicate all fittings, hardware or appurtenances required for a complete operating installation. It is the Fire Alarm System contractor's responsibility to provide devices that may not be indicated or shown on the contract documents for a fully functional system.

C. The Fire Alarm System contractor shall be responsible for reviewing all architectural, civil, electrical, mechanical, plumbing, structural, and fire protection drawings. These drawings may contain information related to the design and construction of this project and it is the Fire Alarm System contractor's responsibility to review the contract documents of all trades and to coordinate the contract documents with the Fire Alarm System "Shop Drawings".

D. KCHA scope of work (SOW) takes precedence over drawings.

E. The Fire Alarm System installation shall be developed in accordance with the contract documents, project specifications, and applicable standards. Should a conflict occur between the contract documents and project specifications, the project specifications shall prevail, refer to Division 1.

F. In the case that criteria contained on the contract documents is omitted from the project specifications or the project specifications have criteria that is omitted from the contract documents, the criteria given in one location shall apply as if shown in both the contract documents and in the project specifications (what's in one document applies to both documents). The contract documents and what is called for in either is binding as if called for in both.

G. Fire Alarm System Work shall be as defined in the contract documents and in this specification Section. Any details beyond these limits are meant only to give installation clarity to that portion which is a part of this Contract.

1.14 SHOP DRAWINGS

A. Prepare detailed working drawings for the system layout in accordance with N.F.P.A. #72 and the following:
   1. Shop Drawing Requirements: The Installing Vendor's/Contractor's complete and full-size set of PDF Shop Drawings shall be submitted to the owner and issued in the following format:
      a. They shall be clear and legible.
      b. The same sheet size as the Contract Drawings where provided (min. size 24" x 36").
      c. A minimum of 1/8" text height shall be used for all text, symbol text, and subscript text.
      d. Scale of Drawings

1) Any Site plan drawings shall be the same scale as issued in the Contract Documents.
2) Floor plan drawings shall be 1/8”=1’-0”, unless directed to do otherwise.

e. The Electrical Legend, Wire Legend, Load and Battery Calculations, Riser Diagram, Sequence of Operation Info, Wiring Details, and Mounting Details shall precede the Site Plans and Floor Plans.

f. All sheets, including the cover, shall include a title block along the edge of each of the drawings that, when the drawings are rolled up, the following information shall be visible:
1) The system-specific sheet number
2) Project name, specification section number and section title name
3) Floor name, area, and/or section of the building (Use the name of the area and/or floor description that is on the Contract Drawings.)

g. Architectural information on the Contract Drawings shall be included on the Installing Vendor’s/Contractor’s Shop Drawings, including, but not limited to: match lines, grid lines, grid bubbles, key plan, and enlarged floor plans.

B. All items contained in Section 7.4 "Shop Drawings" of the latest edition of N.F.P.A. #72 adopted by the Authority Having Jurisdiction shall be included on the Fire Alarm System Shop Drawings including, but not limited to the following:
1. Sheet Index.
2. Fire Alarm System Component Legend.
3. Cabling Legend.
4. Alpha-numeric labeled cables based upon the "Cabling Legend" for each cable type and cable run.
5. Electrical Legend listing the electrical devices to be utilized as part of the Fire Alarm System installation.
6. Site Plan.
7. Floor Plans indicating all Fire Alarm System devices.
8. End-Of-Line Resistor(s) where applicable.
9. Device Address is shown adjacent to each device.
10. One-Line Riser Diagram.
11. "Sequence of Operations" Matrix indicating all system Inputs and Outputs.
12. Mounting details and mounting heights.

C. Provide "Shop Drawings" that are usable for trouble-shooting purposes showing equipment/device locations, conduit routing, junction boxes, connection cabling for the entire Fire Alarm System layout, and riser diagrams.

D. Shop Drawings shall be clear and legible with a minimum text height of 1/8” for all text.

E. A graphical scale shall be provided for each floor plan or detail on the shop drawings in accordance with N.F.P.A. #72.

F. Projects that require more than one sheet to show the entire Fire Alarm System shall require a key plan.

G. The key plan shall identify the location of the Fire Alarm System that is contained on that sheet and shall contain a reference north arrow.

H. All sheets that contain a break in the building background shall contain a "Match Line" designation to indicate where the building and Fire Alarm System continues, even if on the same sheet.

I. One-Line Riser Diagram shall show all field devices and their respective room names, room numbers, device address, device designation and candela settings in the order wired on the floor plans. Per N.F.P.A. #72, a riser diagram is required to show the type and number of system components/devices on each circuit and the number of conductors for each circuit. Since a circuit is defined in N.F.P.A. #72 as a connection path between locations, the riser diagram should show the order that devices are connected.

J. Prior to submitting fire alarm shop drawings to AJH for approval contractor shall get approval for the design of the fire alarm shop drawings from the owner.

K. Submit the fire alarm shop drawings to AJH for approval.

1.15 BUILDING EXPANSION, SEPARATION, OR SEISMIC JOINTS

A. The Fire Alarm System Contractor shall provide a junction box on each side of the Building Expansion, Separation, or Seismic joint.

B. The Fire Alarm System Contractor shall provide a section of flexible conduit between the junction boxes of sufficient length to accommodate for the calculated building movement.

C. The Fire Alarm System Contractor shall provide grounding bushings with #12 grounding cable to maintain continuity between junction boxes. Grounding cable shall be of sufficient length to accommodate for the calculated building movement.

D. The Fire Alarm System Contractor shall secure flexible conduit and grounding cable on each side of the Building Expansion, Separation, or Seismic joint.

1.16 SUBMITTALS

A. Product substitution during installation from the approved Equipment Submittals will not be allowed and shall result in the removal and re-installation of system components at no additional cost to the Owner.

B. Fire Alarm System equipment submittals, shop drawing submittals, back-up battery calculations, voltage drop calculations, and graphic maps shall be submitted together at one time as listed below.

C. Equipment Submittals for the Fire Alarm System shall be submitted to the Owner for review and approval within 30 calendar days from the date of the Contract signing by the General Contractor.

D. All remote power supply locations deemed necessary by the Fire Alarm System Contractor shall be submitted for review and approval.

E. "Shop Drawings", Back-up Battery Calculations, Voltage Drop Calculations, and the Graphic Map(s) for the Fire Alarm System shall be submitted to the Owner for review and approval within 30 calendar days from the date of the Contract signing by the General Contractor.

F. Graphic Maps shall be submitted for review and approval within 30 calendar days from the date of the Contract signing by the General Contractor.

G. Equipment Submittals shall contain original brochures supplied by manufacturers (Photocopies of originals will not be accepted). Each type of device provided shall be identified in the Equipment Submittals using the same identification as shown on the drawings and specifications. The information included must be the exact equipment to be installed, not the complete "line" of the manufacturer. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.

H. Submittals shall be delivered electronically. The Fire Alarm System Contractor shall provide the following:
   1. Submittal Drawings:

a. The Submittal Drawings shall be a single PDF that is formatted to actual contract drawings size (not 11x17) and collated in numerical order as designated in the title block of each drawing. Shop drawing submittals shall include the following information:
   1) Floor plans identifying all Fire Alarm System components and devices.
   2) Cabling / conduit routing and sizing.
   3) Sequence of Operations
   4) Input/Output Matrix per SLC Address.
   5) Fire Alarm System zoning.
   6) Point to point cabling diagrams.
   7) One-line risers.
   8) Back-up Battery Calculations.
   9) Voltage Drop Calculations.
   10) Graphic Map Details / Artwork.

2. Equipment Submittals:
   a. The Equipment Submittal shall be a single PDF.
   b. The Equipment Submittal PDF shall contain all equipment, devices, and components that are collated for printing on 8½"x11" sized paper.
   c. The Equipment Submittal PDF shall be a searchable document.
   d. The Equipment Submittal PDF shall be formatted for duplex printing with blank sheet inserted where necessary.
   e. The Equipment Submittal PDF shall contain a "Table of Contents" that indicates all pieces of equipment, devices, and components. Equipment submittals shall be broken up by "Tabbed Dividers" that shall include, at a minimum, the following:
      1) Fire Alarm System Control Panel.
      2) Fire Alarm Remote Annunciator Panels.
      3) Power Supplies.
      4) Initiating Devices.
      5) Notification Appliances.
      6) Graphic Maps.
      7) Modules.
      8) Miscellaneous Equipment.
   f. The Equipment Submittal PDF shall be bookmarked by "Tabbed Divider" and for each piece of equipment, device, and component.
3. Back-Up Battery Calculations and Voltage Drop Calculations that are submitted as part of the Equipment Submittal PDF shall be formatted to the following:
   a. Calculations shall be included at the end of the Equipment Submittal PDF under a separate "Tabbed Divider" for both Back-Up Battery Calculations and the Voltage Drop Calculations.
   b. The Equipment Submittal "Table of Contents" shall also indicate all calculations being provided for both the Back-Up Battery and the Voltage Drop Calculations
4. Back-Up Battery Calculations and Voltage Drop Calculations that are submitted as a separate PDF from the Equipment Submittal PDF:
   a. The single Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall contain all calculations that are collated for printing on 8½"x11" sized paper.
   b. The Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall be a searchable document.
   c. The Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall be formatted for duplex printing with blank sheet inserted where necessary.
   d. The Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall contain a "Tabbed Divider" to separate the Back-Up Battery Calculations from the Voltage Drop Calculations.

e. The Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall contain a "Table of Contents" that indicates all calculations contained within each "Tabbed Divider".
f. The Back-Up Battery Calculations and Voltage Drop Calculations submittal PDF shall be bookmarked by "Tabbed Divider" and for each Back-Up Battery Calculation or Voltage Drop Calculation.

5. Graphic Maps:
   a. Graphic Maps shall be submitted in a PDF that is full sized to allow printing of actual sized proposed Graphic Maps.

I. Review of Fire Alarm System submittal by the Owner does not relieve the Contractor of responsibility for compliance with the intent of all contract documents and / or code.

J. Any material found to be installed without prior approval will be required to be removed and replaced with only specified approved material at Contractor's cost.

K. The contract documents (if provided) shall not be used as the Fire Alarm System Contractor's Shop Drawings.

L. The Fire Alarm System Shop Drawings shall be system specific with only Fire Alarm System equipment and connections to other equipment that will be interfaced to the Fire Alarm System being shown.

M. All re-submittals shall have the areas of revision clearly marked with revision clouds.

N. Upon receiving a review letter rejecting any portion of the Fire Alarm System submittal, the Fire Alarm System Contractor shall resubmit within 7 calendar days.

1.17 CERTIFICATION AND LICENSING

A. The Fire Alarm System shall:
   1. Be manufactured by an ISO 9001 certified company.
   2. Meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
   3. Shall bear the marking for a U.L. Listed UOJZ control unit.

B. The Fire Alarm System Contractor shall:
   1. Be currently listed and approved by Underwriters Laboratories Incorporated with a Certificate Service for Protective Signaling Services – Local, Auxiliary, Remote Station.
   2. Be currently listed and approved by Underwriters Laboratories Incorporated for "Proprietary Protective Signal System Listing Program" with a UUJS certificate of compliance.
   3. Be a certified Level IV technician by National Institute for Certification in Engineering Technologies (NICET) in the Fire Alarm Technology subfield of fire protection engineering technology.
   4. Be a certified/licensed Washington State Electrician 06 Journey or higher.

C. At the request of the Owner, the Fire Alarm System Contractor shall provide:
   1. UL certificate specific to this installation.
   2. Proof of all Certificates and Listings

D. Fire Alarm System Shop Drawings shall be designed by one of the following (provide a copy of documentation):
   1. NICET Level IV Certified Designer.
   2. Registered Professional Fire Protection Engineer.

E. The Installing Fire Alarm System Contractor shall employ a minimum of NICET Level II technicians to:
   1. Provide and/or perform on site installation assistance throughout the duration of the project, up to and including acceptance of the Fire Alarm System by the Authority Having Jurisdiction.
   2. Oversee the final check-out and to ensure systems integrity.

3. Trim and program the Fire Alarm System Control Panel.

F. Certificates issues by any company not directly associated with the installation of this project will be rejected

G. The installing Contractor shall have a minimum of fifteen (15) years' experience in the design, installation, servicing, and testing of the Fire Alarm System to be installed. A list of installations of a similar nature and scope shall be provided on request.

1.18 COMPETITIVE PRODUCTS

A. Any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

B. The Fire Alarm System Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner, expressed in writing, is equal to that specified.

1.19 REQUESTS FOR INFORMATION (RFI)

A. It is our intent to provide a response within 10 business days to any Request for Information (RFI) regarding the Fire Alarm System work. To further expedite this process, if a suggestion can be determined or derived at by the initiator of the Request for Information (RFI), this suggestion shall be supplied with the submitted Request for Information (RFI). If no suggestion is given where one is possible, the RFI will be returned as incomplete.

B. All Fire Alarm System Request for Information (RFI) questions shall be written on the forms provided in Division 0 or 1 of the General and Supplemental Conditions of the Project Manual.

1.20 QUALITY ASSURANCE

A. All devices, components, and equipment of the Fire Alarm system shall be listed as a product of a single Fire Alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), shall bear the UL label, and shall be listed under UL category UOJZ as a single control unit.

B. Partial or pending listings for a Fire Alarm system or components is not acceptable.

C. The Fire Alarm system installation shall comply with Article 760 of N.F.P.A. #70 with all circuits being marked in accordance with Article 760-30, 760-176, and 760-179.

D. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable Codes.

In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern.

1.21 OPERATIONS AND MAINTENANCE MANUAL

A. Bind Operation & Maintenance Manual for the Fire Alarm System in a single three-ring tabbed hard-backed binder with clear plastic pocket on spine. Spine of each binder shall have following typewritten lettering inserted:

OPERATION
AND
MAINTENANCE
MANUAL
FIRE ALARM SYSTEM

B. The Operations and Maintenance Manuals shall include a complete materials list of the Fire Alarm system including the addresses and phone numbers of local sources of replacement parts.

C. Operation and Maintenance manuals shall contain the following:
   1. "As-Built" Shop drawings.
   2. Half-size pages of 11by17 floors of the fire alarm graphic map.
   3. Fire Alarm Addressable Point List.
   4. Cabling diagrams.
   5. Operation and Maintenance instructions.
   6. Replacement parts lists.
   7. Manufacturer’s equipment submittal literature for all components.
   8. Typewritten "Sequence of Operations".
   9. Thorough testing procedures.
   10. Recommended testing frequency for each item.
   11. Copy of the NFPA 72 Acceptance Test Certificates
   12. Copy of the Local AHJ Acceptance Test certificates.

D. Operation and Maintenance Binders:
   1. Binders shall be commercial quality, 8-1/2 x 11-inch (3) D-ring binders.
   2. Binders shall have durable plastic covers with clear pockets on the cover and spine to hold labels.
   3. Binders shall have a 1" minimum and 3" maximum ring size.
   4. Binders shall not be filled more than 2/3 of its capacity to accommodate future revisions.
   5. Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the project manual table of contents. Cross reference other binders where necessary to provide essential information for proper operations and maintenance of each piece of equipment.

E. Operation and Maintenance manuals shall contain the following:
   1. Cover: Identify each binder with a typed or printed title.
   2. Project Directory: Name, address, and phone number of Architect, General Contractor, and Electrical Subcontractors. Also include complete list of equipment installed with name, address, and phone number of each vendor.
   3. Table of Contents: List every item separated by a divider, using the same identification as on the divider tab.
   4. Dividers: Provide heavy paper dividers with printed tabs for each section. Immediately following the divider tab include a description of product.
   5. Typewritten Operation and Maintenance instructions.
   6. Complete replacement parts list with part numbers.
   7. Manufacturer’s equipment submittal literature for all components used in the system.
   8. Typewritten "Sequence of Operations Input/Output Matrix".
   9. Thorough testing procedures.
   10. Recommended testing frequency for each item.
   11. Acceptance Test Certificates.
   12. Copy of "As-Built" drawings.
      a. Where oversized drawings are necessary, fold drawings to the same size as text pages and use as foldout.
      b. If drawings are too large to be used practically as a foldout, place the drawing neatly folded in the front or rear pocket of the binder. Insert a typewritten page indicating drawing title, description of contents and drawing location in the appropriate location in the manual.
   13. Warranties: Provide a copy of each warranty in the appropriate manual. Provide written data outlining the procedures to follow in the event of product failure.
   14. Electronic copy of the final system program software and Panel Data . (Finger USB Drive).

F. Submit copies as specified by Division 1, and at a minimum, provide one (1) copies of Operation & Maintenance Manual to Owner to review prior to scheduling the training session. In addition to hardcopies, an identical electronic version of the Manual shall be provided as a single PDF file, divided and organized in the same manner as the hardcopies.

G. Operation and Maintenance manuals shall contain original color printed brochures supplied by manufacturers (Photocopies originals will not be accepted).

H. First section of the Operations and Maintenance Manual shall consist of name, address, and phone number of Architect, General Contractor, and Electrical Subcontractors. Also include complete list of equipment installed with name, address, and phone number of each vendor.

I. The information included must be the exact equipment installed not the complete "line" of the manufacturer. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.

J. Cabling Diagrams for each system shall be complete for the specific system installed under the Contract with typical "Cabling Diagrams" not being acceptable.

1.22 TRAINING MANUAL

A. The Training Manual shall contain a Syllabus titled "Section 283100 Fire Alarm System – Training Syllabus".

B. Prior to starting the training session, provide a quantity of up to ten (10) Training Manuals to the Owners staff.

C. Each Training Manual shall be in its own 3-ring hard covered binder that shall be sized to allow for 20% additional documentation.

D. The spine and front cover of each Training Manual shall have a clear cover with a typed insert with the following information:
   1. Labeled "Section 283100 Fire Alarm System – KCHA Burndale Training Manual".
   2. Site Name.
   3. Site Address.
   4. Project Name.
   5. Project address.
   6. Current Date.
   7. Installing Fire Alarm System Contractor.
   8. Installing Fire Alarm System Contractor’s Address.
   9. Installing Fire Alarm System Contractor’s Contact Name.
   10. Installing Fire Alarm System Contractor’s Phone Number.

E. Each Training Manual shall include the following:
   1. Use color coded numbered tabs to separate each item defined below and for each device that was installed.
   2. Provide a "Table of Contents" as the first page indicating each piece of equipment or device document.
   3. "Section 283100 Fire Alarm System – KCHA Burndale Training Syllabus".
   4. Provide color copies of a power point presentation consisting of two slides per page that demonstrates typical functions and operational instructions of the new Fire Alarm System that shall consist of, but not limited to the following:
      a. Step-by-step instructions of the most common features.
      b. How to acknowledge and silence an "Alarm" condition.
      c. How to acknowledge and silence a "Trouble" condition.
      d. How to acknowledge and silence a "Supervisory" condition.
      e. How to operate the "Drill" feature.
      f. What to do when there is a "Dirty Detector" alert.
      g. What to do when there is a loss of dialer communication alert.

h. How and when the Owners Maintenance Staff should call for help.
i. Include the Manufacturer's Software User's Manual.

1.23 WARRANTY LETTER

A. The Fire Alarm System contractor shall warranty the Fire Alarm System against defects in materials and workmanship for a period of 1 year from date of approved acceptance testing.

B. Provide a "Certificate of Warranty" letter at the completion of the project. The date of "Substantial Completion" shall be clearly shown on the letter indicating when the warranty period begins.

C. The "Certificate of Warranty" letter shall be signed by the Fire Alarm System contractor.

D. The "Certificate of Warranty" shall be included as part of the Operation and Maintenance Manual. The date of "Substantial Completion" shall be the date indicated on the approved test certificate that was signed by the Authority Having Jurisdiction for system acceptance.

E. The full cost of maintenance, labor, and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.24 TEST CERTIFICATES

A. Completely fill out the Fire Alarm System "Record of Completion" documents contained within the latest adopted Edition N.F.P.A. #72 and provided to the Owner at completion of this project.

B. Obtain the Authority Having Jurisdiction signature, printed name, date, and telephone number on the "Record of Completion" documents.

C. Upon completion of the Fire Alarm System installation, testing, and Instruction & Training, the Installing Vendor shall provide the following Signed Test Forms:
   1. The signed original "Record of Completion".
   2. The signed original Fire Alarm System Permit.

1.25 OFF SITE MONITORING SERVICE AGREEMENT

A. King County Housing Authority (KCHA) shall provide central station monitoring, as part of a complete fully functional system. Prior to completion of the project, the Fire Alarm System Contractor shall provide a point list and zone list to the King County Housing authority project manager. This must occur at least l one month prior to project completion or sooner.

B. KCHA shall provide monitoring account numbers and associated information to the fire alarm contractor to facilitate programming of the fire alarm monitoring panel that communicates with the central station. The fire alarm contractor and KCHA are to coordinate to ensure these details are addressed.

1.26 AS-BUILT DRAWINGS

A. The Fire Alarm System Contractor shall maintain, in addition to any reference drawings, an "As-Built" set of drawings, which have been reproduced from the approved site set on which all deviations from the original design shall be drafted in a neat legible manner with red colored pencil.

B. "As-Built" drawings shall clearly indicate the following:
   1. Actual routing of all raceways.
   2. Actual cable type, numbers, and routing.
   3. System cabling diagrams.
   4. Connection diagrams.
   5. Interface of all components in the system.
   6. Equipment and device locations.
   7. Final room names and numbers.

8. Programming addresses assigned for all components.

C. The room numbering system depicted in all graphics and referenced in data bases generated by the Fire Alarm System Contractor shall match that of the final signage and room identification system adopted by the Owner, unless specifically approved otherwise in writing by the Owner.

D. The "As-Built" drawings shall show actual installation from all addenda items, change orders, field authorizations, design changes, installation modifications, etc.

E. The Fire Alarm System Contractor shall update all references to specific products to indicate products actually installed on project.

F. Upon completion of work, the Fire Alarm System Contractor shall deliver the red lined drawings and one set of neatly drafted "As-Built" drawings on electronic media in AutoCAD and PDF format to the Owner and Architect for the Engineer to review and accept prior to being forwarded to the Owner for their records.

1.27 PROGRAM SOFTWARE AND FIRE ALARM PROGRAM DATA

A. Following the completion of final system programming, the Fire Alarm System Contractor shall provide to the Owner an electronic copy of the final system program software and "Point Status Report".

B. A hard copy of the "System Report" which documents the status of all active devices in the system shall also be provided.

C. The software program shall be compatible with an PC and provided with a verification software package.

D. A report shall be generated of the test results and two hard copies submitted to the Owner for review.

E. Provide no less than one (1) software upgrade and one (1) firmware upgrade at the end of the 1-year warranty period. Coordinate this work with KCHA Project Manager.

F. Factory default install code will not be changed.

G. Program owner code to 1111

H. Program the options to access date & time, smoke status, event log, and add devices.

1.28 CLOSEOUT MATERIAL

A. The Fire Alarm System close out material shall be submitted to the Owner.

B. All close out materials shall be contained within a single 3-ring hard cover binder.

C. The close out materials shall include the following at a minimum:
   1. Operations and Maintenance Manuals: See Paragraph 1.21 of this Specification Section for "Operations and Maintenance Manual" requirements.
   2. Training Manuals: See Paragraph 1.22 of this Specification Section for "Training Manual" requirements.
   3. Warranty Letters: See Paragraph 1.23 of this Specification Section for "Warranty Letter" requirements.
   4. Test Certificates: See Paragraph 1.24 of this Specification Section for "Test Certificate" requirements.
   5. Off-Site Monitoring Services Agreement: See Paragraph 1.25 of this Specification Section for "Off-Site Monitoring Service Agreement" requirements.
   6. "As-Built" Drawings: See Paragraph 1.26 of this Specification Section for "As-Built" Drawing requirements.
   7. Program Software: See Paragraph 1.27 of this Specification Section for "Program Software" requirements.
   8. Spare Parts: See Paragraph 1.29 of this Specification Section for "Spare Parts" requirements.

1.29 WARRANTY SERVICE

A. During the warranty service period the Fire Alarm Contractor shall perform all the following;

1. All Fire Alarm System equipment shall be of a single supplier and installed by an authorized factory distributor, having a local office that is staffed with trained full-time employees who are capable of performing testing, inspections, repair, maintenance, and has the ability to provide prompt emergency services.
2. For non-emergency service, response time of the technician to the site shall not exceed four (4) hours.
3. Service calls received before 1:00 P.M. shall be provided that day and service calls received after 1:00 P.M. shall be the following business day.
4. For emergency service, response time of the technician to the site shall not exceed two (2) hours in accordance with N.F.P.A. #72 Section 26.3.8.

1.30 BATTERY BACK-UP CALCULATIONS

A. Battery Back-Up power shall be an integral part of the Fire Alarm System and shall automatically switch over upon the loss of AC power.

B. It shall be the Fire Alarm System Contractor’s responsibility to confirm that the proposed Fire Alarm system will meet or exceed the local Authority Having Jurisdiction (AHJ) requirements for Battery Back-Up power.

C. At a minimum, provide battery Back Up power for the entire Fire Alarm system to provide 24 hours of standby operation immediately followed by a minimum of 5 minutes of alarm operation.

D. Battery Back-up Calculations for each Control Panel and/or Power Supply shall indicate the following:
   1. "Standby" or Non-Active Mode: "Amp Draw" for each device, quantity of each device, and total "Amp Draw" load for each circuit of the Fire Alarm System Control Panel and/or Power Supply.
   2. "Alarm" or Active Mode: Individual "Amp Draw" of each device, quantity of each device, and total "Amp Draw" load in with all devices operating at the maximum load condition for each Control Panel and/or Power Supply.
   3. Total "Amp Draw" load required by each Control Panel and/or Power Supply for verifying selection of back-up batteries.

E. For systems that include an Uninterruptible Power Supply (UPS), provide the maximum load allowed by the UPS manufacturer and list each item along with its maximum load that will be connected to the UPS.

1.31 VOLTAGE DROP CALCULATIONS

A. Provide the Voltage Drop Calculations for each Fire Alarm System Control Panel and/or Power Supply circuit.

B. Voltage Drop Calculations for each Fire Alarm System Control Panel and/or Power Supply circuit shall indicate the following:
   1. All devices on each circuit.
   2. Quantity of each device on each circuit.
   3. Cable length of each circuit.
   4. Gauge of cabling for each circuit.
   5. Total line loss for each circuit.
   6. Factor the line loss and "Amp Draw" to show the actual voltage available at the end of each circuit (after the last device).

1.32 SPARE CAPACITY

A. Spare capacity shall be incorporated into the Fire Alarm System design to support future expansion or renovations.

B. The minimum spare capacities shall be provided for the following circuits:
   1. A minimum of 1 or what is higher 25% for each Signaling Line Circuit (SLC).
   2. A minimum of 1 or what is higher 25% for each Initiating Device Circuit (IDC).
   3. A minimum of 2 or what is higher 25% for each Notification Appliance Circuit.

C. Batteries shall be provided with at least 25% spare capacity.

D. Conduit and wiremold fill shall not exceed 40% of the interior cross-sectional area.

PART 2 - PRODUCTS

2.1 FIRE ALARM SYSTEM CONTROL PANEL

A. The Fire Alarm System Control Panel:
   1. The Fire Alarm System Control Panel shall be a Potter Electric Signal Company model AFC-1000 microprocessor-based analog addressable type system.
   2. A minimum of two (2) 24 Volts D.C., Intelligent, Analog, and Addressable that shall connect to the FACP's supervised "Class B or A" Signaling Line Circuit (SLC).
   3. Provide "Class B" SLC Circuits unless otherwise noted.

2.2 FIRE ALARM SYSTEM TERMINAL CABINETS

A. Fire Alarm System Terminal Cabinets shall be listed to UL #50 "Enclosures for Electrical Equipment, Non-Environmental Considerations", N.F.P.A. #72, and shall be approved for fire protection service.

B. The terminal cabinet shall be suitable for surface or semi-flush mounting.

C. The terminal cabinet shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

D. The door shall be provided with a keyed cylinder lock that is keyed similar to the main Fire Alarm Control Panel enclosure and include a transparent opening for viewing all indicators.

E. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.

F. The terminal cabinet shall be modular in structure for ease of installation, maintenance, and future expansion.

2.3 FIRE ALARM REMOTE ANNUNCIATOR PANELS (FARAP)

A. Provide a Fire Alarm Remote Annunciator Panel in the main lobby or at the location(s) indicated within the contract documents.

B. The Fire Alarm Remote Annunciator Panel(s) shall be programmed to clearly indicate the exact same information that is displayed at the Fire Alarm Control Panel and shall be protected from unauthorized use by a keyed switch (similar to the main Fire Alarm Control Panel enclosure) or password.

2.4 MAIN FIRE ALARM SYSTEM POWER SUPPLIES (FAPS)

A. The Main Fire Alarm System Control Panel shall provide all power requirements for the Fire Alarm System Control Panel plus additional power for the operation of external Notification Appliance Circuits (NACs) and 24VDC POWER circuits, remote annunciators, remote paging units, etc.

B. The Addressable Monitored Output Notification Appliance Circuits (NAC) Module shall provide one (6) 3.0A, 24VDC supervised Notification Appliance Circuit NAC Class A or B Circuit.

C. The Notification Appliance Circuits (NACs) provide a synchronizes (sync) driver for the following horn/strobe manufacturers AMSECO, Gentex, Cooper-Wheelock and System Sensor.

D. The Main Fire Alarm System Control Panel Power Supply input power shall be 120 Volts A.C. at 50/60 Hertz.

E. The Main Fire Alarm System Control Panel Power Supply shall be modular in design allowing additional Remote Power Supplies to be added.

2.5 BACK-UP BATTERIES

A. Provide quantities of Back-Up Batteries that exceed the minimum Back-Up Battery calculation requirements specified in Paragraph 1.30 of Specification Section 283100.

B. Back-Up batteries for the Fire Alarm Control Panel Power Supply and for each Remote Power Supply shall be a minimum of 12 Volts D.C.

C. Back-Up Batteries shall be Absorbed Glass Material (AGM) or Gel style sealed batteries.

D. Back-Up Batteries shall have the following features:
   1. Completely Maintenance Free.
   2. Deep Cycle.
   3. Used in any Position.
   4. Low Self-Discharge Rates.
   5. Safe for use in Low Ventilated Areas.
   6. Can be transported by Ground or Air.

E. All batteries shall be placed inside a key lockable metal enclosure that is approved by the manufacturer.

F. Each battery shall have the date of installation written on the battery with a permanent marker and be visible when the enclosure door is open.

G. The back-up batteries shall be completely sealed, maintenance free, leak proof, and usable in any position.

2.6 INTERNAL BATTERY CHARGERS

A. The entire Fire Alarm System shall automatically charge Back-Up Batteries by an Internal Battery Charger that operates on a 120 Volts A.C. power source.

B. The Internal Battery Charger shall either be trickle or float charged and shall be capable of recharging batteries from a fully discharged condition to 100% within a 48-hour time period.

C. The Internal Battery Charger shall be an integral component of the Fire Alarm System Control Panel.

D. The charging rate of the Internal Battery Charger shall reduce upon attaining a fully charged condition to avoid damaging of the batteries.

E. The Internal Battery Charger shall provide either integral meters or readily accessible terminal facilities for the connection of portable meters by which the battery voltage and charging current can be determined.

F. The Internal Battery Charger shall be provided with a means for monitoring integrity to detect a battery charger failure and to provide a "Trouble" signal at the FACP.

G. This Internal Battery Charger will automatically inhibit the deep discharge of the system secondary batteries and shall be protected against the accidental reverse polarity connection of the secondary batteries.

2.7 ADDRESSABLE MANUAL PULL STATIONS

A. Manual Pull Stations shall be dual action type with a key operated test/reset lock (keyed similar to the FACP), and designed so that after actuation, the Manual Pull Station cannot be restored to normal operating condition without the use of the key.

B. Manual pull stations shall be constructed of metal, Lexan, or polycarbonate with clearly visible operating instructions and the word "FIRE" in white lettering provided on the cover.

C. Provide Manual pull stations in the main lobby as a minimum design. Provide Manual pull stations as required by local AHJ and NFPA-72 codes.

2.8 ADDRESSABLE HEAT DETECTORS

A. Heat Detectors shall be 24 Volts D.C., Intelligent, Analog, and Addressable that shall connect to the FACP's supervised Signaling Line Circuit (SLC).

B. An output connection shall also be provided in the base of the Heat Detector for connections to the following items:
   1. Sounder base rated at a minimum of 85 dBA with a low frequency sound.
   2. Isolator base.

C. Provide remote indicating lamps for Heat Detectors that when installed, the Light Emitting Diodes (LEDs) are not visible from the walking surface / floor, such as when installed above a ceiling, at an elevation higher than 15'-0" above finished floor, in an attic, etc.

D. Provide anti-ligature guards for Heat Detectors installed in areas subject to mechanical damage.

2.9 ADDRESSABLE SMOKE DETECTORS

A. Smoke Detectors shall be 24 Volts D.C., Intelligent, Analog, and Addressable that shall connect to the FACP's supervised Signaling Line Circuit (SLC).

B. An output connection shall also be provided in the base of the Smoke Detector for connections to the following items:
   1. Sounder base rated at a minimum of 85 dBA.
   2. Isolator base.

C. Upon receiving an alarm signal at the FACP from a system style Smoke Detector (outside of a dwelling unit), all notification appliances shall operate.

D. Provide remote indicating lamps for Smoke Detectors that when installed. The Light Emitting Diodes (LEDs) are not visible from the walking surface / floor, such as when installed above a ceiling, at an elevation higher than 15'-0" above finished floor, etc.

E. Provide anti-ligature guards for Strobe Only Appliances installed in areas subject to mechanical damage.

2.10 ADDRESSABLE MULTI-CRITERIA DETECTORS - FIRE AND CARBON MONOXIDE (CO) DETECTORS

A. Multi-Criteria Fire and CO Detectors shall be listed to and be compatible with the FACP.

B. Multi-Criteria Fire and CO Detectors shall be 24 Volts D.C., Intelligent, Analog, and Addressable that shall connect to the FACP's supervised Signaling Line Circuit (SLC).

C. An output connection shall also be provided in the base of the Multi-Criteria Fire and CO Detector for connections to the following items:
   1. Sounder base rated at a minimum of 85 dBA with low frequency sound.
   2. Isolator base.

D. Provide remote indicating lamps for Multi-Criteria Fire and CO Detectors that when installed. The Light Emitting Diodes (LEDs) are not visible from the walking surface / floor, such as when installed above a ceiling, at an elevation higher than 15'-0" above finished floor, etc.

E. Provide anti-ligature guards for Multi-Criteria Fire and CO Detectors installed in areas subject to mechanical damage.

2.11 LED STROBE ONLY APPLIANCES

A. LED Strobe Only Appliances shall be compatible with the FACP.

B. LED Strobe Only Appliances shall connect to the FACP's or NAC Panel.

C. LED Strobe Only Appliances shall have the following characteristics:
   1. Shall be 24 Volts D.C.
   2. Be installed on the ceiling or on the wall.
   3. Shall be white finished.
   4. Tamper resistant construction.
   5. Shall flash at a rate of one flash per second at 1Hz over the strobes entire operating voltage.
   6. Shall have field selectable candela settings.
   7. Shall be plug-in type.
   8. Shall terminate at a universal mounting plate.

D. Strobe Only Appliances installed in interior climate-controlled spaces shall have an operating temperature between 32°F and 120°F.

E. Weatherproof Strobe Only Appliances installed outdoors or in spaces of high humidity shall have the following characteristics:
   1. Shall be listed for outdoor use by UL.
   2. Shall have an operating temperature between -40°F and 151°F.
   3. Shall be provided with an outdoor/weatherproof back box with:
      a. Conduit entries of ½" and ¾".
      b. Weatherproof sealant per the manufacturer’s recommendations to prevent moisture from entering the structure.

2.12 COMBINATION HORN / LED STROBE APPLIANCES

A. Combination Horn / LED Strobe Appliances shall be compatible with the FACP.

B. Combination Horn / LED Strobe Appliances shall connect to the FACP's or NAC Panel.

C. The Horn Appliance shall be powered independently of the Strobe Appliance on a coded or non-coded power supply.

D. Combination Horn / LED Strobe Appliances shall have the following characteristics:
   1. Shall be 24 Volts D.C.
   2. Be installed on the ceiling or on the wall.
   3. Shall be white finished.
   4. Tamper resistant construction.
   5. Shall have three (3) audibility options and an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern.
   6. Shall produce a nominal sound output of 82 dBA at 10'-0".
   7. Shall produce a maximum sound output of 90 dBA at 10'-0".
   8. Shall flash at a rate of one flash per second at 1Hz over the strobes entire operating voltage.
   9. Shall have field selectable candela settings.
   10. Shall be plug-in type.
   11. Shall terminate at a universal mounting plate.
   12. Shall be backward compatible.

E. The Combination Horn / Strobe Appliance rated decibel output shall be de-rated by 6 decibels each time the distance is doubled as follows:
   1. At a distance of 10'-0" from sounder: Rated dB Output.
   2. At a distance of 20'-0" from sounder: Rated dB Output less 6 dB.
   3. At a distance of 40'-0" from sounder: Rated dB Output less 12 dB.

F. Combination Horn / Strobe Appliances installed in interior climate-controlled spaces shall have an operating temperature between 32°F and 120°F.

G. Weatherproof Combination Horn / Strobe Appliances installed outdoors or in spaces of high humidity shall have the following characteristics:
   1. Shall be listed for outdoor use by UL.
   2. Shall have an operating temperature between -40°F and 151°F.
   3. Shall be provided with an outdoor/weatherproof back box with:
      a. Conduit entries of ½" and ¾".
      b. Weatherproof sealant per the manufacturer's recommendations to prevent moisture from entering the structure.

2.13 TRANSIENT VOLTAGE SURGE PROTECTION

A. If not provided as an integral part of the Fire Alarm System power supply, an external means of Transient Voltage Surge Protection shall be provided for all components of the system.

2.14 CABLING AND WIRING

A. Provide plenum-rated red cable for all fire alarm system cabling unless otherwise noted.
   1. The manufacturer's recommendations shall only be used as a minimum requirement.
   2. Exception to plenum-rated cable is underground-rated cable when fire alarm cabling leaves the building. Provide protect per manufacture requirements.
   3. All cabling shall be a minimum of #16 AWG CU unless otherwise noted.
   4. All conduits shall be a minimum EMT ¾" unless otherwise noted.
   5. All underground conduits shall be a minimum PVC 1" unless otherwise noted.

2.15 FIRE ALARM SYSTEM CIRCUITS

A. All Circuits, Cabling, and Wiring shall be in accordance with Article 760 of the National Electrical Code and Local Electrical Codes.

2.16 FIRE ALARM DOCUMENTS STORAGE CABINET

A. Provide fire alarm documents storage cabinet adjacent to the main fire alarm panel per NFPA-72 code.

B. Coordinate location with the Architect or Owner prior to installation.

C. Download program data and point list onto the 4GB flash drive built-in to cabinet per NFPA-72 code.

D. Manufacturers:
   1. Space Age Electronic Part Number SSU00685 or equal.

2.17 PRIMARY 120VAC POWER PROTECTION DEVICE

A. Provide primary 120VAC power circuit lockout kit per NFPA code.

B. Manufacturers:
   1. Space Age Electronic Part Number ELOCK_FA or equal.

2.18 NAMEPLATES AND LABELS

A. Manufacturers:
   1. Marking Services, Inc. (MSI): http://www.markserv.com.
   2. Double O Laser Services, Inc. http://www.doubleolaser.com.
   3. Or approved equal.

B. Fire Alarm Main Control Panel, Fire Alarm Subpanels, and Duct detectors Nameplates: Engraved plastic, high contrast for maximum visibility. 1/16" engraving plastic with mounting adhesive backing.

1. Fire Alarm Panels: White letters on Red.

Description:	Example:
Panel Name:	**MAIN FIRE ALARM**
Node #:	**Node 10**
AC PANEL:	**AC Panel 2X2A**
BREAKER #:	**Breaker #34**

2. Duct Detector Locations: 3/8" White letters on Red 1"x3" plate with 1/2" letters. Install on the grid next to the ceiling tile to gain access to the duct detector. Mount in clear sight of the floor.

Description:	Example:
Device Name:	**DUCT SLC1-S26**

3. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use for identification of all fire alarm input and output control devices. In clear sight of the floor. Otherwise provide a duct detector type label. These address label shall match fire alarm readout and as-built drawings. All module devices shall have a description of what it is monitoring and controlling.

Description:	Example:
Device Name:	**N10SLC1-S26**

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with N.F.P.A. #72 except as modified herein.

B. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "Good Quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

C. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings).

E. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all cabling diagrams, schematics, physical equipment sizes, etc. before beginning system installation and refer to the riser / connection diagram for all specific system installation / termination / cabling data.

F. Fasteners and supports shall be adequate to support the required load.

3.2 FLEXIBILITY IN SYSTEM DESIGN

A. The Fire Alarm System contractor shall provide flexibility in their design to accommodate future expansion or tenant improvements.

B. Provide all quantities of equipment as specified, while maintaining the “Spare Capacity” requirements listed in this Specification.

3.3 FIRE ALARM SYSTEM MOUNTING HEIGHTS AND LOCATIONS

A. Fire Alarm System Control Panel (FACP):
   1. The FACP shall be installed in the main electrical room.
   2. The FACP shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
   3. The top of the FACP shall be located 60" above the finished floor, unless noted otherwise, and shall be installed level.

B. Fire Alarm NAC Power Supply Panel:
   1. The Fire Alarm NAC Power Supply Panel shall be installed in the main electrical room. they shall be installed within spaces designated for electrical equipment (Electrical Rooms, MDF Rooms, IDF Rooms, etc.).
   2. The Fire Alarm NAC Power Supply Panel shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
   3. The top of the Fire Alarm NAC Power Supply Panel shall be located 60" above the finished floor, unless noted otherwise and shall be installed level.

C. Fire Alarm Distribution Panel (FADP):
   1. The FADP shall be installed in the main electrical room. they shall be installed within spaces designated for electrical equipment (Electrical Rooms, MDF Rooms, IDF Rooms, etc.).
   2. The FADP shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
   3. The top of the FADP shall be located 60" above the finished floor, unless noted otherwise and shall be installed level.

D. Fire Alarm System Terminal Cabinets:
   1. Where Fire Alarm System Terminal Cabinets are required, they shall be installed within spaces designated for electrical equipment (Electrical Rooms, MDF Rooms, IDF Rooms, etc.).
   2. Fire Alarm System Terminal Cabinets shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
   3. The top of the Fire Alarm System Terminal Cabinet shall be located 60" above the finished floor, unless noted otherwise and shall be installed level.

E. Fire Alarm Remote Annunciator Panel(s) (FARAP):
   1. The FARAP(s) shall be installed in the location indicated on the contract documents.
   2. The FARAP(s) shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
   3. The top of the FARAP(s) shall be located 54" above the finished floor, unless noted otherwise and shall be installed level.
   4. Mount fire alarm graphic map adjacent to the remote annunciator at 60" above the finished floor, unless noted otherwise and shall be installed level.

F. Fire Alarm SLC Loop Smoke Detectors:
   1. Fire Alarm SLC Loop Smoke Detectors shall be installed in the following locations:
      a. Above Fire Alarm Control, NAC Power Supply, Distribution, and Amplifier Panels within 5-feet or mounted on wall 3-feet above panel.
      b. In all paths of egress.
         1) Open offices.
         2) Ground level stairway hallway exit to exterior.
         3) At the top of stairways.
      c. On every level hallways (corridors) within 15-feet from each end of the hallway(corridor) and 25-feet to 28-feet between.

d. Within 3-feet of both side of a fire door.
e. Within 5-feet of the supply side of the fire/smoke damper.
f. All Electrical Power rooms.
g. All Telecomm/Data MDF and IDF rooms.
h. Main Lobby.
i. Reception Room.
j. Multi-Purpose Room.
k. Hobby/Craft Room.
l. Men and Women Public Restrooms.
m. Verify in as-built drawings and site walk any other areas that will need smoke detector coverage.

2. Provide a remote alarm/test station in an accessible location from the floor if the smoke detector cannot be reached with a 6-feet ladder.

G. Fire Alarm SLC Loop Duct Smoke Detectors:
1. Fire Alarm SLC Loop Duct Smoke Detectors shall be installed in the following locations:
a. Within Mechanical Air Handle Unit 2,000 CFM or above.
b. 3-feet the motor and 90-gegree bends.
c. Do not install a Duct Smoke Detector between the motor, heat unit, or control damper.
d. With would be on the supply and return side of the unit unless the AHJ approves supply only.
e. Within 5-feet of the supply side of the fire/smoke damper.
2. All Duct Smoke Detector shall have a remote alarm/test station in an accessible location from the floor.

H. Fire Alarm SLC Loop Multi-Criteria Fire CO Detectors:
1. Fire Alarm SLC Loop Multi-Criteria Fire CO Detectors in Dwelling Units shall be installed in the following locations:
a. All Fire Alarm SLC Loop Multi-Criteria Fire CO Detectors in Dwelling Units shall have low frequency sounder bases.
b. Sounder base shall be programmed together with all detectors with sounder bases and strobe only in each dwelling unit.
c. On every level of a dwelling unit.
d. Inside every sleeping area of a dwelling unit.
e. In the hall outside of every sleeping area of a dwelling unit.
f. At the top and bottom of a stairway.
g. In any room that contains a fuel-burning appliance.
2. Listed Multi-Criteria Fire CO Detector spacing shall be de-rated in accordance with Table 17.6.3.5.1 of N.F.P.A. #72 for spaces having a ceiling height of 10'-0" up to 30'-0" in height.
3. Multi-Criteria Fire CO Detectors in Dwelling Units shall not be installed in the following locations:
a. Within 1'-0" of fluorescent light fixtures.
b. Within 20'-0" of sources of combustion particles (Stoves, Furnaces, Water heaters, Space Heaters, etc.).
c. Within 10'-0" of Damp, Humid, or Steamy Areas (Showers, Saunas, Dishwashers, etc.).
d. Within 10'-0" of the corner of the range, oven, or microwave.
e. Within 3'-0" from a door to a bathroom containing a shower or tub.
f. Within 3'-0" from a supply or exhaust HVAC grille.
g. Within 3'-0" from the tip of the blade of a ceiling suspended fan.
h. Within 4" of a ceiling/wall corner.
i. No further than 3'-0" from the peak of the ceiling measured horizontally.
j. On the wall lower than 1'-0" down from the ceiling.
k. In poorly ventilated Kitchens, Garages, and Furnace Rooms.
l. In air streams near Kitchens.

m. In areas where temperatures are regularly below 40°F or above 100°F (Unheated Buildings, Outdoor Rooms, Porches, Unfinished Attics, Basements, etc.).
n. In very Dusty, Dirty, or Greasy Areas (Directly over Stoves or Ranges, Laundry Rooms, etc.).
o. In insect infested areas.
p. Near fresh air vents, ceiling fans, or in very drafty areas.

I. Fire Alarm Addressable Manual Pull Stations:
1. Fire Alarm Manual Pull Stations shall be installed in the following locations in a non-sprinklered building:
a. All exterior exits to the building.
b. All stairway levels.
2. Fire Alarm Manual Pull Stations shall be mounted where the manually operable part of the fire alarm manual pull station to be installed at a minimum height of 42 inches. The pull station height should not be more than 48 inches from the top of device, the finished floor, and shall be installed level.

J. Fire Alarm Addressable Input (Monitor) Modules:
1. Provide label on plate indicating device address number and designation.

K. Addressable Relay Module shall be provided for the following:
1. Fire Alarm Input (Monitor) Modules shall be installed in the following locations:
a. All modules shall be mounted adjacent to the device or panel be interfaced to the fire alarm system. The modules are to be accessible and minimum of 48-inches a above the finished floor.
b. Duct Smoke Detectors Interface to HVAC unit or system
c. HVAC Systems DDC Interface.
d. Fire / Smoke Dampers.
e. Magnetic Door Holders.
f. Magnetic Door Releases.
g. Access Control Systems Interface.
h. Other building functions.
2. Provide label on plate indicating device address number and designation.

L. Multi-Voltage Interface Relay Modules (Relay In Box) shall be provided for the following:
1. Multi-Voltage Interface Relay Modules (Relay In Box) shall be installed in the following locations:
a. All Interface Relay Modules shall be mounted adjacent to the device or panel be interfaced to the fire alarm system. The Raley modules are to be accessible and minimum of 48-inches a above the finished floor.
b. Fire/Smoke Dampers.

M. Addressable Monitored Output Notification Appliance Circuit (NAC) and Sync Modules:
1. Fire Alarm (NAC) and Sync Modules shall be installed in the following locations:
a. All modules shall be mounted adjacent to the device or panel be interfaced to the fire alarm system. The modules are to be accessible and minimum of 48-inches a above the finished floor.
b. Shall be mounted the (NAC) and Sync modules behind the dwelling unit front door or closet.
2. Provide label on plate indicating device address number and designation.

N. Strobe Only Appliances:
1. Strobe Only Appliances shall be flush mounted when located in finished areas.
2. Strobe Only Appliances may be surface mounted when located in unfinished areas.
3. Strobe Only Appliances shall be ceiling or wall mounted at a Height - 80" minimum to 96" maximum, measured to the bottom of the lens to the finished floor and shall be installed level.

4. Dwelling ADA Sleeping Areas Strobe Only Appliances shall be ceiling with 177cd strobe or wall mounted 110cd strobe at a 24”to the ceiling and shall be installed level.
    a. When using 177 cd strobes, NFPA requires that the strobe be positioned no more than 24 inches from the ceiling. The strobe must be placed on the wall within 16 feet of the pillow on the bed. KCHA wants to ceiling mounted with 177cd strobe.

O. Combination Horn / Strobe Appliances:
1. Combination Horn / Strobe Appliances shall be flush mounted when located in finished areas.
2. Combination Horn / Strobe Appliances may be surface mounted when located in unfinished areas.
3. Combination Horn / Strobe Appliances shall be ceiling or wall mounted at a Height - 80" minimum to 96" maximum, measured to the bottom of the lens to the finished floor and shall be installed level.
    a. On every level hallways (corridors) within 15-feet from each end of the hallway(corridor) and a minimum of 50-feet between.
    b. In all paths of egress.
        1) Open offices.
        2) Ground level stairway hallway exit to exterior.
    c. Main Lobby.
    d. Reception Room.
    e. Multi-Purpose Room.
    f. Hobby/Craft Room.
    g. Men and Women Public Restrooms.
    h. Community Room.
    i. Laundry rooms.
    j. Library.
    k. Exterior Community Outdoor Decks.
    l. Verify in as-built drawings and site walk any other areas that will need smoke detector coverage.
4. Some Local AHJ require an exterior horn/strobe facing the street. Confirm this requirement with the site Local AHJ.

3.4 CONDUIT

A. Provide and install conduit, junction boxes, couplers, connectors, cabling, terminations, and the necessary Fire Alarm System equipment to monitor and/or power any specialty system control panel(s) and equipment.

B. The Contractor is responsible for assuring that the conduit size is suitable for the equipment supplied.

C. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas.

D. Cabling installed in walls, below 8'-0" in elevation, above inaccessible ceilings or installed exposed to view shall be installed in conduit.

E. Conduit shall be in accordance with N.F.P.A. #70, local requirements, and state requirements.

F. The minimum radius bend of conduit shall be:
1. Ten (10) times the cable outside diameter with no tensile load applied during installation.
2. Twenty (20) times the cable outside diameter with a maximum tensile load of 25 feet/lbs. applied during installation.

G. Conduit shall not enter the Fire Alarm System Control Panel or any other remotely mounted panel, equipment, or back box, except where conduit entry is specified by the manufacturer.

3.5 CABLING

A. Cabling for 24 Volts D.C. control, alarm notification, emergency communications, and similar power-limited auxiliary functions may be run in the same conduit as Initiating Device Circuits (IDC) and Signaling Line Circuits (SLC).

B. The Contractor is responsible for assuring that the cable quantity, size, and type is suitable for the equipment supplied.

C. Cable must be separated from any open conductors of Power or Class 1 circuits and shall not be placed in any conduit, junction box, or raceway containing these conductors per Article 760 of N.F.P.A. #70.

D. Do not exceed the cabling distance limitation of the equipment, device(s), cable(s), and/or conductor(s) as recommended by the manufacturer of either equipment and/or cables for each installation application.

E. All Fire Alarm System cabling must be new and free from insulation scrapes or peeling.

F. Cabling insulation shall be one of the types required by Article 725-16 of N.F.P.A. #70 and shall be consistently color-coded throughout the system.

G. The Fire Alarm System Control Panel shall be connected to a separate dedicated branch circuit rated for a maximum of 20 amperes at 120 Volts A.C. This circuit shall be labeled at the main power distribution panel as "FIRE ALARM".

H. Permanent cable markers shall be affixed to all conductors at terminations and splices.

I. T-Tapping of Class "A" circuits (i.e. Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), Signaling Line Circuits (SLC) etc.) is not allowed.

J. T-Tapping of Class "B" circuits (i.e. Initiating Device Circuits (IDC) and Notification Appliance Circuits (NAC) is not allowed.

K. T-Tapping of Class "B" circuits (i.e. Signaling Line Circuits (SLC) etc.) is allowed.

L. All cabling terminal blocks shall be the plug-in / removable type and shall be capable of terminating up to 12 AWG cable.

M. Exposed cabling not allowed, entire system wiring to be enclosed in conduit.

N. The Fire Alarm System Contractor shall insure that cables are installed within conduit with care, using techniques which prevent kinking, sharp bends, scraping, cutting, deforming the jacket, or other damage. During inspection, evidence of such damage will result in the material being declared unacceptable. The Fire Alarm System Contractor shall replace all unacceptable cabling at no additional expense to the Owner.

O. For consistency of cabling throughout the entire system equipment, if specific conductor colors are not called out in each system specification, then the following colors shall apply:
   1. Red is (+) Positive voltage.
   2. Black is (-) Negative voltage.
   3. White is common.
   4. Green is normally open or normally closed.

P. All cabling penetrations into a box, fitting, enclosure, panel, etc. shall be provided with a bushing to protect the cabling from abrasion in accordance with Paragraph 342.46 of N.F.P.A. #70. Hard rubber or compression bushings will not be approved and shall not be used.

Q. In the event of a primary power failure, disconnected back-up battery, an open circuit in the field cabling, or removal of any internal modules a trouble signal shall be activated and remain active until the system is restored to normal condition.

R. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow).

S. No cable other than the detector circuit shall be permitted in conduit feeding detectors unless approved.

T. Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

U. Minimum cable sizes shall be as follows:
   1. 120 Volts A.C. cabling shall be a minimum of #12 American Wire Gauge (AWG).
   2. Initiating Device Circuits (IDC) (Manual Pull Stations, Heat Detectors, Smoke Detectors, Carbon Monoxide Detectors, Duct Smoke Detectors, etc.) shall be a minimum of #16 American Wire Gauge (AWG) pair FPL rated.
   3. Notification Appliance Circuits (NAC) (Horns, and Strobes) shall be a minimum of #16 American Wire Gauge (AWG) FPL rated cable.
   4. Voice (Speaker) Appliance Circuits (VOICE) (Speakers) shall be a minimum of #16 American Wire Gauge (AWG) shielded, twisted FPL rated cable.
   5. Signaling Line Circuit (SLC) (Manual Pull Stations, Heat Detectors, Smoke Detectors, Carbon Monoxide Detectors, Duct Smoke Detectors, etc.) shall be a minimum of #16 American Wire Gauge (AWG) twisted FPL rated cable.
   6. Heat detectors shall be a minimum of #16 American Wire Gauge (AWG).
   7. Linear Heat Detector Cables shall be served by a minimum of #16 American Wire Gauge (AWG) from the Fire Alarm System Control Panel out to the hazard area where it is then connected to the beginning of the Linear Heat Detector Cable portion of the circuit.
   8. Monitor modules shall be a minimum of #16 American Wire Gauge (AWG).

V. Provide a Fire Alarm System Device Naming Matrix that identifies the nomenclature used on the shop drawing consisting of the following:
   1. Circuit Type
   2. Circuit Number
   3. Device type
   4. Device number

W. Circuit labels shall be provided using an electronic labeler for the following circuit locations:
   1. At the Fire Alarm System Control Panel.
   2. At all junction boxes.
   3. At all addressable devices – Label with device address and loop number.

3.6 JUNCTION BOXES

A. Provide access panels as needed for junction boxes (j-box) located above inaccessible ceilings or behind walls.

B. All junction boxes for the Fire Alarm System shall be painted red.

C. All Fire Alarm System junction boxes shall be annotated "FA" on the cover in black bold print having minimum character font size of 2" tall by 1" wide.

D. All Fire Alarm System junction boxes shall be painted red (inside and out) and annotated "FIRE ALARM POWER LIMITED" on the cover in black bold print having a minimum character font size of ¼" tall by ¼” wide per WAC 296-46B 760.

E. Mark outside cover with a sharpy maker circuits within the j-box.

3.7 GROUNDING

A. A grounding system shall be maintained as required by code.

3.8 PROGRAMMING

A. Program system to for complete operation to the satisfaction of the Authority Having Jurisdiction. Program all addressable devices to correspond with final room identification/numbering. Verify room identification with the Owner’s representative.

B. Factory default install code will not be changed.

C. Program owner code to 1111

D. Program the options to access date & time, smoke status, event log, and add devices.

3.9 DOCUMENTS

A. As a condition for the project final acceptance, the Contractor shall, prior to final testing, submit the following documents to the Owner's representative for approval. If as a result of final testing there is a change to the system design, then the Contractor shall correct the as-built drawings.

B. Record Drawings:
   1. Provide as-built record drawings indicating the completed installation. Drawings shall be prepared on approved shop drawings with changes marked in red pencil, in a legible and neat manner. Drawings shall indicate the locations of: fire alarm devices, junction boxes, terminal cabinets, sensors and controlled equipment (motor starters, fans, pumps, valves, dampers, etc.). Drawings shall indicate: Riser diagrams, sources of power, raceway sizes and routing, type and number of conductors.
   2. As-built panel schematic, connection, and interconnection wiring diagrams showing all system components. Trunk type wiring diagrams are not acceptable.
   3. Component connection diagrams shall show schematic point-to-point identification (Test and Control Input /Output Matrix).
   4. Provide a written detailed description of each duct detector location to direct a person to that location in the closeout documents.
   5. Central station monitoring pre-test report of all new addressable points.

C. Provide the AHJ at final acceptance of the following documents:
   1. As-built drawings shall be full construction set with redline markups that contain the following (all zoning, device point numbers, new device conduit or wiring pathways, and exact location of devices and panels.)
   2. Component connection diagrams shall show schematic point-to-point identification (Test and Control Input /Output Matrix).
   3. Central station monitoring pre-test report of all new zones.
   4. Fire alarm panel alarm, supervisory, and trouble event log report of all devices.
   5. Addressable points list for bldg.
   6. Completed NFPA 72 Record of Completion current forms to owner and AHJ.
   7. Provide digital copy of all above on one following (finger drive).
   8. Provide all the above documents in O&M manuals binder.

D. Operation and Maintenance Manuals:
   1. Manuals shall contain cut sheets of all equipment and devices installed, wiring diagrams, operational and maintenance instructions. All device options shall be clearly identified.
   2. Manual shall contain all documents in Section 283100 Para 3.11c
   3. Contractor to provide O&M Manual binder at each fire alarm panel locations.

E. Functional Description For Auxiliary Controls:
   1. When an interface exists between the FA system and other control systems or controlled devices, the contractor shall provide a complete narrative describing operational relationships to the FA system.

3.10 FORMAL TESTS AND INSPECTIONS

A. Do not submit a request for formal test and inspection until the preliminary test (including audibility and intelligibility testing results) are completed and corrections are made and approved.

B. The Fire Alarm System Contractor shall arrange for and obtain all required inspections and certificates pertaining to the Fire Alarm System work and deliver the certificates to the Fire Protection Engineer.

C. Submit copies of preliminary test results to the Owner for review and approval prior to submitting a request for final acceptance testing with the Authority Having Jurisdiction.

D. Submit a written request to local fire protection authority for formal inspection at least 14 days before the inspection date.

E. An experienced technician regularly employed by the system installer shall be present during the inspection.

F. At this inspection, repeat any or all of the required tests as directed.

G. Correct defects in work provided by the Contractor and perform additional system tests until the system complies with current code and the contract requirements.

H. Furnish appliances, equipment, electricity, instruments, connecting devices and personnel for the tests.

I. Furnish Owner with one (1) copies of test certificates required by testing agencies.

3.11 FIRE ALARM SYSTEM TESTING

A. Upon completion on the system installation, the Fire Alarm System Contractor shall conduct a system test for the Owner, Architect, Engineer, and Authority Having Jurisdiction (for those who wish to attend) to verify operation of the system.

B. This system test shall be conducted by a factory trained technician.

C. The Fire Alarm System Contractor shall provide a minimum of (2), two-way communication devices for the system test.

D. The Fire Alarm System Contractor shall completely fill out all applicable documents contained Section 7.8 "Forms" of N.F.P.A. #72.

E. If the Fire Alarm System Contractor fails the Authority Having Jurisdiction system test and inspection, the following shall occur:
   1. The Fire Alarm System Contractor shall make all of the necessary corrections as required, to pass the Authority Having Jurisdiction testing and inspection.
   2. Notify the Authority Having Jurisdiction and schedule another test.
   3. Pay all associated fees for additional site visits made by the Authority Having Jurisdiction.
   4. Continue making corrections until the Fire Alarm System has been accepted by the Authority Having Jurisdiction.

F. After acceptance of the system testing, the Fire Alarm System Contractor shall submit a copy of approved test certificates with Authority Having Jurisdiction signature.

3.12 AUDIBILITY REQUIREMENTS

A. The Fire Alarm System Contractor shall perform audibility testing in each space of the building prior to acceptance testing.

B. Decibel readings shall be taken at a point 10'-0" from the appliance at an elevation of 5'-0" above finished floor.

C. The sound level shall meet both of the following requirements:
   1. A minimum of 15 decibels (dBs) above the average ambient sound level.
   2. A minimum of 5 decibels (dBs) above the maximum sound level having a minimum duration of 60 seconds.

D. Decibel measurements shall be taken using the "A-weighted" measurements which are relatively flat from 600 Hz to 7,000 Hz, "B-weighted" (relatively flat from 300 Hz to 4,000 Hz) and "C-weighted" (relatively flat from 700 Hz to 4,000 Hz, measurements will not be acceptable.

3.13 INSTRUCTION AND TRAINING PERIOD

A. Upon completion of the work and after all tests and inspections by the authority(s) having jurisdiction, the Fire Alarm System Contractor shall "Hands On" demonstrate and train the Owner's designated operation and maintenance personnel in the operation and maintenance of the Fire Alarm System.

B. The Fire Alarm System Contractor's representative shall be a superintendent, foreman, or technician who is knowledgeable in the system installed.

C. The Fire Alarm System Contractor shall arrange scheduled instruction periods with the Owner’s designated operation and maintenance personnel.

D. The Fire Alarm System Contractor shall provide in their bid the following:
   1. One (1) editing session of the control panel programming to address any changes required by the Owner.
   2. Training periods shall be based upon complexity of the system installed, but in no case be less than 4 hours in duration. This includes travel time to site and training session time.

3.14 PROJECT COMPLETION

A. Project completion and payment will be based on completion of the following:
   1. Completion and approval of acceptance tests.
   2. Completion of punch list items.
   3. Delivery and acceptance of the as-built drawings and operation and maintenance manuals.
   4. Provide finger drive of program data in fire alarm panel as required by NFPA-72 codes.
   5. Clean-up of installation site to the satisfaction of the Owner's representative.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and fiberglass doors.

B. Thresholds.

C. Weatherstripping and gasketing.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2021.

C. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2017.

D. BHMA A156.4 - Door Controls - Closers; 2019.

E. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

F. BHMA A156.7 - Template Hinge Dimensions; 2016.

G. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.

H. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.

I. BHMA A156.16 - Auxiliary Hardware; 2018.

J. BHMA A156.17 - Self Closing Hinges & Pivots; 2019.

K. BHMA A156.18 - Materials and Finishes; 2020.

L. BHMA A156.21 - Thresholds; 2019.

M. BHMA A156.22 - Standard for Gasketing; 2021.

N. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.

O. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

P. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

Q. DHI (KSN) - Keying Systems and Nomenclature; 2019.

R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

S. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

T. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.

U. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:

1. Owner.
2. Installer's Architectural Hardware Consultant (AHC).
3. Hardware Installer.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Convey Owner's keying requirements to manufacturer.

1.04 SUBMITTALS

A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.
   3. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   4. Include account of abbreviations and symbols used in schedule.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.

E. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

F. Specimen warranty.

G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. Lock Cylinders: Ten for each master keyed group.
   2. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.07 WARRANTY

A. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: 25 years, minimum.
      a. Concealed: 5 years, minimum
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   4. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.

2.02 HINGES

A. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Self Closing Hinges: Comply with BHMA A156.17.
   2. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
      a. Provide hinge width required to clear surrounding trim.
   3. Provide hinges on every swinging door.
   4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   5. Provide ball-bearing hinges at each door with closer.
   6. Provide non-removable pins on exterior outswinging doors.
   7. Provide following quantity of butt hinges for each door:
      a. Doors From 60 inches High up to 90 inches High: Three hinges.

2.03 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide cams and/or tailpieces as required for locking devices.

2.04 CLOSERS

A. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Concealed, overhead mounted and Surface mounted.
   2. Provide door closer on each exterior door.
   3. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

2.05 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
   1. Provide stop for every swinging door, unless otherwise indicated.

2.06 PROTECTION PLATES

A. Protection Plates: Comply with BHMA A156.6.

B. Metal Properties: Stainless steel material.
   1. Metal, Standard Duty: Thickness 0.050 inch, minimum.

C. Edges: Beveled, on four sides unless otherwise indicated.

D. Fasteners: Countersunk screw fasteners.

2.07 KICK PLATES

A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Singles: 8 inch high by 2 inch less door width (LDW) on push side of door.
   2. Pairs: 8 inch high by 1 inch less door width (LDW) on push side of doors.

2.08 DOOR HOLDERS

A. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Provide surface mounted door holders when wall or floor stop is not applicable and hold-open device is mounted on door.
   2. Type: Push-to-Hold.
   3. Material: Stainless steel.

2.09 FLOOR STOPS

A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide floor stops when wall surface is not available; be cautious not to create a tripping hazard.
   2. Type: Push-to-Hold, with dome floor stop.
   3. Material: Stainless steel housing with rubber insert.

2.10 WALL STOPS

A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide wall stops to prevent damage to wall surface upon opening door.
   2. Type: Bumper, concave, wall stop.
   3. Material: Stainless steel housing with rubber insert.

2.11 ASTRAGALS

A. Astragals: Comply with BHMA A156.22.
   1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
   2. Type: Split, two parts, and with sealing gasket.
   3. Interior: Split, two parts, and with sealing gasket.
   4. Exterior: Security astragal with sealing gasket.
   5. Material: Stainless steel or Aluminum, with neoprene weatherstripping.
   6. Provide non-corroding fasteners at exterior locations.

2.12 THRESHOLDS

A. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
   2. Provide threshold at each exterior door, unless otherwise indicated.
   3. Provide threshold with Sound Transmission Class (STC) of 25-30 at locations indicated.
   4. Type: Flat surface.
   5. Material: Aluminum.
   6. Threshold Surface: Fluted horizontal grooves across full width.
   7. Field cut threshold to profile of frame and width of door sill for tight fit.
   8. Provide non-corroding fasteners at exterior locations.

2.13 WEATHERSTRIPPING AND GASKETING

A. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Screw applied, compatible with stop/closer arm mounting.
   2. Door Sweep Type: Door shoe with drip cap.
   3. Material: Stainless steel or Aluminum, with Neoprene or brush weatherstripping.
   4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   5. Provide door bottom sweep on each exterior door, unless otherwise indicated.
   6. Provide sound-rated gasketing and automatic door bottom on doors indicated as "Sound-Rated", "Acoustical", or with "Sound Transmission Class (STC) rating"; fabricate as continuous gasketing, do not cut or notch gasketing material.

2.14 LATCH PROTECTOR

A. Latch Protector: Provide on door to protect latch from being tampered with while in locked position.
   1. Type: Standard latch protector.
   2. Material: Stainless steel.

2.15 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.

1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, black color.

2.16 KEY CONTROL SYSTEMS

A. Key Control Systems: Comply with guidelines of BHMA A156.28.
   1. Provide keying information in compliance with DHI (KSN) standards.
   2. Keying: Grand master keyed.
   3. Include construction keying and control keying with removable core cylinders.
   4. Supply keys in following quantities:
      a. 4 each Master keys.
      b. 1 each Grand Master keys.
      c. 4 Control keys if new system.
      d. 6 Extra Cylinder cores. Two sets of three keyed alike.
      e. 4 Change keys for each keyed core.
   5. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.

2.17 FIRE DEPARTMENT LOCK BOX

A. Fire Department Lock Box:
   1. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
   2. Capacity: Holds 10 keys.
   3. Finish: Manufacturer's standard black.

2.18 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
   2. Secondary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
      a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.02 ADJUSTING

A. Adjust hardware for smooth operation.

B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.03 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

PART 4 HARDWARE SETS

4.01 GENERAL

A. These Hardware Sets indicate requirements for single doors that type with conditional requirements for pairs and other situations.

Manufacturer List

CODE	NAME
AB	ABH Manufacturing Inc.
BE	Best Access Systems
DM	Dorma Door Controls
NA	National Guard
SC	Schlage
ST	BEST hinges and sliding
TR	Trimco

Option List

CODE	DESCRIPTION
B4E-HEAVY-KP	Beveled 4 Edges - Kick Plates
CSK	Counter Sinking of Kick and Mop Plates
INV	Inverted Closer in Header (Painted)

Finish List

CODE	DESCRIPTION
26D	Satin Chrome
32D	Satin Stainless Steel
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
BLACK	Black
US32D	Stainless Steel, Dull

4.02 HARDWARE SETS

HW 01 – EXTERIOR ENTRY DOORS (101, 112)

3	HINGES	FBB199 4.5" X 4.5" NRP	32D	ST
1	CLASSROOM LOCKSET	ND70H RHO	626	SC
1	CYLINDER	SFIC FINAL CORE, MATCH EXISTING SFIC SYSTEM	626	SC
1	CLOSER	ITS 9613 INV	626	DM
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	DOME STOP	W1211	630	TR
1	LOCK ASTRAGAL	5002	630	TR
1	GASKETING	700 NA @ HEAD & JAMBS		NA
1	THERMAL BREAK DOOR SHOE	819 NA		NA
1	THRESHOLD	BY DOOR MFR, COMPOSITE ADJUSTABLE		

HW 02 - EXTERIOR DOUBLE DOOR (102B)

6	HINGES	FBB199 5" X 4.5" NRP	32D	ST
1	SEMI-AUTO FLUSHBOLT	3820 X 3810	626	TR
1	STOREROOM LOCKSET	ND80H RHO	626	SC
1	CYLINDER	SFIC FINAL CORE, MATCH EXISTING SFIC SYSTEM	626	SC
1	COORDINATOR	3094B3	BLACK	TR
2	CLOSER	ITS 9613 INV	626	DM
2	OVERHEAD STOP	9026	US32D	AB
2	KICK PLATE	K0050 8" X 1" LDW B4E CSK	630	TR
1	DUST PROOF STRIKE	3910	626	TR
1	MOUNTING BRACKET	3095/3096 AS REQ'D	BLACK	TR
1	GASKETING	700 NA @ HEAD & JAMBS		NA
1	GASKETING	5050 B @ ASTRAGAL		NA
1	SECURITY ASTRAGAL	1390 SP		NA
2	THERMAL BREAK DOOR SHOE	819 NA		NA
1	THRESHOLD	BY DOOR MFR, COMPOSITE ADJUSTABLE		

HW 03 - SIDE ACCESS DOORS (113A, 113B)

3	HINGES	FBB199 4.5" X 4.5" NRP	32D	ST
1	CLASSROOM LOCKSET	ND70H RHO	626	SC
1	CYLINDER	SFIC FINAL CORE, MATCH EXISTING SFIC SYSTEM	626	SC
1	CLOSER	ITS 9613 INV	626	DM
1	OVERHEAD STOP	9024	US32D	AB
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	LOCK ASTRAGAL	5002	630	TR
1	GASKETING	700 NA @ HEAD & JAMBS		NA
1	THERMAL BREAK DOOR SHOE	819 NA		NA
1	THRESHOLD	BY DOOR MFR, COMPOSITE ADJUSTABLE		

HW 04 - PASSAGE (102A, 114)

3	BUTT HINGE	FBB179 4.5" X 4.5"	26D	ST
1	PASSAGE LEVERSET	ND10 RHO	626	SC
1	CLOSER	HD8016 AF80P	689	BE
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B @ HEAD & JAMBS		NA

HW 05 - CONFERENCE ROOM DOOR (105, 106, 111A, 111B)

3	BUTT HINGE	FBB179 4.5" X 4.5"	26D	ST
1	OFFICE LOCKSET	ND53H RHO	626	SC
1	CYLINDER	SFIC FINAL CORE, MATCH EXISTING SFIC SYSTEM	626	SC
1	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B @ HEAD & JAMBS		NA

HW 07 - RESTROOM DOOR (104, 107, 108)

3	BUTT HINGE	FBB179 4.5" X 4.5"	26D	ST
1	PRIVACY LEVERSET	ND40 RHO	626	SC
1	CLOSER	HD8016 AF80P	689	BE
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	WALL BUMPER	1270WV	630	TR
1	GASKETING	5050 B @ HEAD & JAMBS		NA

HW 08 - STORAGE DOOR (115)

3	BUTT HINGE	FBB179 4.5" X 4.5"	26D	ST
1	STOREROOM LOCKSET	ND80H RHO	626	SC
1	CYLINDER	SFIC FINAL CORE, MATCH EXISTING SFIC SYSTEM	626	SC
1	CLOSER	HD8016 SIS	689	BE
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	GASKETING	5050 B @ HEAD & JAMBS		NA

END OF SECTION

Electrical Symbols

S_{VS} VACANCY SENSOR LIGHT SWITCH

S_{LV} LOW VOLTAGE SWITCH CONTROLLED BY ROOM SENSOR

S_{LVD} (b R1)

LIGHT SWITCH SUBSCRIPTS ARE AS FOLLOWS:

LV = LOW VOLTAGE, D = DIMMING

b = LOWER CASE LETTER CORRESPONDS TO LETTER AT FIXTURES TO BE CONTROLLED

R# = RELAY # IN LIGHTING CONTROL PANEL

S# = SENSOR ZONE

These requirements are per the Washington State Energy Code, and the spec note of 0.46 max is the correct SHGC target value (slightly easier than 0.40).

TABLE C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM *U*-FACTOR AND SHGC REQUIREMENTS

CLIMATE ZONE	5 AND MARINE 4	
***U*-factor for Class AW windows rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site-built fenestration products[a]**		
Fixed[b] *U*-factor	U-0.38	
Operable[c] *U*-factor	U-0.40	
***Entrance doors*[d]**		
U-factor	U-0.60	
U-factor for all other vertical fenestration		
U-factor	U-0.30	
SHGC for all vertical fenestration		
Orientation[e,f]	**SEW**	**N**
PF < 0.2	0.38	**0.51**
0.2 ≤ PF < 0.5	0.46	**0.56**
PF ≥ 0.5	0.61	**0.61**
Skylights		
***U*-factor**	U-0.50	
SHGC	0.35	

The U-factors remain the same (0.3 max).

These U-Value and SHGC numbers (both 0.4 and 0.46) both seem achievable after reviewing Milgard's Thermal Chart for Tuscany windows (see attached). The spec further clarifies under 2.05 Glazing that it's insulated glass, 7/8", SunCoat with Argon fill

MILGARD
WINDOWS and DOORS

V400 Tuscany® Series Thermal Chart

Revision Date: 8/3/2023

IG Thickness	Exterior Glass	Spacer	Interior Glass	Gas Fill	No Grids					Flat Grids					Sculptured Grids				
					U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24
Horizontal Slider																			
7/8"	SunCoat	Intercept	Clear	Air	0.33	0.29	0.53	-	-	0.33	0.26	0.47	-	-	0.33	0.24	0.41	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.29	0.29	0.53	-	-	0.29	0.26	0.47	-	-	0.29	0.23	0.41	S	Yes
7/8"	SunCoatMax	Intercept	Clear	Air	0.33	0.21	0.46	-	-	0.33	0.19	0.41	-	-	0.33	0.17	0.37	-	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.29	0.21	0.46	S	Yes	0.29	0.19	0.41	S	Yes	0.29	0.17	0.37	S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.28	0.29	0.52	-	-	0.28	0.26	0.46	-	-	0.28	0.23	0.41	SC, S	-
7/8"	SunCoat	Intercept	4th Surface	Argon	0.25	0.29	0.52	NC	-	0.25	0.26	0.46	NC	-	0.25	0.23	0.41	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.27	0.19	0.45	SC, S	Yes	0.27	0.18	0.40	SC, S	Yes	0.27	0.16	0.34	SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.25	0.19	0.45	NC, SC, S	Yes	0.25	0.17	0.40	NC, SC, S	Yes	0.25	0.16	0.35	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.26	0.47	0.58	N	-	0.26	0.43	0.52	N	-	0.26	0.38	0.46	-	-
7/8"	SunCoat	Foam	Clear	Air	0.32	0.29	0.53	-	-	0.32	0.26	0.47	-	-	0.32	0.24	0.41	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.29	0.29	0.53	-	-	0.29	0.26	0.27	-	-	0.29	0.23	0.41	S	Yes
7/8"	SunCoatMax	Foam	Clear	Air	0.32	0.21	0.46	S	-	0.32	0.19	0.41	S	-	0.32	0.17	0.37	S	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.28	0.21	0.46	SC, S	-	0.28	0.19	0.41	SC, S	Yes	0.28	0.17	0.37	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.27	0.29	0.52	-	-	0.27	0.26	0.46	-	-	0.27	0.23	0.41	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.25	0.29	0.52	NC	-	0.25	0.26	0.46	NC	-	0.25	0.23	0.41	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.27	0.19	0.45	SC, S	Yes	0.27	0.18	0.40	SC, S	Yes	0.27	0.16	0.35	SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.24	0.19	0.45	NC, SC, S	Yes	0.24	0.17	0.40	NC, SC, S	Yes	0.24	0.16	0.35	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.25	0.47	0.58	N	-	0.25	0.43	0.52	N	-	0.25	0.38	0.46	-	-
Double Slider																			
3/4"	SunCoat	Intercept	Clear	Air	0.33	0.28	0.50	-	-	0.33	0.25	0.45	-	-	0.34	0.23	0.39	-	-
3/4"	SunCoat	Intercept	Clear	Argon	0.29	0.28	0.50	-		0.29	0.25	0.45	-		0.31	0.22	0.39	S	
3/4"	SunCoatMax	Intercept	Clear	Air	0.32	0.19	0.44	S	-	0.32	0.17	0.39	S		0.34	0.16	0.34	-	
3/4"	SunCoatMax	Intercept	Clear	Argon	0.29	0.19	0.44	S	Yes	0.29	0.17	0.39	S	Yes	0.31	0.15	0.34	S	-
3/4"	SunCoat	Intercept	4th Surface	Air	0.28	0.28	0.49	-	-	0.28	0.25	0.44	-	-	0.29	0.22	0.39	S	Yes
3/4"	SunCoat	Intercept	4th Surface	Argon	0.26	0.28	0.49	-	-	0.26	0.25	0.44	-	-	0.27	0.22	0.39	SC, S	Yes
3/4"	SunCoatMax	Intercept	4th Surface	Air	0.28	0.19	0.43	SC, S	Yes	0.28	0.17	0.38	SC, S	Yes	0.29	0.15	0.34	S	Yes
3/4"	SunCoatMax	Intercept	4th Surface	Argon	0.26	0.19	0.43	SC, S	Yes	0.26	0.17	0.38	SC, S	Yes	0.27	0.15	0.34	SC, S	Yes
3/4"	Cardinal 180	Intercept	4th Surface	Argon	0.26	0.45	0.56	N	-	0.26	0.41	0.50	N	-	0.27	0.36	0.44	-	-
3/4"	SunCoat	Foam	Clear	Air	0.32	0.28	0.50	-	-	0.32	0.25	0.45	-	-	0.34	0.23	0.39	-	-
3/4"	SunCoat	Foam	Clear	Argon	0.29	0.28	0.50	-	-	0.29	0.25	0.45	-	-	0.31	0.22	0.39	S	Yes
3/4"	SunCoatMax	Foam	Clear	Air	0.32	0.19	0.44	S	-	0.32	0.17	0.39	S	-	0.34	0.16	0.34	-	-
3/4"	SunCoatMax	Foam	Clear	Argon	0.29	0.19	0.44	S	Yes	0.29	0.17	0.39	S	Yes	0.30	0.15	0.34	S	Yes
3/4"	SunCoat	Foam	4th Surface	Air	0.28	0.28	0.49	-	-	0.28	0.25	0.44	-	-	0.29	0.22	0.39	S	Yes
3/4"	SunCoat	Foam	4th Surface	Argon	0.25	0.28	0.49	NC	-	0.25	0.25	0.44	NC	-	0.26	0.22	0.39	SC, S	Yes
3/4"	SunCoatMax	Foam	4th Surface	Air	0.27	0.19	0.43	SC, S	Yes	0.27	0.17	0.38	SC, S	Yes	0.29	0.15	0.34	S	Yes
3/4"	SunCoatMax	Foam	4th Surface	Argon	0.25	0.19	0.43	NC, SC, S	Yes	0.25	0.17	0.38	NC, SC, S	Yes	0.26	0.15	0.34	SC, S	Yes
3/4"	Cardinal 180	Foam	4th Surface	Argon	0.26	0.45	0.56	N	-	0.26	0.41	0.50	N	-	0.27	0.36	0.44	-	-
Single Hung																			
7/8"	SunCoat	Intercept	Clear	Air	0.33	0.29	0.53	-	-	0.33	0.26	0.47	-	-	0.33	0.24	0.41	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.29	0.29	0.53	-	-	0.29	0.26	0.47	-	-	0.29	0.23	0.41	S	Yes
7/8"	SunCoatMax	Intercept	Clear	Air	0.33	0.21	0.46	-	-	0.33	0.19	0.41	-	-	0.33	0.17	0.37	-	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.29	0.21	0.46	S	Yes	0.29	0.19	0.41	S	Yes	0.29	0.17	0.37	S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.27	0.29	0.52	-	-	0.27	0.26	0.46	-	-	0.27	0.23	0.41	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Argon	0.25	0.29	0.52	NC	-	0.25	0.26	0.46	NC	-	0.25	0.23	0.41	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.27	0.19	0.45	SC, S	Yes	0.27	0.18	0.40	SC, S	Yes	0.27	0.16	0.35	SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.25	0.19	0.45	NC, SC, S	Yes	0.25	0.17	0.40	NC, SC, S	Yes	0.25	0.16	0.35	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.26	0.47	0.58	N	-	0.26	0.43	0.52	N	-	0.26	0.38	0.46	-	-
7/8"	SunCoat	Foam	Clear	Air	0.32	0.29	0.53	-	-	0.32	0.26	0.47	-	-	0.32	0.24	0.41	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.29	0.29	0.53	-	-	0.29	0.26	0.47	-	-	0.29	0.23	0.41	S	Yes

Due to continual product development, data presented is subject to change at any time .
Available components may vary by manufacturing location.

MILGARD WINDOWS and DOORS

V400 Tuscany® Series Thermal Chart

Revision Date: 8/3/2023

IG Thickness	Exterior Glass	Spacer	Interior Glass	Gas Fill	No Grids					Flat Grids					Sculptured Grids				
					U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24
7/8"	SunCoatMax	Foam	Clear	Air	0.32	0.21	0.46	S	-	0.32	0.19	0.41	S	-	0.32	0.17	0.37	S	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.28	0.21	0.46	SC, S	Yes	0.28	0.19	0.41	SC, S	Yes	0.28	0.17	0.37	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.27	0.29	0.52	-	-	0.27	0.26	0.46	-	-	0.27	0.23	0.41	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.25	0.29	0.52	NC	-	0.25	0.26	0.46	-	-	0.25	0.23	0.41	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.27	0.19	0.45	SC, S	Yes	0.27	0.18	0.40	SC, S	Yes	0.27	0.16	0.35	SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.24	0.19	0.45	NC, SC, S	Yes	0.24	0.17	0.40	NC, SC, S	Yes	0.24	0.16	0.35	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.25	0.47	0.58	N	-	0.25	0.43	0.52	N	-	0.25	0.38	0.46	-	-
Double Hung																			
3/4"	SunCoat	Intercept	Clear	Air	0.33	0.29	0.51	-	-	0.33	0.26	0.45	-	-	0.35	0.23	0.40	-	-
3/4"	SunCoat	Intercept	Clear	Argon	0.29	0.28	0.51	-	-	0.29	0.26	0.45	-	-	0.31	0.23	0.40	S	-
3/4"	SunCoatMax	Intercept	Clear	Air	0.33	0.21	0.45	-	-	0.33	0.19	0.40	-	-	0.34	0.17	0.35	-	-
3/4"	SunCoatMax	Intercept	Clear	Argon	0.29	0.21	0.45	S	Yes	0.29	0.19	0.40	S	Yes	0.31	0.17	0.35	S	-
3/4"	SunCoat	Intercept	4th Surface	Air	0.28	0.28	0.50	-	-	0.28	0.25	0.45	-	-	0.29	0.23	0.39	S	Yes
3/4"	SunCoat	Intercept	4th Surface	Argon	0.26	0.28	0.50	-	-	0.26	0.25	0.45	-	-	0.27	0.23	0.39	SC, S	Yes
3/4"	SunCoatMax	Intercept	4th Surface	Air	0.28	0.19	0.44	SC, S	Yes	0.28	0.17	0.39	SC, S	Yes	0.29	0.16	0.34	S	Yes
3/4"	SunCoatMax	Intercept	4th Surface	Argon	0.25	0.19	0.44	NC, SC, S	Yes	0.25	0.17	0.39	NC, SC, S	Yes	0.27	0.15	0.34	SC, S	Yes
3/4"	Cardinal 180	Intercept	4th Surface	Argon	0.26	0.46	0.57	N	-	0.26	0.41	0.50	N	-	0.27	0.37	0.44	-	-
3/4"	SunCoat	Foam	Clear	Air	0.32	0.29	0.51	-	-	0.32	0.26	0.45	-	-	0.34	0.23	0.40	-	-
3/4"	SunCoat	Foam	Clear	Argon	0.29	0.28	0.51	-	-	0.29	0.26	0.45	-	-	0.31	0.23	0.40	S	-
3/4"	SunCoatMax	Foam	Clear	Air	0.32	0.21	0.45	S	-	0.32	0.19	0.40	S	-	0.34	0.17	0.35	-	-
3/4"	SunCoatMax	Foam	Clear	Argon	0.29	0.21	0.45	S	Yes	0.29	0.19	0.40	S	Yes	0.30	0.17	0.35	S	Yes
3/4"	SunCoat	Foam	4th Surface	Air	0.27	0.28	0.50	-	-	0.27	0.25	0.45	-	-	0.29	0.23	0.39	S	Yes
3/4"	SunCoat	Foam	4th Surface	Argon	0.25	0.28	0.50	NC	-	0.25	0.25	0.45	NC	-	0.26	0.23	0.36	SC, S	Yes
3/4"	SunCoatMax	Foam	4th Surface	Air	0.27	0.19	0.44	SC, S	Yes	0.27	0.17	0.39	SC, S	Yes	0.29	0.16	0.34	S	Yes
3/4"	SunCoatMax	Foam	4th Surface	Argon	0.25	0.19	0.44	NC, SC, S	Yes	0.25	0.17	0.39	NC, SC, S	Yes	0.26	0.15	0.34	SC, S	Yes
3/4"	Cardinal 180	Foam	4th Surface	Argon	0.26	0.46	0.57	N	-	0.26	0.41	0.50	N	-	0.27	0.37	0.44	-	-
Picture Window (direct set)																			
7/8"	SunCoat	Intercept	Clear	Air	0.32	0.31	0.55	-	-	0.32	0.28	0.49	-	-	0.32	0.25	0.44	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.28	0.30	0.55	-	-	0.28	0.28	0.49	-	-	0.28	0.25	0.44	-	-
7/8"	SunCoatMax	Intercept	Clear	Air	0.32	0.23	0.49	S	-	0.32	0.20	0.43	S	-	0.32	0.18	0.38	S	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.28	0.22	0.49	SC, S	Yes	0.28	0.20	0.43	SC, S	Yes	0.28	0.18	0.38	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.26	0.30	0.54	-	-	0.26	0.27	0.48	-	-	0.26	0.25	0.43	-	-
7/8"	SunCoat	Intercept	4th Surface	Argon	0.24	0.30	0.54	NC	-	0.24	0.27	0.48	NC	-	0.24	0.24	0.43	NC	-
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.26	0.20	0.47	SC, S	Yes	0.26	0.19	0.42	SC, S	Yes	0.26	0.17	0.37	SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.23	0.20	0.47	NC, SC, S	Yes	0.23	0.18	0.42	NC, SC, S	Yes	0.23	0.17	0.37	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.24	0.49	0.60	N	-	0.24	0.44	0.53	N	-	0.24	0.39	0.47	N	-
7/8"	SunCoat	Foam	Clear	Air	0.31	0.31	0.55	-	-	0.31	0.28	0.49	-	-	0.31	0.25	0.44	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.28	0.30	0.55	-	-	0.28	0.28	0.49	-	-	0.28	0.25	0.44	-	-
7/8"	SunCoatMax	Foam	Clear	Air	0.31	0.23	0.49	S	-	0.31	0.20	0.43	S	-	0.31	0.18	0.38	S	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.28	0.22	0.49	SC, S	Yes	0.28	0.20	0.43	SC, S	Yes	0.28	0.18	0.38	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.26	0.30	0.54	-	-	0.26	0.27	0.48	-	-	0.26	0.25	0.43	-	-
7/8"	SunCoat	Foam	4th Surface	Argon	0.23	0.30	0.54	NC	-	0.23	0.27	0.48	NC	-	0.23	0.24	0.43	NC	-
7/8"	SunCoatMax	Foam	4th Surface	Air	0.26	0.20	0.47	SC, S	Yes	0.26	0.19	0.42	SC, S	Yes	0.26	0.17	0.37	SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.23	0.20	0.47	NC, SC, S	Yes	0.23	0.18	0.42	NC, SC, S	Yes	0.23	0.17	0.37	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Air	0.26	0.49	0.60	N	-	0.26	0.44	0.53	N	-	0.26	0.40	0.48	N	-
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.24	0.49	0.60	N	-	0.24	0.44	0.53	N	-	0.24	0.39	0.47	N	-
Picture Window (slider frame)																			
7/8"	SunCoat	Intercept	Clear	Air	0.31	0.31	0.55	-	-	0.31	0.28	0.49	-	-	0.31	0.25	0.44	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.27	0.30	0.55	-	-	0.27	0.27	0.49	-	-	0.27	0.25	0.44	-	-
7/8"	SunCoatMax	Intercept	Clear	Air	0.31	0.21	0.48	S	-	0.31	0.19	0.43	S	-	0.31	0.17	0.38	S	-

Due to continual product development, data presented is subject to change at any time .
Available components may vary by manufacturing location.

MILGARD WINDOWS and DOORS

V400 Tuscany® Series Thermal Chart

Revision Date: 8/3/2023

IG Thickness	Exterior Glass	Spacer	Interior Glass	Gas Fill	No Grids					Flat Grids					Sculptured Grids				
					U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24
7/8"	SunCoatMax	Intercept	Clear	Argon	0.27	0.20	0.48	SC, S	Yes	0.27	0.18	0.43	SC, S	Yes	0.27	0.17	0.38	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.25	0.30	0.54	NC	-	0.25	0.27	0.48	NC	-	0.25	0.24	0.43	NC	-
7/8"	SunCoat	Intercept	4th Surface	Argon	0.23	0.30	0.54	NC	-	0.23	0.27	0.48	NC	-	0.23	0.24	0.43	NC	-
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.25	0.20	0.47	NC, SC, S	Yes	0.25	0.18	0.42	NC, SC, S	Yes	0.25	0.17	0.37	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.23	0.20	0.47	NC, SC, S	Yes	0.23	0.18	0.42	NC, SC, S	Yes	0.23	0.16	0.37	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Air	0.26	0.49	0.60	N	-	0.26	0.44	0.54	N	-	0.26	0.40	0.48	N	-
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.24	0.49	0.60	N	-	0.24	0.44	0.54	N	-	0.24	0.39	0.47	N	-
7/8"	SunCoat	Foam	Clear	Air	0.31	0.31	0.55	-	-	0.31	0.28	0.49	-	-	0.31	0.25	0.44	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.27	0.30	0.55	-	-	0.27	0.27	0.49	-	-	0.27	0.25	0.44	-	-
7/8"	SunCoatMax	Foam	Clear	Air	0.30	0.21	0.48	S	Yes	0.30	0.19	0.43	S	Yes	0.30	0.17	0.38	S	Yes
7/8"	SunCoatMax	Foam	Clear	Argon	0.27	0.20	0.48	SC, S	Yes	0.27	0.18	0.43	SC, S	Yes	0.27	0.17	0.38	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.25	0.30	0.54	NC	-	0.25	0.27	0.48	NC	-	0.25	0.24	0.43	NC	-
7/8"	SunCoat	Foam	4th Surface	Argon	0.23	0.30	0.54	NC	-	0.23	0.27	0.48	NC	-	0.23	0.24	0.43	NC	-
7/8"	SunCoatMax	Foam	4th Surface	Air	0.25	0.20	0.47	SC, S	Yes	0.25	0.18	0.42	NC, SC, S	Yes	0.25	0.17	0.37	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.22	0.20	0.47	NC, SC, S	Yes	0.22	0.18	0.42	NC, SC, S	Yes	0.22	0.16	0.37	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Air	0.26	0.49	0.60	N	-	0.26	0.44	0.54	N	-	0.26	0.40	0.48	N	-
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.23	0.49	0.60	N	-	0.23	0.44	0.54	N	-	0.23	0.39	0.47	N	-
Casement																			
7/8"	SunCoat	Intercept	Clear	Air	0.30	0.26	0.47	-	-	0.30	0.24	0.43	-	-	0.30	0.22	0.38	S	Yes
7/8"	SunCoat	Intercept	Clear	Argon	0.27	0.26	0.47	-	-	0.27	0.24	0.43	-	-	0.27	0.22	0.38	SC, S	Yes
7/8"	SunCoatMax	Intercept	Clear	Air	0.30	0.19	0.42	S	Yes	0.30	0.18	0.38	S	Yes	0.30	0.16	0.34	S	Yes
7/8"	SunCoatMax	Intercept	Clear	Argon	0.27	0.19	0.42	SC, S	Yes	0.27	0.18	0.38	SC, S	Yes	0.27	0.16	0.34	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.26	0.26	0.46	-	-	0.26	0.24	0.42	NC	-	0.26	0.22	0.38	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Argon	0.24	0.26	0.46	NC	-	0.24	0.24	0.42	NC	-	0.24	0.21	0.38	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.25	0.17	0.40	NC, SC, S	Yes	0.25	0.16	0.36	NC, SC, S	Yes	0.25	0.15	0.33	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.23	0.17	0.40	NC, SC, S	Yes	0.23	0.16	0.36	NC, SC, S	Yes	0.23	0.15	0.33	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Air	0.26	0.43	0.52	N	-	0.26	0.39	0.47	-	-	0.26	0.35	0.43	-	-
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.24	0.43	0.52	N	-	0.24	0.39	0.47	N	-	0.24	0.35	0.43	N	-
7/8"	SunCoat	Foam	Clear	Air	0.30	0.26	0.47	-	-	0.30	0.24	0.43	-	-	0.30	0.22	0.38	S	Yes
7/8"	SunCoat	Foam	Clear	Argon	0.27	0.26	0.47	-	-	0.27	0.24	0.43	-	-	0.27	0.22	0.38	SC, S	Yes
7/8"	SunCoatMax	Foam	Clear	Air	0.30	0.19	0.42	S	Yes	0.30	0.18	0.38	S	Yes	0.30	0.16	0.34	S	Yes
7/8"	SunCoatMax	Foam	Clear	Argon	0.27	0.19	0.42	SC, S	Yes	0.27	0.18	0.38	SC, S	Yes	0.27	0.16	0.34	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.26	0.26	0.46	-	-	0.26	0.24	0.42	NC	-	0.26	0.22	0.38	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.24	0.26	0.46	NC	-	0.24	0.24	0.42	NC	-	0.24	0.21	0.38	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.25	0.17	0.40	NC, SC, S	Yes	0.25	0.16	0.36	NC, SC, S	Yes	0.25	0.15	0.33	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.23	0.17	0.40	NC, SC, S	Yes	0.23	0.16	0.36	NC, SC, S	Yes	0.23	0.15	0.33	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Air	0.24	0.43	0.52	N	-	0.25	0.39	0.47	-	-	0.25	0.35	0.43	-	-
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.23	0.43	0.52	N	-	0.23	0.39	0.47	N	-	0.23	0.35	0.43	N	-
Awning																			
7/8"	SunCoat	Intercept	Clear	Air	0.31	0.26	0.47	-	-	0.31	0.24	0.43	-	-	0.31	0.22	0.38	S	-
7/8"	SunCoat	Intercept	Clear	Argon	0.27	0.26	0.47	-	-	0.27	0.24	0.43	-	-	0.27	0.22	0.38	SC, S	Yes
7/8"	SunCoatMax	Intercept	Clear	Air	0.30	0.19	0.42	S	Yes	0.30	0.18	0.38	S	Yes	0.30	0.16	0.34	S	Yes
7/8"	SunCoatMax	Intercept	Clear	Argon	0.27	0.19	0.42	SC, S	Yes	0.27	0.18	0.38	SC, S	Yes	0.27	0.16	0.34	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.26	0.26	0.46	-	-	0.26	0.24	0.42	-	-	0.26	0.22	0.38	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Argon	0.24	0.26	0.46	NC	-	0.24	0.24	0.42	NC	-	0.24	0.21	0.38	NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.26	0.18	0.40	SC, S	Yes	0.26	0.16	0.36	SC, S	Yes	0.26	0.15	0.33	SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.24	0.17	0.40	NC, SC, S	Yes	0.24	0.16	0.36	NC, SC, S	Yes	0.24	0.15	0.33	NC, SC, S	Yes
7/8"	Cardinal 180	Intercept	4th Surface	Argon	0.25	0.43	0.52	N	-	0.25	0.39	0.47	-	-	0.25	0.35	0.43	-	-
7/8"	SunCoat	Foam	Clear	Air	0.30	0.26	0.47	-	-	0.30	0.24	0.43	-	-	0.30	0.22	0.38	S	Yes
7/8"	SunCoat	Foam	Clear	Argon	0.27	0.26	0.47	-	-	0.27	0.24	0.43	-	-	0.27	0.22	0.38	SC, S	Yes

Due to continual product development, data presented is subject to change at any time .
Available components may vary by manufacturing location.

MILGARD WINDOWS and DOORS

V400 Tuscany® Series Thermal Chart

Revision Date: 8/3/2023

IG Thickness	Exterior Glass	Spacer	Interior Glass	Gas Fill	No Grids					Flat Grids					Sculptured Grids				
					U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24
7/8"	SunCoatMax	Foam	Clear	Air	0.30	0.19	0.42	S	Yes	0.30	0.18	0.38	S	Yes	0.30	0.16	0.34	S	Yes
7/8"	SunCoatMax	Foam	Clear	Argon	0.27	0.19	0.42	SC, S	Yes	0.27	0.18	0.38	SC, S	Yes	0.27	0.16	0.34	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.26	0.26	0.46	-	-	0.26	0.24	0.42	-	-	0.26	0.22	0.38	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.24	0.26	0.46	NC	-	0.24	0.24	0.42	NC	-	0.24	0.21	0.38	NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.26	0.18	0.40	SC, S	Yes	0.26	0.16	0.36	SC, S	Yes	0.26	0.15	0.33	SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.23	0.17	0.40	NC, SC, S	Yes	0.23	0.16	0.36	NC, SC, S	Yes	0.23	0.15	0.33	NC, SC, S	Yes
7/8"	Cardinal 180	Foam	4th Surface	Air	0.26	0.43	0.52	N	-	0.26	0.39	0.47	-	-	0.26	0.35	0.43	-	-
7/8"	Cardinal 180	Foam	4th Surface	Argon	0.24	0.43	0.52	N	-	0.24	0.39	0.47	N	-	0.24	0.35	0.43	N	-
Sliding Patio Door																			
7/8"	SunCoat	Intercept	Clear	Air	0.32	0.29	0.54	-	-	0.32	0.26	0.48	-	-	0.32	0.23	0.41	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.29	0.29	0.54	-	-	0.29	0.26	0.48	-	-	0.29	0.23	0.41	-	Yes
7/8"	SunCoatMax	Intercept	Clear	Air	0.32	0.22	0.50	-	-	0.32	0.19	0.44	-	-	0.32	0.17	0.38	-	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.28	0.22	0.50	SC, S	Yes	0.28	0.19	0.44	SC, S	Yes	0.28	0.17	0.38	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Air	0.27	0.29	0.53	-	-	0.27	0.25	0.47	-	-	0.27	0.22	0.41	SC, S	Yes
7/8"	SunCoat	Intercept	4th Surface	Argon	0.24	0.28	0.53	N, NC	-	0.24	0.25	0.47	N, NC	-	0.24	0.22	0.41	N, NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.26	0.21	0.49	SC, S	Yes	0.26	0.19	0.43	N, NC, SC, S	Yes	0.26	0.17	0.37	N, NC, SC, S	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.24	0.21	0.49	N, NC, SC, S	Yes	0.24	0.19	0.43	N, NC, SC, S	Yes	0.24	0.17	0.37	N, NC, SC, S	Yes
7/8"	SunCoat	Foam	Clear	Air	0.32	0.29	0.54	-	-	0.32	0.26	0.48	-	-	0.32	0.23	0.41	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.28	0.29	0.54	-	-	0.28	0.26	0.48	-	-	0.28	0.23	0.41	SC, S	Yes
7/8"	SunCoatMax	Foam	Clear	Air	0.32	0.22	0.50	-	-	0.32	0.19	0.44	-	-	0.32	0.17	0.38	-	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.28	0.22	0.50	SC, S	Yes	0.28	0.19	0.44	SC, S	Yes	0.28	0.17	0.38	SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Air	0.26	0.29	0.53	N, NC	-	0.26	0.25	0.47	N, NC	-	0.26	0.22	0.41	N, NC, SC, S	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.24	0.28	0.53	N, NC	-	0.24	0.25	0.47	N, NC	-	0.22	0.22	0.41	N, NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.26	0.21	0.49	N, NC, SC, S	Yes	0.26	0.19	0.43	N, NC, SC, S	Yes	0.26	0.17	0.37	N, NC, SC, S	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.24	0.21	0.49	N, NC, SC, S	Yes	0.24	0.19	0.43	N, NC, SC, S	Yes	0.24	0.17	0.37	N, NC, SC, S	Yes
Inswing Patio Door																			
7/8"	SunCoat	Intercept	Clear	Air	0.36	0.22	0.40	-	-	0.36	0.19	0.34	-	-	0.36	0.17	0.29	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.33	0.22	0.40	-	-	0.33	0.19	0.34	-	-	0.33	0.17	0.29	-	-
7/8"	SunCoatMax	Intercept	Clear	Air	0.36	0.17	0.37	-	-	0.36	0.15	0.32	-	-	0.36	0.13	0.27	-	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.33	0.17	0.37	-	-	0.33	0.14	0.32	-	-	0.33	0.13	0.27	-	-
7/8"	SunCoat	Intercept	4th Surface	Air	0.31	0.22	0.39	-	-	0.31	0.19	0.34	-	-	0.31	0.16	0.28	-	-
7/8"	SunCoat	Intercept	4th Surface	Argon	0.30	0.22	0.39	-	Yes	0.30	0.19	0.34	-	Yes	0.30	0.16	0.28	-	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.31	0.16	0.36	-	-	0.31	0.14	0.31	-	-	0.31	0.13	0.26	-	-
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.30	0.16	0.36	-	Yes	0.30	0.14	0.31	-	Yes	0.30	0.12	0.26	-	Yes
7/8"	SunCoat	Foam	Clear	Air	0.35	0.22	0.40	-	-	0.35	0.19	0.34	-	-	0.35	0.17	0.29	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.33	0.22	0.40	-	-	0.33	0.19	0.34	-	-	0.33	0.17	0.29	-	-
7/8"	SunCoatMax	Foam	Clear	Air	0.35	0.17	0.37	-	-	0.35	0.15	0.32	-	-	0.35	0.13	0.27	-	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.32	0.17	0.37	-	-	0.32	0.14	0.32	-	-	0.32	0.13	0.27	-	-
7/8"	SunCoat	Foam	4th Surface	Air	0.31	0.22	0.39	-	-	0.31	0.19	0.34	-	-	0.31	0.16	0.28	-	-
7/8"	SunCoat	Foam	4th Surface	Argon	0.29	0.22	0.39	-	Yes	0.29	0.19	0.34	-	Yes	0.29	0.16	0.28	-	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.31	0.16	0.36	-	-	0.31	0.14	0.31	-	-	0.31	0.13	0.26	-	-
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.29	0.16	0.39	-	Yes	0.29	0.14	0.31	-	Yes	0.29	0.12	0.26	-	Yes
Outswing Patio Door																			
7/8"	SunCoat	Intercept	Clear	Air	0.35	0.22	0.40	-	-	0.35	0.20	0.34	-	-	0.35	0.17	0.29	-	-
7/8"	SunCoat	Intercept	Clear	Argon	0.32	0.22	0.40	-	-	0.32	0.19	0.34	-	-	0.32	0.17	0.29	-	-
7/8"	SunCoatMax	Intercept	Clear	Air	0.35	0.17	0.37	-	-	0.35	0.15	0.32	-	-	0.35	0.13	0.27	-	-
7/8"	SunCoatMax	Intercept	Clear	Argon	0.32	0.17	0.37	-	-	0.32	0.15	0.32	-	-	0.32	0.13	0.27	-	-
7/8"	SunCoat	Intercept	4th Surface	Air	0.31	0.22	0.39	-	-	0.31	0.19	0.34	-	-	0.31	0.17	0.28	-	-
7/8"	SunCoat	Intercept	4th Surface	Argon	0.29	0.22	0.39	-	Yes	0.29	0.19	0.34	-	Yes	0.29	0.17	0.28	-	Yes
7/8"	SunCoatMax	Intercept	4th Surface	Air	0.30	0.17	0.36	-	Yes	0.30	0.15	0.31	-	Yes	0.30	0.13	0.26	-	Yes

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Available components may vary by manufacturing location.

MILGARD
WINDOWS and DOORS

V400 Tuscany® Series Thermal Chart

Revision Date: 8/3/2023

IG Thickness	Exterior Glass	Spacer	Interior Glass	Gas Fill	No Grids					Flat Grids					Sculptured Grids				
					U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24	U-Value	SHGC	VLT	Energy Star 7.0	Title 24
7/8"	SunCoatMax	Intercept	4th Surface	Argon	0.29	0.17	0.36	-	Yes	0.29	0.15	0.31	-	Yes	0.29	0.13	0.26	-	Yes
7/8"	SunCoat	Foam	Clear	Air	0.35	0.22	0.40	-	-	0.35	0.20	0.34	-	-	0.35	0.17	0.29	-	-
7/8"	SunCoat	Foam	Clear	Argon	0.32	0.22	0.40	-	-	0.32	0.19	0.34	-	-	0.32	0.17	0.29	-	-
7/8"	SunCoatMax	Foam	Clear	Air	0.34	0.17	0.37	-	-	0.34	0.15	0.32	-	-	0.34	0.13	0.27	-	-
7/8"	SunCoatMax	Foam	Clear	Argon	0.32	0.17	0.37	-	-	0.32	0.15	0.32	-	-	0.32	0.13	0.27	-	-
7/8"	SunCoat	Foam	4th Surface	Air	0.30	0.22	0.39	-	Yes	0.30	0.19	0.34	-	Yes	0.30	0.17	0.28	-	Yes
7/8"	SunCoat	Foam	4th Surface	Argon	0.29	0.22	0.39	-	Yes	0.29	0.19	0.34	-	Yes	0.29	0.17	0.28	-	Yes
7/8"	SunCoatMax	Foam	4th Surface	Air	0.30	0.17	0.36	-	Yes	0.30	0.15	0.31	-	Yes	0.30	0.13	0.26	-	Yes
7/8"	SunCoatMax	Foam	4th Surface	Argon	0.28	0.17	0.36	SC, S	Yes	0.28	0.15	0.31	SC, S	Yes	0.28	0.13	0.26	SC, S	Yes

Due to continual product development, data presented is subject to change at any time .
Available components may vary by manufacturing location.