

SECTION 12322

PLASTIC LAMINATE-FACED CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Products Supplied But Not Installed Under This Section
 - 1. Cabinetry in Nurses' Station and Medication Room.
- B. Related Sections
 - 1. Section 06201 - Installation
 - 2. Section 15440 - Plumbing fixtures and connections

1.2 REFERENCES

- A. American National Standards Institute
 - 1. ANSI A161.2-1979 (R1987), 'Performance Standards for Fabricated High Pressure Decorative Laminate Countertops'
- B. National Electrical Manufacturer's Association
 - 1. NEMA LD 3-1991, 'High Pressure Decorative Laminates'

1.3 SUBMITTALS

- A. Product Data - Manufacturer's literature

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Cabinets
 - 1. Construct cabinetry from 45 lb/sq ft density pre-finished flakeboard and 1/4 inch thick pre-finished wood fiber hardboard.
 - a. Finish exposed exterior surfaces with high pressure laminate.
 - b. Finish exposed interior surfaces with high pressure laminate or polyester balancing sheet, matte finish.
 - 2. Edge Finish - Finish edges on ends, standards, shelves, doors, drawers, and drawer box with extruded barbed 'Tee' shape polyethylene edging matching laminate color.
 - 3. Hardware - Casework Manufacturer's best standard in all cases where there is an option.
- B. Plastic Laminates
 - 1. Quality -
 - a. Counter tops shall have rolled front edge and backsplash with plastic laminate meeting requirements of NEMA LD 3 - PF 42.
 - b. Other laminates shall meet requirements of NEMA LD 3 -
 - 1) Vertical Applications - GP 28.
 - 2) Horizontal (other than countertops) - GP 38.
 - c. Balancing Material - BK 20
 - d. AWI Quality Grade - Premium
 - 2. Assemblies -
 - a. Counter tops shall meet requirements of ANSI A161.2.
 - b. Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.

2.2 ACCEPTABLE MANUFACTURERS

- A. Any prefabricated cabinetry or product of millwork shop meeting requirements of AWI custom grade and this Section are approved upon approval of Architect before bidding.

PART 3 EXECUTION - Not Used

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

13300 AUDIO AND VIDEO SYSTEMS

13376 SOUND SYSTEM

13381 SATELLITE / CABLE AND TV SYSTEM / MONITORS

13800 DETECTION AND ALARM

13851 FIRE DETECTION AND ALARM SYSTEMS

13900 FIRE SUPPRESSION

13930 WET-PIPE FIRE SUPPRESSION SPRINKLERS

END OF TABLE OF CONTENTS

SECTION 13376

SOUND SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install complete and operational sound system as described in Contract Documents to include but not limited to speakers for the televisions at the Dayrooms and speakers for the existing Dukane PA system in all rooms.
 - 2. The speakers for the televisions shall NOT be connected to the PA system. Connect the speakers for the television only to the televisions and audio system. The system shall have all the hardware and accessories to allow both televisions to broadcast in the individual Dayrooms with individual broadcasting or in both Dayrooms with the same broadcasting of television channel or movie. The speakers for the televisions shall be limited to the immediate area around the televisions in the Dayrooms, refer to Contract Documents for location.
 - 3. Existing speakers shall be connected to the existing Dukane PA system as well as required new speakers. Ensure the PA system is operational for the ETS Suite as well as for the entire facility. Correct any issue that have affected the existing system from operating in the entire facility due to the remodel work in ETS.

- B. Related Sections
 - 1. Section 13381 - Satellite/Cable and TV System/Monitors
 - 2. Division 16 - Electrical
 - a. Conduits, pre-fabricated speaker enclosures, fittings, and audio cables.
 - b. Power to equipment location and power relay wiring.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. The PA system shall be rerouted and new wires pulled and installed back to the telecommunications room to where the "Dukane" equipment is located.
 - 2. The speakers shall be distributed equally in the rooms to provide complete coverage throughout the space.
 - 3. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
 - 4. Sound systems shall reproduce program material at level of 80 to 85 dBA without audible distortion
 - 5. All input levels shall be pre-set so system may be operated without going into feedback under normal conditions.

1.3 SUBMITTALS

- A. Product Data - Manufacturer's data sheet for each item of equipment to be supplied.

- B. Closeout
 - 1. Operations And Maintenance Data -

- a. Equipment Manufacturer's manuals
- b. Include following items
 - 1) Sound system operation and maintenance instructions
 - 2) List of equipment provided showing make, model, and serial number.
 - 3) PA system operation and maintenance instructions.

1.4 SEQUENCING

- A. Deliver metal speaker grilles, which are to be painted to match ceiling, before attachment to speakers and before installation of sound system.

1.5 WARRANTY

- A. Provide complete warranty repair or replacement for three (3) years at no cost to Owner, except in case of obvious abuse. If failure causes sound system or PA system to be inoperative or unusable for its intended purpose, Installer, when notified of problem shall repair system so it will be operational same day. If defective components cannot be repaired in time, furnish and install new equipment as required.
- B. Honor component warranties for term established by Manufacturer, if greater than three years.

1.6 QUALITY ASSURANCE

- A. Manufacture:
 - 1. The manufacture of the speaker components shall have a minimum of 10 years experience in manufacturing of similar types of systems and who can refer to similar installations providing satisfactory service.
- B. Installer:
 - 1. The installer contractor shall be Certified and Authorized and trained by the manufacturer to design, install, test and maintain the system.
 - 2. The installing contractor shall be an experienced firm regularly engaged in the installation of the PA system and must have a minimum of ten (10) years experience in the design, installation and testing of the system. A list of similar systems of a similar nature and scope shall be provided on request.
 - 3. The installing contractor shall be an experienced firm regularly engaged in the installation of the audio speaker systems and must have a minimum of ten (10) years experience in the design, installation and testing of the system. A list of similar systems of a similar nature and scope shall be provided on request.
- C. Quality Assurance / Control:
 - 1. All reference to model numbers and other pertinent information herein are intended to establish standards of performance, quality and construction and are based upon equipment designed and manufactured by Atlas Sound. The design standard shall be as follows:

Speakers: Model number "GD87" 8" coaxial, 16 watt, loudspeaker with high quality factory installed 8 watt transformer, recessed vandal-proof baffle model number "VP60-R" and back box enclosure model number "96-8-7". Provide

required amplifier and accessories for complete and operable television audio system to power required speakers.

- a. Speaker specifications:
 - 1) Low-frequency reproducer cone shall be a full 8" in diameter
 - 2) High frequency reproducer cone shall be 3" in diameter
 - 3) Woofer shall have 10oz. Ceramic magnet
 - 4) Tweeter shall have a 2.35oz ceramic magnet
 - 5) Two reproducer sections shall be coupled through a built-in crossover network
 - 6) Crossover frequency shall be a 2800Hz
 - 7) Frequency response range shall be 100Hz - 10kHz (nominal)
 - 8) Average sensitivity shall be 97dB (1W/1M)
 - 9) Low frequency voice coil diameter shall be 1" and operate in a magnet field of a least 10,600 gauss
 - 10) Transformer primary voltage shall be 70.7V with a frequency response range of plus/minus 1dB-50Hz-15kHz and power taps at 1,2,4 & 8 watts.
 - 11) Depth of the loudspeaker/transformer shall be 2.875"
- b. Baffles:
 - 1) Welded studs behind the perforated 22-gauge CRS plate for speaker mounting
 - 2) Protected by a stainless steel-woven wire-mesh screen positioned 3/8" in front of plate for direct impact protection
 - 3) Mesh screen reinforced by a thick bead of sealant on the inside
 - 4) Tamperproof heat-treated alloy screws (provide wrench)
 - 5) Countersink mounting holes
- c. Backbox:
 - 1) Acoustic high density fiberglass lining 1-1/2" thick
 - 2) Backbox inner surfaces undercoated to prevent metallic resonance
 - 3) Enclosure constructed of heavy-gauge CRS

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Components as shown on Drawings from following Manufacturers. No substitution allowed without approval of written request submitted to Sound / Acoustical Consultant through Architect.
 1. Atlas Sound, Ennis, TX (800) 876-3333 www.atlassound.com
 2. Equal as approved by Architect or County Representative.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify compliance with following items before beginning work of this Section.
 - 1. No cables spliced
 - 2. Isolated ground run back to electrical panel from all equipment cabinets.
 - 3. Specified conduit, cables and speaker enclosures are properly installed.
 - 4. Installation of the plywood backer board shall be installed behind the suspended ceiling and gypsum board ceilings.
- B. Ensure that no solid structural or decorative member impedes sound propagation from speakers and that no member with cross section greater than 3/4 inch is placed in front of speakers.
- C. Verify installation of fiberglass insulation in field-fabricated speaker enclosures.

3.2 INSTALLATION

- A. Speakers
 - 1. Maintain uniform polarity in speakers and wiring.
 - 2. Employ no positive stop in rotation of speaker volume controls. Controls shall be capable of continuous rotations in either direction.
 - 3. Mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
 - 4. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
 - 5. Provide brackets, screws, adapters, springs, rack mounting kits, etc, recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
 - 6. Line factory-fabricated speaker backboxes with one inch minimum fiberglass if not done by Backbox Manufacturer.
- B. Cables
 - 1. Leave sufficient service loops of uniform length on cables to allow for future equipment replacement.
 - 2. Make parallel connections or splices on standard barrier terminal blocks using spade lugs, or on equipment terminals using appropriate connection type. Do not attach more than three spade lugs under any one screw terminal.
 - 3. Strip wires installed in Euroblock or Phoenix connectors so 1/16 inch of wire is exposed outside connector when wire contacts back of connector. Secure wires using screwdriver with blade of same width as screw slot and handle 3/4 inch minimum diameter and of length to allow applying sufficient torque to prevent wires from becoming disconnected.
 - 4. Terminate conductors with proper mating connectors. Do not use adapters. Use proper crimp tool as recommended by Connector Manufacturer. Use controlled duty cycle ratcheting crimp tools of proper size for spade lugs and Molex pins.

3.3 FIELD QUALITY CONTROL

A. Installer Testing

1. Upon completion of installation perform following -
 - a. Conduct system tests and make necessary corrections for proper system operation including, but not limited to, following -
 - 1) Output level uniformity.
 - 2) Polarity.
 - 3) Shock, strain excited hum, and oscillation.
 - 4) Clipping, hum, noise, and RFI in all system configurations.
 - 5) Speaker line impedances.
 - 6) Loose parts and poor workmanship or soldering.
 - b. Sweep speaker systems with high level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to speakers or enclosures. Notify Contractor and Sound / Acoustical Consultant of external causes of buzzes or rattles.

END OF SECTION

SECTION 13381

SATELLITE/CABLE AND TV SYSTEM/MONITORS

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install complete and operational TV system including DVD player as described in Contract Documents. Connect the TV systems to Owner's Satellite or Cable service provider.
 - 2. Ensure system is left in working order at final inspection. Correct any problems found at time of final inspection of system.
- B. Related Sections
 - 2. Section 11521 Security Cameras of Monitors
 - 3. Division 16 -
 - a. Conduits, equipment, fittings, and cables.
 - b. Power to equipment location.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. Satellite/Cable and TV system refers to paid subscription to satellite or cable providers (provided by the owner) and the television monitors and equipment necessary to receive broadcast signals and all ancillary equipment necessary for successful reception and distribution of video and audio signals from input devices.
 - 2. Intent of this specification is that receiving system will receive broadcasts from satellite/cable currently in use by Owner and provide video, audio, and modulated TV signals distributed properly throughout system.
 - 3. Provide television monitors and mounting hardware for security surveillance system, refer to Section 11521.

1.3 SUBMITTALS

- A. Product Data
 - 1. For each product specified; Manufacturer's data sheets identifying equipment to be supplied to include but not limited to model number, manufacturer, input and output options, color and wall mounting bracket and hardware.
 - 2. Operating instructions.
- B. Quality Assurance / Control:
 - 1. Manufacturer's written installation instructions
- C. Operations And Maintenance Data :
 - 1. Equipment manufacturer's manuals
 - 2. Leave clear plastic sheet protector in rear of equipment cabinet with system drawings and documentation.

1.4 WARRANTY

- A. Provide complete warranty repair or replacement for two (2) years at no cost to Owner, except in case of obvious abuse. If failure causes system to be inoperative or unusable for its intended purpose, Installer, when notified of problem shall repair system so it will be operational and usable within one working day. If defective components cannot be repaired in timely manner, furnish and install temporary loaner equipment as required.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Provide products by the following manufacturer: Vizio 606 Gateway Drive, Suite 200, North Sioux, SD 57049, 888-849-4623 x3024, www.vizio.com, jason.cleveland@vizio.com or County approved equal prior to bidding.
- B. Components as shown on Drawings from following manufacturers
1. 42" LCD FHDTV flat screen television model number "MO42LF" full HD 1920 x 1080 native resolution, four HDMI inputs and HD connection for RGB input and 178 degree viewing angle by Vizio for Dayroom #1A/106 and #2A/130, quantity (2) two. The flat screen television shall have but not limited to the following specifications:
 - a. Integrated NTSC/ATCS/QAM HDTV Tuner
 - b. Native panel resolution 1920 x 1080
 - c. Full HDTV (1080P)
 - d. Signal Compatibility: 480i (SDTV), 480P (EDTV), 720P (HDTV), 1080i (HDTV), 1080P (Full HDTV).
 - e. 16.77 million colors
 - f. RF (F Connector for internal tuner): 1
 - g. HDMI with HDCP: 4
 - h. Analog stereo audio for HDMI inputs: 1
 - i. Composite video: 2
 - j. S-Video plus stereo audio: 1
 - k. Analog audio out (RCA): 1
 - l. 5.1 SPDF digital optical audio: 1
 - m. V-chip
 - n. Power - IEC connector for direct power line connection
 - o. Removable base
 - p. Remote control
 2. 32" LCD HDTV flat screen television model number "VA320E" high definition 1366 x 768 resolution with 7x high definition inputs, 3x HDMI inputs by Vizio for nurse's station monitoring system. The flat screen television shall have but not limited to the following specifications.
 - a. 1xRF (F connector for internal NTSC/ATSC/AM tuner)
 - b. 1080p support TV formats
 - c. Native panel resolution 1366x768
 - d. Signal Compatibility: 640 x 480, 800 x 600, 1024 x 768, 1360 x 768 (default) via RGB
 - e. Display compatibility 720P (HDTV)
 - f. 16.7 million colors
 - g. Contrast ration of 15,000:1
 - h. 176 degree viewable angle
 - i. Composite video and stereo audio (one stereo audio shared with S-Video input)
 - j. Removable base
 3. DVD Player with HD upconversion model number "DVP5990/37" by Philips. Provide two, one for each television. DVD players to be installed in cabinet by medication room. The DVD player shall have but not limited to the following specifications:
 - a. 1080p video output
 - b. Plays DVD, DVD-R, DVD-RW, DVD+R, DVD+RW, CD, CD-R, CD-RW, VCD/SVCD, MP3, WMA, JPEG, MPEG-1 and MPEG-2 formats
 - c. DivX and DivX Ultra playback integrated features such as subtitles, multiple audio languages, multiple tracks and menus into 1 convenient file format
 - d. Dolby Digital decoding for cinematic sound quality
 - e. HDMI output provides an uncompressed all-digital audio/video link for the highest quality connection and supports.
 - f. 108MHz/12 bit video digital-to-analog (D/A) conversion; 192kHz/24-bit audio digital-to-analog (D/A) conversion
 - g. Video upsampling technology decreases distortion for improved picture quality of standard DVD's.

- h. Outputs: coaxial digital audio, composite video, stereo audio, component video and HDMI.
 - i. Parental controls and child lock
 - j. Remote control
4. Provide switch board controls for synchronized channel control and DVD video player.
 5. Seismic Strap model numbers QP22BL and QP23APP-PU (two for each television unit) by Safe-T-Proof, 858-554-1150, www.safe-t-proof.com. Straps shall be black in color.
 6. Ceiling television mount model number "PC932A" with adjustable extension and tilt by Peerless Industries Inc, 3215 W. North Avenue, Melrose Park, IL 60160 USA, 800-473-3753, www.peerlessmounts.com. The television mount shall have but not limited to the following specifications:
 - a. VESA 75, 100, 200 x 100 and 200 x 200 mm complaint
 - b. Adjustable tilt of +20/5 degrees with optional lock in 5 degrees increments
 - c. 360 degree of mountable adjustment for limitless screen placement.
 - d. Internal cable management within extension channels
 - e. Supports up to 80lbs LCD flat panel TV's

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify compliance of following items before beginning system installation
 1. Prior to mounting the television units, ensure that all satellite/cable t.v. provider's cables, electrical and connections are installed and in a location behind the unit that will prevent the cable from being seen. Assure all cables are in conduits and lead back to television enclosure adjacent to medication room and telecommunication room for security system.
 2. No cables spliced
 3. Prior to installation of the flat screen televisions, ensure all blocking is installed and is designed to carry the weight of the television units and mounting hardware as recommended by the manufacturer. Do Not install any flat screen televisions until there is verification that the required blocking is in place. Only use mounting brackets specified by the manufacturer and or designed for the specific model of television.

3.2 INSTALLATION

- A. Flat Screen Televisions and Accessories: Install flat screen televisions and accessories only after cabinets, cabinet doors, painting, electrical, floor material and all trades have completed their scope to prevent damage to the units - Install as shown on Drawings in conjunction with Manufacturer's instructions. Connect televisions to external speakers.
- B. Flat Screen Televisions for surveillance system and Accessories: Install flat screen televisions and accessories only after painting, electrical, floor material and all trades have completed their scope to prevent damage to the units - Install as shown on Drawings in conjunction with Manufacturer's instructions. Connect televisions to cameras and DVR recorder in telecommunications room.
- C. DVD Players, Cable boxes and Switch Board: Install DVD players, cable boxes and switch boards only after cabinets, cabinet doors, painting, electrical, floor material and all trades have completed their scope to prevent damage to the units. Install as shown on Drawings in conjunction with Manufacturer's instructions.
- D. Seismic Straps: Position the television monitors into the cabinets ensuring the alignment is equal on all sides and the monitor is parallel with the cabinet. Position the straps at either side of the base and mark the screw holes to ensure a proper alignment and snuggle fit. Install seismic straps with the mechanical fasteners to the platform ensuring the screws do not protrude through the base. Install the top straps to the wall ensuring it is screwed into position at blocking location. Attach the top end of the seismic strap to the television after all other attachments have been coordinated and installed.
- E. Equipment Cabinet

1. Install vent panels at top and bottom of equipment cabinets and between components where possible for maximum ventilation.
2. Securely fasten equipment plumb and square in place.
3. Connect powered components to 120 VAC outlets on voltage suppressor power bars. Do not connect to outlets on other components.
4. File smooth exposed rough edges after cutting and drilling. Do not allow sharp screws to protrude from cabinet.
5. Identification -
 - a. Legibly identify user-operated system controls and system input/output jacks using engraved, permanently attached laminated plastic plates or imprinted Lexan labels. Label equipment and controls within equipment cabinets using similar labels or printed labels from a label maker or laser printer.
 - b. Affix label to rack panel in cabinet listing name and telephone number of installer. Appropriate warranty instructions may be included.

F. Cables

1. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
2. Make parallel connections.
3. Secure cables to equipment cabinet with wire ties to ensure neat installation. Secure wire tie mounts with screw, except where screw would protrude from side of cabinet. Keep video cables separate from other cable types.
4. Ground both ends of each shielded cable within equipment cabinet only.
5. Terminate conductors with proper mating connectors. Do not use adapters. Use proper crimp tool as recommended by Connector Manufacturer.
6. Label both ends of all cables with the source and destination. Use Titan Tag 49L-100 or similar label types.
 - a. Example 1 - SAT AUD 1 - ENG DA IN
 - b. Example 2 - CH 3 RF OUT - RF COMB IN
7. Ensure all cables are in conduit above the ceiling level.

3.3 FIELD QUALITY CONTROL

A. Installer Testing

1. Upon completion of installation test functions verifying following. Make necessary corrections as necessary.
 - a. System is free from hum, noise, ghosting, loose parts and poor construction.
 - b. Modulated RF signal produces clear, sharp, noise-free picture with good chroma and undistorted, noise free audio.
 - c. Audio to sound system is undistorted and noise free.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures wall material and television units are without damage or deterioration at the time of Substantial completion.

END OF SECTION

FIRE DETECTION AND ALARM SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 1. Furnish and install alarm and detection system as described in Contract Documents.
 2. Furnish and install raceway, cable and conductors, boxes, and miscellaneous items necessary for complete system.
- B. Products Supplied But Not Installed Under This Section
 1. Door Plates for door hold / release devices.
- C. Related Sections
 1. Section 06110 - Installation of blocking for hold / release devices
 2. Sections Under 13900 Heading - Furnishing and installing of water flow switches, post indicating valves, valve tamper switches, and low air pressure switch
 3. Section 15910 - Furnishing and installing of duct smoke detectors in main return air ducts.
 4. Division 16 - Quality of and installation standards for wiring, raceway, conduit, and boxes.

1.2 SYSTEM DESCRIPTION

- A. Automatic fire alarm system consisting of control panel, power supplies, alarm initiating devices, notification appliances, and off-site communicating devices. System shall be non-coded, zoned or addressable, and monitored for integrity of conductors.
- B. Class A (Style D) loop type initiating device circuits and Class A (Style Z) loop type notification appliance circuits.
- C. Performance Requirements
 1. Operation of manual station or automatic activation of any smoke detector, heat detector, or sprinkler flow device shall -
 - a. Cause system notification appliances to operate.
 - b. Indicate zone or device in alarm on control panel.
 - c. Initiate off-site alarm notification system.
 - d. Indicate zone or device in alarm on remote annunciator.
 2. System shall return to normal when operated device is returned to normal and control panel is manually reset, except alarms may be silenced as specified below.
 3. Alarm may be silenced by switch in control panel.
 - a. Ring Back Feature - When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.
 4. When alarms are silenced, zone or device in alarm on control panel and remote annunciator shall remain indicated until operated device is returned to normal and control panel is manually reset.
 5. Green pilot LED, or other visual annunciation, shall be on indicating that system is receiving normal power. In addition, failure of normal power shall be annunciated.
 6. Trouble alarm and annunciation, operating together, shall signal trouble condition.
 - a. Following conditions shall signal trouble condition -
 - 1) Failure of normal power.
 - 2) Opens or short circuits on indicating circuits.
 - 3) Disarrangements in system wiring.
 - 4) Control panel circuit board removal.
 - 5) Ground faults.
 - b. Trouble silencing switch shall silence trouble alarm, but visual annunciation shall remain on until system is restored to normal. As ring-back feature, trouble alarm shall resound as reminder to return silencing switch to normal position.

7. Supervisory visual annunciation, separate from trouble annunciation, and alarm, operating together, shall signal operation of supervisory device, such as control valve tamper, low air pressure, and low temperature switches. Alarm silence switch shall operate in same manner as trouble alarm.

1.3 SUBMITTALS

- A. Shop Drawings
 1. Prepared by authorized factory representative and including -
 - a. Single line diagram of actual system. Typical riser diagrams are not acceptable.
 - b. Complete wiring diagrams.
 - c. Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.
- B. Quality Assurance / Control - Certificate of completion, from Manufacturer's Representative, in accordance with NFPA 72 requirements.
- C. Closeout
 1. Operations And Maintenance Manual Data -
 - a. Provide operating and maintenance instructions for each item of equipment submitted under Product Data. Provide instruction manual from Manufacturer which explains what is to be done in event of various indications.
 - b. Include copy of approved shop drawings.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 1. System shall meet approval of authority having jurisdiction (OSHPD). NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 2. Equipment, devices, and cable shall be UL or Factory Mutual listed for use in fire alarm systems.

1.5 OWNER'S INSTRUCTIONS

- A. Instruct Owner's representative in proper operation and maintenance procedures.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Equipment and accessories furnished under terms of this Specification shall be standard products of single manufacturer, or include written statement by Control Panel Manufacturer confirming compatibility of components and inclusion of these components under system warranty.
- B. Control Panel
 1. Listed under UL Standard 864.
 2. Solid state modular design with flush or semi-flush mounting.
 3. Control functions shall be behind locked door with annunciating devices visible through door. Single key shall operate all keyed functions in system. Provide three keys.
 4. Each zone or device shall be electrically supervised in accordance with wiring style specified.
 5. Provide integral surge protection.
 6. Make provisions for connection to off-site alarm notification system. Provide separate dry contacts for alarm and supervisory/trouble alarms.
 7. Power Supply -
 - a. Provide indication of normal power supply.
 - b. Loss of normal power shall activate trouble alarm.
 - c. Meet requirements of and size in accordance with UL Standard 1481 and NFPA 72.
 - d. Include standby batteries, charger, and automatic transfer equipment.
 8. Visual Annunciation -
 - a. Separate indication on each zone or device for alarm, trouble, or supervisory conditions.
 - b. Visual indication shall be by LED lights or other easily identifiable method.
 - c. On zoned system, permanently custom labeled zones by zone name, not number.
 - d. Fault or trouble condition on any zone shall not affect any other zone.

9. Audible Horn Alarm Annunciation -
 - a. Provide separate and distinct alarm signals for alarm and trouble conditions.
 - b. Alarm signal shall also operate strobe lights, if specified.
 - c. Provide alarm silence switches at control panel.
 - d. Trouble alarm shall be horn integral to control panel.
 - e. Supervisory alarm may be same audible alarm as trouble alarm, but with separate visual annunciation.

- C. Off-Site Alarm Notification System
 1. Provide two telephone lines from telephone terminal board to fire alarm control panel.
 2. Owner will arrange for dialer system equipment and monitoring connection contract.

- D. Alarm Initiating Devices
 1. Smoke Detectors -
 - a. Photoelectric type.
 - b. Listed under UL Standard 268.
 - c. Provide visual indication of alarm on unit when normally pulsed supervisory LED glows continuously.
 2. Heat Detectors -
 - a. Non-settable 200 deg F fixed temperature.
 - b. Provide visible indication that device has operated.
 - c. Listed under UL Standard 521.
 3. Low Building Temperature Device -
 - a. Set for contact closure at 35 deg F.
 - b. Acceptable Products -
 - 1) Dayton No. 2E206
 - 2) Equal as approved by Architect before installation. See Section 01600.
 4. Manual Fire Alarm Boxes -
 - a. Non-coded and double-action requiring two actions to initiate alarm. Breakable glass type are not approved.
 - b. Box shall mechanically latch when actuated and require key to reset. Key shall match control panel door lock.
 - c. Provide STI lexan covers.

- E. Notification Appliances
 1. Combination Horn / Strobe -
 - a. Wall mounted flush or semi-flush.
 - b. Non-coded audible output of 90 dB minimum at 10 feet.
 - c. Integrally mounted flashing light unit with block letters 'FIRE'. Minimum light intensity of 75 candela and flash rate between one and two Hertz.
 - d. Listed under UL Standards 464 and 1971.
 - e. Color - White
 2. Strobe Only -
 - a. Wall mounted flush or semi-flush.
 - b. Integrally mounted flashing light unit with block letters 'FIRE'. Minimum light intensity of 75 candela and flash rate between one and three Hertz.
 - d. Listed under UL Standard 1971.
 - e. Color - White

- F. Accessory Devices
 1. Door Hold / Release Devices - Electrically operated magnetic devices which hold doors open until released by main control panel.
 2. Notification Appliance Protective Devices - Provide wire guard covers for appliances installed in Cultural Center.

2.2 ACCEPTABLE MANUFACTURERS

- A. Bosch Security Systems, Fairport, NY (800) 538-5807 www.radionicsinc.com
- B. Cerebrus Pyrotronics, Florham Park, NJ (973) 593-2600 www.cerbpyro.com
- C. Edwards Systems Technology, Sarasota, FL (800) 226-2333 or (941) 793-4200 www.est.net

- D. Faraday Inc, Tecumseh, MI (517) 423-2111
- E. Mirtone, Sarasota, FL (800) 232-6593 www.mirtone.com
- F. Notifier, Northford, CT (800) 454-9779 or (203) 484-7161 www.notifier.com
- G. Silent Knight Security Systems, Maple Grove, MN (800) 446-6444 or (612) 493-6400 www.silentknight.com
- H. Simplex, Westminister, MA (800) 221-7336 or (978) 731-2500 www.simplexnet.com
- I. Equal as approved by Architect before bidding.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fire alarm and detection systems as indicated, in accordance with Equipment Manufacturer's written instructions, and complying with applicable portions of NEC, NFPA, and NECA's 'Standard of Installation'.
 - 1. Mounting Heights -
 - a. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor
 - 1) Fire alarm horns - 90 inches
 - 2) Fire alarm pull stations - 54 inches
 - 3) Remote annunciator panel - 60 inches
 - 2. Locate fire alarm manual stations 24 inches minimum away from any light switch.
- B. Identification
 - 1. Label zone indicators on control unit indicating location and type of initiating device, i.e., CORRIDOR SMOKE, VALVE TAMPER, AIR SYSTEM SMOKE, etc. Labels shall be engraved plastic laminate, or other permanent labeling system as supplied by Control Unit Manufacturer.
 - 2. Post copy of wire identification list inside fire alarm panel door or other area accessible to fire alarm service personnel.
 - 3. Print location of circuit disconnecting means inside panel. Label disconnect in panel in red.
- C. Conductors
 - 1. Install conductors in conduit.
 - 2. Fire alarm system conductors from different zones may be combined in common conduit. Make certain that raceway size and wire quantity, size, and type is suitable for equipment supplied and is within NEC standards. Label pull and junction boxes 'FIRE ALARM'.
 - 3. Install conductors and make connections to water flow switches, valve tamper switches, low air pressure switches, and duct smoke detectors.
 - 4. Loop wires through each device on zone for proper supervision. Tee-taps not permitted on zoned systems.
 - 5. Minimum conductor size shall be 14 AWG unless otherwise specified.
- D. Do not install ceiling mounted detectors within 36 inches of air discharge grilles. Do not install manual fire alarm boxes close to light switches. Coordinate with other trades as required.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service
 - 1. Provide factory trained representative to perform complete system testing in presence of Owner's representative and local fire department personnel upon completion of installation.
 - a. Test each initiating and annunciating device for proper operation, except fixed temperature heat detectors.
 - b. Test operation of trouble annunciation on each circuit.
 - c. Perform complete testing of control panel functions.

3.3 PROTECTION

- A. Provide dust protection for installed smoke detectors until finish work is completed and building is ready for occupancy.
- B. Protect conductors from cuts, abrasion and other damage during construction.

END OF SECTION

SECTION 13930

WET-PIPE FIRE-SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install complete wet-pipe fire sprinkler system as specified in Contract Documents.
- B. Related Sections
 - 1. Section 16721 - Alarm And Detection System including connection of tamper switches and pressure flow detectors to alarm system and furnishing and installing of low temperature switch.
 - 2. Section 15101 - General Piping Requirements

1.2 REFERENCES

- A. American National Standards Institute / American Society of Mechanical Engineers
 - 1. ANSI / ASME B 16.1-89, 'Cast Iron Pipe Flanges and Pipe Flanged Fittings'
 - 2. ANSI / ASME B 16.4-89, 'Cast Iron Threaded Fittings, Class 125 and Class 250'
- B. American National Standards Institute / National Fire Protection Association
 - 1. ANSI / NFPA 13-1991, 'Installation of Sprinkler Systems'
- C. American Society For Testing And Materials
 - 1. ASTM A 53-98, 'Standard Specification for Pipe, Steel and Hot-Dipped, Zinc-Coated, Welded and Seamless'
 - 2. ASTM A 234-97, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service'

1.3 SUBMITTALS

- A. Shop Drawings
 - 1. Size sprinkler system by one of following methods -
 - a. Pipe schedule method in accordance with ANSI/NFPA 13
 - b. Hydraulic calculation design method based on water supply evaluation performed at building site.
 - 2. Submittal Procedure -
 - a. After award of Contract and prior to purchase of equipment, submit seven sets of shop drawings with specifications and hydraulic calculations, if pipe schedule method is not used, to Architect and two sets to local jurisdiction having authority for fire prevention for review.
 - b. After integrating Architect's and local jurisdiction's comments into drawings, licensed certified fire protection engineer of record submitting fire sprinkler system design construction documents shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
 - c. Submit stamped documents to area office and local jurisdiction having authority for fire prevention for final approval.
 - d. After final approval, submit four copies of approved stamped documents to Architect.
 - e. Failure of system to meet requirements of authority having jurisdiction shall be corrected at no additional cost to Owner.
- B. Closeout
 - 1. Operation And Maintenance Manual Data -
 - a. Modify and add to requirements of Section 01700 as follows -
 - 1) Provide master index showing items included.

- 2) Provide name, address, and phone number of Architect, Architect's Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
 - 3) Provide operating instructions to include -
 - a) General description of fire protection system.
 - b) Step by step procedure to follow in putting system into operation.
 - 4) Maintenance instructions shall include -
 - a) List of system components used indicating name and model of each item.
 - b) Manufacturer's maintenance instructions for each component installed in Project. Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - 5) Include copies of approved shop drawings and copies of required warranties.
2. If system has both wet and dry segments, provide single Operations And Maintenance Manual for total Fire Suppression System.

1.4 QUALITY CONTROL

A. Qualifications

1. Designer -
 - a. Licensed fire protection engineer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer shall -
 - 1) Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
 - 2) Make complete inspection of installation.
 - 3) Provide corrected record drawings to Owner with letter of acceptance.
 - 4) Certify that installation is in accordance with Contract Documents.
2. Installer - Licensed by jurisdiction having authority over installed fire protection systems for location of Project. Furnish verified list of similar projects installed during past 5 years minimum.

B. Requirements of Regulatory Agencies

1. Unless noted otherwise, system shall conform to -
 - a. ANSI / NFPA 13 - 1991 'Light & Ordinary Hazard Occupancies'
 - b. ANSI / NFPA 24 - 1992 'Service Mains and Their Appurtenances, Private'
 - c. ANSI / NFPA 101 - 1991 'Life Safety Code'
 - d. Requirements of local water department and local authority having jurisdiction for fire protection.
 - e. Applicable rules, regulations, laws, and ordinances.
 - f. Underwriter's Laboratories Publication, 'Fire Protection Equipment Directory', January 1990.
 - g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.

1.5 OWNER'S INSTRUCTIONS

- A. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of system utilizing Operation And Maintenance Manual when so doing. Minimum instruction period shall be four hours.
- B. Instruction periods shall occur after Substantial Completion inspection when system is properly working and before final payment is made.

1.6 MAINTENANCE

- A. Extra Materials - Furnish twelve spare heads of each type and temperature rating used, properly boxed with sprinkler head wrench.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Pipe
 - 1. Above Ground - Schedule 40 black welded steel meeting requirements of ASTM A 53.
 - a. 2 Inches And Smaller - Welded, screwed, flanged, or roll grooved coupling system.
 - b. 2-1/2 Inches And Larger - Welded, flanged, or roll grooved coupling system.
- B. Fittings
 - 1. Screwed - Cast iron meeting requirements of ANSI B 16.4.
 - 2. Flanged - Cast iron meeting requirements of ANSI B 16.1.
 - 3. Welded - Carbon steel meeting requirements of ASTM A 234.
 - 4. Roll Grooved Pipe Coupling System -
 - a. Approved Manufacturers -
 - 1) Gustin Bacon
 - 2) ITT Grinnell Coupling
 - 3) Victaulic Coupling
- C. Valves
 - 1. Butterfly Valves -
 - a. UL / FM approved
 - b. Indicating type
 - c. Approved Manufacturers And Models -
 - 1) Mueller -
 - a) B-3250-00 Wafer type with valve tamper switch
 - b) B-3250-52 Grooved ends type with valve tamper switch
 - 2) Nibco -
 - a) WD3510-4 Wafer type with valve tamper switch
 - b) GD1765-4 Grooved type with valve tamper switch
 - 3) Norris O'Bannon - NW285AC-2K Wafer type with optional tamper switch
 - 4) Pratt Valves - IBV
 - 2. Gate Valves -
 - a. UL / FM approved
 - b. Outside Screw and Yoke Type (O.S.&Y)
 - c. Class 150 psi
 - d. Approved Manufacturers And Models -
 - 1) Nibco - F-637-31 Flanged Ends
 - 2) Mueller - A-2073-6 Flanged Ends
 - 3. Ball Valves -
 - a. UL / FM approved
 - b. Valve tamper switch
 - c. Approved Manufacturers And Models -
 - 1) Milwaukee - BBSC with threaded ends
 - 2) Nibco - T-505 with threaded ends
 - 3) Nibco - G-505 with grooved ends
 - 4. Swing Check Valves -
 - a. 1/2 to 3 inch horizontal check
 - b. Regrinding type
 - c. Renewable disk
 - d. Bronze Class 125 with threaded ends
 - e. Approved Manufacturers And Models -
 - 1) Nibco - KT-403-W
 - 2) Walworth - Figure 412
 - 5. Swing Check Valves -
 - a. 2-1/2 to 12 inch Horizontal check
 - b. Bolted bonnet
 - c. Raised face Flanges

- d. Bronze mounted with ductile iron body
- e. 125 lb Class A
- f. Approved Manufacturers And Models -
 - 1) Nibco - F-938-31
 - 2) Walworth - Fig 883F
 - 3) Mueller - A-2120-6
- 6. Wafer Type Check Valves -
 - a. 4 to 8 inch cast iron body
 - b. 175 psi minimum working pressure
 - c. Rubber Seat
 - d. Approved Manufacturers And Models -
 - 1) Nibco - W-900-W
 - 2) Mueller - A-2102
- 7. Alarm Check Valves -
 - a. Approved Manufacturers And Models -
 - 1) Reliable - E with gauges and drain
 - 2) Viking - E-1 with gauges and drain
 - 3) Star - F with gauges and drain
- 8. Retard Chamber -
 - a. Self draining
 - b. Approved Manufacturers And Models -
 - 1) Reliable - E-1
 - 2) Viking - C
 - 3) Star - D
- 9. Inspector's Test Valve -
 - a. Ductile iron body with threaded ends
 - b. Combination sight glass / orifice
 - c. Bronze top works
 - d. Approved Manufacturer And Model -
 - 1) Victaulic - Testmaster Alarm Test Module Style 718

D. Sprinkler Heads

- 1. Concealed Wet Pendant -
 - a. Flush ceiling profile
 - b. Adjustable cover
 - c. UL / FM approved
 - d. Coordinate concealed cover finish with Architect.
 - e. Approved Manufacturers And Models -
 - 1) Reliable - G-4 'Adjustable Concealer'
 - 2) Viking - Model 'Horizon Image'
 - a) Sprinkler Base - Part No. 08281
 - b) Cover Assembly - Part No. 08310
- 2. Horizontal Sidewall Sprinkler -
 - a. UL / FM approved
 - b. Recess adjustable
 - c. Use Viking A-1 chrome plated sprinkler guard where guards are required.
 - d. Approved Manufacturers And Models -
 - 1) Reliable - F-1 with Reliable recessed, 2-piece escutcheon Model GF1
 - 2) Viking - M HSW with Viking recessed, 2-piece escutcheon Model E-1
 - 3) Star - Model LD-2 with Star Nova Series recessed escutcheon.
- 3. Pendant And Upright Sprinkler -
 - a. UL / FM approved
 - b. Use Reliable C-1 chrome plated sprinkler guard where guards are required.
 - c. Use Reliable C flush chrome escutcheon.
 - d. Approved Manufacturers And Models -
 - 1) Reliable - G
 - 2) Viking - M
 - 3) Central - A
 - 4) Star - E
- 4. Adjustable Drop Nipple -
 - a. Steel tube, oxide coated.

- b. Double O-ring seal.
 - c. 175 psi minimum working pressure.
 - d. Approved Manufacturers And Models -
 - 1) CECA - Cold Extrusion Company of America
 - 2) Central - 'Alpha'
- E. Water Flow Alarm
- 1. Mechanical Flow Alarm - Water Gong
 - a. UL / FM approved.
 - b. Approved Manufacturers And Models -
 - 1) Reliable - C
 - 2) Viking - F-1
 - 3) Central - F
 - 4) Star - CD
- F. Pressure Gauges
- 1. Mechanical Water Pressure Gauges -
 - a. UL / FM approved.
 - b. 3-1/2 inch diameter dial.
 - c. 0 to 300 psi in 5 psi increments.
 - d. Approved Manufacturers And Models -
 - 1) Reliable - UA
 - 2) HO Trerice - 500
- G. Pressure Detectors
- 1. Electrical Water Pressure Switch -
 - a. UL / FM approved.
 - b. Switch activates on pressure rise between 4 and 8 psi.
 - c. Two single pole double throw switches.
 - d. Automatic reset.
 - e. Approved Manufacturers And Models -
 - 1) Reliable - J54-8295
 - 2) Potter - PS10
- H. Tamper Switch
- 1. Weather And Tamper Resistant Switch -
 - a. UL / FM approved.
 - b. Two Single Pole Double Throw Switches.
 - c. Approved Manufacturer And Model -
 - 1) Potter - PCVS
- I. Fire Department Connection
- 1. Two-way Inlet with single clapper
 - 2. Polished Brass.
 - 3. 3/4 Inch Straight Design Automatic Drain Device by Potter-Roemer Fig. 5982.
 - 4. Round 'AUTO. SPKR.' identification plate, polished brass by Potter-Roemer Fig. 5962.
 - 5. Approved Manufacturers And Models -
 - a. Potter-Roemer - Fig. 5710
 - b. Reliable - B

2.2 MANUFACTURERS

- A. Central Sprinkler, Lansdale, PA (800) 523-6512 or (215) 362-0700
www.centraisprinkler.com
- B. Cold Extrusion Company of America (CECA), Jacksonville, AR (501) 982-9463
- C. Grinnell Corp, Exeter, NH (888) 610-6101 or (603) 778-9200 www.grinnell.com
- D. Gustin-Bacon, Tyler, TX (903) 882-5511 www.tylerpipe.com
- E. Henry Pratt Co, Aurora, IL (630) 844-4000 www.prattvalves.com
- F. HO Trerice Company, Oak Park, MI (888) 873-7423 or (248) 399-8000 www.hotco.com
- G. Milwaukee Valve Co, Milwaukee, WI (414) 744-5240 www.milwaukeevalve.com

- H. Mueller Company, Decatur, IL (800) 423-1323 or (217) 423-4471 www.muellerflo.com
- I. Nibco Inc, Elkhart, IN (800) 234-0227 or (219) 295-3000 www.nibco.com
- J. Norris O'Bannon,
- K. Potter Electric Signal Co, St Louis, MO (800) 325-3936 or (314) 878-4321
www.pottersignal.com
- L. Potter-Roemer, Cerritos, CA (800) 366-3473 or (714) 530-5300 www.potterroemer.com
- M. Reliable Automatic Sprinkler Co, Mount Vernon, NY (800) 431-1588 or (914) 668-3470
www.reliablesprinkler.com
- N. Star Sprinkler Corp, Oak Creek, WI (800) 558-5236 or (414) 570-5000
www.starsprinkler.com
- O. Victualic Company of America, Easton, PA (610) 559-3300 www.victualic.com
- P. Viking Corp, Hastings, MI (800) 968-9501 or (616) 945-9501 vikingcorp.com
- Q. Walworth Company, Houston, TX (800) 735-6007 or (713) 777-7788
www.walworthvalve.com

PART 3 EXECUTION

3.1 EXAMINATION

- A. Drawings
 1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Fire Protection Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

3.2 INSTALLATION

- A. Follow general piping installation requirements specified in Division 15.
- B. Connect system to flange provided under Division 02.
- C. Install piping in accordance with NFPA 13, Paragraph 4-5.1.1.2.
- D. Install system to drain. Drain trapped piping in accordance with NFPA 13, Paragraph 4-5.3.1.
 1. Install main drain from riser.
 2. Install auxiliary drains in low points of piping system and inspector's test valve drain to mechanical pad located outside building unless otherwise directed by Architect.
- E. Install piping system so it will not be exposed to freezing temperatures.
- F. Do not use dropped, damaged, or used sprinkler heads.
- G. Install sprinkler lines concealed.
- H. Install tamper switches and pressure flow detectors where located by Architect.
- I. Install water powered motor gong on exterior wall in accordance with Manufacturer's instructions.
- J. Install automatic ball drip device in lowest point of piping to fire department connection and drain to exterior of building.
- K. Brace and support system to meet seismic zone requirements for building site.

3.3 FIELD QUALITY CONTROL

A. Site Tests

1. Test system according to 'Contractor's Material And Testing certificate for Above Ground Piping' NFPA-13, figure 8-1(a).
2. Tests shall be witnessed by Architect and representative of local jurisdiction over fire prevention.
3. Test blanks shall have red painted lugs protruding beyond flange to clearly indicate their presence and be numbered to assure their removal when testing is completed.

END OF SECTION

DIVISION 15

MECHANICAL

15000 BASIC MECHANICAL REQUIREMENTS

15010 BASIC MECHANICAL REQUIREMENTS

15100 BUILDING SERVICES PIPING

15101 GENERAL PIPING REQUIREMENTS

15140 SUPPORTS AND ANCHORS

15200 PROCESS PIPING

15245 VIBRATION ISOLATION

15290 INSULATION (DUCTWORK)

15400 PLUMBING FIXTURES AND EQUIPMENT

15410 PLUMBING PIPING

15440 PLUMBING FIXTURES

15700 HVAC EQUIPMENT

15732 ROOFTOP AIR CONDITIONERS

15800 AIR DISTRIBUTION

15890 DUCTWORK

15900 HVAC INSTRUMENTATION AND CONTROLS

15910 DUCTWORK ACCESSORIES

15940 AIR OUTLETS AND INLETS

15950 TESTING, ADJUSTING AND BALANCING

END OF TABLE OF CONTENTS

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1: GENERAL

1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements.

1.2 DESCRIPTION

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.3 WORK INCLUDED

- A. The complete Heating, Ventilating and Air Conditioning (HVAC), including but not limited to these major items.
 - 1. Coordinate work of this Section with related trades.
 - 2. Verify applicable dimensions at the jobsite.
 - 3. Diffusers and registers.
 - 4. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
 - 5. Duct lining and insulation.
 - 6. Refrigerant piping, fittings, valves and specialties, and insulation.
 - 7. Temperature control system.
 - 8. Shop drawings.
 - 9. Equipment identification.
 - 10. Equipment and systems adjustments and balancing.
 - 11. Air testing, adjusting and balancing.
 - 12. Demolition, including removal from site ductwork, terminal boxes, air distribution devices and piping.
 - 13. Record drawings.
 - 14. Guarantee

1.4 WORK SPECIFIED ELSEWHERE

- A. Concrete, Painting and Electrical.

1.5 SITE INSPECTION

- A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions.

1.6 ORDINANCES, REGULATIONS AND CODES

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.

- AFI - Air Filter Institute
- AMCA - Air Moving & Conditioning Association
- ARI - Air Conditioning & Refrigeration Institute
- ASHRAE - American Society of Heating,
Refrigerating and Air Conditioning Engineers
- ASME - American Society of Mechanical Engineers
- ASTM - American Society of Testing Materials
- AWSC - American Welding Society Code
- ANSI - American National Standards Institute
- CBC - California Building Code
- CCR - California Code of Regulations
- CEC - California Electrical Code
- CFC - California Fire Codes
- CMC - California Mechanical Code
- CPC - California Plumbing Code
- FIA - Factory Insurance Association
- NEMA - National Electrical Manufacturer's
Association
- NFPA - National Fire Protection Association
- ORS - Office of Regulatory Services
- SMACNA - Sheet Metal and Air Conditioning
Contractors National Association
- UFC - Uniform Fire Code
- UL - Underwriter's Laboratories
- UPC - Uniform Plumbing Code

- B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

- C. Codes and Standards:

- 1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
- 2. IMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).

3. IPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
 4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
 5. National Fire Protection Association's - National Fire Code.
- D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.
- E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.7 PERMITS, FEES AND INSPECTIONS

- A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.8 DRAWINGS AND SPECIFICATIONS

- A. The Architect's decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained.
- E. Alternate support or seismic detail shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.9 SUBMITTALS

- A. Before starting work, the Contractor shall furnish for the approval of the Architect, shop drawings and itemized equipment lists, complete in all details which he proposes to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.

- C. Submittals shall include, but not necessarily be limited to the following:
1. Draw Equipment Layouts to at least same scale as drawings, including equipment, piping accessories, showing clearances for operating and servicing.
 2. Ventilation and air conditioning equipment, specialties and the air control systems.
 3. Dampers, louvers, grilles, registers, diffusers.
 4. Shop Fabrication Drawings of ductwork and piping layouts. Submit for approval prior to fabrication.
 5. Special and miscellaneous products furnished under this section and not listed herein

1.10 RECORD DRAWINGS AND MANUALS

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 1 requirements.
- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted.
- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
 2. Specifications
 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
 4. Grouting requirements.

5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
 6. Start-up and beginning operation procedures.
 7. Operational procedures.
 8. Shutdown procedures.
 9. Maintenance and calibration procedures
 10. Parts lists
 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.

1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.12 SEISMIC DESIGN

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for items of work, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
1. All mechanical equipment shall be braced or anchored to resist a horizontal force acting in any direction using the following criteria and as detailed otherwise:
 - a. Fixed Equipment on Grade 33% of Operating Weight
 - b. Fixed Equipment on Structure 50% of Operating Weight
 - c. Emergency Power and 50% of Operating Weight Communication Equipment on Grade

- d. Emergency Power and 75% of Operating Weight Communication Equipment on Structure
- e. For Flexibly Mounted Use 2 X Above Values Equipment
- f. Simultaneous Vertical Force Use 1/3 X Horizontal Force. Where anchorage details are not shown on Drawings, the field installation is subject to approval of Architect.

1.13 SUBSTITUTIONS AND CHANGES

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with General Section.

1.14 APPROVALS

- A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

- A. Immediately after award of the Contract and after the approval of submittals by the Architect, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time. He shall deliver to the Architect a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.16 LOCATIONS AND ACCESSIBILITY

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as approved by Architect. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

- C. Installation at thermometers, gauges, controls, or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessibly located with reference to the finished building.
- D. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.
- E. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

1.17 COORDINATION OF TRADES

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference between trades.

1.18 GUARANTEES

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
 - 1. Faulty or inadequate design.
 - 2. Improper assembly or erection.
 - 3. Defective workmanship or material.
 - 4. Incorrect or inadequate operation or other failure.
- C. He shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise.
- D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment within the guarantee period.
- E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.
- F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty to the Owner, who shall be named as beneficiary.

1.19 CLEAN UP, REMOVAL OF DEBRIS.

- A All material removed from the existing system shall be removed from the site at the end of each work day and the work site left broom clean.
- B Thermostats, controls not to be reused shall be delivered to Owner if such is requested.

1.20 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.21 CLOSING-IN OF UNINSPECTED WORK

- A. Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.22 BUILDING FOOTING CLEARANCES

- A. Under no circumstances shall pipes, ducts, or conduits penetrate beams or structural elements without approval of the Architect.

1.23 DAMAGE BY LEAKS

- A. Contractor shall be responsible for all damage to any part of the premises caused by breaks or leaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.24 EQUIPMENT LABELS

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.25 PRELIMINARY OPERATION

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.26 MAINTAINING EXISTING SERVICES

- A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.

- B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Architect.
- C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.
- D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

1.27 ELECTRICAL WORK

- A. Coordinate with Division 16 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.
- B. Voltage for electrical work will be included in Division 16. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment which requires extra expense in the power or control wiring, he shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 16.
- D. Interconnecting wiring, safety switches, and relays, which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 16.
- F. Control wiring shall be provided by Division 15, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 16.

END OF SECTION

SECTION 15101

GENERAL PIPING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. General piping material requirements and installation procedures applicable to all piping systems.
- B. Related Sections
 - 1. Section 15010 - Basic Mechanical Requirements

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Pipe And Pipe Fittings - Use domestic made pipe and pipe fittings on Project. Weld-O-Let and Screw-O-Let fittings are acceptable.
- B. Sleeves
 - 1. In Framing - Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 - 2. In Concrete - Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.

2.2 MANUFACTURED UNITS

- A. Valves - Valves of same type shall be of same manufacturer.
- B. Pipe Hangers
 - 1. Adjustable, malleable iron clevis type, swivel loop type, or swivel split ring type of a diameter adequate to support pipe size.
 - 2. Approved Manufacturers -
 - a. Globe Strut by Globe Pipe Hanger
 - b. B-Line
 - c. Grinnell
 - d. Michigan Hanger
 - e. Superstrut
- C. Di-Electric Unions
 - 1. Suitable for at least 175 PSIG WP at 250 deg F.
 - 2. Approved Manufacturers -
 - a. EPCO
 - b. Victaulic
 - c. Watts Regulator

2.2 MANUFACTURERS

- A. B-Line Systems, Highland, IL (800) 280-7994 or (618) 654-2184 www.blinc.com
- B. EPCO Products Inc, Fort Wayne, IN (800) 879-3726 or (219) 747-8888 www.epcoproducts.com
- C. Globe Pipe Hanger Products Inc, Cleveland, OH (800) 338-3555 or (216) 362-6300
- D. Grinnell Corp, Exeter, NH (603) 778-9200 www.grinnell.com
- E. Michigan Hanger Company, Niles, OH (800) 333-0852 or (330) 544-4700
- F. Superstrut by Thomas & Betts, Memphis, TN (800) 888-0211 or (901) 682-7766 www.tnb.com
- G. Victaulic Company of America, Easton, PA (610) 559-3300 www.victaulic.com
- H. Watts Regulator Co, North Andover, MA (978) 688-1811 www.wattsreg.com

PART 3 EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work
 - 1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
- B. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - 1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - 2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
 - d. Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
 - e. Install piping to insure noiseless circulation.
 - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 - 3. Do not install piping in shear walls.
- C. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - 1. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - 2. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - 3. Make changes in direction with proper fittings.
 - 4. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - 5. Supports For Horizontal Piping -
 - a. Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
 - b. Support thermoplastic pipe at 48 inches on center maximum.
 - c. Provide support at each elbow. Install additional support as required.
 - 6. Supports for Vertical Piping -
 - a. Securely support clamps by structural members which in turn are supported directly from building structure.
 - b. Provide clamps as necessary to brace pipe to wall.

7. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
 8. Expansion of Thermoplastic Pipe -
 - a. Provide for expansion in every 30 feet of straight run.
 - b. Provide 12 inch offset below roof line in each vent line penetrating roof.
- D. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.2 FIELD QUALITY CONTROL

- A. Site Tests
1. Perform tests on mechanical piping systems. Furnish devices required for testing purposes.
 2. Replace material or workmanship proven defective with sound material at no additional cost to Owner. Repeat tests on new material, if requested.

3.3 CLEANING

- A. Remove dirt, grease, and other foreign matter from each length of piping before installation.
1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

3.4 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

END OF SECTION

SECTION 15140
SUPPORTS AND ANCHORS

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Pipe, duct and equipment hangers, supports and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.2 QUALITY ASSURANCE

- A. Supports for Sprinkler Piping: In conformance with NFPA 13.
- B. Supports for Standpipes: In conformance with NFPA 14.
- C. Manufacturer's Qualifications: Firm regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 SUBMITTALS

- A. Indicate hanger and support framing and attachment methods.

PART 2: PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Pipe Support: All piping shall be supported in such a manner that it is securely attached to the structure of the building. Attachment shall be capable of supporting the tributary weight of the pipe and contents in any direction.
 - 1. Pipes, ducts, and conduits shall be supported and braced per OSHPD anchorage pre-approval No. OPA-0485, the I.S.A.T. "Engineered Seismic Bracing of Suspended Utilities". Maximum spacing of supports, braces. Hanger rod sizes to be per pre-approval No. OPA-0485, the SMACNA "Guidelines for Seismic Restraint of Mechanical Systems and Plumbing Piping Systems".
 - 2. The maximum support spacing for vertical and horizontal pipes shall be as required by the California Plumbing Code, Chapter 3, but not less than that indicated in the table below for horizontal piping.

[Maximum Spacing for Horizontal Pipes						
Water/Waste						
Pipe	Hanger Rod			Cast	Nat.	Med.

Size	Size	Copper	Steel	Iron	Gas	Gases
1/2"	1/4"	6'	6'	-	6'	6'
3/4"	1/4"	6'	8'	-	8'	8'
1"	1/4"	6'	8'	-	8'	8'
1-1/4"	3/8"	6'	8'	-	10'	10'
1-1/2"	3/8"	6'	10'	10'	10'	10'
2"	3/8"	10'	10'	10'	10'	10'
2-1/2"	1/2"	10'	10'	10'	10'	10'
3"	1/2"	10'	10'	10'	10'	10'
4"	1/2"	10'	10'	10'	10'	10'
6"	5/8"	10'	10'	10'	10'	10'
8"	5/8"	10'	10'	10'	10'	10'

- B. Arrange hangers to prevent transmission of vibration from piping/ducting to building structure and allow for expansion and contraction to hangers and supports. Clearance for application of specified insulation without cutting pipeline covering or fitting covering in installation of pipe hangers and fittings shall be provided. Uninsulated copper or brass pipe or tubing shall be isolated from ferrous hangers or supports as indicated herein. Where concealed piping may be supported from structural floor, provide angle members to span joint or distribute load of additional members. All hangers and pipe\duct supports that are exposed to weather shall be made of galvanized steel.
- C. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon Steel adjustable swivel, split ring.
- D. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.
- E. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.
- G. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- H. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.
- I. Vertical Support: Steel riser clamp.
- J. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier or steel support.
- K. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- L. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

- M. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- N. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.
- O. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- P. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.2 MANUFACTURERS - SEISMIC BRACING

- A. Systems: Products of I.S.A.T., Buena Park, CA, are the standard of quality required and specified herein. Similar products of other manufacturers meeting the same standards of performance and approved by OSHPD may be submitted for approval.

2.3 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping.

2.5 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts and suspended ceiling spaces are not considered exposed.

PART 3: EXECUTION

3.1 INSERTS

- A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- C. Where concrete slabs form finished ceiling, provide inserts flush with slab surface.

- D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut above.

3.2 PIPE HANGERS AND SUPPORTS

- A. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- B. Place a hanger within 12 inches of each horizontal elbow.
- C. Use hangers with 1-1/2 inch minimum vertical adjustment.
- D. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- E. Support riser piping independently of connected horizontal piping.

3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of type indicated on drawings.
- B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

END OF SECTION

SECTION 15245
VIBRATION ISOLATION

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Vibration isolation on equipment not equipped with internal isolation.
- B. Pumps less than 10 HP will not require isolation.

1.2 QUALITY ASSURANCE

- A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.3 SUBMITTALS

- A. Indicate vibration isolator locations with static and dynamic load on each, on shop drawings and described on product data.
- B. Submit manufacturer's installation instructions.

1.4 CERTIFICATES

- A. Submit manufacturer's certificate that isolators are properly installed and properly adjusted to meet or exceed specified requirements.

PART 2: PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. California Dynamics Corp.
- B. Mason Industries.

2.2 VIBRATION ISOLATORS

- A. Vibration isolators for utility set exhaust fans, air compressors and other motor driven equipment requiring isolation shall be CALDYN TYPE RJ or approved equal in Mason.
- B. Spring isolators for piping shall be CALDYN TYPE HH or approved equal in Mason.
- C. Isolators shall be pre-approved by OSHPD.

2.3 FABRICATION

- A. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

- B. Select springs to operate at 2/3 maximum compression strain with 1/4 inch ribbed neoprene pads.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Install vibration isolators for motor driven equipment.
- B. Provide spring isolators on piping connected to isolated equipment as follows: Up to 4 inch diameter, first three points of support; 5 to 8 inch diameter, first four points of support; 10 inch diameter and over, first six points of support. Static deflection of first point shall be twice deflection of isolated equipment.

END OF SECTION

SECTION 15290
INSULATION (DUCTWORK)

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Ductwork insulation.
- B. Insulation jackets.

1.2 QUALITY ASSURANCE

- A. Applicator: Company specializing in ductwork insulation application with five years minimum experience.
- B. Materials: UL listed; flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with ASTM E84.
- C. Compliance: All insulating material shall meet the minimum requirements of California Energy Commission's latest Energy Efficiency Standards or California Mechanical Code, whichever is higher level but not less than that specified in this section.

1.3 SUBMITTALS

- A. Include product description, list of materials and thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.

PART 2: PRODUCTS

2.1 APPROVED MANUFACTURERS - INSULATION

- A. Schuller International, Inc.
- B. Owens Corning Fiberglas.
- C. Certainteed Products Co.
- D. Thermal Ceramics Fire Master.

2.2 MATERIALS

- A. Type A: Minimum 1-1/2" thick and 0.75 lb/cu.ft. minimum density. Flexible glass fiber; ASTM C612; commercial grade; with installed thermal resistance of 4.2. Vapor barrier material with a perm rating not exceeding 0.5 perm.
- B. Type B: Minimum 1-1/2" thick and 3.0 lb/cu.ft. minimum density. Rigid glass fiber; ASTM C612; Class 1; with installed conductive value of 0.16 at 75 degrees F or equivalent thermal resistance of 6.3. Vapor barrier material with a perm rating not exceeding 0.5 perm.

- C. Type C: Minimum 1" thick and 1.5 lb/cu.ft. minimum density. Flexible glass fiber; ASTM C553; with installed conductive value of 0.16 at 75 degrees F or equivalent thermal resistance of 6.3; coated air side for maximum 5,000 ft./min. air velocity.
- D. Type D - Vapor Barrier Jacket: Kraft Paper reinforced with glass fiber yarn and bonded to aluminum film.
- E. Type E - Jacket: 8 oz. canvas finished with lagging adhesive.
- F. Adhesives: Waterproof fire-retardant type.
- G. Lagging Adhesive: Fire resistive to ASTM E84.
- H. Impale Anchors: Galvanized steel, 12 gage, self-adhesive pad.
- J. Joint Tape: Glass fiber cloth, open mesh.
- K. Tie Wire: Annealed steel, 16 gage.

PART 3: EXECUTION

3.1 PREPARATION

- A. Install materials after ductwork has been tested and approved.
- B. Clean surfaces for adhesives.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Provide insulation with vapor barrier when air conveyed may be below summer ambient temperature.
- C. Exterior Insulation Concealed Application:
 1. Adhere insulation to duct with spot application of fire retardant adhesive in sufficient quantities to prevent sagging.
 2. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive.
 3. Secure insulation with 18 gauge corrosion resistant wire spaced on 12" centers or secured with outward clinch corrosion resistant staples on 4" center.
 4. Duct with a width over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum center.
 5. Seal all breaks and punctures with vapor barrier tape and same type of fire retardant adhesive.
 6. All transverse and longitudinal joints, seams and penetrations of the vapor barrier facing shall be covered with 4 oz. canvas stripping tape applied and sealer with fire retardant mastic.

- D. Exterior Insulation Exposed in the Building - Rectangular Duct:
1. Insulation shall be fastened to duct with stick clips with washers.
 2. Fasteners shall be spaced 12" to 18" on center with a minimum of two rows per side of duct.
 3. Secure insulation in place with washers firmly embedded in insulation.
 4. Form corners with 1-1/2 x 1-1/2 x 26 gauge galvanized steel angle prior to covering with canvas and hold in place with 16 gauge galvanized wire.
 5. Seal all joints, breaks, and punctures with fire retardant vapor barrier adhesive.
 6. Insulation shall be covered with 8 oz. canvas and sized for finish painting.
- E. Liner (Type C) Application:
1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Seal and smooth joints. Do not use nail-type fasteners. Fasteners shall start within 3" of leading edge of transverse joints. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.
- F. Walk-In Plenum Application: Adhere insulation on interior surface of plenum with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners. Seal and smooth joints. Do not use nail-type fasteners.
- G. Continue insulation with vapor barrier through penetrations.

3.3 SCHEDULE

<u>DUCTWORK</u>	<u>TYPE</u>	<u>INSULATION THICKNESS - INCH</u>
• Concealed Supply Ducts	A,D	1-1/2"
• Concealed Return Duct	A,D	1-1/2"
• Supply and Return Ducts, Exposed in the Building	B	1-1/2"
• Supply and Return Ducts, Exposed to Atmosphere	C	2"
• Grease Duct	D	3"
• Fume Hood Exhaust	E	(2 layers 1-1/2") 3" (2 layers 1-1/2")

END OF SECTION

SECTION 15410
PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer and vent piping system.
- D. Domestic water piping system.
- E. Condensate drain piping system.
- F. Natural gas piping system.

1.2 RELATED WORK

- A. Section 15440 - Plumbing Fixtures.

1.3 REFERENCES

- A. ANSI B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
- C. ANSI B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ASME Sec. 9 - Welding and Brazing Qualifications.
- E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- F. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- G. ASTM B32 - Solder Metal.
- H. ASTM B88 - Seamless Copper Water Tube.
- J. AWS D1.1 - Structural Welding Code.
- K. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- L. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- M. AWWA C111- Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

- N. ASME - Boiler and Pressure Vessel Code.
- O. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- P. ASTM B88 - Seamless Copper Water Tube.
- R. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- S. AWS A5.8 - Brazing Filler Metal.
- T. AWS D1.1 - Structural Welding Code.
- U. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
- V. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

1.4 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME Sec 9.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site.
- B. Store and protect products.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SANITARY SEWER AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: Hubless, ASTM A74 service weight. Fittings: Cast iron. Joints: CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Polyethylene Encasement: ASTM D1248 polyethylene tube or sheet form to encase cast iron pipe, with minimum 0.004-inch (0.10 mm) thickness. Install encasement as per ASTM A74 and manufacturer's recommendations.

2.2 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

- A. Cast Iron Pipe: Hubless, ASTM A74, service weight. Fittings: Cast iron. Joints:

CISPI HSN compression type with ASTM C564 neoprene gaskets.

- B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Copper Pipe: ASTM B306, DWV. Fittings: ANSI B16.3, cast bronze, or ANSI B16.29, wrought copper. Joints: ASTM B32, solder, Grade 50B.

2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Tubing: ASTM B88, Type K hard drawn. Fittings: ANSI B16.18, cast copper alloy solder joint pressure fittings. Joints: ASTM B32, solder, Grade 95TA.
- B. Cast Iron Pipe: AWWA C151, cement lining as per AWWA C104. Fittings: Ductile iron, Class 52. Joints: AWWA C111, rubber gasket with 3/4-inch diameter rods.

2.4 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI B16.18, cast copper alloy solder joint pressure fittings. Joints: ASTM B32, solder, Grade 95TA.

2.5 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53, Schedule 40 black. Fittings: ANSI B16.3, malleable iron threaded fittings, or ASTM A234, forged steel welding type. Joints: Screwed with approved standard threads, or AWS D1.1 welded.
- B. Steel pipe exposed to weather shall be prime coated and painted. Color as selected by Owner.

2.6 CONDENSATE DRAIN PIPING, ABOVE GRADE

- A. DWV Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI B16.29, wrought copper solder joint drainage fittings. Joints: ASTM B32, solder Grade 95TA. Insulate concealed piping with one-inch thick fiberglass insulation with factory applied vapor barrier jacket.

2.7 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick preformed.
- C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; "C" shaped composition sealing gasket; steel bolts, nuts and washers; galvanized couplings for galvanized pipe.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier. Underground metal piping shall be bonded for electrical continuity.

2.8 ACCEPTABLE MANUFACTURERS - GATE VALVES

- A. Crane, Model 1320
- B. Stockham, Model B-104
- C. Milwaukee, Model 1145

2.9 GATE VALVES

- A. Up to 2 Inches: Bronze body, non-rising stem and handwheel, inside screw, solid wedge or disc, threaded ends.
- B. Over 2 Inches: Iron body, bronze trim, rising stem and handwheel, OS & Y, solid wedge flanged ends.

2.10 ACCEPTABLE MANUFACTURERS - GLOBE VALVES

- A. Crane, Model 1310
- B. Stockham, Model B-17
- C. Milwaukee, Model 1502

2.11 GLOBE VALVES

- A. Up to 2 Inches: Bronze body, rising stem and handwheel, inside screw, renewable composition disc, screwed ends, with backseating capacity.
- B. Over 2 Inches: Iron body, bronze trim, rising stem and handwheel, OS&Y, plug-type disc, flanged ends.

2.12 ACCEPTABLE MANUFACTURERS - BALL VALVES

- A. Apollo; Model 77-100 Series
- B. Nibco, Model T-585-Y
- C. Stockham, Model S-207

2.13 BALL VALVES

- A. Up to 2 Inches: Bronze body, full port stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.
- B. Over 2 Inches: Cast steel body, full port chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged. Nibco Model F-510 series.

2.14 ACCEPTABLE MANUFACTURERS - GAS COCKS

- A. Peter Healey, Model 7005
- B. Conbraco, Model 50 Series

2.15 GAS COCKS

- A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.

- B. Over 2 Inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

2.16 ACCEPTABLE MANUFACTURERS - SWING CHECK VALVES

- A. Crane, Model 1342.
- B. Stockham, Model B-309.
- C. Milwaukee, Model 1509.

2.17 SWING CHECK VALVES

- A. Up to 2 Inches: Bronze 45 degree swing disc, solder ends.
- B. Over 2 Inches: Iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

2.18 ACCEPTABLE MANUFACTURERS - WATER PRESSURE REDUCING VALVES

- A. Watts
- B. Wilkins
- C. Spence

2.19 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric-reinforced diaphragm, strainer, threaded double union ends.
- B. Over 2 Inches: Cast iron body, bronze fitted, elastomer diaphragm and seat disc, flanged.

2.20 ACCEPTABLE MANUFACTURERS - RELIEF VALVES

- A. Watts
- B. Wilkins
- C. Conbraco

2.21 RELIEF VALVES

- A. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Underground metal piping shall be bonded for electrical continuity.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Slope water piping and arrange to drain at low points.
- I. Establish elevations of buried piping outside the building to ensure not less than 1.5 ft. of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.
- K. Prepare pipe, fittings, supports and accessories not prefinished, ready for finish painting.
- L. Establish invert elevations, slopes for drainage as indicated on drawings. Maintain gradients.
- M. Excavate and backfill in accordance with Project General Requirements.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 2-1/2 inches and larger with a wrench with set screw.
- P. Provide firestopping at fire rated walls, floors or ceiling assemblies.
- Q. Underground metal piping shall be bonded for electrical continuity if rubber gasketed, mechanical, grooved end, or other nonconductive type joints are used.

3.3 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate or ball valves for shut-off and to isolate equipment or part of system.

- E. Install globe or ball valves for throttling, bypass or manual flow control services. Install access panel in hard ceilings and or walls as indicated on plans.
- F. Provide spring loaded check valves on discharge of water pump.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfection of potable water system shall comply with ANSI/AWWA C651-92.
- B. When hot and cold water piping, including fixtures, have been installed, tested and accepted. Disinfect the system using any of the three methods of chlorination explained in AWWA C651-92 standard.
- C. The basic disinfection procedure shall consists of:
 - 1. Preventing contaminating materials from entering the water piping system during storage, construction or repair.
 - 2. Removing, by flushing or other means, those materials that may have entered the water piping system.
 - 3. Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the piping system.
 - 4. Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
 - 5. Determining the bacteriological quality by laboratory test after disinfection. At least one water sample from the existing distribution system shall be tested.
 - 6. Final connection of the water piping system to the active distribution system.
- D. Submit Record of Compliance: The record of compliance shall be the bacteriological test results certifying the water sampled from the water piping system to be free of coliform bacteria contamination, and to be equal to or better than the bacteriologic water quality in the distribution system.
- E. Submit Record of Compliance: The record of compliance shall be the bacteriological test results certifying the water sampled from the new water piping to be free of coliform bacteria contamination.

3.5 TESTS

- A. Test entire piping systems, including valves and fittings in accordance with governing codes and ordinances, conduct testing in the presence of Owner's Representative and the local Inspector until satisfactory to both.
- B. Sanitary Soil, Waste, Storm Drain and Vent Piping: The system shall be tested with ten-foot head of water. The water shall be kept in the system for at least fifteen minutes before inspection starts. The system shall then be tight at all points.
- C. Domestic and Industrial Hot and Cold Water Piping Systems: The system shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used. The piping shall withstand the test without leaking for a period of not less than fifteen minutes.
- D. Gas System: The system shall be tested with air, CO2 or nitrogen. The piping shall stand a pressure of not less than ten pounds per square inch gauge pressure, test

pressure shall be held for not less than fifteen minutes, with not perceptible drop in pressure. For welded piping and for piping carrying gas at pressures in excess of fourteen inches of water column pressure, the test pressure shall be not less than 60 pounds per square inches and shall be continued for not less than thirty minutes.

3.6 CLEANING PIPING SYSTEMS

- A. After piping systems have been tested and proved tight, clean piping systems of dirt, scale, oil, grease, waste and other foreign substances that may have accumulated during the process of installation.

3.7 SERVICE CONNECTIONS

- A. Provide new sanitary sewer service. Before commencing work check invert elevations required for sewer connection, confirm inverts and ensure that these can be properly connected with slope for drainage.
- B. Provide new water service complete with sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to wall. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 2 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.
- C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 5 psi. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

END OF SECTION

SECTION 15440
PLUMBING FIXTURES

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.

1.2 REFERENCES

- A. ANSI A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
- D. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
- E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures.
- F. ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.

1.3 QUALITY ASSURANCE

- A. Fixtures: By same manufacturer for each product specified throughout.
- B. Trim: By same manufacturer for each product specified throughout.

1.4 SUBMITTALS

- A. Submit product data.
- B. Include fixtures, sizes, utility sizes, trim and finishes.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit 3 copies of operation and maintenance data.

1.6 WARRANTY

- A. Provide 1 year manufacturer's warranty.
- B. Warranty: Include coverage of electric water cooler compressor.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIXTURES

- A. American Standard
- B. Kohler
- C. Eljer

2.2 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

- A. Chicago Faucet
- B. Symmons
- C. T & S Brass

2.4 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

- A. Olsonite
- B. Beneke
- C. Church

2.5 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

- A. J.R. Smith
- B. Zurn
- C. Josam

2.6 ACCEPTABLE MANUFACTURERS - MIXING VALVES (PRESSURE BALANCED)

- A. Symmons
- B. Leonard
- C. Powers

2.7 WATER CLOSET

- A. Bowl: ANSI A112.19.2; floor mount, vitreous china closet bowl with elongated rim and 1-1/2" spud, .1.0 gallon per flush.
- B. Flush Valve: ANSI A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop, vacuum breaker;
- C. Seat: Solid white plastic open front with self-sustaining hinge, brass bolts;

2.8 URINAL (WATERLESS)

- A. Urinal: Vitreous china, wall hung, waterless;

- B. Carrier: Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs

2.9 LAVATORY

- A. Basin: ANSI A112.19.2; vitreous china wall-hung lavatory 20 x 18 inch minimum, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow and soap depression;
- B. Trim: ANSI A112.18.1; chrome plated combination supply fitting with No. 7723.018 open grid strainer, water economy aerator, chrome plated 17 gage L.A. pattern cast brass P-trap and arm with secured escutcheon and rigid supplies;
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs;

2.10 SERVICE SINK

- A. Bowl: 22 x 18 inch white enameled cast iron, floor mounted, with trap standard with strainer and rim guard;
- B. Trim: ANSI A112.18.1; chrome plated fitting with vacuum breaker, pail hook and hose thread outlet;
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, exposed arm supports.

PART 3: EXECUTION

3.1 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.2 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning. Provide and install pre-molded beige color insulation kit by "Truebo" at all handicap accessible lavatories.
- B. Provide chrome plated rigid supplies to fixtures with loose key stops reducers and secured escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Caulk fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture. Remove and wipe clean excess sealant.

3.3 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.
- B. At completion, clean plumbing fixtures and equipment.
- C. Adjust handicapped lavatory faucet flow for 10 second minimum duration.

END OF SECTION

SECTION 15732
ROOFTOP AIR CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following rooftop air conditioners:
1. Cooling and heating units 5 to 20 tons.

1.2 SUBMITTALS

- A. **Product Data:** Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. **Shop Drawings:** Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:
1. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
 2. **Wiring Diagrams:** Power, signal, and control wiring.
- C. **Manufacturer Seismic Qualification Certification:** Submit certification that rooftop air conditioners, accessories, and components will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:
1. **Basis for Certification:** Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. **Dimensioned Outline Drawings of Equipment Unit:** Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. **Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.**
- D. Field quality-control test reports.
- E. **Operation and Maintenance Data:** For rooftop air conditioners to include in emergency, operation, and maintenance manuals.
- F. **Warranties:** Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- D. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- E. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- F. Comply with NFPA 54 for gas-fired furnace section.
- G. ARI Certification: Units shall be ARI certified and listed.
- H. ARI Compliance for Units with Capacities Less Than 135,000 Btuh: Rate rooftop air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."
 - 1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."
- I. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
 - 1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.4 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."
- B. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.
 - 1. Coordinate installation of restrained vibration isolation roof-curb rails.

1.5 WARRANTY

- A. Warranty: Standard form in which contractor agrees to replace components of rooftop air conditioners that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years.
5. Warranty Period for Electronic Thermostats: Manufacturer's standard, but not less than three years.

1.6 EXTRA MATERIALS

1.7 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

1.8 ROOFTOP AIR CONDITIONERS

- A. Manufacturers:
1. Carrier Corp.
 2. Lennox Industries Inc.
 3. Trane Company
 4. YORK International Corporation.
 5. Or equal.
- B. Description: Factory assembled and tested; designed for exterior installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, filters, and dampers.
- C. Casing: Galvanized-steel construction with enamel paint finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2-inch- thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.
- D. Indoor Fan: Forward curved, centrifugal, belt driven with fixed motor sheaves, grease-lubricated ball bearings, and motor.
- E. Outside Coil Fan: Propeller type, directly driven by permanently lubricated motor.
- F. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor. Provide phenolic epoxy corrosion-protection coating to both coils.

- G. Compressor(s): One hermetic scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief.
- H. Refrigeration System:
1. Compressor(s).
 2. Outside coil and fan.
 3. Indoor coil and fan.
 4. Four-way reversing valve and suction line accumulator.
 5. Check valves.
 6. Expansion valves with replaceable thermostatic elements.
 7. Refrigerant dryers.
 8. High-pressure switches.
 9. Low-pressure switches.
 10. Thermostats for coil freeze-up protection during low-ambient temperature operation or loss of air.
 11. Independent refrigerant circuits.
 12. Brass service valves installed in discharge and liquid lines.
 13. Charge of refrigerant.
- I. Filters: 2-inch- thick, fiberglass, throwaway filters in filter rack.
- J. Heat Exchanger: Aluminized-steel construction for natural gas-fired burners with the following controls:
1. Redundant dual gas valve with manual shutoff.
 2. Direct-spark pilot ignition.
 3. Electronic flame sensor.
 4. Induced-draft blower.
 5. Flame rollout switch.
- K. Outside-Air Damper: Linked damper blades, for 0 to 25 percent outside air, with fully modulating, spring-return damper motor and hood.
- L. Economizer: Return- and outside-air dampers with neoprene seals, outside-air filter, and hood.
1. Damper Motor: Fully modulating spring return with adjustable minimum position.
 2. Control: Electronic-control system uses **outside-air temperature** to adjust mixing dampers.
 3. Relief Damper: Gravity actuated with bird screen and hood.
- M. Power Connection: Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in circuit breaker.
- N. Unit Controls: Solid-state control board and components contain at least the following features:
1. Indoor fan on/off delay.
 2. Default control to ensure proper operation after power interruption.
 3. Service relay output.
 4. Unit diagnostics and diagnostic code storage.

5. Field-adjustable control parameters.
- O. Thermostat: Programmable, electronic; with heating setback and cooling setup with seven-day programming; and the following:
1. Touch sensitive keyboard.
 2. Automatic switching.
 3. Deg F readout.
 4. LED indicators.
 5. Hour/day programming.
 6. Manual override capability.
 7. Time and operational mode readout.
 8. Status indicator.
 9. Battery backup.
 10. Subbase with manual system switch (on-heat-auto-cool) and fan switch (auto-on).
 11. Fan-proving switch to lock out unit if fan fails.
 12. Dirty-filter switch.
- P. Optional Accessories:
1. Service Outlets: Two, 115-V, ground-fault, circuit-interrupter type.
 2. Copper condensate drain trap.
 3. Dirty-filter switch.
 4. Coil guards of painted, galvanized-steel wire.
 5. Flush diffuser with aluminum grilles, insulated diffuser box with flanges, and interior transition.
 6. Vertical vent extension.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances.
- B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

2.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
 1. Gas Piping: Comply with applicable requirements in Division 15 Section "Fuel Gas Piping." Connect gas piping to burner, full size of gas train inlet, and

- connect with union and shutoff valve with sufficient clearance for burner removal and service.
2. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of ducts
- C. Electrical System Connections: Comply with applicable requirements in Division 16 Sections for power wiring, switches, and motor controls.
 - D. Ground equipment according to Division 16 Section "Grounding and Bonding."
 - E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

2.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field quality-control tests and inspections and prepare test reports:
 1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.

2.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 1. Inspect for visible damage to unit casing.
 2. Inspect for visible damage to furnace combustion chamber.
 3. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
 4. Inspect internal insulation.
 5. Verify that labels are clearly visible.
 6. Verify that clearances have been provided for servicing.
 7. Verify that controls are connected and operable.
 8. Verify that filters are installed.
 9. Clean outside coil and inspect for construction debris.
 10. Clean furnace flue and inspect for construction debris.
 11. Connect and purge gas line.

12. Adjust vibration isolators.
13. Inspect operation of barometric dampers.
14. Lubricate bearings on fan.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system in summer only.
 - b. Complete startup sheets and attach copy with Contractor's startup report.
18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
 - a. Measure combustion-air temperature at inlet to combustion chamber.
 - b. Measure flue-gas temperature at furnace discharge.
 - c. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - d. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
20. Calibrate thermostats.
21. Adjust and inspect high-temperature limits.
22. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
23. Start refrigeration system and measure and record the following:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outside-air, dry-bulb temperature.
 - d. Outside-air-coil, discharge-air, dry-bulb temperature.
24. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
25. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outside-air intake volume.
26. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through outside coil or from outside coil to outside-air intake.
27. Verify operation of remote panel, including pilot-light operation and failure modes. Inspect the following:
 - a. High-limit heat exchanger.
 - b. Warm-up for morning cycle.

- c. Freezestat operation.
 - d. Economizer to limited outside-air changeover.
 - e. Alarms.
28. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

2.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

2.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train maintenance personnel to adjust, operate, and maintain rooftop air conditioners. Refer to Division 1 Section Project Closeout.

END OF SECTION

SECTION 15890

DUCTWORK

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Fibrous glass ductwork.
- C. Duct cleaning.

1.2 DEFINITIONS

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Pressure-Velocity Classification: Duct construction pressure classification shall comply with SMACNA HVAC Duct Construction Standards.

1.3 REGULATORY REQUIREMENTS

- A. Duct system shall be constructed, installed, sealed and insulated as provided in Chapter 10 of the California Mechanical Code.
- B. Construct ductwork to NFPA 90A and NFPA 90B standards.

1.4 SUBMITTALS

- A. Submit under provisions of General Section.
- B. Indicate duct fittings, particulars such as gages, sizes and configuration prior to start of work for air distribution and exhaust systems.
- C. Submit manufacturer's installation instructions for glass fiber connectors at air terminals.
- D. Submit manufacturer's certificate that installation of glass fiber ducts meets or exceeds recommended fabrication and installation requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site.
- B. Store and protect products.

PART 2: PRODUCTS

2.1 APPROVED MANUFACTURERS - FOR FLEXIBLE DUCTS

- A. Casco flexible duct.
- B. Thermaflex flexible duct.

2.2 MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. Flexible Ducts: Interlocking spiral of galvanized steel; rated to 2 inches WG positive and 1.5 inches WG negative. Flexible ducts shall consist of an exterior reinforced laminated vapor barrier, 1-1/2" thick fiber glass insulation (K = .25 @ 75 degrees F), encapsulated spring steel wire Helix and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.

Flexible ducts shall be supported at or near mid-length with 2" wide 26 ga. steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets. The maximum length will be seven feet and can be used at the terminal ends only, except that flexible ducts properly installed may be used to cross seismic joints without offsets. Flexible ducts shall not be used for duties other than described above.

- F. Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F.
- G. Fasteners: Rivets, bolts or sheet metal screws.
- H. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape or heavy mastic.
- I. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end or continuously threaded.
- J. Exposed round ductwork shall be spiral lockseam with paintable surface. Unlined round duct shall be Uni-Seal by United McGill or equal. Lined round duct shall be Acousti-Line by United McGill or equal with 1" liner.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- D. Connect diffusers or troffer boots to ducts with 7 feet maximum length of flexible duct. Hold in place with strap or clamp.
- E. Neck connection of diffuser or register shall not be made directly into main trunks. Where direct duct neck connections are required due to space limitations, main duct shall be lined 5 feet each side of neck connection.

- F. Boxes for square or rectangular ceiling diffusers, having a round, square or rectangular side inlet, must be equipped with 2" turning vanes. Boxes for square or rectangular ceiling diffusers shall not have a round connection to the top. Boxes for round ceiling diffusers shall not have an elbow discharging into the top of the box. For such applications, use a tee fitting with a cap on the run to form an extended plenum with the branch connected to the diffuser. Refer to details on drawings

3.2 ADJUSTING AND CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters or bypass during cleaning.
- B. Clean duct systems and existing reheat coils with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters or bypass during cleaning.

END OF SECTION

SECTION 15910
DUCTWORK ACCESSORIES

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Volume control dampers.
- B. Combination fire and smoke dampers.
- C. Backdraft dampers.
- D. Air turning devices.
- E. Flexible duct connections.
- F. Duct access doors.
- G. Duct test holes.

1.2 SUBMITTALS

- A. Provide shop drawings for shop fabricated assemblies indicated, including volume control dampers, duct access doors and duct test holes. Provide product data for hardware used.
- B. Submit manufacturer's installation instructions for fire dampers and combination fire and smoke dampers.

PART 2: PRODUCTS

2.1 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards for pressure classification, in which it will be installed.
- B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction and two gages heavier for sizes over 24 inches.
- C. Fabricate splitter dampers of [single] [double] thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- D. Fabricate single blade dampers for duct sizes to [9-1/2 x 30 inch [12 x 48 inch].
- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

- F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. "Jiffy" type damper regulators having handle attached to a threaded damper shaft are not acceptable. Where rod lengths exceed 30 inches provide regulator at both ends.
- H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases or adapters.

2.2 APPROVED MANUFACTURERS - COMBINATION FIRE AND SMOKE DAMPERS

- A. California Aire.
- B. Ruskin.
- C. Pottorff.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and as indicated.
- B. Provide factory sleeve for each damper. Install damper operator on exterior of sleeve and link to damper operating shaft.
- C. Fabricate with multiple blades with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade tops, lock and 1/2 inch actuator shaft.
- D. Operators shall be spring return pneumatic type suitable for operation on 0-20 psig instrument air or electric type suitable to operate on 120 V AC, 60 cycle. Operators shall be UL listed and labelled. Provide end switches to indicate damper position.

2.4 APPROVED MANUFACTURERS - BACKDRAFT DAMPERS

- A. California Aire.
- B. Ruskin.
- C. Pottorff.

2.5 BACKDRAFT DAMPERS

- A. Gravity backdraft dampers, size 18x18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.
- B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gage galvanized steel or extruded aluminum, with center pivoted blades of

maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.6 APPROVED MANUFACTURERS - AIR TURNING DEVICES

- A. Dura Dyne
- B. Elgin
- C. Titus (Extractors Only)

2.7 AIR TURNING DEVICES (TURNING VANES & EXTRACTORS)

- A. Multi-blade device (Extractors) with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps for use where supply registers are connected to rectangular ducts with a short collar.
- B. Turning vanes shall be a multi-blade device with double wall blades attached to a rail. Refer to SMACNA duct manual for acceptable construction methods.

2.8 APPROVED MANUFACTURERS - FLEXIBLE DUCT CONNECTIONS

- A. Duro-Dyne.
- B. Or Equal

2.9 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per sq yd, approximately 3 inches wide, crimped into metal edging strip.
- C. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.
- D. Flexible duct connections are not required for air handling equipment where fans are internally isolated.

2.12 APPROVED MANUFACTURERS - DUCT ACCESS DOORS

- A. California Aire.
- B. Ruskin.
- C. Pottorff.

2.13 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards suitable for pressure classification in which it will be installed.
- B. Review locations prior to fabrication.
- C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
- D. Access doors smaller than 12 inches square may be secured with sash locks.
- E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.
- F. Access doors with sheet metal screw fasteners are not approved.

2.14 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.15 CABLE CONTROL SYSTEMS AND VOLUME DAMPERS

- A. Manual volume dampers, round or rectangular, with cable control or manual quadrant.
- B. General: All volume dampers above inaccessible ceilings shall be provided with Bowden remote cable controls as manufactured by Young Regulator Company, no known equal. Dampers mounted in diffuser inlets or requiring ceiling access panels for adjustment are not acceptable.
- C. Construction:
 - 1. Round dampers shall be butterfly design with heavy-duty spiral shell, 20 ga. "V" style blade, 1/2" round steel shaft and oil impregnated bronze bearings requiring no lubrication. Round dampers shall be Young Regulator Model 5020 or equal.
 - 2. Rectangular dampers shall be opposed blade design. Dampers up to 12" in height shall be constructed of .050 extruded aluminum double channel frame with stainless steel hardware including the damper slide. Blades shall be .050 extruded aluminum with longitudinal reinforcing beads. Blades shall be installed in individual Teflon blade bushings in the damper frame. Dampers shall be used in branch ducts with velocities under 750 fpm and maximum pressures of 2" w.g. Rectangular dampers shall be Young Regulator Model 820/830 or equal.

3. For volume dampers above 12" in height, refer to control damper specification.
 4. Cable control manufacturer shall supply all necessary hardware for simple installation of remote cable control system including the Bowden aluminum angle bracket and the Bowden control hub to accommodate the cable control system mounted on the damper.
- D. Cable Control System: Cable control system shall consist of Bowden cable .054" stainless steel control wire encapsulated in 1/16" flexible galvanized spiral wire sheath to insure positive operation. Control kit shall be designed for use with internally or externally controlled round or rectangular dampers and shall consist of 14 ga. Steel rack and pinion gear drive to convert rotary motion to push-pull motion. Control shaft shall be D-style flattened 1/2" diameter with 265 degree rotation providing graduations for positive locking control and 1-1/2" linear travel. Cable shall terminate in a 1" or 3" inconspicuous access port, as indicated on plans. Twisting or rotating cable controls are not acceptable.
- E. Manual Quadrant: Manual quadrant shall be commercial quality, locking type for 3/8" square or 1/2" round shaft and shall be available on an extended base for externally insulated ductwork. "Jiffy" type regulators with wing nut is not acceptable on this project.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions.
- B. Provide balancing dampers at points on (<3" pressure classification) supply, return and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
- C. Provide combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- E. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- F. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.[Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.]
- G. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

- H. Provide duct test holes where indicated and required for testing and balancing purposes.
- I. Provide double wall turning vanes in all rectangular or square 90 degree elbows having a square heel.

END OF SECTION

- C. Fabricate 1-1/4 margin frame with countersunk screw mounting and gasket.
- D. Fabricate of steel or aluminum with 20 gage minimum frames and 22 gage minimum blades or aluminum extrusions with factory baked enamel finish.
- E. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.7 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Streamlined fixed 45° angled deflecting vanes, depth of which exceeds 0.6 inch spacing horizontal face; "MetalAire Model RHD or Model S35HOD" manufactured by Anemostat.
- B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.
- C. Fabricate of steel or aluminum with 20 gage minimum frames and 22 gage minimum blades with factory baked enamel finish.
- D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Install items in accordance with manufacturers' instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of refrigerating systems.
- C. Commissioning activities.

1.2 RELATED REQUIREMENTS

- A. General Conditions, Article 1, subsection 1.4 – Standard References
- B. General Conditions, Article 12 – Inspection and Testing

1.3 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.4 SUBMITTALS

- A. General Conditions, Article 5 – Shop Drawings and Submittals
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 1. Submit to GKK Works.
 2. Submit to the Commissioning Authority.
 3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with GKK Works and other installers to sufficiently understand the design intent for each system.
 5. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.

- f. Expected problems and solutions, etc.
 - g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
 - h. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - j. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - l. Time schedule for deferred or seasonal TAB work, if specified.
 - m. False loading of systems to complete TAB work, if specified.
 - n. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - o. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - p. Procedures for formal progress reports, including scope and frequency.
 - q. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least twice a week to Commissioning Authority.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
 - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for GKK Works and for inclusion in operating and maintenance manuals.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project GKK Works.

- g. Project Engineer.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 - 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Proper strainer baskets are clean and in place.

- 13. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

- A. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Measure static air pressure conditions on air supply units, including filter and coil

- pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
 - H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
 - I. Where modulating dampers are provided, take measurements and balance at extreme conditions.

3.7 COMMISSIONING

- A. Perform prerequisites prior to starting commissioning activities.
- B. Fill out Prefunctional Checklists for:
 - 1. Air side systems.
 - 2. Water side systems.
- C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- D. Re-check a random sample equivalent to 25 percent of the final TAB report data as directed by Commissioning Authority.
 - 1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
 - 2. Use the same test instruments as used in the original TAB work.
 - 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
 - 4. For purposes of re-check, failure is defined as follows:
 - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
 - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
 - c. Temperatures: Deviation of more than one degree F.
 - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
 - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
 - 5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- E. In the presence of the Commissioning Authority, verify that:
 - 1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
 - 2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal

- unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

END OF SECTION

DIVISION 16

ELECTRICAL

16000 BASIC ELECTRICAL REQUIREMENTS

16010 BASIC ELECTRICAL REQUIREMENTS

16100 WIRING METHODS

16110 RACEWAYS AND BOXES
16123 BUILDING WIRE AND CABLE
16170 GROUNDING AND BONDING
16190 SUPPORTING DEVICES

16400 LOW-VOLTAGE DISTRIBUTION

16470 PANELBOARDS

16500 LIGHTING

16510 INTERIOR LUMINAIRES

16700 COMMUNICATIONS

16720 NURSE CALL

END OF TABLE OF CONTENTS

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1: GENERAL

1.1 SCOPE

- A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The Work required under this division, is not limited to the Electrical Drawings. Refer to Site, Architectural, Structural, and Mechanical Drawings that may designate Work to be accomplished. The intent of the Specifications is to provide a complete electrical system that includes all documents that are a part of the Contract.
1. Work Included: Furnish all labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on the Drawings, and its delivery to the Owner complete in all respects ready for use.
- B. Contract Drawings: The Contract Drawings are shown in part diagrammatic, intended to convey the Scope of Work indicating the intended general arrangement of equipment, conduit and outlets. Follow the contract drawings in laying out the work and verify spaces for the installation of the materials and equipment based on actual dimensions of equipment furnished. Where conflicts occur, the most stringent application shall apply wherever a question exists as to the exact intended location of outlets or equipment, obtain instructions from the Architect before proceeding with the Work.
- C. Equipment or Fixtures: Equipment and fixtures shall be connected to provide circuit continuity in accordance with the Specifications whether or not each piece of conductor, conduit, or protective device is shown between such items of equipment or fixtures, and the point of circuit origin.
- D. Work Installed but Furnished under Other Sections: The Electrical Work includes the installation or connection of certain materials and equipment furnished under other sections. Verify installation details.

1.2 GENERAL REQUIREMENTS

- A. Guarantee: Furnish a written guarantee for a period of one year from date of substantial completion.
- B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- C. Codes and Regulations:

1. Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:

Institute of Electrical and Electronic Engineers - IEEE
National Electrical Manufacturers' Association - NEMA
California Fire Code - CFC
California Building Code - CBC
Underwriters' Laboratories, Inc. - UL
National Fire Protection Association - NFPA
Federal Specifications - Fed. Spec.
American Society for Testing and Materials - ASTM
American National Standards Institute - ANSI
American Standard Association - ASA
California Electrical Code - CEC
National Electrical Safety Code - NESC
Insulated Power Cable Engineers Association - IPCEA
Public Utilities Commission - PUC
California Code of Regulations, Title 8, Subchapter 5
California Code of Regulations, Title 24
State & Municipal Codes in Force in the Specific Project Area
Occupational Safety and Health Administration -OSHA

The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.

D. Requirements of Regulatory Agencies:

1. Codes, Permits and Fees: Where the Electrical drawings and specifications exceed minimum requirements, the Electrical drawings and specifications take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved. **Where provisions in the electrical drawings and specifications differ in regard to code application, size, quality, quantity or type of equipment, Contractor shall include in the bid, costs for the most costly provision either denoted in the specifications or on the drawings. This provision shall apply as an amendment to the California Public Contracts Code.**
 - a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Work shall be obtained by the Contractor at his expense, unless otherwise specified.
 - b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.
2. Substitutions: The materials, products, and equipment described in the electrical plan drawings and specifications establish a standard of required function, dimension, appearance, and quality. Architect may consider requests for substitutions of specified equipment, materials, or products and then only when request are submitted in accordance with

