



2011 District Design Standards Manual

Volume II

SAN DIEGO COMMUNITY COLLEGE DISTRICT

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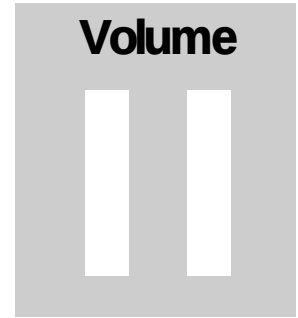
Note that significant revisions to the 07/07/10 Version of the District Design Standards Manual are shown in **BLUE** print.

Divisions 15-30

Sample Specification Sections

Note that sample specification sections depicting content from these District Standards have been incorporated by hyperlink to reinforce the 10/31/2011 Updated District Standards language and to help the A/E team to organize their design and materials and incorporate the District Standards and Guidelines. These are sample reference specifications and their use and reference in no way relieves the architects and engineers from preparing accurate technical specifications specific to the project for which they are contracted.

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RESERVED**



WET PIPE SPRINKLER SYSTEMS

- **REFER TO SAMPLE WET PIPE SPRINKLER SYSTEMS SECTION #211313** [\(Click Here\)](#)

GENERAL:

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device.
- B. At least one tampered shut-off valve shall be provided for each floor of a building.
- C. Standard-Pressure Piping System Component: List for 175-psig minimum working pressure at Mesa College; verify the listings for the other campuses for basis of design criteria.
- D. Comply with the provisions of applicable NFPA standards including:
 - 1. NFPA 13, Standard for the Installation of Sprinkler Systems
 - 2. NFPA 24, Standard for the Installation of Private Fire Service Mains and their Appurtenances.
 - 3. NFPA 72, National Fire Alarm and Signaling Code (CA Amended) 2007 Edition (see UL Standard 1971 for "Visual Devices."
- E. Reference Code sections for NFPA Standards – 2007 CBC (SFM) Chapter 35.

SEISMIC PERFORMANCE:

- A. Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13, ASCE/SEI 7 and latest State of California requirements.
- B. DSA has required Flex connectors or oversized escutcheon at all fire sprinkler heads. Provide the oversized escutcheons until otherwise directed by the District.
 - 1. ASCE Standard, Revision of ASCE 7-98 to 7-02 sets the requirement.
 - a) "9.6.2.6.2.1 Seismic Design Category C. Suspended ceilings in Seismic Design Category C shall be designed and installed in accordance with the CISCA

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recommendations for seismic Zones 0-2, (Ref. 9.6-16, except that seismic forces shall be determined in accordance with Sections 9.6.1.3 and 9.6.2.6.1.

- b) Sprinkler heads and other penetrations in Seismic Design Category C shall have a minimum of 1/4 in. (6 mm) clearance on all sides." San Diego is in Seismic Zone 1
- C. Mechanical-T and -cross pipe fittings: Permitted in retro-fit applications only (not applicable for new projects), but only upon prior specific written approval from Engineer
- D. Alarm-device types shall match piping and equipment connections.

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Oversized Escutcheon at fire sprinkler heads

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PLUMBING & PIPING SYSTEMS REQUIREMENTS

GENERAL REQUIREMENTS

- A. Underground pipe design standards shall be of 50+ year quality standards.
- B. Contractor and architect shall provide accurate as-built 3D BIM model per District BIM standards.
- C. Provide an access ladder in storm drain and sewer manholes that are greater than four feet deep per San Diego Regional Standards.

GENERAL DESIGN GUIDELINES

- A. **Unisex, single-occupancy restrooms shall be provided as follows, with no exceptions;**
 - a. **One per building for each 100,000 SF, this will be a public accessible restroom with the control of the keys to be determined by the specific Dean. A sign should be posted providing direction to the individual with the key.**
- B. Hose bibs every 100 feet in lockable flush boxes
- C. **For design of multi-stall restroom facilities, men should be consistently on the right and women on the left.**
- D. **Where drinking fountains are provided near multi-stall restrooms they should be recessed.**
- E. Architecture and plumbing design shall Coordinate that eyewash stations and emergency showers have floor drains
- F. Environmental Plumbing considerations
 - 1. Avoid polyvinyl chloride (PVC) pipe for water delivery and drain systems (due to potential impacts of PVC disposal at end of product life)
 - 2. Do not use solder containing lead.
 - 3. Use of greywater shall be encouraged (non-treated water from showers, lavatories, and clothes washers) for below grade landscape irrigation where applicable.

SANITARY AND STORM SEWER SYSTEMS

A. Goals and Objectives:

- 1. Provide safe, efficient and easily maintained systems. Coordinate Elevations of surfaces; level appurtenances with relationship to other site elements.

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2. Provide systems that are designed to be easily accessible for maintenance.
3. Design storm drainage systems for a 50 year rain. Storm drains that are otherwise compliant, serving collection deeper than 2", shall have a full size clean out adjacent to collector to serve its outlet drain.
4. Coordinate the design of storm and sanitary sewer systems with state and local governing authorities. Comply with San Diego city regulations for storm water leaving the site.
5. **All storm water shall be collected and piped off-site only if water cannot be filtered through landscape or other means.**
6. The District maintains service request forms and contact points for public utility systems.
7. Design systems that do not require pumping. Coordinate the depth of site utilities with building utilities.

B. Waste Piping - General

1. Acceptable sanitary sewer pipe materials:
 - a. Cast-iron; no hub (husky bands above/below grade couplings)
 - b. SDR 35 PVC sewer pipe
2. Acceptable storm drainage pipe materials:
 - a. Ductile iron; within building zone of influence.
 - b. HDPE with gasketed water-tight couplers
 - c. SDR 35PVC pipe
3. Note that only cast-iron is acceptable beneath buildings **under a concrete slab, however storm drain piping shall not be routed underneath buildings.**
4. Laboratory sinks and floor drains shall use **copper piping.**
5. Do not use asbestos cement piping.
6. Use mechanical pipe joints wherever possible
7. Where soil is acidic, encase metallic pipe in PE sheathing
8. Use consistent type of piping and fittings; review selection with District
9. Provide accessible clean outs, opening to practical clear space adequate for server equipment and personnel to service the cleanout.
10. In system design, consider future expansion, or the addition of re-locatable units.
11. Outdoor Lunch areas require a large catch basin with a separator to retain solids
12. Where drain lines are required in planter areas, locate lines to avoid proposed trees.
13. If roof drain lines are required to be connected to the storm drain system. Coordinate depth of footings where required so piping can be properly installed.
14. Exterior downspouts shall be scheduled 40 galvanized steel pipe. Equip downspouts with cast iron "T" cleanout with ABS plug just above grade.
15. Provide storm drain connection to drain electrical manholes.
16. Where retaining walls include perforated pipe foundation drainage connect to storm drain system.
17. Locate catch basins so that runoff from paved areas does not pond on hardscape.
18. Avoid locating catch basins or manholes in pedestrian traffic lanes.

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19. At drainage structure inlets in pedestrian traffic areas, spacing of grating bars shall comply with ADA requirements.
20. Building underground drainage/sewer piping shall be laid in a uniform bed of sand; provide pea gravel bedding material beneath piping laid to drain from 2 ft. outside of building.
21. Contractor to pressure jet storm drains and sewers at end of construction, prior to occupancy to insure they are free of any construction debris, then specify that Contractor is to video-tape sewers and storm drains to verify alignment, full and drainage. Video tape must show a wet run water test with inspector present.
22. Provide 24 inch wide concrete apron around catch basins located in decomposed granite surfacing.
23. Grates for catch basin inlets shall be galvanized steel, traffic rated and ADA compliant in all traffic areas.
24. In any building the water delivery water system and bathroom on each floor must be able to be isolated from the rest of the building without affecting the water supply system to the remainder of the building. Provide shut-off valve in accessible area for all restrooms.

C. Laboratory Piping Requirements

1. For PP Drainage Pipe and Fittings, provide ASTM F 1412, pipe extruded and drainage-pattern fittings molded, with Schedule 40 dimensions, from PP resin with fire-retardant additive complying with ASTM D 4101; with fusion-joint ends.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) IPEX Inc.
 - 2) Orion Fittings, Inc.; a
 - 3) George Fischer Sloane Inc.
2. Adapters and Transition Fittings shall be Corrosion-Resistant including assemblies with combination of clamps, couplings, adapters, and gaskets; compatible with piping and system liquid; made for joining different piping materials.

Domestic water system

A. Goals and Objectives:

1. The intent of this section is to define system features that will provide a safe and sanitary domestic water distribution system designed for a life of 50 years, with low maintenance and operating costs. Natural gas shall be the energy source of choice for all heating requirements. Electric heat shall only be used when the installation of natural gas is cost prohibitive.

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B. Domestic water lines

1. Neither galvanized steel nor soft copper water piping shall be used for domestic water systems except for under slab trap primers. All domestic water lines within buildings and above ground shall be type "L" copper. Cold water piping below grade shall be type "L" copper, with wrought copper brazed fittings. Pipes outside buildings in the ground will be. Copper up to 3 inch lines and C900 for larger lines with mechanical compression couplings, mechanical joints, or cement lined cast iron bell and spigot pipe with cement lined cast iron Class D fittings. Asbestos cement pipe shall not be installed.
2. Sterilization or disinfection of domestic water systems shall be by approved processes and testing.
3. Shut-off valves shall be installed for each building on an exterior wall and clearly labeled. Shut-off valves for the building may be inside the building provided they are in a service room, e.g., such as custodial, with access to an attic, etc. Where the valve must be in the ground, a concrete box shall be provided.
4. Branch mains serving fixtures in a battery shall be valved at pipe space; single fixtures and lines to hose bibs shall be valved. Concealed lines shall be provided with partition stops. No toilet room piping shall be exposed. Each restroom and cafeteria shall be provided with isolation valves. Use hot and cold full port ball valves only. Partition stops to be accessible through access panels.
5. Exterior water piping shall sheathed/encased with 6 inches of clean sand below and 12 inches above the piping. All valves operators are to be within 6 inches of grade. All portions of pipes within a minimum of 24 inches of covering over piping and fittings to finished grade. Install metallic tracer wires/tube over all below-grade piping. Trap primer valves should be accessible through access panels on vertical walls.

C. Inspection and Testing Water Piping:

1. All water piping shall be inspected in conformance with the applicable provisions of CCR Title 24 and the Uniform Plumbing Code and local regulations. All water piping shall be flushed out and hydrostatically tested at 150-psi pressure. No air testing shall be allowed.
2. Copper lines shall be isolated from all dissimilar metal and equipment with dielectric couplings. Dielectric couplings shall be used for all connections between pipe or tubing and all hot water equipment, both on inlets and outlets.
3. Meter size shall be determined by a consulting Engineer for each site by flow demand, available pressure, length of lines and future requirements. The water meter installation shall be provided in the construction contract. At least three water services shall be provided for each site, one for domestic, one for all landscape irrigation, and one for fire protection. In addition, schools with turf playfields designed to be maintained by the City of San Diego shall receive a separate meter and separate service, currently only Miramar College. The water service may consist of, either one or more meters manifolded in parallel with bypass and gauges. Use meters in parallel in cases where the meter

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installation and rate charges would cost less than the next larger single meter size. This is to be determined by the consulting Mechanical Engineer following a cost-of-service analysis.

D. Pressure Regulators for Domestic Water:

1. Pressure regulators shall be required when water pressure exceeds 80 psig. Pressure regulators shall be two or more regulator valves manifolded together. If very high flow volume is required, pilot-operated regulators may be required. It may be necessary to install multiple regulators. If the current requirements do not require installation of a regulator, space shall be provided for the future addition of a regulator where possible, all regulators should have unions on inlet and outlet piping adjacent to regulator.
2. Strainers shall be provided ahead of all regulators. Gate valves and flanged unions shall be installed on each side of the strainer regulator assembly over 2" to facilitate servicing. One set of 0 to 200 psi pressure gauges shall be installed upstream and downstream of the strainer regulator assembly.
3. Regulator assemblies may vary in makeup and layout depending on conditions (load, length of lines, and pressure drops, etc.) to suit each project as determined by the consulting Mechanical Engineer. All services shall be above ground in a fenced area.
 - a. Small services (up to 75 gpm and less than 2 inch pipe size) may be handled with just two regulators in parallel, one for high-flow and one for low-flow.
 - b. Medium size services (up to 100 gpm and 2 ½ inch pipe size) may have multiple regulator assemblies for high-flow conditions and one smaller assembly on a straight-through run for low-flow conditions from the regulator assembly to serve toilet facilities for portable buildings, if these areas can be anticipated and suitable toilet facilities are not provided for them in adjacent permanent building(s). Lines shall be properly valved at the service end with a ball valve in a service box, and shall be capped or stubbed off.
 - c. Large size services (over 100 gpm and pipe size above 2 1/2 inch) shall have multiple regulator assemblies similar to the medium service. The service gate valves on both the line from the meter(s) and the line to the building shall be installed above ground. Provide in the specifications that the contractor shall deliver to the District Inspector or Maintenance Department two wrenches of a length adequate to operate any gate valve installed.
4. Provide valved water branch lines of a minimum 2 inch size downstream the regulator assembly to serve toilet facilities for portable buildings, if these areas can be anticipated and suitable toilet facilities are not provided for them in adjacent permanent building(s). Lines shall be properly valved at the service end with a ball valve in a service box, and shall be capped or stubbed off downstream from the valve.

E. Water Valves:

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1. Temperature and pressure relief valves shall be piped to the full size of valve to point of discharge, with no other valve in the discharge line. Relief valves shall discharge into an approved receptor in a visible location. Brass compression unions should be used to join temporary pressure valve drains to the valves; they serve to help facilitate valve change.
2. Water hammer arresters shall be located, sized and certified according to manufacturers recommendations. Branch lines in toilet rooms feeding batteries of fixtures with quick closing valves shall be equipped with water hammer arresters. Air chambers are not acceptable. Access panels shall be provided for their removal and replacement.
3. Shut off valves shall be provided for each restroom.

F. Hose Bibs:

1. Hose bibs used in or on buildings shall be provided with partition stops or shall be fed with fixtures having stop valves. Hose bibs in finished areas shall be rough chrome plated; all others shall be rough brass. Hose bibs accessible to students shall be a vandal proof type.
2. Provide outside hose bibs every 100' around all buildings (exterior). Domestic water shall be used for wall mounted hose bibs at buildings for maintenance and cleaning purposes; greywater shall be used for quick coupler landscape hose bibs with signage indicated same.
3. Provide a chrome-plated, lock shield cold water hose bib in a chromed recessed box with cover in men and women restrooms.
4. Provide outside hose bibs at each rooftop mechanical area (enclosure).

G. Domestic Water Systems:

1. The generation and delivery of hot water shall comply with the regulations of the Uniform Plumbing Code and of CCR Title 24, Article 2, Division 7, Service Water Heating. As far as design is concerned, system components, distribution systems, hot water requirement estimates, and equipment sizing shall follow the recommendations of the ASHRAE Current Systems Handbook, Chapter 34, "Service Water Heating", unless higher or larger provisions are called for by National, State or Local codes or regulations.
2. Hot water requirements for individual portable classroom buildings or remote locations shall be provided with individual, minimum size of 6-gallon electric water heaters, with drain pan.
3. The hot water system shall have adequate capacity for full recovery. Multiple high efficiency type heaters with fast recovery shall be used.
4. Natural gas is the preferred energy source for water heating and shall be used whenever available. Heaters serving isolated or remote locations may use electricity as a heat source with 6-gallon storage tanks or the use of multiple smaller heaters installed in a manifold arrangement is desired over the use of one or two large boilers where approved by District, non-storage type instant P.O.S. heaters may be used.
5. Re-circulating lines and pump shall be installed on hot water systems whenever there is are remotely located fixture requiring hot water in excess of 60' of delivery piping

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between heat source and fixture. All circulation systems shall be Type L copper installed as much as possible in accessible areas, where possible fittings in circulation system shall be cast brass copper sweat type.

H. Direct Water Heaters:

1. Water Heaters—Gas: These heaters shall be AGA certified; power vented commercial type; high-thermal efficiency, glass lined. 125 psig working pressure; magnesium anode; insulation (per CCR Title 24 Article 2); 100 percent safety shut-off; combination temperature and relief valve. Ball valve and check valve shall be provided on cold water piping and outlet piping at heater and shock absorber and thermometer on hot water piping from heater; ASTM T & P valve. PVC flue through roof shall be provided, as well as approved weather cap.
2. Water Heaters-Electric: These heaters shall; be commercial type, magnesium anode, with immersion type thermostats and heating elements Heaters shall be UL 174 rated, and labeled. Ball valve and check valves shall be provided on cold water piping to heater, and shock absorbers and ball valve and adjustable thermometers on hot water piping from the heater and ASME T&P relief valve. Adequate service space to be provided in front of heater service panel.
3. Electric Booster Heaters-Dishwasher: These heaters shall be stainless steel, rod-type element, aquastat, combination pressure and temperature relief to the outside. They shall be ASME and UL approved.

I. Hot Water Storage Tanks:

1. Tanks shall bear AS ME label for 150 psig service. All storage tanks shall be equipped with magnesium anodes. All larger storage tanks shall either be unlined steel (but be equipped with magnesium anodes), or shall be lined with SOC-CO-CO, Kessite No.1, or Heresite of 6 millimeter thickness applied in three coats minimum, with baking between each coat.
2. Copper lines shall be isolated from hot water tanks and other equipment with dielectric couplings or unions.
3. All hot water storage and water heater tanks shall be equipped with a shut off valve and check valve installed in the cold water and hot outlet supply to the storage tank. A thermometer shall also be installed at the hot water outlet.
4. Where approved by the District, properly sized commercial on demand type tankless water heaters may be used.

J. Insulation of Hot Water Storage Tanks and Piping:

1. Unfired service water storage tanks as well as service hot water supply and recirculation piping (except for run outs for fixtures not longer than 10ft. in length) shall be insulated in compliance with the provisions of CCR Title 24, Article 2, Division 7.

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K. Domestic Water Pumps:

1. Circulating Pumps (in –line): Circulating pumps shall have a 175 psig working pressure. These pumps shall have a bronze body, flanges and impeller, carbon and stainless steel shaft, and drip-proof premium efficiency motor. These pumps should be of the maintenance free self-lubricated type. Installation shall include separate service ball valve shut offs immediately upstream and downstream of the pump. Additionally, a bleed hose bib shall be installed between the pump and the downstream service shut off.
2. Circulating Pumps (floor mounted): These pumps shall be direct connected, close coupled, centrifugal, and rated at 1750 RPM. Pumps shall be equipped with enclosed type bronze impellers, a mechanical seal, a drip-proof premium efficiency motor, and reinforced metal flexible connections on suction and discharge.

SANITARY WASTE SYSTEM

- [REFER TO SAMPLE SANITARY WASTE AND VENT PIPING SECTION #221316](#) - (Click Here)
- [REFER TO SAMPLE SANITARY WASTE PIPING SPECIALTIES SECTION #221319](#) - (Click Here)

A. Goals and Objectives:

The intent of this section is to define system features that will provide a safe and sanitary system for disposal of liquid waste and sewage.

B. Soil Waste and Vent Lines:

1. Chemical Waste and Vent Lines-Use polypropylene fittings, vents, and waste lines on all chemistry sinks. Dilution or neutralization tanks will not normally be required.
2. Sewer Lines-Copper sewer lines in the ground shall be kept 4 feet away from other metal pipes or conduits when running parallel to same, and are to be separated by one foot when intersecting other metal pipe lines or conduits. At point of intersection wrap lines for 1 foot each way with an approved 10 millimeter plastic tape with a 50 percent overlap. Sewer lines serving toilets shall not be less than 4 inch diameter.
3. Vents – Plumbing vents may be:
 - a. Cast iron pipe, service weight, no hub, with neoprene gasketed fittings
 - b. Copper drainage tube, type DWV, with wrought or cast brass solder fittings.
 - c. Roof vent termination points shall appropriate protection against roofing material or debris entering vent system.
4. Closet bends shall be 4" x 4". No 4"x3" closet bends shall be used in District restrooms.

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C. Sewer material-Within Buildings:

1. In ground: Service weight cast iron no-hub pipe with no-hub cast iron couplings or type DWV copper with wrought or cast brass DWV solder fittings.
2. Above ground: Service weight cast iron no-hub pipe with no-hub cast iron couplings or type DWV copper tubing with DWV wrought or cast brass solder fittings.
3. Food prep and service sink grease traps should be located in unobstructed, accessible areas for necessary maintenance.

D. Cleanouts:

1. Provide cleanouts as required by code, where not covered by District standards. The only exception is that cleanout sizes shall be the same as pipe sizes, with the maximum cleanout size being 6 inches. Cleanouts shall be brought to finish grade/surface on a full "Y" angles. Cleanouts in floors or exterior walkways shall have nickel-brass frames and cover plates with mechanical fasteners and set flush with finish floor.
2. Cleanouts at exterior locations, except in walkways, shall terminate in a number three meter box with a cast iron cover marked "sewer", and set flush with finish grade. Cleanouts shall be threaded pipe using a screw plug. Compressor type cleanouts with a rubber seal shall not be acceptable. A minimum 4-inch thick concrete base shall be poured into the base of the box to secure the riser to prevent it from turning. Cleanout boxes shall be installed in line with drainage systems. Lid color shall be as follows: Blue indicating Water, Yellow indicating Gas and Green indicating Sewer. Building and Exterior cleanouts should be of the 2-way type.
3. Provide access door or locking cover plates for cleanouts in walls. Use floor cleanouts in preference to wall type where practical. Terminate wall cleanouts above horizontal waste lines e.g., urinals, lavatories, water closets.
4. Cleanouts shall be provided every 75 feet of developed lengths and extended to the surface to be readily accessible. Two-way cleanout at exterior edge of building.
5. Cleanout plugs must be lubricated and installed in such a manner to allow for easy removal.
6. Where manholes are installed they shall be installed every 200 ft. of developed length, in lieu of cleanouts.
7. Provide cleanouts, at end of all horizontal runs, at all changes of direction exceeding 135 degrees, and at all floor levels. Cleanouts shall be fronted with clear, accessible service space.
8. Floor cleanouts will be installed where there is no conflict with the structural features of the building. Wall cleanouts will be used in lieu of floor cleanouts where structural conflicts exist.
9. Where required end-of-the-line cleanouts would normally be set in a building interior space, the cleanout shall be extended to a serviceable exterior space and be terminated in

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an approved manner. in carpeted areas they shall be extended to the exterior of the building, and be terminated in an approved manner.

10. Stub-outs for future buildings, including a sewer line to serve toilet facilities for portable buildings where these areas can be anticipated, shall be terminated in a full "Y" cleanout brought to within 6 inches of grade, and located in a number 3 concrete meter box with a cast iron cover set flush with finish grade. Cleanout boxes shall be installed in line with the piping run.
11. All sewer lines, 6-inch diameter and smaller, shall pass inspection under ten foot head of water, with no leakage.
12. Accessible cleanouts to be provided in each bathroom, custodial, laundry and kitchen area to serve fixtures within their respective rooms. Cleanouts should be extended to an accessible point next to the fixture it serves and not obstructed by that fixture.
13. Cleanouts shall not be concealed in a wall.

STORM DRAINAGE SYSTEM

- **[REFER TO SAMPLE STORM DRAINAGE PIPING SECTION #221413](#)** - **[\(Click Here\)](#)**

A. Goals And Objectives:

The intent of this section is to define system features that will provide a rainwater drainage system to dispose of rain from a 4inch minimum rainfall without pooling or allowing erosion.

B. Downspout and Storm Drain System:

1. All downspout and storm drain piping underneath buildings, and to a point 5 ft. 0 inch outside and 6 inches above concrete slabs, shall be ASTM A 74 service weight hub-and-spigot cast iron pipe with cast iron fittings using elastomeric gaskets. ([Husky HD 4 band](#)).
2. All downspout piping to 6 inches above grade shall be ASTM A120 Schedule 40 galvanized steel pipe and fittings. Anchoring for securing the piping shall be as determined by the consulting Mechanical Engineer.
3. Non-pressure type cement pipe, or Schedule 40 PVC pipe may be used, from 5 ft. outside of building, if so selected by the consulting Mechanical Engineer, for sizes up to 8 ft. in diameter, using approved and correct fittings per pertinent ASTM specifications.
4. For exposed rain leaders, use unpainted Schedule 40 galvanized iron pipe with threaded or mechanical couplings. In general, rain leaders should be concealed in walls or pipe chases to minimize maintenance and improve appearance. Galvanized steel, cast iron, or copper may be used for concealed rain leaders. When making a transition from copper or plastic to cast iron, use a mechanical dielectric coupling. Domes on roof drains shall be attached to the drain body in a vandal-proof manner. Plastic domes shall not be used. No P-traps shall be permitted in storm drain lines. All piping is to be run as straight as possible without unnecessary bends.
5. Provide clean outs in all rain water systems. Use sanitary fittings whenever possible. Cleanouts shall be a 4" galvanized tee with a newer seal or ASS plug.

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6. Provide a clean sand backfill around all underground piping, 6 inches below pipe and 12 inches above pipe.
7. Roof over flow drains shall be daylighted from the roof through a scupper or brought to and through the wall at the lowest level through a drain outlet that would be visible to the Facility Services Staff. While recent code changes may now allow over flow drains to be connected to the storm sewer system piping within the building, this will only be allowed if the flow of water from the roof over flow drain can be visibly seen and/or monitored by water flow sensors.
8. Drains: Minimum slope for any drain in the District is ¼ inch per foot fall.

PLUMBING FIXTURES

- **REFER TO SAMPLE PLUMBING FIXTURES SECTION #224000 - [\(Click Here\)](#)**

A. Goals and Objectives:

1. Provide safe and sanitary plumbing systems with low operating and maintenance costs.
2. System design shall consider ease of fixture accessibility.
3. Select low-flow, water-efficient plumbing fixtures

B. Design Criteria:

1. Location of plumbing equipment must not conflict with the clearance required in front of electrical panels or other equipment.
2. All location and mounting heights shall be as directed by the construction documents, SDCCD Planning Guides, and/or as specified herein.
3. Where feasible and where back to back fixture carriers are specified, provide a 24" wide, walk-in pipe and plumbing chase access should be provided for multiple fixture restrooms accessible through men's room only.
4. Stop valves shall be provided at all fixtures to enable shut down of supply to fixture. Shut-off valves shall be provided for groups of areas of plumbing fixtures to prevent having to shut off entire building(s) for repair or maintenance. Use full port valves only. Do not use compression fittings, use IPS type stops only. Ball valves are preferred to gate valves. Contractor to provide District inspector, at job completion with a register of water shutoffs at job site including areas or fixtures served by each valve. Valve tags to be contractor provided that correspond to valve identification numbers on register so as to guide maintenance personnel to shut off location.
5. Water lines serving each faucet with provisions for a hose attachment shall be provided with a vacuum breaker. Vacuum breaker to be outside walls, not mounted inside walls.
6. All garbage disposals in food service areas shall be provided with an automatic flow of water through an air gap device or vacuum breaker.
7. Branch lines in restrooms feeding batteries of fixtures with quick closing valves, such as flush valves or quick-closing faucets, shall be equipped with water hammer arresters.

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- Install ball valves ahead of water hammer arresters and in such a manner as to be readily accessible for replacement.
8. Water services shall be divided into three separately metered services; one for the primary school site (except for any additional remote service to supply/relocatables), one for all landscape irrigation, and one for fire protection. Approved backflow prevention devices shall be provided in each service at the main takeoff. Contractor to secure and provide initial certification of backflow devices. Building domestic water delivery systems requiring backflow to include all devices 2" larger should be split and manifolded with properly sized matching backflows installed in parallel to that area. Brass backflow devices shall be protected from theft and tampering by a stainless steel mesh cage, secured to the concrete slab below the device. The cage shall include a hinged or sliding lockable access panel so as to allow for certification testing and repairs.
 9. No-hub cast iron sewer pipe shall be installed under buildings or in the ground. PVC piping is not acceptable within buildings. Plastic pipe is in the crawl space under permanent buildings.
 10. Provide 4-band or "Husky" type couplings where no-hub pipe is used.
 11. All piping, fittings and strainers size 3 inches and less, in water pressure regulator stations 3 inches and less, shall be brass or copper.
 12. Self-closing metering faucets (requiring 5 psi or less operating pressure) shall be used in all school lavatories.
 13. Water piping shall not be installed in or under concrete slabs, but may be installed under raised buildings with a crawl space.
 14. All vents through the roof shall be metal-type and provided with a vandalism-proof cap. Where roofing is a built-up roof with gravel, PVC or ABS is not acceptable, except when installed in conjunction with single-ply roofing systems.
 15. The main soil line cleanout shall be extended to grade and made accessible within 2 feet of exterior of each building, and shall be 2-way cleanout.
 16. Showers for the handicapped, if any, shall be hand-operated with flexible hose, a single lever water control and vacuum breaker.
 17. Lead shall not be used in any system. All solvents shall be water flushed.
 18. Sterilization or disinfection of domestic water systems shall be approved by processes and testing.
 19. Hot water shall be provided at all service sinks. If not economical to supply from a central hot water source, a minimum 6-gallon electric water heater shall be installed at each service sink. No hot water shall be provided in student restrooms.
 20. At least one hose bib shall be made available within 10 feet of equipment on every roof that has mechanical cooling/heating equipment installed thereon.
 21. All sanitary, horizontal waste and storm lines shall be rodded out. Rodding shall be accomplished using a rotary cutter, which shall be full size of pipe being cleaned. The lines shall be flushed simultaneously. Rodding shall not take place until building construction is complete, but prior to occupancy. This work shall be done in the presence of the School District Inspector.

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22. The contractor shall provide a videotape of the interior of the sanitary and storm drainage and sewer systems at the completion of the job. Taping shall be done with the District Inspector present. Drain videos to include running water, so as to show a consistent drain "fall" and absence of "bellies" in drain piping.
23. No DWV copper shall be used in drain branches serving waterless urinals. Dirty arms for waterless urinals shall fall ¼" per foot.
24. Eye Washes: Free standing shower-type eye washer fixtures are to be located near a floor type drain in order to be served by the drain.
25. All cold, hot and re-circulating water piping, as well as de-ionized, fire sprinkler and gas piping, shall be appropriately labeled in at least two suitable locations as needed in each room that piping is installed. Flow direction shall be indicated with arrows and easily visible on pipe runs.
26. Bathroom shut off valves will be located in a bathroom interior wall 5 feet above the floor with an access door installed such that both valves can be operated through one wall penetration.
27. **Sloan sensor activated faucet is acceptable as long as it is hardwired and not battery powered. If sensor is used, each faucet should be wired separately and not in a daisy-chain.**
28. **Standard for stainless steel sink and Drinking Fountain is now 18 ga. and no longer 24 ga.**

C. Faucet Types:

Item	Make/Model	Part Number
Bathroom Lavatory Sinks 4" center faucets	Chicago	802-665CP
De-ionized faucet – for labs	Chicago	869-BPVC
Kitchen wall mount sink faucets double and triple pot sinks	Chicago	445 L8CP
Lavatory faucet, single hole, deck mount for potable water	Chicago	930-CP
Lavatory Air/Gas Vacuum dispensers	Chicago	900 series valves
Service/custodial sinks	Chicago	897-CP (wall mount)
Toilet Floor Mount Disabled	Kohler	K4368 (12" rough)
Toilet Floor Mount Standard	Kohler	K4350 (12" rough)
Lavatory faucets; hot & cold	Sloan	EAF-100
Lavatory faucet; cold only	Sloan	EBF-615
Lavatory peddle valves	Chicago	625 CP or 625 LPSLOCP
Gooseneck single-hole electronic faucet	Moen	8303

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"Emergency Shower Eyewash Station" fixture	WaterSaver	Varies
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D. Multiple Gang Lavatory Sinks:

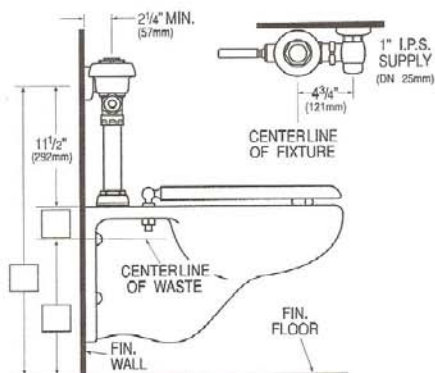
1. Trough sink (Kohler - Undertone® 60" undercounter trough sink - K-3157; EKO - Commercial Trough CounterSink; Sonoma Cast Stone Commercial Trough Countertop).
2. Solid Surface 3- compartment sink
 - a. Stained/ stamped concrete also acceptable.

E. Urinals:

1. 1- Pint Urinals are preferred to the waterless. District standard manufacturer is Zurn or Moen, Sloan, or Kohler. Unit should be battery powered; china urinal and flushometer should match and come as a single unit. A Clean out shall be provided that serves the sanitary tee for that urinal.
2. Waterless Urinals; The **Waterless urinal** is no longer installed in the District.

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F. Flush Valves



WES-111 Dual-Flush Flushometer S.S. — Rev. 0b (10/05)
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Dual-Flush Flushometer

WES-111

- **Description**
Exposed Water Closet Flushometer with Dual-Flush Feature, for floor mounted or wall hung top spud bowls.
- **Flush Cycle**
☐ Model WES-111 Low Consumption
(Down 1.6 gpf/6.0 Lpf, Up 1.1 gpf/4.2 Lpf)
- **Specifications**
Dual-Flush, Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer with the following features:
 - Lifting Handle UP initiates reduced flush (1.1 gpf/4.2 Lpf), eliminating liquid and paper waste, saving a 1/2-gallon of water
 - Pushing Handle DOWN initiates full flush (1.6 gpf/6.0 Lpf), eliminating solid waste and paper
 - Reduces water volume by up to 30% when activated UPWARDS
 - Antimicrobial Coating on Handle protects against germs
 - PERMEX™ Synthetic Rubber Diaphragm w/Dual Filtered Fixed Bypass
 - Distinctive Green ADA Compliant Metal Non-Hold-Open Handle with Triple Seal Handle Packing signifies Water Conserving Device
 - 1" I.P.S. Screwdriver Bak-Chek™ Angle Stop
 - Free Spinning Vandal Resistant Stop Cap
 - Adjustable Tailpiece
 - High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
 - Spud Coupling and Flange for 1 1/2" Top Spud
 - Sweat Solder Adapter w/Cover Tube and Cast Set Screw Wall Flange
 - High Copper, Low Zinc Brass Castings for Dezincification Resistance
 - Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
 - Flush Accuracy Controlled by CID™ Technology
 - Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker molded from PERMEX™ Rubber Compound for Chloramine Resistance
 - Includes (2) adhesive backed Metal Wall Plates etched w/Instructions

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037, ANSI/ASME A112.19.2 and Military Specification V-29193.

- **Variations**
 - ☐ TP Trap Primer
 - ☐ YG Extended Bumper on Angle Stop (for seat with cover)
 - ☐ YO Bumper on Angle Stop (for open front seat without cover)

See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.



Patent Pending

This space for Architect/Engineer approval

SLOAN.

Made in the U.S.A.
SLOAN VALVE COMPANY • 10500 SEYMOUR AVE. • FRANKLIN PARK, IL. 60131
Ph: 1-800-9-VALVE-9 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380
www.sloanvalve.com

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G. Hydration Station:

1. Provide for one hydration (bottle or cup filling) station at the lobby or other central location at every new or reconstructed building. Use Hawes 2000 Hydration Station that is semi-recessed or approved equal.

2000

Hydration Station



FEATURES & BENEFITS

Sensor Operated

Electric sensor allows for touch-free hygienic operation, eliminating the need for manual activation under a number of circumstances.

Antimicrobially Treated

Specific components are antimicrobially treated using the natural protection of silver which helps protect against the growth of mold and mildew on those treated components.

Quality Control

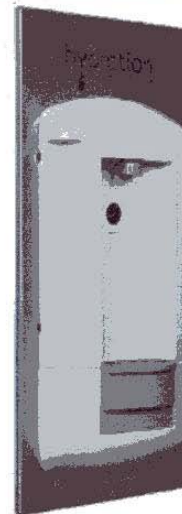
The Hydration Station is pre-built and fully water and pressure tested to ensure no leaks and proper function for reduced installation time and added peace of mind.

Finish

#4 satin stainless steel finish back panel can be easily cleaned and maintained while also resisting corrosion.

Servicing

Durable ABS plastic front panel allows simple access to internal components. Hidden lock and hinges discourages vandals.



OPTIONS

- ☐ HCR8 (8 gallon chiller)

To see all options for this model, visit www.hawesco.com.

SPECIFICATIONS

Model 2000 Hydration Station is a semi-recessed, bottle or cup filling station constructed of durable ABS plastic and 18 gauge, Type 304 Stainless Steel with a satin finish. It shall feature an electric sensor allowing for touch-free hygienic operation, laminar flow to prevent splashing, .8 gpm flow rate for quick fill-up, and antimicrobially treated components to prevent the growth of mold and mildew on those treated surfaces. Hidden lock and hinges on ABS front panel allows access to internal components and indicator light to notify when filter replacement is necessary. The mounting consists of heavy gauge galvanized steel frame, hardware and trap access panel. Tailpiece is 1-1/4" O.D. Provision for trap (not included) must be made in or behind wall.

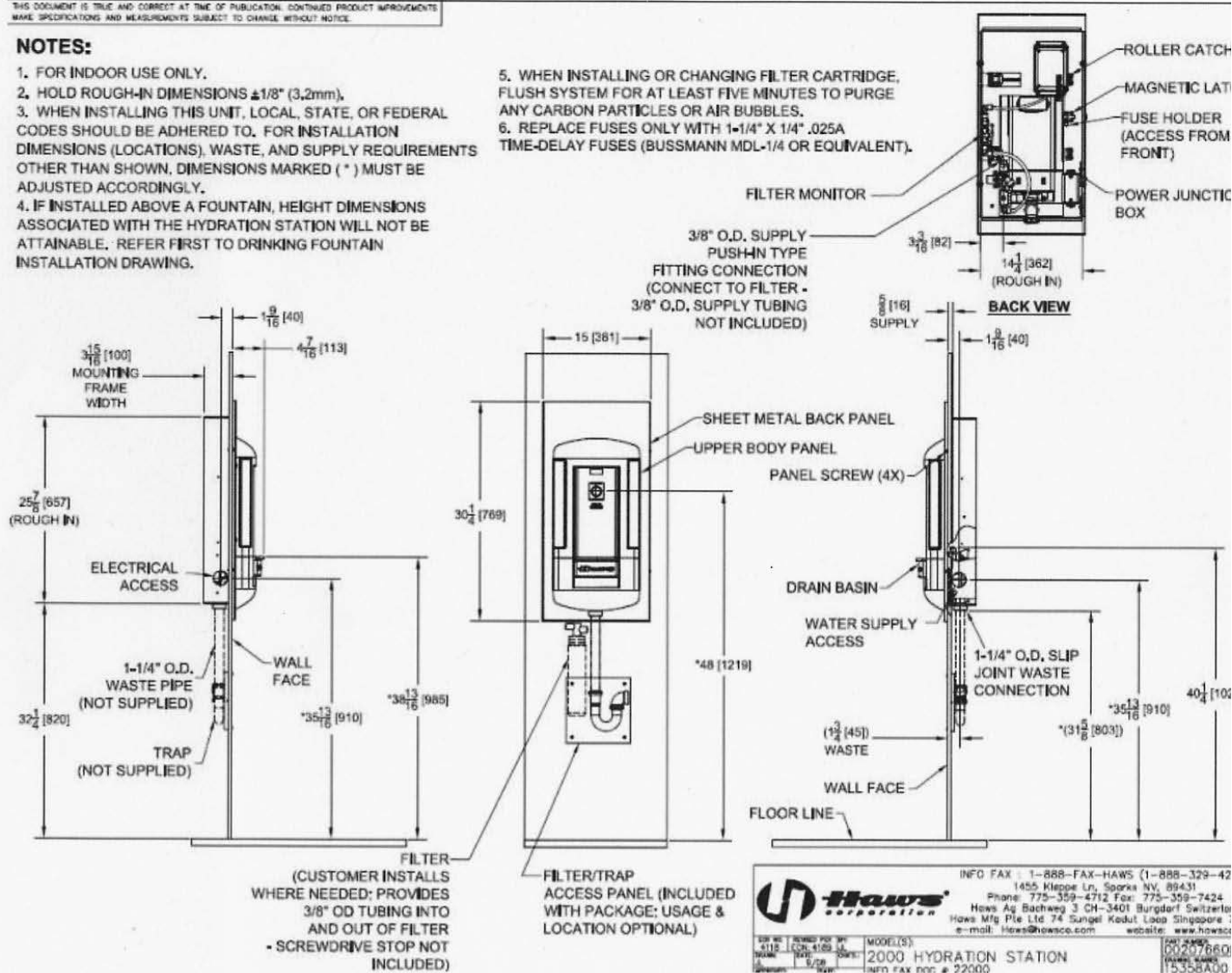
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THIS DOCUMENT IS TRUE AND CORRECT AT TIME OF PUBLICATION. CONTINUED PRODUCT IMPROVEMENTS
MAKE SPECIFICATIONS AND MEASUREMENTS SUBJECT TO CHANGE WITHOUT NOTICE.

NOTES:

1. FOR INDOOR USE ONLY.
2. HOLD ROUGH-IN DIMENSIONS $\pm 1/8"$ (3.2mm).
3. WHEN INSTALLING THIS UNIT, LOCAL, STATE, OR FEDERAL CODES SHOULD BE ADHERED TO, FOR INSTALLATION DIMENSIONS (LOCATIONS), WASTE, AND SUPPLY REQUIREMENTS OTHER THAN SHOWN, DIMENSIONS MARKED (*) MUST BE ADJUSTED ACCORDINGLY.
4. IF INSTALLED ABOVE A FOUNTAIN, HEIGHT DIMENSIONS ASSOCIATED WITH THE HYDRATION STATION WILL NOT BE ATTAINABLE. REFER FIRST TO DRINKING FOUNTAIN INSTALLATION DRAWING.

5. WHEN INSTALLING OR CHANGING FILTER CARTRIDGE, FLUSH SYSTEM FOR AT LEAST FIVE MINUTES TO PURGE ANY CARBON PARTICLES OR AIR BUBBLES.
6. REPLACE FUSES ONLY WITH 1-1/4" X 1/4" .025A TIME-DELAY FUSES (BUSSMANN MDL-1/4 OR EQUIVALENT).

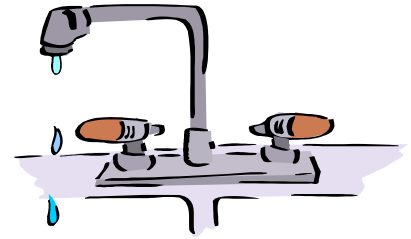


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SPECIAL PLUMBING SYSTEMS

A. Goals and Objectives:

1. Provide system features that will provide safe and sanitary special plumbing systems with long life and ease of maintenance.
2. When air conditioning condensate plumbing is beyond the drain receptacle, and above grade, use DWV copper. Pipe and fitting joints to be tin antimony (95/5). Provide dual drains on any units above the ceiling.
3. Except for spouts and spout fittings, deck-mounted de-ionized H₂O Dispenser for laboratory use shall not have fittings or connectors at their base less than 1/2" nominal pipe size.



WATER AND GAS SUPPLY AND DISTRIBUTION SYSTEMS

- [REFER TO SAMPLE NATURAL GAS PIPING SECTION #227000](#) - [\(Click Here\)](#)

A. Goals and Objectives:

1. Provide safe and sanitary water supplies for potable water, irrigation water and fire water systems.
2. Provide safe gas piping systems that comply with utility company and government requirements. Coordinate the design of water systems with state and local governing authorities.
3. The District maintains service request forms and contact points for public utility systems.
4. Provide separate services for domestic, fire and irrigation water, along with separate meters for each.

B. Water Service:

2. Provide water systems that minimize wasting of water.
3. Locate water meters and control valves above ground; secure in a fenced enclosure.
4. Verify meter location with San Diego City Water Department. Contact prior to design.
5. Provide separate meter for irrigation water.
6. Acceptable underground water pipe materials:
 - a. Type "L" copper with silver soldered joints.
 - b. Cement-lined ductile iron with mechanical or flanged joints.
 - c. PVC Schedule 80 or Class 200 as applicable, with ductile iron joints.
7. Do not use ABS or asbestos cement piping.
8. Do not use glued pipe fittings; use mechanical joints or soldered copper.
9. Use copper for lines 3 inches and smaller.

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10. Where soil is acidic, encase metallic pipe in PE sheathing.
11. Use consistent type of piping and fittings; review selection with District.
12. Provide zone valves for water supply to each building.
 - a. Identify valve locations on Contract drawings and post printed/numbered valve schedule in a building mechanical room for service reference. Tag valves with corresponding numbers for identification of zones controlled by each valve.
 - b. Underground outdoor water shut offs shall include a brass tag identifying the area of the building it serves.
13. Do not use piping less than 3/8" diameter.
14. Do not use 3-piece valves underground.
15. Both single and multi-story buildings shall have main hot and cold water shutoffs for services; same for custodial, kitchen and related areas with multiple plumbing fixtures. Additionally each floor in multi-story buildings shall have accessible hot and cold shut-offs for each floor.
16. Buildings that are served by a campus "looped" water system, or connected systems fed by 2 separate meters, shall be plumbed in such a way that individual buildings or areas can be isolated, (shut off) with one water valve.

C. Fire Water Service:

1. Coordinate number and locations of fire hydrants, detector check valves and alarm devices with State and local fire authorities. Contractor to supply certified flow charts for hydrants showing sufficient water volume and pressure to serve protected area.

D. Gas Service:

1. Use PE piping for gas distribution underground.
2. Provide shut-off valve for gas service to each building.
3. An underground gas piping to include tracer wire to meet local code.
4. Provide seismic automatic shut off valves at each gas main and shut-off. Provide protective enclosure.
5. Confirm design goal of 10 Lbs. minimum gas pressure at project meter.

HVAC SYSTEMS REQUIREMENTS

A. General Requirements:

1. Main Point of Entry (M.P.O.E.) I.T. Environmental Requirements
 - a. Dedicated Air Conditioning is required unless only used as MPOE without joint use as Telco. See also Telco requirements.
 - b. Environmental HVAC considerations
 - 1) Select equipment with highest efficiency available.
 - 2) Choose cooling equipment that does not utilize ozone-depleting refrigerants
 - 3) Maximize efficiency of mechanical systems through duct sealing and high-efficiency fans.
 - 4) Select radiant heating systems that are effective at lower air temperatures.

B. Commissioning:

- **REFER TO SAMPLE COMMISSIONING SECTION #230800 - [\(Click Here\)](#)**

1. Commissioning is a quality based process developed for the contractors use as a means of managing the quality of the installation, start-up, and operation of the building equipment and systems to ensure they perform according to the design intent and the Owner's operational needs. The commissioning process shall encompass and coordinate the separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations, the Owner's needs, and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors.
 - b. Verify and document proper and energy efficient performance of equipment and systems.

C. HVAC Construction Equipment

1. New package units should have a minimum SEER rating of 12
2. Units above 5-ton shall use 460v 3-phase; **Note:** *do not install 460v units above ceilings.*

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3. 5-ton units shall use 208v, 230v 3-phase
4. Use 3-Phase motors, where it supports the best operation of the equipment
5. Reciprocating type compressors 5-ton and under only in package units. Larger units, scrolls are preferred.
6. Use 134A, R410A or R22 refrigerant
7. When chillers are air cooled use all copper fins/copper tubes.
8. Manufacturers: Use York, Trane or McQuay compressors or Turbo Core Compressors.
9. Larger tonnage units: use two each (for 300 ton, use two 150 ton units)
10. Computer server rooms use carrier duct free split system, Russell refrigeration medium temperature. Commercial grade condensing unit and matching fan coil unit.
11. Hot water /chill water pumps: install two (ea.) to operate alternately.
12. Exhaust fans: use direct drive; **exhaust fan motors shall be sized to handle 110% design airflow at design static pressure and 110% design static pressure at design airflow.**
13. Timers: use Tork Mod. DTS200A/DZS200A
14. Thermostats: use White/Rogers 7-day programmable electrical thermostats.
15. Boiler Manufacturers: Use Kelly or Patterson
16. Provide the means to measure outside air temperature, room temperature, supply air temperature, return air temperature, discharge air temperature, mixed air temperature on economizers. VAV systems shall show duct static pressure and building static pressure.

D. HVAC Controls

1. Ethernet compatible controls.
2. **Automated Logic, Web controls for EMS and Lighting.**
3. HVAC Controls
 - a) DDC Controls by Automated Logic
 - b) Conventional Controls consisting of time clock, bypass timer and room thermostats

E. Ductwork Standards

1. Vent ducting: must provide access to coils for cleaning
2. All vent ducting exposed to the weather will be covered with lagging tape, P/N OV-L44 or equal and lagging adhesive P/N lag grip 671 or equal.
3. Ducting must also be crowned to assure drainage.

F. Ductwork

- **[REFER TO SAMPLE METAL DUCTS SECTION #233113](#)** - **[\(Click Here\)](#)**

1. SMACNA HVAC Duct Construction Standards for Metal and Flexible Ducts 2nd Edition – 1995
2. California Mechanical Code, Chapter 10, Duct Systems

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3. Ductwork exposed to weather shall be waterproof and lined with high quality duct liner. Ducts shall be pitched, cross-break, or have a cap sheet to provide rainwater drainage.
4. Ducts penetrating roofs shall be detailed with curbs and proper flashings.
5. All concealed supply, return and exhaust ducts shall be sealed with a high quality duct sealant similar to Polymer Adhesive Air seal #11.
6. Manual volume dampers shall be shown on drawings for all branch ducts to supply, return and exhaust outlets. Use high quality manual volume dampers similar to Ruskin.
7. Flexible duct connections shall be used for all duct connections to flexibly mounted equipment.
8. Flexible ducts shall be UL Class 1, 7 foot length with factory attached collars.
9. Completely detail duct supports and seismic restraints.

G. HVAC Package Equipment

1. Rooftop package gas/electric units are preferred. Acceptable manufacturers include Trane, York, and Carrier.
2. Air handler units exposed to weather shall be specifically designed for outdoor use. Weatherproofing an indoor unit is not acceptable.
3. Exhaust fans shall be direct drive whenever possible. Acceptable manufacturers include Cook and Greenheck.
4. Ceiling supply diffusers shall be modular core type with or without perforated face. Sidewall supply diffusers shall be double deflection type.
5. Ceiling return grilles shall match ceiling supply diffusers. Use ¾ inch blade spacing.
6. Exhaust grilles shall be ¾ inch blade type.
7. Completely detail HVAC seismic restraints.

H. Other HVAC Related Components

1. Gas cocks shall be high quality bronze body plug type.
2. Appliance connectors shall be stainless steel.
3. Gas pipe and fittings exposed to weather shall be galvanized.
4. Completely detail piping supports and seismic restraints.
5. Condensate piping in ceiling space shall be insulated.
6. HVAC Filters: Only standard filter sizes are to be used.

HEAT GENERATING SYSTEMS

A. Goals and Objectives:

1. Provide heat generating systems to maintain specified thermal conditions and at the same time minimize energy costs.
2. Use heat generating systems equipment which is :
 - a) Designed and built for commercial and/or industrial applications.

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- b) Installed in a professional manner by experience contractor as approved by the equipment manufacturer.
- 3. Electric heat sources shall not be used. Gas furnaces shall be used in package air-handlers capable of two stage or modulating control. Forced air heating system shall have a ducted return.

B. Central Heating Boilers and Accessories:

- 1. Centralized heating hot water boiler plants shall be designed with multiple, staged, hot water generators, selected for high-efficiency (equal to 85% or greater) operation.
- 2. Low Nitrous Oxide (NOx) burners with modulating gas valves shall be specified whenever possible.
- 3. Systems shall be monitored and controlled through the District Energy Management Control Systems (EMCS). Time clocks and self-contained temperature controls shall not be used.
 - a) Avoid dual service hot water boilers where both space heating and water heating requirements are met by one or more heat generators.
 - b) Select heat-generating equipment, which is sized with automatic controlled outside air dampers for minimum flow during building warm-up period.
 - c) Steam heat generation equipment is not to be specified.
 - d) Use heat recovery strategies whenever possible.

C. Gas Furnaces:

- 1. Gas furnaces and heaters greater than 250,000 BTU in size, are to be constructed with 321 stainless steel heat exchangers. Unit heaters to be constructed with aluminized steel heat exchangers.
 - a) Use ducted combustion air with forced-drafts fans (natural drafts units shall not be used).
 - b) Allow enough space for maintenance.

D. Fuel Fired Heater:

- 1. Use only high-efficiency, high-quality heaters.
- 2. Furnaces shall be designed to operate on natural gas only.
- 3. Unit heaters can be used in some application with District approval.

E. Heat Pumps:

- 1. Heat pumps can be used if natural gas is not readily available, minimum of 12 SEER.

COOLING GENERATING SYSTEMS

A. Goals and Objectives:

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1. Provide cooling systems when required to maintain specified thermal conditions.
2. Cooling Generated Systems shall use equipment, which is:
 - a) Designed and built for commercial and/or industrial applications.
 - b) Installed in a professional manner by experienced contractors as approved by the equipment manufacturer, and to afford access for maintenance.
 - c) Designed to meet varying loads. Variable flow air systems shall be considered the norm.
 - d) Integrated with the use of occupancy sensors and the District EMCS - Automatic Logic Systems in system design.

B. Central Cooling Equipment and Accessories:

1. Systems shall be monitored and controlled through the District EMCS - Automatic Logic Systems.
2. Specify and install cooling equipment with high EER or SEER ratings.
3. Provide variable frequency drives (VFD's) on all equipment rated at 5 horsepower (hp) and greater.
4. Use energy efficient motors.
5. Screw compressors and rotary compressors shall not be specified.

C. Economizers:

1. Use air economizers on air conditioning systems.

D. Evaporated Coolers:

1. May be used only under specific and limited conditions, to be determine by SDCCD Architects and HVAC Department.

E. Refrigeration Systems:

1. Shall be Bulb Type Thermostat controls with Freeze-Stat or Defrost controls.

AIR DISTRIBUTIONS SYSTEMS

A. Goals and Objective:

1. Provide system features that will provide a supply of air to the conditioned spaces that is:
 - a) Temperature controlled.
 - b) Filtered and augmented with outside air control and CO₂ sensors.
 - c) Uniformly distributed throughout each zone.
 - d) Delivered in a draft free manner and at an acceptable noise level less than NC 35.
 - e) Supplied in a well-controlled energy efficient manner.

B. System Acoustical Features:

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1. In order to control sound levels in spaces such as classrooms, offices, and multimedia centers refer to ASHRAE HVAC Applications Handbook, Chapter on Sound, and Vibration Control, "Design Guideline for HVAC Noise in Occupied Spaces."
2. Locate noise generating equipment such as compressors, fan coil units, exhaust fans, and pumps outside the conditioned spaces.
3. Control duct noise transmission into the occupied spaces with turning vanes, low duct and discharge grill velocities, and sound attenuation baffles and material.
4. Ensure vibration-isolating connections are adequate between air handlers, connecting ducts, and the supporting structure(s).

C. Efficient System Energy Use:

1. Use low-pressure drop filters, dampers, silencers and diffusers. Filters shall be of an extended surface type, configured for easy replacement.
2. Use high-efficiency backward curved or airfoil impellers fans.
3. Use variable frequency drives (VFDs) for motors of 5 horsepower and greater with variable loads.
4. Use "premium efficiency" motors, tailor the size of the motors for their task, can be optional drive belt.
5. Locate exhaust hoods and return air intakes near heat and/or odor generating equipment such as copiers and kilns, to expedite removal of heat and odors from the space and minimize air temperature variations within the space. Areas of specific concern are graphic arts rooms, areas with large copiers, and food preparation/serving areas. Air supplies to the space shall be sized to accommodate the additional exhaust requirement.
6. Locate thermostats away from known locations where heat generating equipment will be located or where natural airflow will be obstructed by furniture, equipment or partitions. Avoid locations on exterior walls or near doors or windows.
7. Connect system controls to the District EMCS.
8. Shall use Economizers on units 5 ton and larger.

D. Minimize System Maintenance and Costs:

1. Locate system components requiring routine service outside the conditioned space to avoid disruption of classroom and administrative activities, and ensure manufacturers minimum accessibility clearances are provided around equipment components requiring service or replacement.
2. Damper actuators shall be installed outside the volume control units.
3. Access panels shall be located and sized to provide ready and unobstructed access to components when needing service or replacement.
 1. Where interior insulation is required, ensure that it is resistant to air erosion and deterioration due to environmental factors such as humidity and corrosive air borne chemicals. Insulation material(s) limitations of use and application precautions, as

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detailed in manufacturer's publications, shall be carefully considered during all stages of a building's life cycle; design, materials specification, construction, operation/maintenance, and renovation. Internal HVAC system insulation materials shall be designed to be durable when rated in accordance with ASTM or UL 181 erosion tests. All internal insulation materials shall not support microbial growth as determined by ASTM or UL. HVAC systems shall be designed and insulation installed in a manner, which prevents insulation contact with liquid water. Fiberglass is not to be used as an interior insulation material for supply ducting that is downstream of the filters.

2. In environments that are considered high risk for fungus, mold, and other microorganism growth, ultra violet lamps should be installed for sterilization of air handling units coils and air discharge plenums.
3. Do not use pneumatic controls and actuators on new construction, and avoid their use on replacement and retrofit projects where economically feasible.
4. Flexible duct connections shall not exceed 7 feet in length and shall be properly sized and matched, and mechanically connected with clamps, brackets, or screws for a solid, secure fit.
5. All air distribution grilles and registers shall be equipped with opposed blades dampers (OBD's), at the device and at the main duct work take off.
6. Air intakes shall be positioned to avoid ingesting contaminated air, and to minimize vandalism. Avoid locating air intake near or downwind of loading docks and passenger pick up zones, and positioned in relation to vent locations in accordance with the California Mechanical Code.

TERMINAL AND PACKAGE UNITS

A. Goals and Objectives: Terminal and package units used in the air conditioning systems shall be:

1. Designed and built for commercial and/or industrial applications. Installed in a professional manner by experienced contractors as approved by the equipment manufacturer.
2. Maintained in accordance with a recognized preventive
3. maintenance program to provide the highest possible system efficiencies.
4. Single duct variable volume terminal units will be used on air conditioned areas where a large air-handling unit is serving a multitude of occupied areas with different occupancies and orientation.
5. Package units may be used in small isolated air-conditioned areas with integral heating coils, or natural gas duct heaters.

B. Terminal Units:

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1. Systems shall be monitored and controlled through the District EMCS, where cost effective.
2. Provide removable panels on terminal units to permit access to dampers, regulatory assemblies, and other parts requiring service, adjustment, or maintenance with airtight gaskets
3. and quarter-turn latches.
4. Do not located terminal units above classrooms areas.
5. Determine noise levels, then provide attenuator section lined with insulation as may be required.
6. Maximum damper leakage allowance shall be a rate of 2.5 percent of nominal terminal airflow at 1 inch wg inlet static pressure.

C. Package Units:

1. Specify the use of natural gas heating.
2. Use, where possible, extended surface disposable air filters, with ultra low-pressure drop filters.
3. Use seismic vibration isolators.
4. Use forward curved direct drive centrifugal indoor fans.
5. Use 100% OSA economizers having 15 CFM fresh air per person minimum on package units.
6. Use hermetically sealed compressors 5 ton or smaller, and scroll compressors on package units 7 ½ tons or greater.
7. Do not use window type air conditioners.
8. Air cooled condensers on package air conditioning equipment to be copper tube, copper fin construction on all units.
9. Fifteen (15) CFM per person of outside air, in accordance with latest ASHRAE Standards, shall be positively supplied to all occupied classrooms.
10. Package air conditioning units shall have full access and services provisions to all components of the unit once installed.
11. The condensate drains shall be connected outside the air handling unit, and this water should be discharged through an air lock. The depth of the drain tap should be twice the static pressure differential of the AHU's fan. The AHU base mount shall be high enough to accommodate this depth. The pitch of the drain should be ¼ inch per foot.
12. Package unit for Monday thru Friday must be operational twenty-four (24) hours a day, seven (7) days a week.

CONTROLS AND INSTRUMENTATION

- **[REFER TO SAMPLE INSTRUMENTATION AND CONTROL FOR HVAC SECTION #230900 \(Click Here\)](#)**

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HEATING, VENTILATING, AND AIR CONDITIONING

A. Goals and Objectives:

1. SDCCD has begun the implementation of a district wide EMCS. Controllers at each individual site are linked through use of Local Area Network (LAN), and all sites are linked to each other and to the Maintenance and Operations office through use of the District Wide Area Network (WAN).
2. The EMCS provides the means to measure and analyze the energy performance of individual systems (mechanical and electrical) and sites, in addition to providing direct control of the site mechanical systems.
3. All new construction shall include installation of the District Standard EMCS to provide monitoring and control of all mechanical systems. These new mechanical systems, as well as the new EMCS installations, shall include provisions for periodic testing and recalibration. Detailed control sequences of operation, and product specifications shall be used.
4. Shall use current sensors for VFD feedbacks. Use (DI's), digital inputs for feedbacks
5. Temperature sensors and wells shall be installed at 45° on all horizontal piping runs of chilled water systems, heating hot water systems and domestic hot water systems.
6. Pete's plugs shall be installed on the inlet and outlet sides of all pumps, condenser water loops, heating hot water loops, chiller barrel heat exchangers and on all inlet and outlet of all piping systems going into and out of buildings.
7. Controls, temperature and pressure sensors or gauges shall be labeled with large legible lettering of a type and style sufficient to withstand the elements.

B. Equipment controlled by the Energy Management System:

1. Boilers.
2. Package HVAC units.
3. All chillers, towers and KW meters.
4. All pumps 5 horsepower and larger.
5. Associated valves.
6. Exterior lighting.

SPECIAL HVAC SYSTEMS AND EQUIPMENT

A. Goals and Objectives:

1. Special HVAC systems and equipment used by the District in their air conditioning and refrigeration systems shall be:
 - a) Designed and built for commercial and/or industrial applications.
 - b) Installed in a professional manner by experienced contractors as approved by the equipment manufacturer.
 - c) Maintained in accordance with a recognized preventative maintenance program to provide the highest possible system efficiencies.

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- d) Design to include all Department of State Architect seismic requirements.
- 2. Select the use of computer air conditioning systems to meet temperature and humidity requirements as required by the computer equipment supplier. Year around operation shall be considered in the selection of equipment. Split systems shall be used in Monday thru Friday rooms.

B. System Description:

- 1. Use extended surface, low-pressure drop disposable air filters configured for easy replacement.
- 2. Select and install special HVAC equipment with high EER and SEER.
- 3. Consider economizers for systems rated at 5 tons of refrigeration or greater, unless modeling indicates appropriate use on smaller units.
- 4. Select HVAC and refrigeration equipment to meet actual special systems load requirements and provide physical space for additional equipment if future load requirements increase.
- 5. Consider heat recovery strategies where possible on special large refrigeration and cooling units.
- 6. Exhaust heat from printers and copiers where direct duct connections are provided.

C. Building Systems Approach to Provide Good IAQ Control:

- 1. Where possible, locate HVAC equipment in such a manner to provide outside air supplies without the use of lengthy runs of ductwork.

INDOOR AIR QUALITY

A. General:

- 1. SDCCD Building Systems Approach is based on a group of ASHRAE Standards with the common goal of good indoor air quality and comfort.
- 2. A school building is a dynamic entity with often changing pollutant, heating and cooling loads. A well design and functioning ventilation system will respond to any change in loads before it affects the occupants. It is often difficult to accomplish this ideal condition in schools, however, the Building System Approach should be applied at the design stage and continued through construction, commissioning, operator training, and ongoing building operation and maintenance. It requires interaction between many disciplines and proper IAQ education of key systems operators. The common goal is to ensure the health and comfort of building occupants over the life of the building.

B. Rules of the Building System Approach:

- 1. Adherence to the following standards and guidelines, or current standards is instrumental to a successful application of the Building Systems Approach.
 - ASHRAE Standard 62.1-2004 (for ventilation).

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- ASHRAE Standard 55-2004 (for comfort).
 - ASHRAE Standard 52.1-1992 (for filtration).
2. These standards and guidelines should be studied by all relevant building personnel, and equipment operation and maintenance manuals should be changed accordingly. Some equipment may need to be modified.
 3. There are seven main indoor environmental issues to consider during the programming, design and construction phases of a new building.
 4. Provide for Merv 13 filters unless otherwise directed.

C. Guidelines

1. **Site Plan:** The physical site that the future building will occupy and its outdoor environment must be studied with respect to how they will likely impact the future indoor environment. Prevailing weather and wind patterns, ambient air quality, and major outdoor sources of pollution should be considered.
2. **Building Configuration:** The building configuration may impact the migration of pollutants both from the outside to the inside, and within the building both vertically from one floor to another and horizontally across floors. Issues to be scrutinized include location and orientation of building air intakes, exhausts, and stacks, planning of vehicle access, parking, and garages, pollutant pathways, apertures and glazing in relation to solar heat load and IAQ.
3. **Heating, Ventilating, and Air Conditioning (HVAC) System:** In today's tight, sealed, energy efficient buildings the majority of the indoor air is introduced through the HVAC system. Proper design of these mechanical systems, therefore, is imperative to the creation of a healthy indoor environment. The design team must review the projected occupant densities, activities, and locations in the building and ensure proper respective ventilation rates and distribution. This task includes critical attention to ventilation flexibility, core versus perimeter loads, control systems humidification/dehumidification, filtration systems, dedicated exhausts, occupied space layout, and energy recovery technology. Particular areas of concern are explained in further detail as follows:
 - a) **Outdoor (Fresh) Air in Building Air Supply:** The minimum requirements of outdoor air for all types of building and spaces can be found in ASHRAE Standards 62.1-2004 or current standard.
 - b) **Temperature and Relative Humidity (RH):** What is considered appropriate temperature and relative humidity levels indoors may vary from location to location within SDCCD, but they must remain constant in each season, with slightly higher temperatures being acceptable in summer. ASHRAE Standard 55-2004 or current standard recommends comfort ranges, District standards are heating 68 degrees and cooling 76 degrees.
 - c) **Filters in HVAC Systems:** Filters shall be selected based on the ASHRAE Standard 52.1-1992 or current standard, which requests that filter manufacturers specify both a weight

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- test and a dust test for each class of filter. Filters shall also be well fitting. The outdoor air quality shall be considered, when specifying filter efficiency.
- d) **Maintaining Correct Pressurization Within Buildings:** A school building shall be under slightly positive pressure. Some areas, including special use areas with dedicated exhaust such as art areas, shall be under negative pressure in order for cleaner building air to flow toward the more contaminated areas, helping dilute the contaminants, and finally being exhausted. Air from special use areas shall not be re-circulated, unless it has been subjected to cleaning with filters appropriate for the contamination produced.
4. **Maintainability:** The ability to conduct frequent and effective maintenance on the HVAC system during the building's operational life is another critical step toward a healthy indoor environment. This ability can be greatly enhanced via full consideration of maintainability at the design stage. Proper access points to critical areas of the HVAC system must be included in the design. Building and mechanical system materials best suited for resistance against corrosion, microbial contamination, and other IAQ factors shall be identified. Insulation material characteristics shall be included.
5. **Interior Material Selection:** The materials for the interior spaces shall be selected carefully with regard to their future impact on the indoor pollutants loads. The general principles of making sound environmental material selection decisions must be customized to the specific indoor environment planned. Material selection criteria to be judged include off gassing, fiber release, microbial support, sink effect, durability, proper installation, and maintenance for good IAQ.
6. **Implementation of Temporary Ventilation and Filtration Practices:**
- a) Such practices shall be implemented when interior finishing products are to be applied or installed at the end of construction or during renovations. This may require increased ventilation rates and schedules and the use of items such as temporary operations and pre-filters, unitary conditioning filtering units, and removing doors and windows.
7. **Prudent Ventilation Regime:** Once the HVAC system is activated, and its proper function and control system is fully verified it shall be set to operate on the maximum fresh air which is possible on a 24 hour basis with the return air dampers closed down. The system shall also be set to dehumidify and warm the interior as far as is practicable for products to cure and for acceptable working conditions. Preventing cold conditions will cause more VOCs to be emitted early from interior finishes. This mode should be maintained for a minimum of 48 hours before beneficial occupancy. This is a general recommendation that may not be suitable for all systems.
8. **Installation Sequence:** Installation of equipment, materials and finishes in a particular order can have a beneficial impact on final indoor air quality. The District may require wet products such as adhesives and paints to be applied before the installation of potential sinks such as fabrics, ceiling tiles and furniture.

ELECTRICAL SYSTEMS REQUIREMENTS

GENERAL DESIGN GUIDELINES

- A. To accommodate effective and safe cleaning of buildings, place designated GFI electrical outlets every 100 feet throughout building for custodial equipment such as buffers, floor machines, and vacuums.

GENERAL REQUIREMENTS

- A. At Computer labs and standard classrooms, provide wall outlets for power and data; Use of Floor outlets shall be minimized **and must be approved**.
- B. Conduits and raceways for power, data, and classroom systems controls shall be provided at podiums. Power, data, and classroom systems controls by FF&E Podiums shall be fixed to the floor and made accessible to the disabled. **Access to podiums must meet Title 24 accessibility standards**. The **lighting circuit** for Telco rooms shall not be connected to the building lighting time clock. See Division 27.
- C. **The District is requiring Smart Meters on all new buildings; see attached section at the end of Division 26.**
- D. **The District standard controls Automated Logic for the Energy Management System will have a maximum of four points for each transformer.**

Service and Distribution

A. Goals and Objectives:

- 1. The design of the Electrical Distribution System shall meet or exceed all requirements of the California Electrical Code.
- 2. The design of the electrical service and distribution systems shall be based on long term (more than 30 years) maintainability of the systems. Provisions shall be made for the future growth of the District. Space and capacity shall be allotted for increasing the original designed electrical load by 20 percent. The future capacity shall be calculated on connected load. The use of the demand loads is not permitted.

B. System Description:

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1. The distribution system shall be 3-phase, 600 V or less. Existing campuses have different distribution system types. Generally radial type supplies power from single source through radial lines that are extended to the various areas of the District.
2. For sites with loads less than 500 kVA, including future growth, the service shall be 120/208 volt, three phases, four wires. For services larger than 500 kVA the service shall be 277/480 volt, three phase, four wire.
3. Electrical service shall be underground and shall meet the requirements of the San Diego Gas and Electric where lines are under the jurisdiction of SDG&E; otherwise meet all current applicable codes. The electrical designer shall coordinate all on-site and off- site improvements required to install the new electrical service to the site. **A/E shall coordinate work with SDG&E Savings by Design and CCCIOU.**
4. All San Diego Gas and Electric fees shall be included in the project budget.
5. Site Utilities:
 - a) The San Diego Gas and Electric transformer shall be a location approved by the utility company and shall minimize the transformer secondary feeder length.
 - b) Utility transformers shall be site-oriented to avoid student access and provide proper maintenance access.
 - c) Where transformers are connected to District utilities, location shall be approved by the District.
6. Service Entrance:
 - a) Ground fault protection shall be provided with the main breaker as required by the CEC.
 - b) The electric room shall not house the telecom/data network equipment, which shall be located in a separate room.
 - c) SDG&E meter room and main switchboard room shall have exterior access.
 - d) The electrical room shall have double-doors and keyed to SDCCD standards. The opening shall be not less than the largest single piece of equipment.
 - e) Electrical room shall have a duplex outlet on each wall.
 - f) Electrical room shall have adequate lighting that is not on a timer or occupancy sensor.
 - g) Electrical room shall have floors with proper slope for drainage. Surrounding ground elevation shall not be higher than finished floor. Floor drains shall not be installed in electrical rooms; natural drainage to the exterior shall be used.
 - h) Cabinet and panel mounting locations shall be selected for efficient serviceability.
7. Branch Circuits:
 - a) All mechanical equipment shall be connected to a separate feeder and panel board separate from lighting and receptacle loads.
 - b) Separate circuits for lighting, mechanical and general-purpose loads shall be provided.
 - c) The computer switching equipment in IDF's shall be powered by a circuit separate from classroom computer loads, Up to four powered switches may be on a single circuit.
 - d) Computer laboratories shall be provided with a minimum of six circuits.

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- e) All raceways shall be a minimum of ¾ inch conduit. Use of ½ inch conduit is not acceptable.
 - f) Classrooms shall have not less than two duplex outlets on each wall. There should be alternate circuits on adjacent receptacles.
 - g) Surface mounted raceways are not acceptable in any educational or office space. Outlets must be recessed into walls.
8. Panel Boards:
- a) All distribution panels shall be provided with a main circuit breaker for each building.
 - b) Provide for 20% additional capacity for future circuits at all main panels and branch panels.
9. Grounding:
- a) Provide a service entrance ground within 5 feet of service entrance.
 - b) Provide a building ground at each distribution panel per code.
 - c) Where grounding rod is provided, resistance shall not exceed 5 ohms.
10. Conductors and Conduits:
- a) All conductors shall be copper THHN; where subject to moisture, provide THWN insulation type.
 - b) All conductors shall be in conduit or raceways.
 - c) There shall not be less than one 3 inch conduit from power distribution to each sub-distribution panel.
 - d) Underground raceways shall be PVC or non-metallic raceway materials. Duct banks shall be encased in red concrete.
 - e) All power and signal underground distribution system shall be run in separate duct banks and through a separate manhole system. Signal and power shall never occupy the same manhole.
 - f) Conduits shall be rigid metal where exposed in a room. Conduits within a wall or otherwise concealed shall be in EMT or rigid below 6 feet AFF.
 - g) The use of MC Cable shall not be used without approval. 6 foot fixture whips are permitted.
 - h) Compression fittings only
 - i) Penetration through rated walls to use firestop EZ-path or equal.
11. Meters:
- a) Meter rooms shall be accessible by SDG&E personnel at all times.
 - b) Meters shall be located inside of the main electric room for protection from the elements.
 - c) Site meters shall have a dedicated 4-20 mA or pulse output for input to the District Energy Management Control System.
12. Surge Protection:
- a) Transient voltage surge suppressors shall be installed at each auxiliary panel As follows:
 - b) Surge Protective Device Description: Unit type, panel-mounted design with The following features and accessories:

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- 1) LED indicator lights for power and protection status.
 - 2) Audible alarm, with silencing switch, to indicate when protection has failed.
 - 3) One set of dry contacts rated at 5 A, 220-V ac, for remote monitoring of protection status.
 - 4) Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - 5) Red and green LED indicator lights for power and protection status.
 - 6) Audible alarm, with silencing switch, to indicate when protection has failed.
 - 7) Suppressors shall be installed in panels that supply HVAC equipment.
13. Warning mark:
- a) All enclosures that do not clearly show that they contain electrical devices shall be marked with a black lightning flash on a yellow background within a black triangle as NFPA-79 Code requires.

INTERIOR LIGHTING

- **REFER TO SAMPLE INTERIOR LIGHTING SECTION #265100** - [\(Click Here\)](#)

- A. Lighting systems shall be designed to be the most energy efficient possible for the specific applications. If current technology allows for a more efficient system than what is in the District Standard then the District would be receptive to the newer technology.
- B. All interior light fixtures to be fluorescent fixtures unless approved by District Architect. No T-12 lighting.
- C. Fluorescent lamps for classroom, lab, and corridor spaces shall be coordinated and approved through the District Facilities Department and the District Architect. A/e should submit proposed lighting plan and fixture cut sheets in schematic design submittal.
- D. Fluorescent lamps for utility spaces shall be 4 foot, 25 watt type having a T 8 lamp and medium bipin bases or equal as manufactured by Phillips or equal; part no. F32T8/ADV850/XLL/ALTO-25W. Lamps shall have a correlated color .temperature of 5000 k with a color rendering index (CRI) of 82 and contain no more than 1.7mg of mercury. The lamps are to be operated on high frequency electronic soft start ballasts specifically designed for 25 watt T 8 lamps. The rated design lumen output shall be 2280 lumens and the rated average life shall be 40,000 hours at 12 hours per start. The District has standardized on the 5000 Kelvin fluorescent lamps for utility rooms and some retrofits.
- E. Provide Philips 5000 lamps with minimum 4 year warrantee on lamps and minimum 4 year warrantee on ballasts. Certain classrooms that require a larger spectrum of light may use 32 watt 2900 K lamps by Phillips or equal.
- F. Provide fixed data on lamps to rooms using product number in Revit Model.
- G. District Standardize is for two fixtures: T-5 indirect and Super T-8 .
- H. T-8 Ballasts shall be by Advance:
 1. 2 lamp Low, Program Start - IOP-2S32-LW-SC351
 2. 2 lamp Normal, Program Start - IOP-2S32-SC351

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- I. Input voltage to be 120 volt unless noted on plans.
- J. Provide motion sensor/timer switches at all rooms.
- K. Light fixtures shall have a label specifying the lamp type specified for LEED Silver Certified Criteria.
- L. Interior Luminaires:
 - 1. Linear fluorescent-T5,T8
 - 2. Integral daylight controls
 - 3. Uplight or combined uplight and downlight
 - 4. Exit Signs: Maximum 5 watts per face
 - a. Lamps
 - 1) LED
 - 2) Electrominescent

EXTERIOR LIGHTING

- **REFER TO SAMPLE EXTERIOR LIGHTING SECTION #265600 - [\(Click Here\)](#)**
- A. Fluorescent fixtures. Some exterior lights shall be classified as security lighting and will go on and off with photo cells. All other exterior lights will go on by photo cell and off by time clock. Smaller fixtures use compact fluorescent.
- B. Pole lights shall match existing pole lighting fixtures in the area around the new building on that campus, unless otherwise directed by the District Architect.
- C. All exterior building, walkway, pole and site lighting shall be installed so that each light can be controlled in an alternate method such as A/B switching. Pole lights are to be induction lighting. Exterior building lights are to be fluorescent. Pole standards shall be by District Architect.
- D. Exterior lighting shall be placed on an existing LCP panel, or new LCP panel to match existing District wide standard.
- E. Exterior Luminaires:
 - 1. Full-cutoff luminaries:
 - 2. Photovoltaic power source
 - 3. Lamps
 - a. Fluorescent
 - b. Metal halide
 - c. High-pressure sodium
 - d. LED (primarily decorative)
- F. Standard Lighting Controls Manufacturers - (**Automatic Logic is the District Standard**).
 - 1. For all other buildings including learning and resource buildings, electronic lighting control systems shall be installed to control building, site corridor and assembly area lighting. A photocell shall be incorporated into the control system.
 - a. Occupancy Sensors:
 - 1) Passive, infrared motion sensor

- 2) Ultrasonic sensor
- 3) Mounting:
 - a) Wall
 - b) Ceiling
- b. Light Level Controls:
 - 1) Automated control system computes light levels based on daylight intensity, occupancy sensors, and timed schedules.

ENVIRONMENTAL LIGHTING CONSIDERATIONS

A. Lamps

- 1. Fluorescent Lamps:
 - a. T8 Lamp or T5 Lamp
 - 1) Mercury:
 - a) Nonleachable form
 - b) Reduced mercury content
 - b. Efficacy: T5-90 to 100 lumens/ watt, depending on wattage
 - c. Color Rendering Index (CRI) Minimum 70
- 2. Compact Fluorescent Lamps (CFLs):(Equivalent wattages for fluorescent/incandescent lamps: 7W= 25W, 11W = 40W, 15W = 60W, 20W = 75, 25W = 100W
 - a. Circuline
 - b. Folded Tube
 - c. Twisted tube
 - d. Dimmable
 - e. Color Rendering Index (CRI) Minimum 80
- 3. High-Intensity Discharge Lamps: High-bay applications are often better served with high-output T5 fluorescent fixtures.
 - a. Metal halide
 - b. High-pressure sodium
 - c. Mercury vapor (generally not recommended)
 - d. Low-pressure sodium (generally not recommended)
- 4. Halogen Lamps
 - a. PAR lamp
 - b. Low-voltage MR16

B. Ballasts

- 1. Fluorescent Lamp Ballasts
 - a. Efficiency: shall meet or exceed California Energy Commission Requirements
 - b. Tandem wiring: Use two lamp ballasts; provide interwiring between fixtures
 - c. Type: (Magnetic ballasts are not allowed.)
 - d. Integral Ballast for CFL
 - 1) Modular ballast for plug-in lamp
 - a) High-frequency electronic

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- b) Power Factor 90% minimum
- c) High Ballast Factor
- 2) Dimmable: 100%-10%

C. UPS

- 1. Refer to Division 27 for UPS panels requirements in each building's IT room.

SMART METERING

Each new and renovated project will comply with the Smart Metering Guideline.

San Diego Community College District

District-Wide Smart Metering

Guidelines for

NEW & RENOVATED BUILDINGS

City College, Mesa College, and Miramar College

Prepared by: **Randall Lamb** May 24, 2011

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INTRODUCTION – *Program Description*

As part of its Green Building Policy, the San Diego Community College District (SCDDC) is deploying a District Wide Smart Metering System (SMS). This program is expected to generate specific energy consumption information for each of the three campuses, all buildings within those campuses and certain systems within those buildings. The information will be used to 1) confirm building performance for LEED compliance, 2) compare campuses and buildings for operational efficiencies, and 3) develop operational and maintenance programs that will reduce energy consumption and cost.

All new and remodeled facilities on the three campuses will require “smart meters” to be installed as part of their design and construction process. These meters will be connected to the Automated Logic Corporation’s (ALC) interface module in a similar fashion as other environmental control devices. These interface modules are then connected through the campus data networks and the District wide data network to the SMS management system located in the SDCCD Data Processing Center.

Existing buildings on the three campuses will be retrofitted to comply with these same SMS requirements.

The purpose of this document is to provide the SMS guidelines for all new and remodeled buildings located on the three District campuses.

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METER LOCATION GUIDELINES

Meters shall be installed to measure building's electrical, gas, chilled water and heating hot water loads. These meters shall measure, where possible, the following loads:

Electrical

- Building main electrical service
- Indoor lighting
- Exterior lighting
- Air handling equipment
- Fume hoods or other laboratory equipment
- Any special or unique power loads

Meters may be positioned to determine the above categories in an additive or subtractive configuration.

Gas

- Building main gas service
- Kitchens
- Any special or unique gas loads

Chilled Water

- Building main chilled water service

Heating Hot Water

- Building main hot water service

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Electrical – Main Building Service

Measured Quantities:	1. Voltage per phase 2. Voltage line to line 3. Voltage line to neutral 4. Current per phase 5. Power factor per phase 6. kWh, Consumption 7. kW, Real power 8. kW, Demand 9. Frequency 10. kVA per phase 11. kVAR per phase 12. THD, Voltage line to neutral 13. THD, Voltage line to line 14. THD, current per phase
----------------------	--

Measurement Configuration:	For 3-phase application, 208-600V, 3 wire delta or 4 wire wye.
----------------------------	--

Operating Temperature:	20 degrees C. to +70 degrees C. For exterior mounting, consider the local ambient temperature extremes and moisture proof enclosures.
------------------------	---

Humidity Operating Range:	5% to 90% RH (non-condensing)
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Accuracy:	ANSI C12.20 (0.5% Accuracy)
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Frequency:	60 Hz
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Output:	Modbus RTU/RS485
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Display:	Background-illuminated graphic display
----------	--

Suggested Manufacturers:	1. Square D 2. Eaton 3. Electro Industries/GaugeTech 4. Veris Industries 5. Siemens
--------------------------	---

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Electrical – All other Electrical Loads (*lighting, mechanical, any special power*)

Measured Quantities:	1. Voltage per phase
	2. Current per phase
	3. kWh
	4. Real-time load in kW
	5. Power factor per phase

Measurement Configuration:	For 3-phase application, 208-600V, 3 wire delta or 4 wire wye.
----------------------------	--

Operating Temperature:	20 degrees C. to +70 degrees C. For exterior mounting, consider the local ambient temperature extremes and moisture proof enclosures.
------------------------	---

Humidity Operating Range:	5% to 90% RH (non-condensing)
---------------------------	-------------------------------

Accuracy:	ANSI C12.20 (0.5% Accuracy)
-----------	-----------------------------

Frequency:	60 Hz
------------	-------

Output:	Modbus RTU/RS485
---------	------------------

Display:	None
----------	------

Suggested Manufacturers:	1. Square D
	2. Eaton
	3. Electro Industries/GaugeTech
	4. Veris Industries
	5. Siemens
	6. E-Mon Energy Monitoring

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Gas – Main Building Service

Measured Quantities:	Cubic Feet of Natural Gas
Measurement Configuration:	Natural Gas service to a building
Operating Temperature:	-40 degrees F to +140 degrees F.
Humidity Operating Range:	5% to 90% RH (non-condensing)
Accuracy:	± 1% of scale
Pulse Frequency:	Not less than two pulses per revolution. Meter pulser shall be coupled to meter dial to provide a pulse rate of not less than one pulse for every 100 cubic feet of gas.
Output:	Pulse Output
Rotary Type:	Rotary type meter shall conform to AGA B109.3 Meters shall be pipe or pedestal mounted and provided with a strainer immediately upstream. Meters shall be provided with over-pressure protection as specified in ASME B31.8. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates present. Meters shall have a pulse switch initiator capable of operating up to speeds of 500 pulses per minute with no false pulses and shall require no field adjustments or calibration. Initiator shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. The minimum pulse rate shall not be less than one pulse per 100 cubic feet of gas.

Suggested Manufacturers:	1. Dresser 2. Elster – American Meter
--------------------------	--

Chilled Water and Heating Hot Water – BTU Meters

Measured Quantities:	1. Total Energy 2. Total Flow 3. Energy Rate 4. Flow Rate 5. Supply Temperature 6. Return Temperature
----------------------	--

Measurement Configuration:	Chilled water , heating hot water, Domestic Hot Water, and condenser water
----------------------------	--

Liquid Temperature Range:	32 degrees F to 200 degrees F.
---------------------------	--------------------------------

Humidity Operating Range:	5% to 90% RH (non-condensing)
---------------------------	-------------------------------

Accuracy:	Differential temperature accuracy $\pm 0.15^{\circ}$ F over calibrated range. Computing nonlinearity within $\pm 0.05\%$.
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Frequency:	60 Hz
------------	-------

Output:	Modbus RTU/RS485
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Display:	Alphanumeric LCD Display
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Suggested Manufacturers:	1. Onicon 2. Flexim 3. GE Panametrics
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Chilled Water and Heating Hot Water – Flow Meters
Flow meter should be vortex shedding type

Measured Quantities:	Flow Rate (gpm)
----------------------	-----------------

Measurement Configuration:	Chilled water , heating hot water, Domestic Hot Water, and condenser water
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Liquid Temperature Range:	32 degrees F to 200 degrees F.
---------------------------	--------------------------------

Humidity Operating Range:	5% to 90% RH (non-condensing)
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Accuracy:	±2% accuracy with minimum flow rate of 1 fps.
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Output:	Analog Output
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Display:	Digital LCD Display
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Suggested Manufacturers:	1. Dresser 2. Bell & Gossett 3. Paco 4. GE PanaFlow MV82
--------------------------	---

Chilled Water and Heating Hot Water – Temperature Sensors

Measured Quantities:	Temperature (°F)
----------------------	------------------

Temperature Range:	-32 degrees F to 200 degrees F.
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Humidity Operating Range:	5% to 90% RH (non-condensing)
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Accuracy:	±0.1% accuracy
-----------	----------------

Output:	Analog Output
---------	---------------

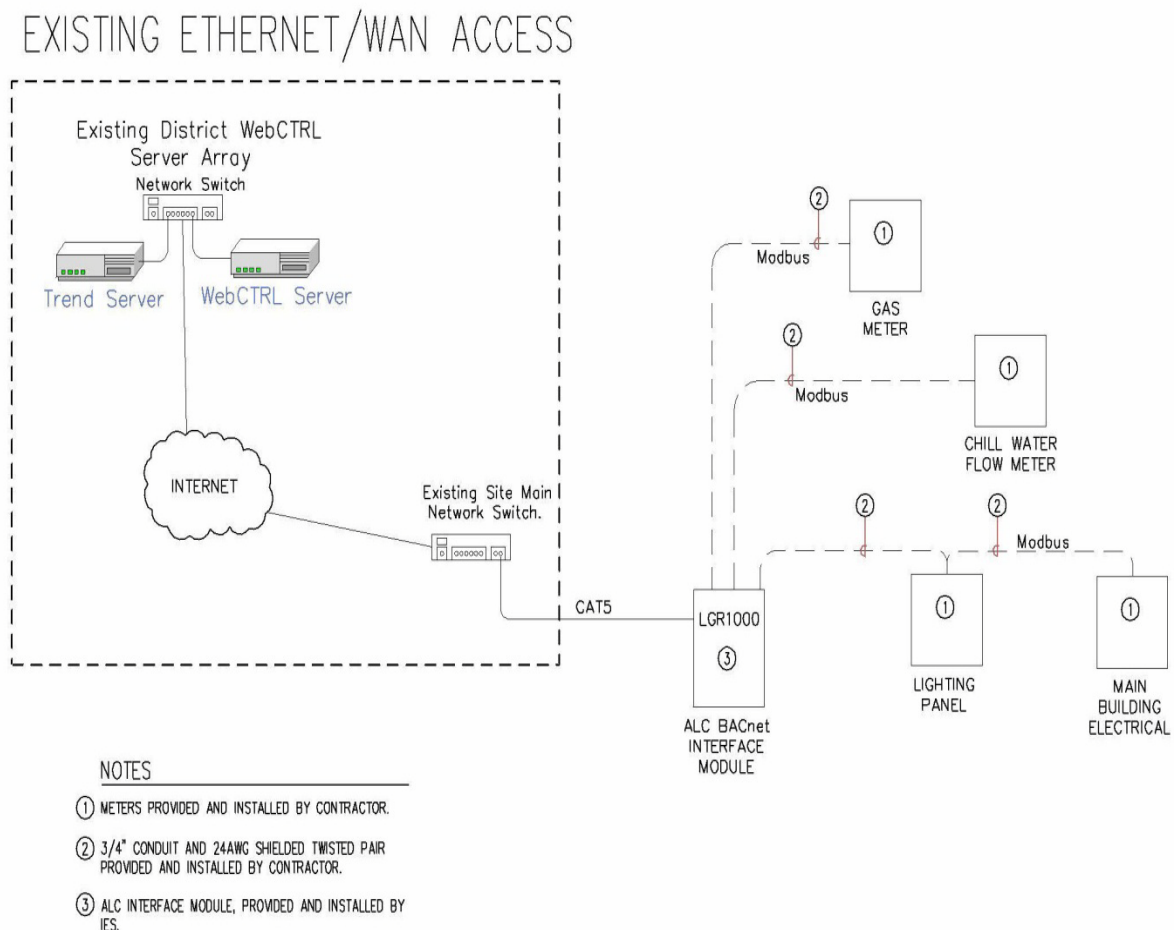
Suggested Manufacturers:	1. Johnson Controls 2. GE 3. Pyromation
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INSTALLATION GUIDELINES

Install meters in accordance with standard practices for good workmanship and other ANSI approved installation standards. Meter's output terminals shall be connected to closest Automated Logic Corporation (ALC) interface module using 24AWG shielded twisted pair (STP) cable, Belden #9841 or equal, in 3/4" conduit. Coordinate the location of the closest ALC modules with District's energy automation contractor, Integrated Energy Solution (IES). Each meter installed, shall be accompanied with the form in Attachment A (District Wide Smart Metering Installation Form).

Refer to diagram below for the general overall connection of the meters and areas of responsibility.



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ATTACHMENT A

Meter Documentation

District Wide Smart Metering Form									
Campus:		City	☐	Mesa	☐	Miramar	☐		
Building's Name:									
Meter Type:		Electrical	☐	Gas	☐	BTU	☐		
Meter Model #:									
Metered System:									
	Electrical:	Main Entrance	☐	Lighting	☐	Mechanical	☐		
		Special System	☐	Special System Description:					
	Mechanical:	Chilled Water	☐	Heating Hot Water	☐	Building Gas	☐		
		Kitchen/Spacial Gas	☐	Domestic Hot Water	☐	Other	☐		
Meter's Location:									
(e.g., Switchboard									
"MSB" in main electrical									
room, Chilled water									
pipe in mechanical room									
"ABC")									
Meter's Tag number as defined by ALC:									
<i>Note: This form must be completed and submitted to the district for every smart meter installed.</i>									

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ELECTRICAL**



COMMUNICATIONS REQUIREMENTS

I) DESIGN GUIDELINES FOR TELECOMMUNICATIONS

A) General Issues

- 1) A San Diego Community College District Information Technology Project Manager (IT PM) shall be assigned to all construction projects

- a) The IT PM shall

- (1) Be available and participate during all phases of design and during the construction period.

- (2) assist in understanding the current needs of the IT department to support the student, faculty and staff IT needs within the building

- b) SDCCD Information Technology Contacts

- (1) Primary contact(s):

Jim Phalan
IT Project Manager Prop S/N
District office/DSC
City College
Continuing Education
619-388-1135 (office)
619-654-1162 (cell)
619-388-1195 (fax)
jphalan@sdccd.edu

Don Bertram
IT Project Manager Prop S/N
Mesa College
Miramar College
619-388-1166 (office)
619-654-1166 (cell)
619-388-1195 (fax)
dbertram@sdccd.edu

- (2) Secondary contact

Glenn Bowers
Manager, Network and PC Services
619-388-1161 (office)
619-388-1195 (fax)

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2) Telecommunications Room (MPOE/MDF/IDF)

a) MPOE (Minimum Point Of Entry)

- (1) The MPOE is where all outside plant cables enter the building from an outside communication vault.
- (2) Requires a non-vented door leading directly to the outside of the building. If outside door is not possible, then leading into a main hallway on the 1st floor.
- (3) The MPOE and MDF can be located in one room provided the required ASF is achieved.
- (4) A minimum of four 4" conduits are required for cable pathways from the MPOE to the MDF.
- (5) A stand-alone MPOE does not require any environmental controls

b) MDF (Main Distribution Frame)

- (1) Each building will have one MDF. The MDF will contain core routers and switches for the building and provide services to additional IDF's if required.
- (2) Requires a non-vented door leading directly to the outside of the building. If outside door is not possible, then leading into the main hallway on the 1st floor.
- (3) Requires dedicated computer room air conditioning (CRAC) with a thermostat located inside the MDF room. Room temperature to be maintained at 72 degrees $\pm$ 2 degrees 24 hours a day 7 days a week.
- (4) Requires dedicated 208V power distribution panel

c) IDF (Intermediate Distribution Frame)

- (1) All secondary telecommunication rooms are called IDFs and will contain additional switches and/or server equipment to support the surrounding area
- (2) Requires a non-vented door leading directly to a main hallway
- (3) Requires dedicated computer room air conditioning (CRAC) with a thermostat located inside the MDF room. Room temperature to be maintained at 72 degrees $\pm$ 2 degrees 24 hours a day 7 days a week.

d) All MPOE/MDF/IDF's

- (1) When possible, the door should open out of the room
- (2) Door should be located at one corner of room
- (3) When possible, the door should be on the "short" wall
- (4) Doors should be keyed for a District MER4

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e) Access

- (1) To other spaces shall not be granted through MDF/IDF**
- (2) To MDF/IDF shall not be gained through other spaces**

f) Location

- (1) Normally each MDF /IDF should be located close to the center of area servicing within the building**
- (2) All IDF's for each floor should be stacked on top of each**
- (3) Location must not exceed 260 feet per drop inclusive of all pathways, conduits and cable trays**
- (4) If cable lengths will exceed 260 feet per drop, an additional IDF must be added to each floor to support all current and future data/telecommunication needs**

g) Assignable Area

- (1) Assignable space shall be determined using interior room dimensions**
- (2) Typical MPOE will be at least 80 assignable square feet with a minimum short wall distance of 8 feet.**
- (3) Typical MPOE/MDF combined room will be at least 220 assignable square feet with a minimum short wall distance of 12 feet.**
- (4) Typical MDF will be at least 180 assignable square feet with a minimum short wall distance of 10 feet.**
- (5) Typical IDF will be at least 120 assignable square feet with a minimum short wall distance of 8 feet.**

h) Walls/Surface Finishes

- (1) Drywall from floor to ceiling**
- (2) All walls to be taped, spackled and painted**
- (3) After final paint has been applied, install Fire-Rated Backboard**
 - (a) Shall be installed on all walls**
 - (b) Shall be 100% painted after IOR's inspection of material (Fire Rating Symbol can be masked and remain visible)**
 - (c) Shall be 5/8" minimum thickness**
 - (d) Shall start at 6" AFF**
 - (e) Shall rise to 8 ½' AFF (similar to standard 4' x 8' plywood sheets)**
 - (f) Shall be installed before any equipment, conduits, etc. is mounted on the wall**

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i) Flooring

- (1) Shall have 100% vinyl composition tile (VCT) coverage on all floors including Access Flooring with matching base.
- (2) Conduits or sleeves penetrating the floor shall extend between 3" and 6" AFF

j) Ceiling

- (1) Shall be open to floor above with no T-Grid or other plenum ceiling
- (2) All ventilation ducts shall be installed at the wall and not enter the room
- (3) When installed within the MDF/IDF, "Fan Coil Units" shall be mounted above the door
- (4) No other HVAC units or components will be placed within the MDF/IDF

k) Lighting

- (1) Shall consist of a minimum of two (2) each double bulb 4' fluorescent type fixtures
- (2) Shall be hung by chain from the ceiling and allow for a 90 degree reposition to maintain parallel positioning
 - (a) Intent is to light the front and back of Data/Server racks and not the cable tray running through the middle, racks may be parallel to the long wall or the short wall
- (3) Shall not be controlled by building lighting control panel (LCP)
 - (a) MDF/IDFs must be usable 24/7
- (4) Light switch can have motion or occupancy sensor to turn lights on and off but must have a manual override to turn lights on or off.
- (5) Should be installed at minimum 10' AFF

l) Plumbing or other "wet" pipes

- (1) No plumbing supplies, returns, drains, etc. shall run through any MDF or IDF
- (2) When this is not possible, a solid run with no joints must be used. Plumbing should run as not to have any leaks directly over items mounted to the wall or Data/Server racks running through "middle" of the room. This must be coordinated with assigned IT project Manager

m) Other utilities or services

- (1) No fan coils, compressors, pumps, water or drainage pipes, ducts or other devices not directly related to the function of the MDF/IDF shall be placed in any MDF/IDF

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- (2) No transformers, UPS, converters, power supplies or other electrical items not directly related to the function of the MDF/IDF shall be placed in any MDF/IDF

B) Pathways (CFCI)

- 1) All data conduits will be installed with pull string
- 2) All data conduits shall have a blue/green banding & labeled "TEL/DATA Use Only" both ends
- 3) Sufficient number and size NOT to exceed 40% fill ratios depending on type of cable (plenum, outside plant, fiber or CAT6) and its corresponding outside diameter (O.D.)
 - a) For O.D. purposes, use the following in determining 40% fill ratios
 - (1) Systimax CAT 6 copper
 - (2) Systimax 48 SM fiber

See Fill Ratio chart below

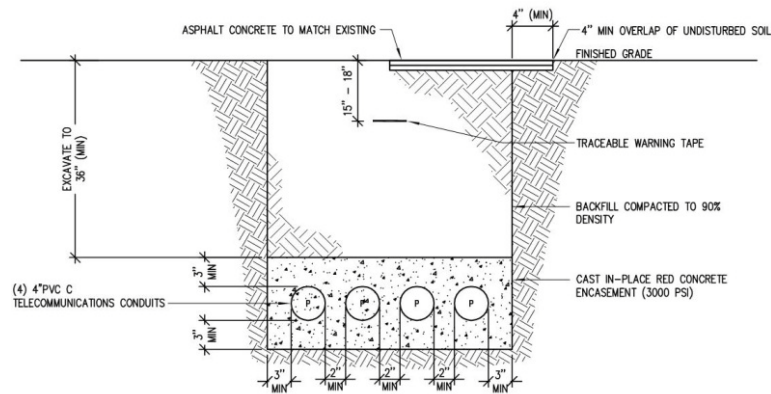
Fill Ratio	Conduit Trade Size (Diameter in Inches)	SYSTIMAX - CAT6					
		Inside Plant 0.23" OD 1071 & 2071			Outdoor Plant 0.25" OD 1571		
28%	1"		5			4	
	2"		7			6	
	4"		11			9	
40%	1"		21			17	
	2"		30			25	
	4"		45			38	
60%	1"		84			71	
	2"		121			102	
	4"		182			154	
28%: Recommended fill ratio for the cable capacity of <u>horizontal pathway</u> conduits that have no more than two 90 degree bends (180 degrees total) and are no longer than 100 ft.							
40%: Recommended fill ratio for <u>initial installation</u> of cable in furniture and horizontal pathway.							
60%: Recommended fill ratio for <u>unplanned additions</u> after initial installation. This fill ratio range may be used as an estimate and does not account for corners and other factors.							
All are per BICSI TDMM							

b) Fire-rated wall penetrations

- (1) Use E-Z Path or Hilti devices

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- (2) Observe 40% fill ratios based on same criteria as above
- (3) Ensure all fire caulking is 100% complete and inspected by IOR prior to cable pulls
- 4) Outside plant
 - a) All conduits shall
 - (1) be 4" inside diameter Schedule 40 or higher grade PVC
 - (2) Be a package of 4 each (minimum). Total number to be verified by IT PM
 - (3) have a pull tape not rope installed in all conduits
 - (4) have one mule tape installed within the package
 - b) Innerduct
 - (1) Contractor shall install
 - (a) Two 3-pocket MaxCell 4" in one conduit per package for fiber OSP
 - (b) Two 3-pocket MaxCell 4" in one conduit per package for copper OSP
 - c) Slurry encasement
 - (1) All 4" conduits to be installed during construction will be installed at prescribed depth using chairs to set spacing and encased in slurry (see diagram below).
 - (2) Typical depth is 4 feet with 3 feet of coverage over encasement as shown



TELECOMMUNICATIONS DUCT BANK (TYPICAL)

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5) Inside Plant

a) Inside conduits, cable trays, pathways and wall penetrations

- (1) Shall meet all requirements as specified by IEEE 802.3u**
- (2) Shall be clearly identified on all DD, DSA and Construction Drawings**
- (3) All conduits and cable trays must have access from an accessible area**
- (4) The primary pathways for inside plant should be via the above ceiling grid space. Below or in slab conduits for data should only be utilized when absolutely necessary.**
- (5) Inside plant should utilize cable tray as the primary means of distribution in the above ceiling grid areas.**

b) Floor Boxes(where approved)/Wall Access panels

(1) Raised floor/Access flooring

- (a) Submit one with electrical and data compartments configured as a submittal item.**
- (b) Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to floor boxes and components. Meet or exceed UL Fire Classification requirements for recessed and flush style boxes. Listed and Labeled in accordance with NFPA 70, Article 100**
- (c) Accessibility Compliance: Design device flange to meet ADA Accessibility Guidelines as to changes in floor and ground surface levels.**
- (d) Must be capable of accommodating a minimum two 20 amp 120VAC electrical circuits and 12 CAT-6 data circuits**
- (e) Box should have at a minimum, three (3) 1" concentric knockouts, one (1) 1.25" Knockout, and one (1) 2" knockout.**
- (f) Floor boxes are discouraged and must be approved by District Architect. If floor boxes are provided, submittals should be submitted to District Architect prior to acceptance.**
- (g) Floor box covers should be manufactured from die-cast aluminum with powder coat finish. The covers should have the capability to accept tile or carpet inserts or solid covers.**
- (h) Conduits feeding floor box need to accommodate the fill ratio for power and data cables being installed at the specific location. Coordinate final configuration with IT PM.**

(2) Cast in Concrete

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- (a) Submit one with electrical and data compartments configured as a submittal item.
 - (b) Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to floor boxes and components. Meet or exceed UL Fire Classification requirements for recessed and flush style boxes. Listed and Labeled in accordance with NFPA 70, Article 100
 - (c) Accessibility Compliance: Design device flange to meet ADA Accessibility Guidelines as to changes in floor and ground surface levels.
 - (d) Must be capable of accommodating a minimum two 20 amp 120VAC electrical circuits and 12 CAT-6 data circuits
 - (e) Floor boxes are discouraged and must be approved by District Architect. If floor boxes are provided, submittals should be submitted to District Architect prior to acceptance.
 - (f) Box should have at a minimum, three (3) 1" concentric knockouts, one (1) 1.25" Knockout, and one (1) 2" knockout.
 - (g) Floor box covers should be manufactured to meet requirements for cast in concrete environment. The covers should have the capability to accept tile or carpet inserts or solid covers.
 - (h) Conduits feeding floor box need to accommodate the fill ratio for power and data cables being installed at the specific location. Coordinate final configuration with IT PM.
- c) Surface Mounted Raceways
- (1) Surface mounted Raceways
 - (a) Raceway will be a minimum dual channel raceway for branch circuit wiring and data network, voice, audio video low voltage wiring.
 - (b) Raceway should be manufactured from aluminum alloy and be UL Listed
 - (c) Should feature a two piece design with a base and a snap-on cover.
 - (d) Minimum size should be a minimum of 8 sq. inches of internal volume space of which 4.5 sq. inches for the data compartment and 3.5 sq. inches for the electrical compartment.
- d) Number of riser conduits/sleeves shall be sufficient between the floors
- (1) All conduits or sleeves will be 4" in size
 - (2) Minimum of two conduits/sleeves for each IDF above or below MDF. Refer to 40% fill ratios in determining the number conduit/sleeves required. This shall be verified with IT PM

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Example - MDF (1st Floor) to IDFs on 2nd, 3rd and 4th floors

- MDF to IDF 2nd floor – minimum 6 conduits/sleeves
- IDF (2nd floor) to IDF (3rd Floor) – minimum 4 conduits/sleeves
- IDF (3rd floor) to IDF (4th floor) – minimum 2 conduits/sleeves

e) Conduit risers within classrooms, labs, lecture halls, conference rooms and offices

(1) All data drops should be fed by minimum 1" conduits within the wall and/or floors

(2) All data boxes should be Quad electrical J-box with duplex reducer mounted within the wall

(3) Data boxes should normally have (1) 1" EMT from j-box location to an accessible ceiling space

(4) If more than 6-8 cable drops are needed, either use;

(a) One each 2" EMT, or

(b) Two each 1" EMT, or

(c) More as prescribed by 40% fill ratio for CAT6 UTP plenum cable per manufacturer's specification

f) Recommended penetrations for fire-rated walls are EZ-Path (preferred) and Hilti devices

(1) Quantity and size of these devices should be consistent for the number of cables that will pass through the wall.

(2) Installation of these devices should include all fire stopping required to maintain fire rating of fire-rated walls

(3) Wiring contractors will provide fire stopping to the interior of conduits, etc.as required to maintain fire rating of fire-rated wall

C) Electrical Requirements

1) Power Panels/Distribution Panels (CFCI)

- a) A dedicated surface-mounted Power Distribution Panel (sized as necessary to accommodate the required circuits) should be located in the MDF room. This panel will provide power (at a minimum) to the main Critical Power IT UPS (Uninterruptible Power Supply) and convenience outlets within the MDF
- b) A surface-mounted Critical Power Distribution Panel (sized appropriately to accommodate all individual dedicated circuits for all floors in a stack) to be located in the MDF room. This panel is fed from the output of the Critical Power IT UPS.

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2) Ground Bus (CFCI)

- a) A ground bus bar is required in each MDF/IDF
- b) All ground bus bars are to be the same electrical ground as building ground for electrical systems for the building
- c) Each MDF/IDF ground bus bar shall be tied together with the ground bus bar located in the MDF

3) Convenience Outlets

- a) One Quad Outlet will be located in the middle each wall
 - (1) If any wall is longer than 10 feet, then place (2) each quad outlets evenly spaced
- b) One Duplex Outlet will be located at 96" AFF on the opposite "short" wall from the door
- c) One Duplex outlet will be located on the "short" wall adjacent to the door per Intrusion panel
 - (1) Verify with District Fire/Alarm team on number of intrusion panels in each MDF/IDF

4) Controls

- a) MDF/IDF requires 7/24 service
- b) Electrical, lighting and CRAC requirements preclude placing these services on a building management system
- c) District monitoring of lighting and CRAC should be included with local controls for both.
- d) HVAC/Lighting Control may be located in the MDF Telco on same short wall adjacent to Door as Fire/Intrusion alarm systems at 96" AFF or higher

5) Transformers/Inverters

- a) No transformers should be co-located within the MDF or IDF rooms
- b) No transformers in adjacent rooms should be on common walls with the MDF or IDF rooms
- c) No Inverters should be co-located in any MDF/IDF

6) Telco UPS Requirements (OFCI)

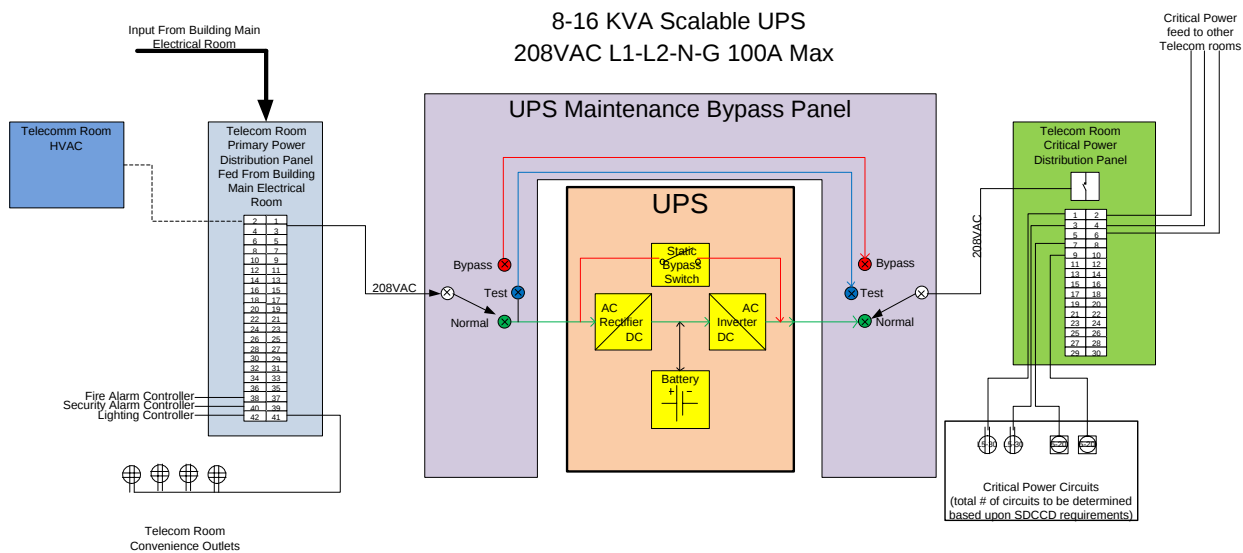
- a) District IT will purchase an appropriate size UPS for each MDF/IDF
- b) Construction Electrical contractor shall be responsible to provide the appropriate plugs, outlets, wiring, conduits and installation as required, thus Owner Furnished

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Equipment (UPS) and Contractor Installed (all other items not limited to what is described here)

- c) District IT will determine which makes and models will be installed for each new building. This information will include the number of UPS that will be installed, which MDF/IDFs and make/models of each unit.

San Diego Community College District Typical 8-16KVA UPS Single Line Drawing



- d) The above diagram should be used as a reference and should be modified for each new building. Final design should be completed in concert with direction from the assigned IT PM for the project
- e) Per the diagram above, the project electrical contractor will perform the following tasks;
- (1) Install the Surface Mounted Telecom Room Primary Power Distribution Panel with appropriately sized circuits for the required services (to be confirmed by the IT PM)
 - (2) Install the Surface Mounted UPS Maintenance Bypass Panel (OF CI)
 - (3) Install the Surface Mounted Telecom Room Critical Power Distribution Panel with appropriately sized circuits for the required services (to be confirmed by the IT PM)
 - (4) Route power from the Telecom Room Primary Power Distribution Panel to the UPS Bypass Switch/Panel using EMT

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- (5) Route power from the UPS Bypass Switch/Panel to the UPS using EMT and Seal Tight
- (6) Route Power from the UPS back to the UPS Bypass Switch/Panel
- (7) Route Power from the UPS Bypass Switch/Panel to the “Telecom Room Critical Power Distribution Panel”
- (8) From the “Telecom Room Critical Power Distribution Panel” (4) each dedicated Quad circuits will be provided to each MDF/IDF room
 - (a) Location will be verified by IT PM
- (9) From the “Telecom Room Critical Power Distribution Panel” (2) each dedicated circuits will be provided to (normally) one MDF/IDF room utilizing a L5-30R receptacle
 - (a) Location will be verified by IT PM
- (10) All circuits and receptacle’s will be labeled at each location
- f) In addition, a dedicated wall mounted L6-30R is needed in each IDF. Location to be determined by assigned IT PM
 - (1) Separate dedicated circuit from the “Telecom Room Primary Power Distribution Panel” to each Telco
 - (2) L6-30R will be mounted on the wall
 - (a) Location to be verified by IT PM

D) Heat Loads

- 1) Initial equipment heats loads will be based on the placement of 1-3 core switches in the MDF and 1-2 Core switches or multiple Stackable Switches in each IDF.
 - a) Location of the Core Switches will generally be in the 1st floor MDF room but could be located on an upper floor as directed by the District IT Manager
 - b) Each Core switch has redundant 1200 watt power supplies and will be at max loads
 - c) Stackable switches at 375 watts may be distributed throughout the building MDF/IDF locations
- 2) MDF will have a minimum of one 12-16 kVA UPS with up to 16kVA load (this includes a core router switches and servers)
- 3) Each IDF will have a minimum of 2 and a maximum of 8 switches at 375 watts each (750-3000 watts) plus any required HP DL380 series servers. Estimating 2-4 servers (800 watts each) could be added within 1- 2 years after opening building. This could add an additional 1600 - 3200 watts of load in an IDF room.

E) SDCCD Information Technology Project Manager

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- 1) IT PM will assist the project architect and electrical engineer to determine the following information;
 - a) Cable pathways
 - (1) Cable trays
 - (2) Conduits
 - (3) Which manhole will provide District IT backbone facilities
 - b) J-box locations for;
 - (1) Data/telephone drops
 - (2) Emergency phone drops including site located Talk-a-phone
 - (3) Call box drops
 - c) Provide location in MDF and/or IDFs for the following items;
 - (1) Fire panels and Annunciators
 - (2) Intrusion panels
 - (3) Wiring (110 blocks)
 - (4) HVAC controller(s)
 - (5) Lighting Control panel(s)
 - d) Working with Campus A/V coordinator, will provide assistance with Infrastructure to support A/V equipment
 - e) Coordinating work of district wiring vendor
 - f) MDF and IDF room layout
 - g) Wiring plan
 - h) Outside Plant Cabling (OSP) both copper and fiber
 - i) Inside Plant Cabling (ISP) both copper and fiber
 - j) All other wiring needed for other items, TV, Video-teleconferencing, etc.
 - k) IT switch locations
 - l) Assist (with campus A/V coordinator) in coordinating work of district A/V vendor
 - m) Assist (with District Police) in coordinating work of District Safety Camera vendor.
- F) IT PM will assist the General Contractor foreman/project manager or Construction Manager (CM-Multi-Prime contracts) Superintendent/Project manager with the following;
 - 1) Setting up a meeting to integrate installation of OSP and ISP cabling with District Wiring Vendor into the Project Master Schedule

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- 2) Setting up a meeting to integrate installation of A/V wiring and equipment into the Project Master Schedule
 - 3) Coordinating District IT personnel to support network and telephone needs for commissioning items
 - 4) Coordinating District IT personnel and District Wiring Contractor to support FF&E items for a successful move-in of District Staff/faculty/Students into new and renovated buildings
 - 5) Be the primary point of contact for District IT related issues during to the construction period
 - 6) Attending meetings as needed to maintain active communications for District IT during the construction period.
- G) The San Diego Community College District (SDCCD), Information Technology (IT) Department works with the architect and engineers to design the following:
- 1) Data/telephone cabling pathways
 - a) Cable Trays
 - b) Data/Telephone Conduit and Box Locations
 - c) Conduit Labeling
 - d) Pull Strings
 - 2) Ladder rack installations in primary corridors/hallways
 - 3) Audio Visual solutions, infrastructure to support (power/conduits/floor box locations)
 - 4) Lighting issues in all classrooms/conference rooms that will have Audio Visual solutions
 - 5) Dedicated power to Audio Visual locations
 - 6) MDF/IDF room (MPOE/MDF/IDF) size, backboards, lighting, ground bus bars
 - 7) Fire Panel location if in MDF/IDF
 - 8) Alarm Panel location if in MDF/IDF
 - 9) MDF/IDF Dedicated Power Distribution panels
 - 10) MDF/IDF Dedicated CRAC if needed
 - 11) Conduit from nearest campus data manhole to new building
- NOTE: All of the above shall be part of the construction contract
- H) SDCCD contracts with their own third party vendors to procure and/or install some or all of the following:
- 1) UPS and UPS Equipment

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- 2) All racks, cable tray, wire management residing in the MDF/IDF(s)
- 3) All Data/Telephone Cabling
- 4) Audio Visual equipment to include possible electric screens in ceiling grid and projector mounting hardware
- 5) Telephone solutions, including desktop phones and emergency classroom phones
- 6) Camera systems, if any
- 7) All fiber-optic and copper connectivity to new building
- 8) All fiber-optic and copper cabling in new building
- I) The following items shall be accommodated in the construction schedule. Please provide the assigned SDCCD IT Project Manager with a copy of the construction schedule and place all IT Project Managers and the Network Manager on the email list to be inform of any changes to that schedule and to receive the weekly Owner's Meeting minutes. The assigned IT Project Manager shall attend the weekly meetings as needed and on a periodic basis to maintain good communications with the project management team.
 - 1) Completion of MDF/IDF rooms
 - a) VCT Flooring
 - b) Walls completed and painted
 - c) Backboards installed, inspected and painted on all walls
 - d) Door installed (may be temporary with construction core)
 - e) Lighting (may be temporary construction lights provided by electrical contractor)
 - 2) Date to begin installation of Outside Plant cabling (both copper and fiber facilities)
 - 3) Date to begin rough in of Inside Plant Cabling (both copper, CAT6 and fiber facilities)
 - 4) Date to complete IT cabling related to commissioning items;
 - a) HVAC controller
 - b) EMS
 - c) LCP
 - d) PV
 - e) Elevators
 - f) Fire Alarm
 - g) Intrusion Alarm
 - 5) Date to complete IT cabling related to move-in of faculty and staff;

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- a) Faculty/Staff
 - b) Computers
 - c) Phones
 - d) Fax machines
 - e) Printers
 - f) Other IT related items
- 6) Instructional
- a) Computers
 - b) Emergency Phones
 - c) Printers
 - d) Other IT related items
- J) Communications between management team and SDCCD IT vendors
- 1) SDCCD IT Vendors understand construction safety rules, and are bonded and insured. For each construction project, all SDCCD IT vendors (each worker) shall attend safety orientation, safety briefings as directed by the GC and/or CM.
 - 2) SDCCD IT Vendors (assigned Foreman) shall attend the weekly foremen meetings as directed by the GC and/or CM.
 - 3) Conflicts between SDCCD IT Vendors and the GC and/or CM, should be directed to the assigned IT Project Manager. The PM shall resolve the conflict and shall take appropriate action when conflict involves workmanship, inappropriate conduct and failure to perform issues. Scheduling issues shall be discussed and corrected as swiftly as possible.
 - 4) The goal of the SDCCD IT department is for a smooth partnership between the District's personnel and its vendors, and the project construction team.

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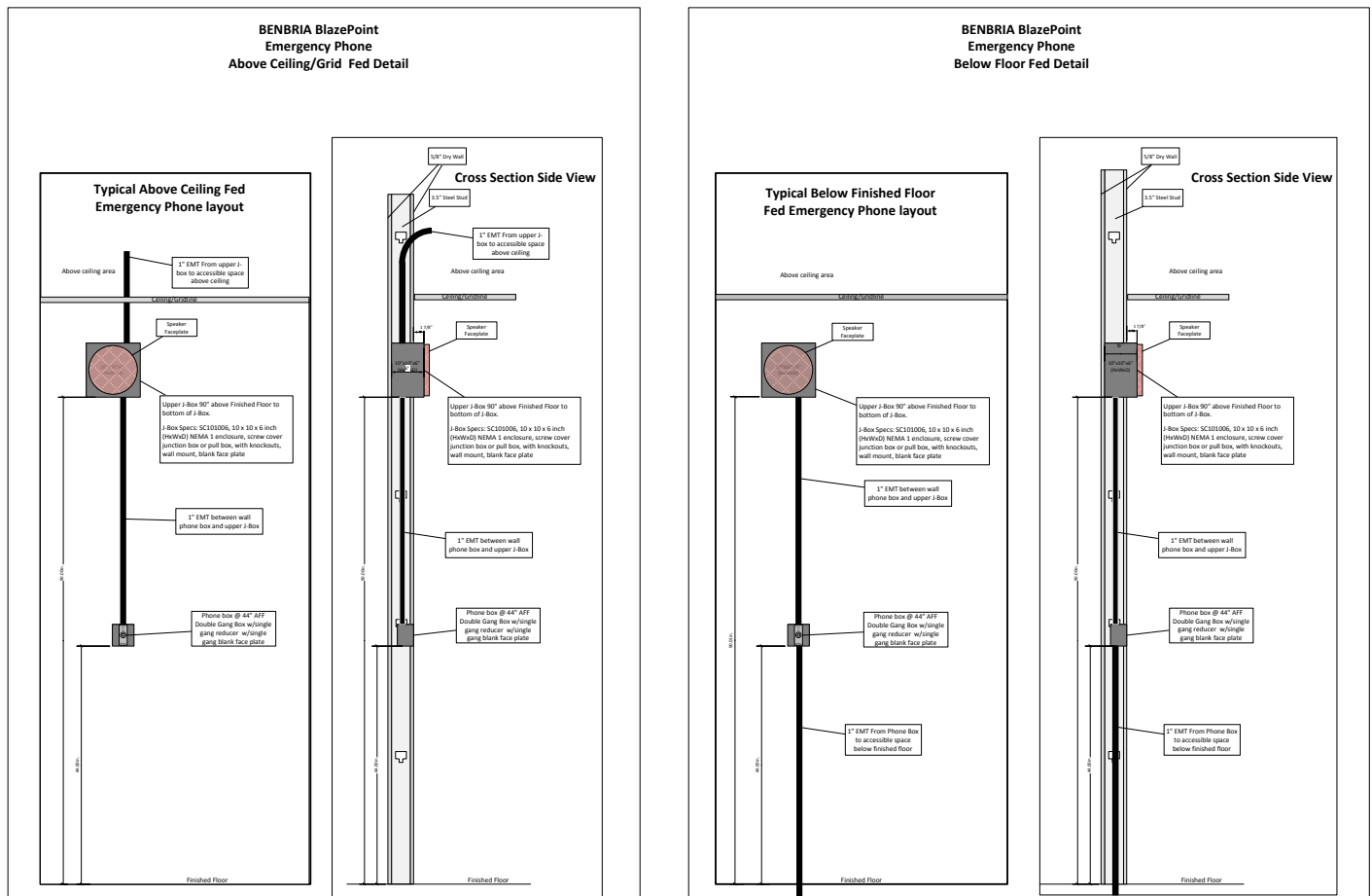
II) DESIGN GUIDELINES FOR TELEPHONY SYSTEMS

A) Emergency Classroom Telephones

- 1) Emergency Classroom Telephones will be installed in every instructional classroom to facilitate communication needs.
 - a) SDCCD will provide and install (OFOI) the Emergency phone device.
 - b) Electrical contractor is responsible for installing the conduit and J-Box as per design (CFCI).
- 2) The location of these devices will normally be near the main entry/exit door and should project sound toward the classroom audience

SDCCD BlazePoint Emergency Phone Typical Layout

Created 02/24/2011 Rev 1.0 (DP8)



- 3) The above diagram should be used as a typical installation for each classroom emergency phone installation. Final design and location should be completed in concert with direction from the assigned IT PM for the project

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B) Elevator Emergency Phone

- 1) Emergency phones will be installed in all elevators.**
 - a) Phone will be integrated into the control panel of the elevator.**
 - b) Elevator Phone must be compatible with the SDCCD PBX system (Mitel SX2000) using an ONS analog port.**
 - c) Phone must be programmable to dial out to SDCCD College Police Dispatch**
 - (1) Programming must be able to be accomplished locally by SDCCD Telephony Technicians or by dialing into the unit from another on-site PBX line**
 - (a) Any hardware, software, and instructions for programming must be provided to SDCCD IT Telephony Manager.**
 - (b) NOTE: All SDCCD elevators dial an on-premise SDCCD PBX number and do not have access to the Public Switched Telephone Network (PSTN).**

III) DESIGN GUIDELINES FOR AUDIO-VISUAL SYSTEMS

A) STANDARD CLASSROOMS

- 1) This section is intended for rooms with a projector and screen installation with a lectern/podium/teaching desk**
- 2) Projector Location:**
 - a) The projector will be located 12'6" from the front wall. It should be center of the room. It's important that this location is centered on a ceiling tile and not on the ceiling grid.**
 - b) Power for the projector should be a 6' whip, above the ceiling grid, 14' from the front wall. The whip is a temporary condition. The outlet will be ceiling mounted by the audio visual contractor when installation of the projector is completed.**
- 3) Screen Location:**
 - a) The top of the screen enclosure will be mounted a minimum of 108" AFF. This is important so that the bottom of the screen, when extended is no lower than 40" AFF. The screen has a 60" drop. The enclosure is an additional 8". The screen should be centered on the front wall.**
 - b) The fire strobe should not be located behind the screen location. A ceiling mounted strobe is preferred.**
 - c) The clock should be mounted on the rear wall.**
 - d) If the room is equipped with a white board, and a whiteboard light is used, the light must be installed above the screen mounting height, 108" AFF.**

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- e) Note –All classrooms screens are manual, with Controlled Screen Return (CSR). Structural backing must be provided for the screens. The shipping weight is 55 pounds. The dimensions of the case are 102"W x 6"H. The District's AV contractor will provide and install the screens.

4) Room Lighting Fixtures:

- a) If pendant lights are used, the lowest point on the light must be at least, 9'6" AFF, and run parallel to the projector. Per SDCCD BIM standards, projector throw should be modeled for clashes with light fixtures.

5) Lectern location:

- a) To meet ADA and the Districts DSPS accessibility requirements, there must be a 48" clear space from the lectern to the lip of the white board tray, or any other protrusion from the teaching wall.
- b) Floor Box
 - (1) Location to support the teaching podium/desk/lectern location should be located at 5 feet from front wall and 4 feet from side wall
- c) Typical floor box should be a Wiremold RFB-11 or Wiremold AT8 or similar. Coordination should be done with assigned IT PM
- d) Two, 1.25" (minimum size) conduits are needed from the floor box to the space above the ceiling grid.
- e) Duplex power receptacles are required in the floor box and on the projector whip.

B) NON-STANDARD ROOMS

- 1) This section is intended for rooms with a projector and screen installation, but without a lectern.
- 2) When a lectern is omitted from a standard Smart Classroom installation, there are two alternatives for housing the electronic equipment that would otherwise be located in the lectern.
- 3) Equipment Alternative #1:
 - a) This the preferred alternative. All A/V electronic equipment will be installed within casework in the room or in a stand-alone credenza. For either of these options, the equipment will be installed in a standard 19" wide rack, (outside dimensions: 22.48"H x 20.40"W x 17.91"D). The rack will then be inserted into the casework or credenza. When casework installation is selected, please provide screen vent on door.

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- b) One, 2" grommet is necessary in the rear of the credenza as a pass-through for the necessary cables.
 - c) A duplex power receptacle is required within the case work or on the wall behind the credenza location. A duplex power receptacle is also required on the power whip for the projector.
 - d) A quad data drop is required within the casework or on the wall behind the credenza location. A single data drop is also required to the controller.
 - e) A 3-gang j-box will be required to mount the system controller. A location will be identified per project, by the AV Project Manager.
 - f) One 1" conduit is required from the controller to the space above the ceiling grid
 - g) One 1" conduit is required from the equipment rack location (casework or credenza) to the space above the ceiling grid
 - h) (Options) If the room is equipped with a floor box and/or LED display, then one, 1" conduit is required from the LED display to the space above the ceiling grid.
 - i) Two 1.25" (minimum size) conduits are needed from the floor box to the space above the ceiling grid
 - j) One 1" conduit is also required from the floor box to the equipment rack location.
 - k) The notes from the Standard Classroom for the projector location, screen location and lighting fixtures apply to this section as well.
- 4) Equipment Alternative #2:
- a) Electronic equipment will be installed in a wall-mounted, rack-box. Specifications for the wall mounted box will be provided by the District's A/V Vendor as needed per project.
 - b) When possible, the wall box is built into the wall. Power and data are run into the wall box from the rear, within the wall.
 - c) In addition to the power for the wall box, a duplex power receptacle is also required on the power whip for the projector.
 - d) A quad data drop is required to the rear of the wall box. A single data drop is also required to the controller.
 - e) A 3-gang j-box will be required to mount the system controller. A location will be identified per project, by the AV Project Manager.
 - f) One, 1" conduit is required from the controller to the space above the ceiling grid.
 - g) One, 1.25" conduit from the wall box to the space above the ceiling grid

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- h) (Options) If the room is equipped with a floor box and/or LED display, then one, 1.25" conduit is required from the LED display to the space above the ceiling grid.
- i) Two, 1.25" (minimum size) conduits are needed from the floor box to the space above the ceiling grid.
- j) One, 1.25" conduit is also required from the floor box to the equipment rack location.
- k) The notes from the Standard Classroom for the projector location, screen location and lighting fixtures apply to this section as well.

C) CONFERENCE ROOMS

- 1) Conference Rooms will be equipped with an LED display instead of a projector and screen.
- 2) Display Infrastructure:
 - a) The display location will require backing to mount the display. The location will also need a duplex power outlet and a 1.25" conduit with a 1-gang j-box installed 60" AFF. The duplex outlet and the 1 gang j-box should be mounted centered of the display wall in coordination with the furniture layout; e.g., center of conference room table.
 - b) 1.25" conduit will be needed from the floor box to the equipment rack location.
 - c) 1.25" conduit will be needed from the equipment rack location to the area above the ceiling grid.
 - d) 1.25" conduit will be needed from the display location to the area above the ceiling grid.
 - e) 1" conduit will be needed from the controller to the area above the ceiling grid
 - f) A 3-gang low voltage mud ring will be needed at the same height as the light switches, left of the display. Note – some installations will require a 2-gang mud ring instead. Please confirm with the AV Project Manager.
 - (1) A network cable drop will be needed at this location.

D) PUBLIC ADDRESS SYSTEM

- 1) The District standard is for a building-wide public address system to be installed in all new buildings with more than two floors. The public address system will be designed and installed by the District's audio visual contractor.
- 2) The point of initiation for an announcement will be through the District's telephone system. Audio output for an announcement will be through speakers installed in all designated announcement zones.

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- 3) Announcement zones will include corridors, conference rooms, classrooms and student/faculty lounge areas.
- 4) PA system Infrastructure Requirements
 - a) The control hardware for the PA system will be rack-mounted in an IDF or MDF closet. The specific closet will be determined on a per-project basis. The total rack space needed for the hardware may be up 24 U's.
 - b) Where available, speakers will be installed above the t- grid. Where t-grid is not available, speakers may be surface mounted. Speaker locations will be determined on a per-project basis.
 - c) Typically, speaker cable will be run above the t-grid. Where t-grid is not available, the AV contractor will coordinate with the CM to determine the optimum cable path.
 - d) A half inch cable pass-through will be needed into each room where PA speakers will be installed.

E) DIGITAL SIGNAGE

- 1) Digital Signage for informational, way-finding, and safety purposes, will be a component of all new buildings. A minimum of one (1) digital signage display shall be located on each floor of any new building. Coordinate the exact locations of all digital signage displays with the Audio Visual Project Manager. The digital signage displays shall be located in a high-visibility area. A typical location would be:
 - a) Entrance Lobby
 - b) Elevator Lobby
 - c) Staircase Landings (for large staircases only)
 - d) Public Gathering / Common Areas
- 2) Display Mounting
 - a) All flat panel display locations shall have structural backing support provided inside the wall construction. Back support shall be a minimum of ¾" plywood spanning the entire size of the flat panel display. Display specifications will be provided by the audio visual contractor.
 - b) For locations requiring extra large displays (60"+) and/or cantilever or swing arm mounts, additional backing support will be required. Specifications will be provided by the audio visual contractor.
 - c) Power receptacles located behind the display shall be recessed "clock" style outlets.
 - d) Typical Flat Panel Display mounting heights will be 52" AFF to the bottom of the display.

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- e) Typical electrical, data, and low voltage connection plate heights will be 60" AFF. A dual port data connection and dual power is required at all Digital Signage Display locations.
- f) A cable path must be identified from each display location to an IDF/MDF closet to be determined on a per project basis.
- g) Digital Signage hardware and installation will be provided and installed by the District's Audio Visual Contractor

A. Digital Clocks (wireless)

1. Locate clock on the wall opposite the teaching wall or back third of the side wall; include in Contractor Bid.



2.5" and 4" 4-Digit Display



2.5" and 4" 6-Digit Display

Primex Wireless

GPS Synchronized Time Systems
shall be District Standard

Wall Display

14201G 4"(10.16cm), 4-digit
display, 120 vac
Green LED Display



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Digital Clocks (wireless) cont'd



Transmitter 1- watt model
number 14006 with internal
antenna



Transmitter 1-watt Model number
14000E
with external antenna

CommandPoint
72 XR Transmitter
72XR5 5-watt Transmitter

ELECTRONIC SAFETY & SECURITY REQUIREMENTS

INTRUSION ALARM SYSTEMS

General:

1. Provide submittal and shop drawings to District Architect for review with Facilities prior to acceptance.

PART 1 GENERAL

1.1 GENERAL AND SPECIAL CONDITIONS

- A. General and Special Conditions apply to all work under this section.
- B. The Contractor shall furnish all labor, equipment, tools, material, drawings, et cetera, necessary for a complete intrusion alarm system. The system shall be as designed by the Owner. The purpose of the furnished specifications and drawings is to convey to the Contractor the scope of the work required, all of which the Contractor is responsible to furnish.
- C. The Contractor shall examine all existing physical conditions which may be material to, or affect, the performance of his work. No extra payments will be allowed made necessary by his failure to do so. Any omission, discrepancy, or lack of clarity shall be promptly identified to the Owner and Engineer for clarification prior to bidding the project.
- D. The Contractor shall provide all devices and equipment required by these specifications and drawings. Under no circumstances shall the Contractor omit or delete any devices or equipment without the written directive of the Owner or Engineer.

1.2 DEFINITIONS

- A. AHJ – Authority Having Jurisdiction (DSA-Inspector)

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- B. Approved – Unless otherwise stated, materials, equipment, or submittals approved by the Owner, Architect, or AHJ**
- C. Communicator – The Control/Communicator**
- D. Concealed – Hidden from view**
- E. Contractor – The Company awarded the primary contract for this work and any of its subcontractors, vendors, suppliers, or fabricators.**
- F. Device – any peripheral equipment including, but no limited to, door contacts, motion detectors, keypads, expansion modules, sounders, etc.**
 - 1. Applied to wiring, conduit, etc. – installed or run above drop ceilings, in chases, inside walls, etc.**
 - 2. Applied to door contacts, installed inside the top of door frames and doors.**
- G. Dispatch – The San Diego Community College Police Dispatch Center.**
- H. District - The San Diego Community College District.**
- I. Engineer – The system designer or engineering company designated by the owner.**
- J. EOL – End-of-line resistor. Typically 1000 (1k) ohms for Bosch equipment.**
- K. Exposed – Visible or not concealed**
 - 1. Applied to wiring, conduit, etc. – installed or run on walls, ceilings, etc. where it is visible.**
 - 2. Applied to door contacts, installed on door frames and doors at the top of the door.**
- L. IAC - Intrusion Alarm Communicator, see ‘Communicator’ above.**
- M. Intrusion Alarm System – the entire system including all panels, devices, wiring, etc.**
- N. Owner – San Diego Community College District.**
- O. Panel – see ‘Communicator’ above.**

1.3 SCOPE OF WORK

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A. The Contractor shall furnish and install, unless otherwise indicated, all items required for a complete Intrusion Alarm System(s) as described in these specifications and drawings.

- 1. Provide a new, state of the art Intrusion Alarm System. This is to include all wiring, communicators, modules, door contacts, motion detectors, keypads, panic/hold-up switches and any other devices and equipment specified either in these specifications or on the blueprints.**
- 2. Provide a network connection for each Panel from the nearest available connection to the District network. Cable to be run by others.**
- 3. Provide an on-site, factory trained technician acceptable to the Owner and AHJ to supervise the installation.**
- 4. Provide an on-site project manager.**
- 5. Conduct weekly progress meetings and issue monthly written job progress reports to the Owner's Representative and Engineer.**
- 6. Submit shop drawings to the Engineer or Owner's Representative for approval by the Engineer and Owner.**
- 7. The contractor shall provide any x-ray of walls or slabs prior to core drilling and any required fireproofing or sealing of the cores.**
- 8. Prior to the final acceptance test and pre-testing by the Contractor, conduct a complete test of the entire system upon completion of the installation to assure the Owner's Representative and Engineer that the system is operational.**
- 9. Conduct the final acceptance test. The Alarm Contractor shall furnish personnel who are familiar with the installation at a time convenient to the Owner's Representative, the Engineer, and the AHJ. This test shall take place as soon as convenient after the completion of the installation and prior to the building being turned over to the Owner for occupation. If necessary, any punch list items shall be corrected and the entire system re-tested at the Contractor's expense prior to final acceptance of the system. The two-year warranty shall begin upon acceptance of the system by the Owner's Representative, the Engineer, and the AHJ.**
- 10. Provide training of the Owner's personnel as required by the Owner. A maximum of two days shall be required for this training.**

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- 11. Provide a two-year job site warranty of all materials and labor as specified elsewhere in this section.**

1.4 RELATED WORK

A. Materials and work specified in other sections.

- 1. Fire stopping**
- 2. Basic electrical materials and work**
- 3. Mechanical (heating and air-condition duct locations, etc.)**

1.5 SYSTEM DESCRIPTION

- A. The Intrusion Alarm System shall be a state-of-the-art, networked system and shall be programmable using the District's current software over the District network (WAN).**
- B. The Intrusion Alarm System shall communicate to Dispatch via the District WAN.**
- C. Each Alarm Initiation Device shall be on its own zone either on the Communicator or on a zone expansion module connected to the Communicator.**

1.6 APPLICABLE STANDARDS

The latest adopted issue of the following standards is hereby made a part of this specification:

- A. NFPA 70 – *National Electrical Code***
- B. Uniform Building Code (with California Amendments)**

1.7 SUBMITTALS

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- A. Provide complete product data (including manufacture's descriptive and technical literature) and catalogue cut sheets clearly marked to indicate the model and catalogue number of each device for approval by the engineer and Owner's Representative.
- B. Provide shop drawings including building floor plans showing device locations, complete wiring and schematic diagrams, conduit size, wire routing, and field terminations; panel layout including all modules and interconnections with the panel. The shop drawings shall show the proposed layout of the panel and all peripheral equipment and devices, its location in relation to other equipment in the area, and clearances for maintenance and serviceability. Shop drawings shall be prepared using a minimum scale of $1/8" = 1$ foot for plans and $1/4" = 1$ foot for details.
- C. Provide substantiating calculations showing the adequacy of power supplies and back-up batteries. If additional power supplies are required, provide calculations for those as well. All power supplies shall have a minimum of 20 percent additional capacity for later expansion if necessary.
- D. Provide submittals within two weeks of notice to proceed. Partial submittals are NOT acceptable and will be returned to the contractor unreviewed.
- E. All costs to review additional submittals resulting from an initial rejection shall be the responsibility of the submitting contractor. The Owner shall back-charge the Contractor for additional review(s).
- F. Submittals rejected by the Owner's Representative and the engineer shall be corrected and resubmitted within seven (7) days of the review letter date.

1.8 DELIVERY, STORAGE AND HANDLING OF MATERIALS

- A. Contractor will deliver all materials to area of project designated by the Owner's Representative. Vehicles shall not block fire lanes or fire doors during delivery of materials
- B. Owner will not accept deliveries for the Contractor
- C. The Owner's Representative will designate an area within the facility for storage of all materials. At the end of each working day, all materials shall be returned to the designated area. Material, equipment, tools, etc will not be left outside the storage area without the consent of the Owner's Representative

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- D. The cost of all material handling, delivery and freight is the Contractor's responsibility. The Owner or his representatives will not be responsible for material delivered to the site.
- E. Maintain premises free from accumulation of waste materials or rubbish caused by this work. At the end of each day, remove from the site all surplus materials, tools, and all waste. The Contractor shall leave the premises clean to the Owner's satisfaction.
- F. The Contractor shall arrange and pay for parking

1.9 WARRANTY

- A. The Contractor shall provide a two (2)-year written guarantee against defects in material and workmanship furnished under this Contract. The costs of such guarantee shall be part of the purchase price. The guarantee commences when the Owner's Representative and Engineer accept the system and installation
- B. The guarantee shall include all necessary material, travel, labor and parts to replace defective components or materials at the job site. The Contractor shall commence repair of any "in guarantee" defects within 24 hours of notification of such defects.
- C. The Contractor shall make allowances in his guarantee to cover diagnosis of system defects, which might ultimately be the responsibility of others to correct. When this occurs, the Owner's Representative and other affected trades shall be notified.
- D. The Contractor shall keep in effect the performance bond for one year after the system has been accepted by the Owner's Representative and the Design Professional

1.10 AS-BUILT DRAWINGS

- A. Maintain at the site an up-to-date, marked set of as-built drawings, which shall be corrected and delivered to the Owner's Representative upon completion of the work

1.11 CHANGES

- A. No changes are to be made in the installation from the layout unless specifically approved by the Owner's Representative. This does not include minor revisions for the purpose of coordination of work.

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1.12 DAMAGE

- A. The Contractor shall be responsible for all damage to the building, its contents, systems, etc. caused by his work during or after installation, testing, clean-up, etc.

1.13 CLEAN-UP

- A. Maintain the premises free from accumulation of waste materials or rubbish caused by this work to the Owner's standard for cleanliness. Carpeting shall be protected from damage and clean up will be the responsibility of the Contractor.
- B. At the completion of work, remove all surplus materials, tools, etc. and leave the premises clean to the Owner's standard of cleanliness.

1.14 SAFETY

- A. All work shall be performed in compliance with the Occupational Safety and Health Act of 1970 (OSHA) and Construction and Safety Act Standards.

1.15 QUALITY ASSURANCE

- A. The Intrusion Alarm Contractor shall maintain a fully staffed branch office including application engineers, drafters and technical service personnel within 30 miles of the San Diego metropolitan area.
- B. The electrical contractor shall perform installation of all electrical circuits for the Intrusion Alarm System, including wire installation and terminations. The Intrusion Alarm Contractor shall install all intrusion alarm wiring related devices and make all connections associated with them.

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PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Acceptable equipment for this project must be suitable for use with the District Wide Area Network (WAN)**
- B. Acceptable equipment for this project must be compatible with the Bosch RPS programming software and be downloadable over the District WAN.**
- C. Acceptable equipment for this project shall have sufficient zone and user capacity to handle the usage for which it is intended.**
- D. Product data information for alternate products shall be submitted to the Engineer and Owner's Representative within seven (7) days after the pre-bid meeting for product equivalency approval.**
- E. Products for this project shall be of the latest design; obsolete or discontinued products will not be accepted.**

2.2 INSTALLATION MATERIAL

A. Wiring

- 1. All wiring is to be solid jacketed: stranded wire is not to be used.**
- 2. All field wiring is to be 22-4 solid station wire with a white outer jacket. Conductor shielding shall be Red, Black, Yellow and Green.**
- 3. Wiring between the panel (and peripherals) and the punch blocks shall be 22-10 or 22-12 solid station wire. Conductor shielding shall be Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, and White. Pink and Tan shielding are the standard for the additional wires for the 12-conductor wire (22-12)**
- 4. All field wiring is to be clearly labeled with permanent marker to be readily identifiable at punch blocks. Each wire is to be labeled with the type of device and its location in such a way as to identify the specific device to which it is connected..**

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5. Splices shall be kept to a minimum. All splices shall be made only in terminal cabinets or on approved backboards using 50-pair, #66 punch blocks. Standoffs are not to be used with the punch blocks.

B. Conduit

- a. Where used, conduit shall be 1/2" minimum and shall conform to NFPA 70 for the specific application
- b. Conduit that is concealed or installed in unfinished areas shall be electric metallic tubing and flexible conduit in conformance with NFPA 70.
- c. Conduit exposed to weather shall comply with NFPA 70 and the requirements of the AHJ.
- d. All fittings shall be listed and approved for the specific conduit. For threaded rigid steel conduit do not use threadless or compression-type fittings.
- e. All EMT conduit fittings shall be steel or malleable iron compression couplings and connectors.
- f. Maximum conduit fill shall be fifty (50) percent of that permitted by the California Electrical Code
- g. All concealed system conduit shall be blue in color or externally identified at 10-foot intervals, in each space, and at junction box covers, by permanent blue paint suitable for the purpose.
- h. Exposed conduit in finished areas shall be plastic wiremold type as specified elsewhere or on the blueprints. Fill shall not exceed fifty (50) percent of its rated capacity. Wiremold not closely matching the surface on which it is installed shall be painted to match the surface on which it is installed.

C. Terminal Cabinets

- a. Minimum size shall be 11 inches x 15 inches x 4 inches deep with a hinged lockable cover. For cabinets 24 inches x 24 inches or larger plate covers mounted with tamper resistant screws may be used.

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- b. Terminal cabinets shall be identified as part of the Intrusion Alarm System on the outside face of the cabinet with an engraved plastic label using ½ inch white letters on a blue background.

D. Plenum Cable

- a. Shall be installed per National Electrical Code, Articles 725 and 760.
- b. The cable shall be marked with the wire model number, wire gauge, and number of conductors.
- c. The cable shall be UL listed for low voltage signaling applications.

2.3 CONTROL EQUIPMENT

A. Communicator (Intrusion Alarm Communicator, Panel)

- 1. The communicator shall be a Bosch 9412G-C with a DX4020 Network Interface Module unless otherwise specified. If building usage permits the 7412G-C may be used in buildings of less than 20,000 square feet with approval of the engineer. The 9412G-C must be used in buildings of 20,000 square feet or larger or where more than 56 zones are required. The DX4020 is to be mounted inside the communicator cabinet and connected to the District network using a Category 5 or better cable. Firmware version 7.06 is not to be used – version 7.07 or higher is preferred. The latest version (currently version 3 – 9412GV3), shall be used.

In the event this communicator is no longer available another communicator may be used provided that it has at least the same capabilities and is compatible with the Bosch RAM/RPS programming software. Otherwise the communicator shall be supplied with at least two (2) computers, to be specified by the District IT department and include all software necessary for trouble shooting, upgrading, and programming the new equipment. These computers are to be installed (1 in the College Police dispatch center and the other in the Alarm Technicians' office), programmed and tied

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into the District network by the contractor in cooperation with the District Alarm Technicians and the District IT department.

2. The communicator shall be capable of communicating to the alarm monitoring system in Dispatch via the District network and include all equipment necessary for such communication.
3. Unless otherwise specified the communicator shall be manufactured by Bosch and be the model specified.
4. The communicator shall be programmable via the District network using the Bosch RPS software.
5. A separate electrical outlet shall be provided for each communicator. The outlet shall be a duplex type mounted in a single gang box with the grounding terminal at the bottom. Outlets for the alarm systems shall be on a separate dedicated circuit. The circuit breaker shall be clearly marked and have a breaker lock to prevent the breaker from being accidentally turned off.

B. Power Supplies

1. All power supplies shall be designed with a capacity of at least 20 percent more than currently used.
2. If more power is required than is available from the communicator, additional auxiliary power supplies shall be used. Each auxiliary power supply shall be 12 VDC and a minimum capacity of 5 amps. (Altronix LCS5C12X or approved equal.)
3. Back-up power supplies (batteries) shall be of sufficient capacity to operate the system for a minimum of eight (8) hours.

C. Keypads

1. Keypads shall be Bosch D1260W unless otherwise specified
2. A maximum of eight (8) keypads shall be connected to each communicator.
3. Each keypad shall be assigned a unique address. Where possible the keypad address shall correspond with the area to which it is assigned

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D. Modules

1. Network interface module (NIM) – Bosch DX4020. Used to connect the communicator to the District WAN.
2. Zone expansion module - Bosch D8128D. Eight (8) zone module used to connect additional zones to the communicator. One required for each additional eight zones or portion thereof in excess of the eight zones available on the main board of the communicator.
3. Relay module – Bosch D8129. Used to add additional outputs to the communicator. One is available (relay A) on the main board of the communicator.

2.4 ALARM INITIATING DEVICES

A. Door Contacts – GE/Sentrol 1087T

1. Unless otherwise indicated, are to be surface mount, spdt (form C) type - Sentrol 1087T or approved equal.
2. Flush mounted contacts may only be used where aesthetics is a concern. In aluminum or silver colored frames use USP 270 spdt or approved equal. Under no circumstances are flush mount contacts to be used in steel doors or steel door frames.
3. Are to be of a color that most closely matches the door and frame on which they are mounted

B. Roll-up Door Contacts – GE/ Sentrol 2207AU

1. Unless otherwise indicated, are to be floor mounted.
2. The magnet is to be mounted magnet side down and may need a mounting bracket for proper orientation.

C. Explosion-proof Door Contacts – GE/Sentrol 2807T

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1. To be used where the potential of explosion exists: for example welding gas or gasoline storage areas.

D. Motion Detectors Honeywell/C&K DT7400 Series

1. Unless otherwise indicated are to be wall mounted and be of the dual technology (combination PIR and microwave) type – Honeywell/C&K DT7400 series or approved equal.
2. In very large open areas (fifty feet or more in each direction) a ceiling mounted detector may be used with the approval of the Engineer and Owner's Representative – Honeywell/C&K DT5360 or approved equal.
3. In all cases motion detectors are to be of a range appropriate to the area being protected.

E. Hold-up/Panic Switches

1. Unless otherwise specified, are to be of the latching type using a metal forked key to reset. – Amseco HUS-7AI or approved equal.

F. Projector Alarms

1. May be used in other applications as well such as large screen monitors.
2. Shall be of the pull-apart type – GRI 4704A or approved equal
3. The assembly shall consist of the following:
 - a. One GRI 4704A contact
 - b. Two each GRI M4704 magnets & 4635 sockets. (One each comes with the contact)
 - c. One Omron 6C873 (or equal) relay
 - d. One ATW SGST-W (or equal) minihorn
 - e. Necessary mounting hardware

2.5 OTHER EQUIPMENT

A. Sounders

1. Minihorns – ATW SGST-W or approved equal.

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2. Sirens – ATW 508 or approved equal. Only to be used in area where the ambient noise level is such that a minihorn could not be readily heard.

PART 3 INSTALLATION

3.1 EQUIPMENT

A. General

1. The Contractor shall provide factory trained and authorized personnel for on-the-job supervision of the proper installation of devices in cooperation with, or as may be required by, other trades. This shall include the following:
 - a. Provide specific on-site instructions to others on mounting and installation of each type of device by physically observing the installation of one or more of each type of device, as required, to assure that the installer is properly instructed in the work.
 - b. Provide supervision as required by others to properly perform alarm installation work.
 - c. Coordinate with the Engineer and District alarm technicians the programming of the communicator and all related equipment.
 - d. Perform a complete test of the system, certifying that all devices have been activated and that the devices and systems have performed in accordance with the requirements of this specification.
 - e. Provide as-built layout drawings and detailed wiring diagrams to the Engineer and Owner's Representative.
2. All mounting screws, except those supplied with the equipment, shall be combination phillips/slotted head. When mounting hardware is supplied, the equipment shall be mounted using the supplied hardware where feasible.
3. All communicators, panels, terminal cans, punch blocks, modules, etc. shall be mounted no lower than 48 inches (to the bottom) nor more than 78 inches (to the top) above the finished floor.

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4. All Bosch equipment is to only be installed by Bosch trained and certified installers or under the direct supervision of the District Alarm Technicians.

B. Wiring

1. All device wiring is to be home run from each device to the room where the communicator is located or other designated centralized location (such as a remote telecommunications room) and terminated on a 50 pair #66 punch block. Each alarm initiating device (motion detector, door contact, hold-up button, etc.) shall be on its own zone on the communicator. Wiring from the communicator (or modules) is to be on the left side of the punch block. Wiring out to the devices is to be on the right side of the punch block. Connection between the left and right sides shall be made using bridging clips.
2. Loop wiring is to be #22-4 solid white jacket station wire unless otherwise specified. The conductor insulation shall be red, black, yellow, and green. The red/black combination is to be used for power only. Each wire is to be labeled at the punchblock with the type of device and its location in such a way as to identify the specific device to which it is connected.
3. Loop wiring for devices not requiring power shall be yellow/black for the primary loop and, if a second loop is used on the same wire, red/green for the second loop. The yellow (or red) shall be the loop feed and the black (or green) shall be the loop return or common.
4. Motion detectors and other devices requiring power shall use the red as positive power, black as negative power, yellow as loop feed, and green as loop return or common.

C. Communicator

1. The communicator is to be mounted on a ¾" plywood backboard using four #10, ¾" or 1" long, pan head screws with combination flat/Phillips head using the cabinet furnished by the manufacturer of the communicator.
2. Wiring from the punch block to the communicator shall be #22-10 or 22-12 solid station wire. If 22-12 is used the tan and pink wire may not be utilized. Conductor insulation colors shall be as listed below. Wires shall be run and be connected as follows:

Wire	Use	(7412)	(9412)
------	-----	--------	--------

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Black	Common (#12)	- Power	(#29)	(#29)
Brown	Zone #1 (#11)	Zonex 2 out ()		(#26)
Red	Zone #2 (#13)	+ DC Power (#32)		(#32)
Orange	Zone #3 (#14)	Zonex +Power (#32)		(#24)
Yellow	Zone #4 (#16)	Data Out	(#31)	(#31)
Green	Zone #5 (#17)	Data In	(#30)	(#30)
Blue	Zone #6 (#19)	Zonex 2 in ()		(#25)
Violet	Zone #7 (#20)	Zonex 1 out (#28)		(#28)
Grey	Zone #8 (#22)	Zonex 1 in (#27)		(#29)
White	Common (#12)	Zonex -Power (#29)		(#23)

3. Zone expansion may be accomplished by using a Bosch D8128D OctoPOPIT 8-zone module for each additional 8 zones or portion thereof. Up to eight OctoPOPITs may be used for the 7412 or 15 per Zonex loop (30 total) for the 9412.

D. Modules

1. D8128D OctoPopit

- a. This is an 8-zone expansion module used for adding addition zones to the Communicator. One module is needed for each additional eight (8) zones or portion thereof.
- b. D8128D OctoPOPIT modules may be added to the communicator. Each OctoPOPIT must be programmed sequentially (i.e. the first for zones 9 thru 16, the second for zones 17 thru 24 etc.) prior to power up. All zones on each OctoPOPIT require an EOL resistor.
- c. If installed remotely, may need to be wired directly to the Zonex loop on the main board of the communicator without going through a punch block. If more than one OctoPopit is used, the jumper supplied with the unit may be used to interconnect the additional units.
- d. Wiring between the OctoPOPIT and the punch block shall be 22-10 or 22-12 (see Communicator above) solid wire and connected as follows:

Brown	1st Zone (9, 17, etc.)	Loop Feed
Red	2nd Zone (10, 18, etc.)	Loop Feed
Orange	3rd Zone (11, 19, etc.)	Loop Feed

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Yellow	4th Zone (12, 20, etc.)	Loop Feed
Green	5th Zone (13, 21, etc.)	Loop Feed
Blue	6th Zone (14, 22, etc.)	Loop Feed
Violet	7th Zone (15, 23, etc.)	Loop Feed
Gray	8th Zone (16, 24, etc.)	Loop Feed
Black	Common	Loop Return
White	Common	Loop Return

2. D-8129 Relay Module

- a. This is an 8-relay output module. One module is needed for each additional eight (8) outputs or portion thereof.
- b. Each module needs to be programmed prior to power up.
- c. If used for minihorns, the relay address must correspond with the address of the keypad with which the minihorn is associated.
- d. If used for minihorns do not use relay A on the main board for a keypad associated minihorn, use the corresponding relay from the D8129 instead.
- e. Install a jumper wire from the positive (+) power terminal of the D8129 to the common terminal of each relay.
- f. Use the same wiring configuration as for the D8128D OctoPopit (section 3.3.A.3 above). Connect the black and white (common) wires to the negative (-) power terminal on the D8219 and the 'loop' wires to the Normally Open (NO) terminal for each relay..

3. DX4020 NIM

- a. Must be mounted inside the communicator cabinet, in the right-hand position on the top of the cabinet.
- b. Must be wired directly to the SDI bus on the communicator. Do not wire through a punch block.
- c. To be programmed by the District alarm technicians.

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E. Keypads

1. Keypads shall be mounted 48 inches above the finished floor maximum to the highest operating component of the keypad.
2. Wire to the keypads shall be 22-4 and have the specified colors from the SDI bus tied to the corresponding colors on the keypad harness.
3. A minihorn shall be installed directly above each keypad either four (4) feet above the keypad or maximum of 12 inches (to the bottom of the minihorn) below the ceiling, whichever is lower.

F. Door Contacts

1. Door contacts shall be installed on (or in) the door frame approximately four (4) inches from the latch side of the door.
2. The yellow and black wires are to be used. The red and green wires are spares and may be cut off at the contact. If a second contact is connected to the same wire the red and green wires may be used for the second loop.
3. The yellow (or red) wire shall be tied to the Closed Loop (CL) terminal and the black (green) wire to the Open Loop(OL) terminal.
4. The EOL shall be installed between the Open Loop (OL) and Common terminals on the contact.

G. Motion Detectors

1. Unless otherwise specified motion detectors shall be installed using #6 pan head sheet metal screws seven feet six inches (7'6") to eight feet (8') above the finished floor or six inches (6") below the ceiling whichever is lower measured to the top edge of the detector.
2. The motion detectors shall be installed in such a way as to cover the area for which they are intended to protect (e.g. windows). If necessary they are to be corner mounted or mounted using swivels designed for use with the motion detector.

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3. The ceiling mounted DT-5360 has a thirty (30) foot radius (minimum) coverage and is only be used in very large open areas. It must be mounted at least twenty-five (25) feet from any wall and thirty (30) feet from any window.
4. Motion detectors shall be wired as follows:

Conductor	Punch Block	Contact
Red	+ DC Power	Positive power (+) terminal
Black	- DC Power	Negative power (-) terminal
Yellow	Loop Feed	Closed loop (CL) terminal
Green	Loop Return	One side of the tamper switch

5. The EOL shall be tied between the Common alarm terminal and the opposite side of the tamper switch from the green wire.

H. Panic/Hold-up Switches

1. Panic/Hold-up switches shall be installed in such a way as to prevent accidental activation of the switch. They should not be mounted facing directly out or up, unless specifically designated.
2. The same wiring scheme shall be used as for door contacts (section 3.4 above)

I. PowerPoint Projectors

1. Two magnet assemblies (GRI 4702M/4635) shall be used. One shall be mounted on the projector using LOCTITE Super Bonder 409 or equivalent. The other shall be mounted away from the projector (preferably on the ceiling) but close enough that the contact can easily be inserted into it without extending the contact cable.
2. An ATW SGST-W Minihorn shall be mounted in close proximity to the projector (preferably on the ceiling) so that the wiring from the contact can be connected to the minihorn without splicing additional wire to it.
3. A 12VDC double-throw relay (Omron 6C873 or approved equal) shall also be used.
4. The wiring and devices shall be connected as follows:

A 22-4 white station wire from the punch block to the unit connected as follows:

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Conductor	Punch Block	Contact
Red	+ DC Power	Open Loop on 4704A
Black	- DC Power	- Terminal on relay & minihorn
Yellow	Loop Feed	Yellow wire on relay (closed loop terminal)
Green	Loop Return	Green Wire on relay (open loop terminal)

Relay: Five wires (yellow, green black & 2 red) as follows:

Conductor	Relay	Other location(s)
Red	+ Coil	4704A Common & + terminal on minihorn
Black	- Coil	Black from panel & - terminal on minihorn
Red	Common contact	One side of EOL resistor
Green	Open Loop contact	EOL and green from punch block
Yellow	Closed Loop contact	Yellow from punch block

4704A Contact

Common	+ terminals on relay coil and minihorn
Open Loop	Red wire (+ DC Power) from punch block

If a wiring schematic is needed, it is available through the District Alarm Technicians' office.

J. Sounders

1. Sounders shall be mounted directly above each keypad either four (4) feet above the keypad or maximum of 12 inches (to the bottom of the minihorn) below the ceiling, whichever is lower and elsewhere as indicated.
2. A 22-4 wire shall be used to connect the sounder to the relay.
3. The red wire shall be for the positive (+) power and tied to the positive terminal on the sounder. The black wire shall be for the negative (-) and be tied to the negative (-) terminal on the sounder.
4. For sounder circuit requiring greater power (multiple minihorns, sirens, etc.) the yellow wire may be tied in parallel with the red wire and the green wire in parallel with the black wire. In such cases the red and yellow wires shall be twisted together as shall the black and green wires.

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K. Other Devices

1. Other devices not requiring power shall be installed per manufacturer's instructions or as directed by the District Alarm Personnel. The same wiring scheme shall be used as for door contacts (section 3.4.B through 3.4.D above).
2. Other devices requiring power (such as glass break detectors) shall be installed per manufacturer's instructions unless otherwise specified or instructed by the District Alarm Personnel. The same wiring scheme shall be used as for motion detectors (section 3.5.D above).

3.2 TESTING / QUALITY CONTROL

- A. The final alarm acceptance test shall be coordinated with the Owner's Representative and the Engineer. A letter certifying that the installation is complete and fully operational shall be forwarded to the Owner and Engineer.
- B. The Contractor, the Engineer, Owner's Representative, and an authorized representative from each supplier of equipment shall be in attendance at the final acceptance test to make necessary adjustments. The final test shall include, but not be limited to:
 1. A test of the complete system for grounded, open and shorted circuits.
 2. A test of each device for functions specified and for the required alarm actions.
 3. All communications equipment shall be tested to ensure that all signals are received the SDCCD Police Dispatch Center. This includes, but is not limited to, all network and digital communications.
 4. A test of the system for electrical supervision.
 5. A test to verify that the emergency power source (back-up battery) is capable of operating the system for specified periods.
 6. A test to verify that the system will operate under specified trouble conditions.
 7. A test to verify that the system will perform all specified tasks
 8. A test to verify that a hard copy of all required system actions will be properly provided.

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- C. A minimum of 2 day(s) may be required for these tests.
- D. If the system requires a retest by the Engineer or Owner's Representative, all costs for the retest shall be the responsibility of the Contractor.
- E. The Contractor shall pay all overtime pay required by the Owner's Representative for witnessing the acceptance test.

3.3 TRAINING

- A. Provide training of Owner's personnel in the proper operation procedures. The training program for the Owner's personnel shall include the following:
 - 1. Operations and Maintenance Manuals containing complete operating instructions, outline step-by-step procedures required for system start up, operation, and shut down, including the manufacturer's name, model number, service manual, parts lists, and brief description of all equipment and their basic operation features. Complete maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, trouble-shooting guide, and as-built blueprint drawings of the complete system, including conduit layout, equipment layout, device labels, and simplified wiring and control diagrams of system. Operations and Maintenance Manuals shall be submitted and approved prior to conducting the training course.
 - 2. Three separate 2 -hour training sessions for operating personnel. The sessions are to cover proper operating and response procedures. These instructions shall be sufficient to enable an untrained person to properly operate the system.

3.4 AS-BUILTS

- A. Provide a complete set of reproducible, two (2) blue line prints, and a set of disks in AutoCAD of the drawings and wiring diagrams reflecting "as-built" conditions.
- B. Provide a complete set of "as-built" data sheets for all equipment connected to the system.
- C. Provide complete "as-built" software for all relevant components.
- D. All items of this section shall be provided prior to final payment request.

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3.5 SPARE PARTS

- A. All spare parts shall be directly interchangeable with the corresponding components of the installed system**
- B. The following spare parts shall be furnished to the Owner. Quantities to be specified elsewhere.**
 - 1. Door contacts**
 - 2. Motion detectors (of each type)**
 - 3. Panic/Hold-up switches**
 - 4. Keypads**
 - 5. Expansion modules**
 - 6. Any other device(s) specified**

FIRE ALARM SYSTEMS

1 GENERAL

1.1 GENERAL AND SPECIAL CONDITIONS

- A. General and Special Conditions shall apply to all work under this section.**
- B. The Contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, etc. necessary for a complete total coverage, addressable fire alarm system. The Contractor shall not delete any equipment or devices without the written directive of the Owner and Engineer.**
- C. The purpose of the furnished specifications and drawings is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to**

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furnish, install, adjust, and make operable.

- D. The fire alarm system shall comply with all applicable codes including, but not limited to, the following: National Fire Code (NFPA72), California Building Code, California Fire Code, National Electric Code (NFPA70).
- E. The Contractor shall examine all existing physical conditions, which may be material to the performance of his work. No extra payments will be allowed to the Contractor as a result of extra work made necessary by his failure to do so. Omission, discrepancy or lack of clarity shall be promptly identified to the Owner and Engineer for clarification prior to the bid due date.
- F. Doors that lead to the Fire Alarm Panel shall have signage in RED that reads, “ FIRE CONTROL PANEL INSIDE.”

1.2 DEFINITIONS

- A. ADA -- Americans with Disabilities Act.
- B. AHJ -- Authority Having Jurisdiction (Division of State Architect).
- C. Approved -- Unless otherwise stated, materials, equipment, or submittals approved by the Owner, Architect or AHJ.
- D. Contractor -- The Company awarded the prime contract for this work and any of its subcontractors, vendors, suppliers or fabricators.
- E. CSFM -- California State Fire Marshal.
- F. District (The District) -- The San Diego Community College District
- G. Engineer -- Engineer or engineering company designated by the District.
- H. FACP -- Fire Alarm Control Panel.
- I. Fire Alarm System -- The entire fire alarm system including all panels, annunciators, devices, and peripheral equipment. The system shall monitor all devices and connected equipment and generate all appropriate responses and signals.
- J. Listed -- Materials or equipment included in a list published by a nationally

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recognized laboratory that maintains periodic inspection of production of listed equipment and material, and whose listing states either that the equipment or materials meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

- K. NFPA -- National Fire Protection Association.
- L. Owner – The San Diego Community College District

1.3 SCOPE OF WORK

- A. The Contractor shall furnish and install, unless otherwise indicated, items required for a complete fire alarm system as outlined in these specifications and shown on the drawings. The work includes, but is not necessarily limited to, the following:
 - 1. Provide a new state-of-the-art fully automatic addressable fire alarm system, including smoke detectors, manual pull stations, heat detectors, duct detectors, ADA compliant annunciation (strobes, horns, etc.), waterflow switches, valve supervisory devices, magnetic door holders and any other devices or equipment specified either elsewhere in these specifications or on the blueprints.
 - 2. Provide a point addressable control system, addressable initiating devices, signaling devices, indicating devices, sensors, annunciators, relays, software, accessories and other materials and equipment for a complete operating system.
 - 3. Provide monitoring of the fire sprinkler system.
 - 4. Provide duct-mounted smoke detectors in the main supply-air ducts(s) to effect shutdown of each air handler rated at supplying more than 2000 CFM. Provide control relays to actuate smoke/fire doors as shown on the drawings.
 - 5. Connect to the existing HVAC control system to provide control functions, in accordance with the specifications.
 - 6. Provide a network connection from the new FACP to the existing fire alarm OnyxWorks or current District monitoring system including all necessary

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hardware components. Network drop to be furnished by others.

7. Install all data into the OnyxWorks or current District monitoring software. This shall include all data necessary for the proper functioning of the system and shall include, but not necessarily be limited to, the building graphics (blueprints/floorplans for the project, device types, locations and addresses, etc.), panel information, network IP addresses, etc.
8. Provide smoke detectors in each elevator machine room and in each interior elevator lobby. Provide relay modules to effect primary and alternate floor recall of each elevator. Connect the new fire alarm system to the elevator controls for elevator recall. Where required provide heat detectors to be mounted at the top of each elevator shaft. Heat detectors shall be fixed temperature.
9. Provide detailed terminal-to-terminal alarm system shop drawings, wiring diagrams, and battery calculations for all components and voltage drop calculations (voltage drop not to exceed 10% per notification appliance circuit), sequence of operation, and operating and maintenance instructions. Drawings (plans) shall use
10. Provide an on-site, factory-trained technician acceptable to the Engineer and the Owner's Representative to supervise the installation.
11. Provide an on-site project manager.
12. Conduct weekly progress meetings and issue monthly written job progress reports to the Owner's Representative and the Engineer.
13. Submit shop drawings and product data submittals to the Engineer for approval by the Engineer and Owner.
14. Where required the Contractor shall provide x-ray of walls or slabs prior to any core drilling and any required fireproofing of the cores.
15. The Contractor shall submit a bar graph schedule at the pre-Construction meeting.
16. Conduct a complete test of the system upon completion of installation to assure the Owner's Representative, the Engineer, and the AHJ that the

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system is operational. This test shall take place prior to a final acceptance test and pre-testing by the Contractor.

17. Conduct the final acceptance test as required by CFC/NFPA 72. The Alarm Contractor shall furnish personnel who are familiar with the installation at a time convenient to the Owner's Representative, the Engineer and the AHJ. The two-year warranty shall begin upon approval by the Owner's Representative, the Engineer and the AHJ. The acceptance test shall take place as soon as convenient after the completion of the installation.
18. Provide training of the Owner's personnel in accordance with the specification.
19. Provide a two-year job site warranty of all materials and labor furnished under this section.

1.4 RELATED WORK:

- A. Materials and methods specified in other sections:
 1. Automatic Sprinkler System.
 2. Firestopping.
 3. Basic Electrical Materials and Methods, Division 1600, except where modified in this section.
 4. Mechanical (Fan and Smoke Control) Division 15.
- B. Materials furnished and installed by others but wired by this Contractor:
 1. Sprinkler waterflow switches, valve supervisory switches and other sprinkler supervisory switches shall be furnished and installed by others. The Fire Alarm Contractor shall wire these switches to the fire alarm system and adjust them for proper operation.

1.5 SYSTEM DESCRIPTION

- A. The fire alarm system shall be a UL listed; CSFM approved addressable system

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capable of individual annunciation of all devices as well as zoned alarm, common trouble, and supervisory signaling.

- B. The fire alarm system shall be capable of programming changes through the main CPU without the use of external devices such as laptop computers or proprietary programming tools.
- C. The fire alarm system shall be provided with a continuous sounding evacuation signaling system.
- D. Where indicated the fire alarm system shall be zoned in accordance with the specifications and drawings.
- E. System circuit wiring:
 - 1. All fire alarm and supervisory alarm initiating circuits shall be NFPA Style 4 or Style 6 (see manufacturer's specification for specific panel) Signaling Line Circuits (SLC) from the fire alarm control panel to the devices.
 - 2. Initiation Device Circuits (IDC) shall be wired NFPA Style B as part of an addressable device connected to an SLC circuit.
 - 3. Notification Appliance Circuits (NAC) shall be wired NFPA Style Z as part of an addressable device connected to an SLC circuit.
 - 4. All notification appliance circuits shall be NFPA Style Y from the fire alarm control panel to the devices.
 - 5. All point addressable Signaling Line Circuits shall be NFPA Style 4 or Style 6.

1.6 APPLICABLE STANDARDS

- A. The latest adopted issue of the following standards is hereby made a part of this Work by reference thereto:
 - 1. NFPA 13 – Sprinkler Systems
 - 2. NFPA 70 - *National Electrical Code*,
 - 3. NFPA 72 - *National Fire Alarm Code*,

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4. *NFPA 90A - Installation of Air Conditioning and Ventilating Systems*
5. *UL Standard 268 - Smoke Detectors for Fire Protective Signaling*
6. *UL Standard 268A - Smoke Detectors for Duct Application*
7. *UL Standard 1971 - Signaling Applications for the Hearing Impaired*
8. *Americans with Disabilities Act (ADA)*
9. *American National Standards Institute (ANSI) A117.1*
10. *American National Standards Institute (ANSI) A17.1*
11. *California Building Code (CBC)*
12. *California Fire Code (CFC)*

1.6 SYSTEM OPERATION

- A. The addressable fire alarm system shall perform the following functions:
 1. Continuous monitoring of all supervisory signal initiating devices.
 2. Continuous monitoring of all electrically supervised fire alarm initiating, supervisory and notification appliance circuits.
 3. Continuous monitoring of all panels, voice communication equipment, and data transmission lines.
 4. Continuous monitoring of all addressable modules.
 5. Operation of elevator controls as required.
 6. Operation of all audible and visual signals as indicated.
 7. Operation of all required HVAC controls as indicated.

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- 8. Operation of all magnetic door holders**
- B. Upon change in status of any device on the system, the CPU shall:**
 - 1. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.**
 - 2. Display the account information, point number, point description and point status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks or current District monitoring system located in the District's Police Dispatch Center.**
 - 3. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications.**
- C. Activation of any manual fire alarm station, waterflow switch, smoke detector, heat detector, duct smoke detector, sprinkler supervisory valve or other fire alarm initiating device shall cause the following functions to occur.**
 - 1. Manual Pull Station operation shall:**
 - a. Perform all operations as described in 1.7.B above.**
 - b. Activate the audible and visible notification appliances throughout the building.**
 - c. Activate the HVAC system fans, dampers and other mechanical equipment.**
 - d. Release all doors normally held open by door-control devices.**
 - e. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.**
 - 2. Sprinkler system waterflow switch operation shall:**
 - a. Perform all operations as described in 1.7.B above.**
 - b. Activate the audible and visible notification appliances throughout the**

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building.

- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.
- e. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

3. Area smoke detector or heat detector operation shall:

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.
- e. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

4. Elevator lobby or elevator machine room smoke detector or heat detector shall

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.
- e. Recall the elevators to the first floor or alternate floor.
- f. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

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5. Duct smoke detector activation shall

- a. As required operate as a supervisory device and perform all operations as described in 1.7.C.5 or as an alarm device and perform the same functions as a smoke detector as described in 1.7.C.3 above.
- b. Activate the HVAC system fans, dampers and other mechanical equipment associated with the specific detector.
- c. Shut down the supply air fan if the duct smoke detector is downstream of this fan.
- d. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

6. Supervisory device operation shall:

- a. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.
- b. Display the account information, point number, point description and point status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks monitoring system located in the District's Police Dispatch Center.
- c. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications.
- d. Where required transmit a supervisory signal to the College Police Remote Station via the digital communicator

D. Removal of any devices, wiring disarrangement, or system component failure shall:

- 1. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.
- 2. Display the account information, point number, point description and point

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status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks monitoring system located in the District's Police Dispatch Center.

3. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications
 4. Where required transmit a supervisory signal to the College Police Remote Station via the digital communicator
- E. When any point in the system returns to normal, the CPU shall:
1. Activate audible and visual indicators and display point identification, time, date and message.
 2. Acknowledgment of "system return to normal" will print the time, date, point identification and message. Acknowledgment will also silence all audible indicators associated with the point at the CPU.
- F. Where required zoned alarms shall be transmitted by the DACT. Each floor shall have a minimum of one zone. Automatic and manual devices shall not be combined on the same zone and, at a minimum, shall be separated by floor. Each of the following shall be on its own zone and shall not be combined onto zones with any other type of device: waterflow/pressure switches, supervisory devices, and duct detectors.

1.7 SUBMITTALS

- A. Provide complete product data (including manufacturer's descriptive and technical literature); and catalog cut sheets clearly marked to indicate model and catalog number, installation instructions, maintenance and testing procedures, dimensions, and wiring diagrams for the equipment provided. Where devices furnished by the Contractor involve work by another Contractor or Subcontractor, submit additional approved data sheets and shop drawing copies to the Contractor or Subcontractor.
- B. Provide shop drawings, including building floor, plans showing sequence of operations, device locations, complete wiring and schematic diagrams, including conduit size and wire routing, wiring size and counts, wire color codes, field terminations; control panel layout, including all modules, circuit terminals and

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interconnections, overall cabinet dimensions; complete riser diagrams indicating wiring sequence for all devices and control equipment. Drawings shall show proposed layout and anchorage of equipment and appurtenances and equipment relationship to other parts of the work, including clearances for maintenance and operation. All shop drawings are to be provided with the manufacturer's logo clearly printed on each drawing.

- C. Provide substantiating calculations, including calculations for determining secondary power supply requirements and voltage drop calculations. Battery calculations shall list the supervisory and alarm current requirements for each component. Battery recharging period shall be included with the calculations. The voltage drop calculations shall list the distance and current draw of each notification appliance and the formula used and shall not exceed 10 percent.
 - 1. Prior to purchase or fabrication of any material, approval shall be obtained from The District and Engineer. Make six (6) complete submittals of all shop drawings, wire diagrams, and literature for review and approval.
 - 2. Provide complete submittal within two (2) weeks of notice to proceed.
 - 3. **PARTIAL SUBMITTALS ARE NOT ACCEPTABLE AND WILL BE RETURNED TO THE CONTRACTOR UNREVIEWED.**
- D. Submittals rejected by the Owner's Representative and Engineer shall be corrected and resubmitted within seven (7) days of notification of rejection.

1.8 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

- A. Contractor will deliver all materials to area of project designated by The District. Vehicles shall not block fire lanes or fire doors during delivery of materials.
- B. Owner will not accept deliveries for the Contractor.
- C. The Owner's Representative will designate an area within the facility for storage of all materials. At the end of each working day, all materials shall be returned to the designated area. Material, equipment, tools, etc will not be left outside the storage area without the consent of the Owner's Representative.
- D. No material storage facilities are available on site. The Contractor is to include in his bid the cost of storage trailers or other suitable storage facilities. The Contractor's storage trailers will be parked in areas designated by the Owner.

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- E. The cost of all material handling, delivery and freight is the Contractor's responsibility. The Owner or his representatives will not be responsible for material delivered to the site.**
- F. Maintain premises free from accumulation of waste materials or rubbish caused by this work. At the end of each day, remove from the site all surplus materials, tools, and all waste. The Contractor shall leave the premises clean to the Owner's satisfaction.**
- G. The Contractor shall arrange and pay for parking.**

1.9 WARRANTY

- A. The Contractor shall provide a two (2)-year written warranty against defects in material and workmanship furnished under this Contract. The costs of such warranty shall be part of the purchase price. The warranty commences when the Owner's Representative and Engineer accept the system and installation.**
- B. The warranty shall include all necessary material, travel, labor and parts to replace defective components or materials at the job site. The Contractor shall commence repair of any "in warranty" defects which may cause the fire alarm system to be impaired within 8 hours of notification of such defects.**
- C. The Contractor shall make allowances in his warranty to cover diagnosis of system defects, which might ultimately be the responsibility of others to correct. When this occurs, the Owner's Representative and other affected trades shall be notified.**
- D. The warranty shall include all necessary factory and field software required to perform the specified tasks.**
- E. The Contractor shall include, as part of the two-year warranty, a test and inspection of the entire fire alarm system within one month prior to the end of the first year and another at within one month prior to the expiration of the two-year construction warranty. The Contractor shall provide a written report of any deficiencies and repair any of the deficiencies. The test and report shall conform to the certification as described in NFPA 72.**

1.10 AS-BUILT DRAWINGS

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- A. Maintain at the site an up-to-date, marked set of as-built drawings, which shall be corrected and delivered to The District upon completion of the work.**
- B. Furnish the Owner with one (1) reproducible set of each approved shop drawing, revised to show "as-built" conditions.**

1.11 CHANGES

- A. Make no changes in installation from layout as shown on drawings unless the Engineer and DSA specifically approve change. This does not include minor revisions for the purpose of coordination.**

1.12 DAMAGE

- A. The Contractor shall be responsible during the installation and testing periods of the fire alarm system for any damage to the building, its contents, etc. caused by the Contractor's work.**

1.13 QUALITY ASSURANCE

- A. The fire alarm system manufacturer shall maintain a fully staffed branch office including application engineers, drafters and technical service personnel within the San Diego metropolitan area.**
- B. The Contractor shall employ NICET certified fire alarm system installers. Minimum certification for on-site supervisory personnel shall be Level III. Installers shall be minimum Level II.**
- C. The electrical contractor shall perform installation of all electrical circuits for the fire alarm system, including wire installation and terminations. The fire alarm contractor shall install all fire alarm related devices and make all connections associated with them.**

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PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Acceptable equipment for this project must be listed for use with the present fire alarm network operating system in use by the District.**
- B. Product data information for other desired manufacturers shall be submitted to the Engineer and The District within Seven (7) days after the pre-bid meeting for product equivalency approval.**
- C. Products for this project shall be of the latest design; obsolete or discontinued products will not be acceptable. All equipment supplied shall be UL and California State Fire Marshal (CSFM) listed for required function.**

2.2 INSTALLATION MATERIALS

- A. All wire and cable shall be new and CSFM/UL listed and/or approved for use in fire alarm signal systems per CFC/NFPA 70, Article 760. All wire shall be solid conductors of copper, minimum size of No. 18 AWG, and insulation rated at 600V.**
- B. Manufacturer's recommended wire type and gauge shall be used. If the fire alarm manufacturer specifies wire from a specific manufacturer(s), this wire shall be used unless the fire alarm manufacturer indicates in writing that other wire manufacturers are considered equal.**
- C. All conduit, junction boxes, pull boxes and fittings shall conform to the following:**
 - 1. Conduit:**
 - a. Conduit shall be (3/4) -inch minimum electric metallic tubing (EMT) and flexible conduit (in wet areas use rigid steel conduit), in conformance with NFPA 70.**
 - b. Conduit exposed to weather shall comply with NFPA 70 and the requirements of the AHJ.**
 - c. Conduit exposed in finished areas shall be Wiremold 800 or 2300 series (plastic). In areas where the Wiremold does not closely match the surface on which it is mounted, it shall be painted to**

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match the surface and/or the surrounding area.

- d. All fittings shall be listed and approved for the specific conduit.
- e. For threaded rigid steel conduit do not use threadless or compression-type fittings.
- f. All EMT conduit fittings shall be steel or malleable iron compression-type couplings and connectors. Do not use set screw or indentation type of fittings.
- g. Maximum conduit fill shall be 75 percent of that permitted by the California Electrical Code.
- h. Magnetic door holding circuits and other non-power limited circuits shall be in separate raceways.
- i. Provide conduit and wiring between the FACP and each elevator machine controller to effect elevator recall as specified herein. This conduit and wiring shall be independent of that required for any other function.
- j. All concealed system EMT conduit shall red in color.
- k. Exposed flexible conduit used for attachment to waterflow and valve tamper switches or similar applications shall be liquid-tight and shall be the minimum length required for neat and secure installation. Flexible conduit shall not be buried or located closer than 12 inches to grade.

2. Junction and Pull Boxes:

- a. Shall be installed in accordance with the National Electrical Code, state or local codes.
- b. Provide galvanized sheet steel junction and pull boxes, with screw-on covers and of types, shapes, and sizes to suit each respective location and installation.
- c. Boxes exposed to weather, moisture, at or adjacent to water or steam connections, at sprinkler waterflow switches and supervisory switches

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shall be corrosion-resistant, cast-metal weatherproof outlet boxes of types, shapes, and sizes, including depth of boxes with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitable for each application, including face plate gaskets and corrosion-resistant fasteners.

- d. Each box shall be large enough to accommodate required splices and conduit in accordance with the NEC.
- e. Sectional boxes shall not be used.
- f. Boxes shall be painted red or otherwise designated for identification as part of the fire alarm system.

3. Field Terminal Cabinets (FTC):

- a. Shall be UL listed for use in electrical wiring systems.
- b. Minimum size shall be 12 inches by 12 inches by 4 inches deep with a hinged lockable cover or a plate cover attached by tamper-resistant screws.
- c. Terminals cabinets shall be mounted no less that 48 inches nor more than 78 inches above the finished floor
- d. Terminal strips shall be numbered and a list of all termination's shall be permanently affixed to the inside cover of all terminal cabinets.
- e. Terminal cabinets shall be identified as part of the fire alarm system on the outward face of the cabinet.

4. Plenum Cable:

- a. Shall be installed per National Electrical Code, Articles 725 and 760.
- b. The cable shall be marked with the wire model number, wire gauge, and number of conductors.
- c. The cable shall be UL listed for fire alarm signaling applications.

D. All wiring components shall be UL listed. Wiring methods shall conform to NFPA 70,

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Sections 760 and 780.

2.3 CONTROL EQUIPMENT

A. Fire Alarm Control Panel (FACP):

- 1. The FACP shall be fully compatible with OnyxWorks or the current District monitoring software. Compatability shall include, but not necessarily be limited to, the ability to modify programming, operate control functions (silence alarms, troubles, reset the panel, etc.), monitor (the FACP, devices, etc.), display devices by point (point address, location, and description), and check the status of the panels remotely using OnyxWorks or the current District monitoring software.**
- 2. The FACP shall be a Notifier NFS2 series (320, 640, or 3030) sized to allow a minimum of twenty-five percent (25%) expansion for future use. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.**
- 3. The FACP shall be wall-mounted and installed in the location shown on the blueprints and approved by the Owner's Representative. The FACP shall be equipped with a locked enclosure having removable access panels for servicing of electronic components.**
- 4. The FACP shall contain a microprocessor based Central Programming Unit (CPU) and power supply. The CPU shall communicate with, and control, the following types of equipment used to make up the system: intelligent addressable smoke and heat detectors, addressable modules, printer, annunciators, and other system controlled devices.**
- 5. The CPU shall be equipped with a non-volatile main memory. This memory shall not be lost even if the system's primary and secondary power systems fail.**
- 6. Normal operating power for the FACP shall be a dedicated 120 VAC, single-phase, 60 Hz circuit supplied from the building distribution power panel. The circuit breaker shall be clearly marked and equipped with a lock to prevent accidental shutting off of the breaker.**
- 7. The system-operating terminal shall be an LCD display with a QWERTY keyboard and other keys for programming, accessing, and operating the system. Functions**

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shall include, but not necessarily be limited to, adding or eliminating devices, accessing history logs, checking status of points, acknowledging and resetting signals, etc.

8. Bypass system functions or features during manual system tests shall be capable of being operated by using a single "hot button" for each function and shall include, but not necessarily be limited to, the following functions: horns & strobes, elevator recall, smoke control systems, door release equipment, automatic extinguishing systems, fan shut down, and smoke dampers.

2.4 ALARM INITIATING DEVICES

- A. Manual fire alarm pull stations shall be provided where indicated. The manual fire alarm pull stations shall be cast metal type or Lexan red with raised or depressed lettering. The manual fire alarm pull station shall be dual-action type. Where pull station covers are used manual fire alarm pull stations are to be single action.

Surface-mounted stations shall mount on a red finished back box. Semi-recessed stations shall mount on a standard electrical box. Operation of a manual fire alarm station shall cause its contacts to lock-in until manually reset and visually indicate an actuation. The station shall be reset using the same key as the FACP.

Each station shall be individually addressed at the central control panel. Stations, which rely on wires from auxiliary contacts to the panel, do not meet this requirement.

- B. Sprinkler system waterflow switches are to be provided where indicated. The waterflow switches, which are wired under this section, shall contain a suitable, adjustable retard device; be of the vane type; and actuate upon flow from a single sprinkler. Waterflow switches shall be housed in a substantial metal housing with gasketed cover. The switch shall actuate in no less than 45 seconds nor more than 90 seconds after the inspectors test valve is opened. Pressure switches are not acceptable.
- C. Addressable point monitoring devices shall be provided to monitor waterflow switches. The wiring from the monitored device to the point-monitoring device shall be a (Style B) electrically supervised circuit. The point monitoring device shall send an individual address to the fire alarm control panel.
- D. Point addressable smoke detectors shall be provided where indicated.
 1. Photoelectric smoke detectors shall be provided with integral LED's to indicate detectors in alarm. The detectors shall operate from the 2-wire alarm initiating circuit

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and be listed under UL Standard 268, latest edition. Line transient and RFI protection shall be built into the detector. Mounted concealed detectors shall have a remote indicator light or LED. There shall be provisions for mounting a control relay in the base of the detector.

2. Ionization smoke detectors shall be provided with integral LEDs to indicate detectors in alarm. The detectors shall operate from the 2-wire alarm initiating circuit and be listed under UL Standard 268, latest edition. Line transient and RFI protection shall be built into the detector. Mounted concealed detectors shall have a remote indicator light or LED. There shall be provisions for mounting a control relay in the base of the detector.

3. Duct-mounted smoke detectors shall be provided, where indicated, with approved duct housings mounted on the exterior of the duct, and shall have perforated sampling tubes extended across the width of the duct. Each mounted concealed detector shall have a remote indicator light and a remote test and reset switch, which shall be clearly visible, clearly labeled and readily accessible. Provide an auxiliary D.P.D.T. load relay for fan shutdown control.

Duct detectors shall either be addressable or provided with an addressable point monitoring module.

4. HARSH type detectors shall be provided where indicated.

- E. Point addressable heat detectors shall be provided where indicated. The heat detectors shall be combination fixed temperature (135°) and rate-of-rise unless otherwise indicated. The heat detectors shall be self-restoring and contain an integral LED to indicate detectors in alarm.

F. General

1. Each device shall be field set and assigned a unique address. Devices that take their address from their position in the circuit are unacceptable because if devices are later added or removed, existing addresses, descriptors and commands must be reprogrammed.
2. Additional devices must be capable of being added to the circuit from any point in the circuit and without affecting any existing device's address or function.
3. All means of addressing detectors and modules must be by manually adjustable rotary type switches. Bar coded devices are not acceptable.

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4. Each addressable device shall be provided with a clearly visible, printed label with the address of the device. This label shall be clearly readable from a distance of ten feet.

2.5 NOTIFICATION APPLIANCES

- A. Alarm horn units shall be provided as required to provide a sound level 15 dBA above ambient noise levels. The units shall be surface mounted in unfinished areas and semi-flush in finished areas. The units shall operate on 24 volts DC (VDC) polarized power to allow for supervision.
- B. Visual alarm units shall be provided where indicated. The visual alarm units shall contain strobe light source and sturdy transparent lens. Standard finish shall be red with the word "FIRE" imprinted on the body. All visual units shall operate on 24 VDC polarized power to allow for supervision. Visual units shall be in accordance with the ADA and UL Standard 1971.
- C. Fire alarm bells shall be provided where indicated. The bells shall be six-inch diameter, vibrating units with a minimum sound output of 90 dBA at 10 feet. All bells shall operate on 24 VDC polarized power to allow for supervision unless otherwise indicated.

2.6 SUPERVISORY DEVICES

- A. Valve supervisory devices shall be provided for all indicated sprinkler control valves. The valves including butterfly-type, O.S.& Y, or a combination of both. The valve supervisory devices shall be installed to transmit a supervisory signal to the panel within the first two turns of the control valve handle or when the stem of the valve has moved a distance of 1/5 of the length of the stem, whichever is less.
- B. Post indicator Valve (PIV) supervisory switches shall be provided for all indicated control valves. All switches shall be SPDT with gasketed rain-tight enclosures. The PIV supervisory switch shall be installed to transmit a supervisory signal within the first two turns, but no less than one-half turn, of the valve handle or when the stem of the valve has moved a distance of 1/5 of the length of the stem, whichever is less.

2.7 CONTROL DEVICES

- A. Provide control relays/contacts for elevator recall, fan shut down, and smoke control

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sequence. The control relays/contacts shall be 24 VDC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.

- B. Magnetic door holders shall be provided where shown. The door holders shall be powered by 24 VDC circuits and shall be of the fail-safe design and shall have a minimum holding force of 25 pounds.
- C. Provide addressable control devices where shown to control fan units. The addressable control device shall be individually controlled from the FACP. Power to these devices shall be provided and supervised from the FACP.

2.8 REMOTE STATION TRANSMITTING EQUIPMENT

- A. Where required central station transmitters (DACT) shall be provided as indicated at the FACP to transmit alarm and trouble signals for fire alarm system to SDCCD Police Remote Station. Transmission methods shall satisfy requirements of the station and NFPA 72.
- B. Where required the DACT shall be as specified by the District and shall be compatible with the District's programming and monitoring software. A Universal DACT (UDACT) shall not be used.

2.9 REMOTE ANNUNCIATOR

- A. Provide LCD remote annunciators where indicated. The annunciator shall provide a backlit, super twist, 80 or 160 character liquid crystal display (LCD) for display of all system information. The annunciator shall also provide keys programmed for system control functions, such as acknowledge, silence, reset, as well as other custom-control functions as required. The annunciator shall be mounted with a clear, hinged, locking cover, using the same key as the fire panel.
- B. Provide graphic remote annunciators where indicated. The graphic annunciator shall be LED spot luminous for each zone in the system and shall have supervised wiring from the control panel. The complete graphic display shall be submitted to the Engineer for review prior to fabrication of the panel.
- C. Provide LED remote annunciator where indicated. The annunciator shall provide RED alarm and YELLOW trouble LEDs for each zone in the system and shall have supervised wiring from the control panel. The annunciator labeling shall be submitted to the Engineer for review

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prior to fabrication of the panel..

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PART 3 EXECUTION

3.1 INSTALLATION

- A. The contractor shall provide factory trained and authorized personnel for on-the-job supervision of the proper installation of devices in cooperation with, or as may be required by, other trades. This shall include the following:
1. Provide specific on-site instructions to others on mounting and installation of each type of device by physically observing the mounting of one or more of each type of device, as required, to assure that the installer is properly instructed in the work.
 2. Provide supervision as required by others to properly perform alarm installation work.
 3. Perform a complete test of the system, certifying that all devices have been activated and that the devices and systems have performed in accordance with the requirements of this specification.
 4. Install, test, trouble-shoot and correct all system software provided under this specification. This includes, but is not limited to, actual keyboard entry, reprogramming required to meet this specification, and any other tasks associated with the system software.
 5. Participate in other related testing, including smoke control, fire pump, fire sprinkler system, etc. which involves the operation of the fire alarm control panel and to verify the proper functioning of the fire alarm related equipment..
 6. Provide layout drawings and detailed wiring diagrams to the Division of the State Architect (DSA) as required by the Submittal section of these specifications and the AHJ.
- B. All work shall be installed as shown and in accordance with the manufacturer's specifications, unless otherwise specified
1. **Control Panel**

The control panel and its components shall be securely mounted on a ¾ inch plywood backboard so that no part of the cabinet is less than 12 inches or more than 78 inches above the finished floor. All manually operable controls shall be at least three feet and less than five feet above the finished floor. Panel shall be installed to comply with the

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requirements of UL 864.

Unless a separate battery cabinet is mounted directly below the control panel, no conduit is to penetrate the bottom of the control panel cabinet.

2. Detectors

- a. Detectors shall be mounted on the ceiling not less than 4 inches (100 mm) from the side wall to the near edge, or if side wall, between 4 inches (100 mm) and 12 inches (300 mm) down from the ceiling to the top of the detector.
- b. Detectors shall be located at least three feet from diffusers of air handling systems.

3. Manual Fire Alarm Stations

Manual fire alarm stations shall be mounted at 48 inches (145 mm) at the pull handle above the finished floor. Where the manual pull station and notification device are located in the same area they shall be center vertically with each other in the same location.

4. Visual Signal Appliances

Visual signal appliances shall be wall mounted such that the entire lens is no less than 80 inches (2030 mm) nor more than 96 inches (2435 mm) above the finished floor or 6 inches (152 mm) below the ceiling, whichever is lower. .

5. Audible Signal Appliances

Where ceiling heights permit, wall-mounted appliances shall have their tops at 90 inches (2300 mm) above the finished. floor or 6 inches (152 mm) below the ceiling whichever is lower.

6. Combination Audible and Visual Signal Appliances

The location of audible/visual signal appliances shall comply with visual signal appliance mounting requirements.

7. Annunciators

Annunciators shall be mounted so that all controls shall be no less than 54 inches

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or more than 60 inches above the finished floor. Where the annunciator, manual pull station and notification device are located in the same area they shall be center vertically with each other in the same location.

8. Peripheral Equipment

Where located remotely from the control panel all peripheral equipment (relay modules, monitoring modules, control modules, etc.) not located in terminal cabinets or device mounting boxes shall be mounted no less than 72 inches AFF.

Where located in exposed locations (lobbies, halls, offices, etc.), peripheral equipment shall be in a recessed cabinet with a hinged lockable door using the same key as the FACP, 48 to 72 inches AFF, and painted to match the surrounding wall.

C. Contractor shall furnish all material and labor to provide a complete and functional system, which operates in accordance with the requirements of this specification. This shall include the following:

- 1. Unless otherwise indicated all wiring is to be in conduit.**
- 2. Conduit, raceway and wiring systems as indicated herein, and throughout the specifications, and shown on the drawings.**
 - a. All wiring shall be appropriately color-coded, and permanent wire markers shall be used to identify the terminations for each circuit at the control panel.**
 - b. Strap or bundle all cables and wires inside equipment enclosures and terminal cabinets, parallel to the enclosure sides.**
 - c. Splices shall be kept to a minimum. Splices shall be made in device mounting boxes and terminal cabinets only. Pull boxes and terminal cabinets must be clearly marked and readily accessible. More than four (4) splices in one location must be in a terminal cabinet.**

Exception: Devices available only with “pig-tail” connections shall be connected to the circuit wiring using approved insulated wire nuts and wrapped with electrical tape.

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2. Repair all surface areas where existing fire alarm equipment has been removed. All holes and walls shall be filled with UL fire-stopping material capable of maintaining the fire-resistance of the fire barriers.
 3. Replace all damaged ceiling tiles.
 4. Paint all exposed conduit, raceway, access panels, etc., and repair or patch surfaces to match existing finish.
 5. All coring and sleeving required. Core drilling shall be performed by qualified personnel to minimize damage. All rebar shall be located before drilling. The Contractor shall repair any damage that occurs because of core drilling.
 6. For existing facilities all underground trenching and conduit shall be the responsibility of the contractor.
- D. Pay for and obtain all permits, approvals, fees and charges required for this work.

3.2 TEST/FIELD QUALITY CONTROL

- A. The final alarm acceptance test shall be coordinated with the Owner and the Engineer. A letter certifying that the installation is complete and fully operational shall be forwarded to the Owner and Engineer.
- B. The final alarm acceptance test shall be done in compliance with CFC/NFPA72. All required documentation shall be completed and provided to the Owner upon acceptance of the system.
- C. The Fire Alarm Contractor and the Owner's Representative shall be in attendance at the final acceptance test to make necessary adjustments. The final test shall be conducted after final clean-up of the area. Per NFPA 72 (2007 edition paragraph 5.7.1.11) '[Smoke] Detectors shall not be installed until after the construction cleanup of all trades is complete and final.' The final acceptance test shall include, but not be limited to:
 1. A test of the complete system for grounded, open and shorted circuits.
 2. A test of each alarm-initiating and supervisory device for functions specified and for the required alarm actions.
 3. All communications equipment shall be tested to ensure that all signals are received

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the SDCCD Police Dispatch Center. This includes, but is not limited to, all network and digital communications (DACTs), types and accuracy of signals, etc.

4. A test of the system for electrical supervision.
 5. A test to verify that the emergency power source is capable of operating the system for specified periods.
 6. A test to verify that alarm signals will operate under specified trouble conditions.
 7. A test to verify that the system will operate under specified trouble conditions.
 8. A test to verify that the system will perform all specified tasks
 9. A test to verify that sound uniformity of voice alarm system has been achieved and voice messages are intelligible in all areas of coverage.
 10. A test to verify that a hard copy of all required system actions will be properly provided.
- D. A minimum of 3 day(s) will be required for these tests.
- E. If the system requires a retest by the Engineer, all costs for the retest shall be the responsibility of the Contractor.
- F. The Contractor shall pay all overtime pay required by the AHJ for witnessing the acceptance test.
- G. Provide a separate test message to facilitate testing of the required voice message unit.
- H. Contractor shall be present at other related tests, including but not limited to, emergency generator, fire pump, and smoke control.

3.3 TRAINING

- A. Provide training of Owner's personnel in the proper operation procedures. The training program for the Owner's personnel shall include the following:
1. Operations and Maintenance Manuals containing complete operating instructions, outline step-by-step procedures required for system start up, operation, and shut down, including the manufacturer's name, model number, service manual, parts lists,

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and brief description of all equipment and their basic operation features. Complete maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, trouble-shooting guide, and as-built drawings of the complete system, including conduit layout, equipment layout, device labels, and simplified wiring and control diagrams of system. Operations and Maintenance Manuals shall be submitted and approved prior to conducting the training course.

2. Three separate 2 -hour training sessions for operating personnel. The sessions are to cover proper operating and response procedures. These instructions shall be sufficient to enable an untrained person to properly operate the system.

3.4 AS-BUILTS

- A. Provide three (3) complete sets of prints, at least one of which is reproducible, and a set of disks in AutoCAD of "as-built" drawings and wiring diagrams
- B. Provide a complete set of "as-built" data sheets for all equipment connected to the system.
- C. Provide complete "as-built" software for all relevant components including, but not limited to, FACP programming and OnyxWorks (or current monitoring software) data files.
- D. Provide NFPA 72 completion certificate, signed by the AHJ.
- E. Provide a completed test form which complies with NFPA 72, signed and dated by the fire alarm system manufacturer or his agent.
- F. All items of this section shall be provided prior to final payment request.

3.5 SPARE PARTS

- A. All spare parts shall be directly interchangeable with the corresponding components of the installed systems.
- B. Spares of each of the following which have been used on this project shall be furnished to the Owner: Unless specified elsewhere quantities shall be a minimum of one of each device or two (2) percent of the number of each device used, whichever is greater.
 1. Manual fire alarm stations.

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2. Smoke detectors, including bases.
3. Duct type detectors
4. Heat detectors.
5. Control relays/devices
6. Addressable monitoring modules.
7. Strobe units.
8. Horn/strobe units (of each candela rating)

3.5 SERVICE CONTRACT

- A. If a separate test and inspection type service is requested, the service contract must include the following:
1. Performance of a test and inspection of the fire alarm system quarterly during which the Contractor shall:
 - a) Test the operation of each waterflow alarm device in the alarm system by opening the inspector's test valve, test alarm and trouble transmitters, and visually inspect each device as it is tested.
 - b) Test the operation of each supervisory valve switch by opening the valve and verifying the receipt of a signal within the first two revolutions of the hand wheel or within one-fifth of the travel distance, and visually inspect each device as it is tested.
 - c) Remove any dirt or dust and make any minor adjustments or calibrations, which are apparent from inspection or testing of the device.
 2. Perform a semi-annual test of the entire smoke detection system and manual fire alarm system as per NFPA 72 testing method requirements.
- B. Emergency service, including all parts and labor, during the warranty period is

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to be included in the system purchase price

C. Service definitions:

- 1. Emergency Services:** Emergency service is a special request for assistance from the Owner that necessitates a special trip or labor. A request to advance a regularly scheduled test and inspection trip is not emergency service.
- 2. Quoted Rates:** Quoted rates refer to the labor rates quoted on the bid form or to adjusted rates which shall be supplied to the Owner at the beginning of each new contract term. In absence of this contract, the rates shall be Contractor's currently published billing rates.

D. A written test and inspection report is to be submitted to The District at completion of every periodic system test and inspection visit.

NOT USED

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END OF VOLUME II