

CSU San Bernardino
DEPARTMENT OF FACILITIES MANAGEMENT

Facilities Management Building Standards

Over the last 20 years California State University, San Bernardino (CSUSB) has added many new facilities. During this time Facilities Management, in partnership with Facilities Planning, Design and Construction (FPDC), has developed the following campus standards for all capital improvements. CSUSB is in a very windy, hot desert environment and these standards take this into account. It is important that these standards be adhered to and only changed in consultation with the Director for Facilities Management.

AS BUILTS (to be included in Special Conditions or Division 01000)

- ✧ Facilities Management has as-builts of CSUSB's main incoming services. The contractor is to allow in their bid for adding the new building infrastructure information for this facility to the campus master as-builts. This includes high voltage, natural gas, water, irrigation mainlines, storm drainage and sewer.
- ✧ The contractor is to provide a list of all materials used in the project with vendors' names, addresses and telephone numbers. Material list shall show all finishes indicating model or manufacturing numbers.
- ✧ All as-builts shall be the original plans showing all changes drawn as built. Any changes shall be indicated by the contractor on the blue lines. The architect will be responsible for a complete clean as-built set of drawings showing the actual as built conditions including specifications.
- ✧ All underground valves and pipes shall be dimensioned to the nearest structure so that it can be accurately plotted. All valves shall be plotted and GPS coordinates provided.
- ✧ A brass disc shall be epoxied on the sidewalk indicating all sleeve locations under hardscape areas.
- ✧ All O&M manuals shall be originals. No photocopies. Four originals to be provided to the owner.

ACCESSIBILITY GUIDELINES

- ✧ The architect must make every effort to provide access to all levels of a lecture hall by using access code compliant ramps. In the past wheel chair lifts have been a maintenance issue.
- ✧ All buildings to have an automatic door at the ground level and basement if access is at that level from the exterior. The automatic door shall have automatic reset features if broken out after hours.
- ✧ All elevators must have buttons on each side of the cabs.
- ✧ All exterior stairs must have contrasting colors on the fronts of the treads.
- ✧ All signage to be access code compliant.

- ✧ All modular furniture layouts may need to be accessible depending on the layouts.
- ✧ Accessibility compliance must comply with Chapter 11B of the California Building Code (CBC) latest adopted edition and the Americans with Disabilities Act Standards latest adopted addition.

GENERAL DESIGN CONSIDERATIONS

- ✧ Architects should consider a whole building design approach for sustainability and energy savings.
- ✧ All landscaping should be drought tolerant and comply with Water Efficient Landscape Ordinance (WELO) as well as the Low Impact Development (LID) for Southern California.
- ✧ No metal panels on exterior of building.
- ✧ All exterior skins are to be hard finishes. Any light colored finishes must be protected to avoid staining.
- ✧ All exteriors shall be designed to avoid water staining caused by smog, dirty air and weather conditions in San Bernardino.
- ✧ All mechanical equipment shall be installed in mechanical rooms, protected from the elements, per California State University (CSU) standards.
- ✧ Access to two sides of the building shall be provided for maintenance vehicles.
- ✧ Buildings higher than two stories shall have adequate access for a 60' high reach to access the elevations for maintenance.
- ✧ Buildings over 45' must have a means for maintaining the outside (Davits, etc. for swing stages. Check OSHA requirements). An OPUS must be provided as part of the contract.
- ✧ A maintenance room should be provided within each facility of 100 square feet to store spare materials for each facility.
- ✧ Preferably no chalk boards in classrooms. Check with Deans. White boards preferred.
- ✧ All buildings to have outside lockable hose bibs.
- ✧ Any outside planters to have GFI protected outlets to plug in outside equipment.
- ✧ Install emergency phones outside buildings (blue light specials, campus standard).
- ✧ All exterior caulking to be Dow Corning 790 Silicone building sealant (or equal) except where limitations indicate that it should not be applied.
- ✧ All lecture halls must have a solid floor finish under seating to allow for mopping.
- ✧ Sound absorbing wall panels must be installed so that students cannot touch them. Dirt and grime are a real problem on sound panels. Also the students cut them and stick pencils in them.
- ✧ Pigeons are a real problem on this campus. They like outside stairwells and ledges. Architects must realize the damage caused by these birds and design with them in mind.

IRRIGATION

- ✧ All irrigation shall be connected to our centralized CALSENSE system.
- ✧ Griswold valves are the campus standard and they will be brass/metal.
- ✧ Rainbird/Hunter are the campus standard for all sprinklers.
- ✧ Eliminate rubber drip systems and use Schedule 80 risers with bubblers.
- ✧ Traffic standard valve boxes in all areas subject to traffic (including lawns).
- ✧ Install water meters for all new building irrigation systems.
- ✧ All irrigation piping to be minimum Schedule 40.
- ✧ Use large rotors as much as possible on lawn areas in lieu of pop ups.
- ✧ All MAIN irrigation lines to have tracer wires installed on top of pipes.
- ✧ All irrigation wiring to be 12 gauge, rodent proof and installed in conduit.
- ✧ A brass disc shall be epoxied on the sidewalk indicating all sleeve locations under hardscape areas.
- ✧ Automatic flow valves should be included in all new irrigation systems for system shut down. Valves shall be connected to the Calsense system, to shut off areas if a main line break occurs.
- ✧ All irrigation for new facilities shall be metered.

LANDSCAPE

- ✧ Xeroscape in landscape areas where possible.
- ✧ Lawn areas to be prepared correctly and no rocks larger than 1" in top 6".
- ✧ Grass shall be a mix of Dwarf Fescue and Bermuda.
- ✧ Redwood bark (large) in plant areas as mulch. No light weight mulches due to high winds in excess of 100 MPH. Preferably no bark at all.
- ✧ All landscape shall be maintained by contractor for 6 months after Notice of Completion to allow for establishment of new landscape.
- ✧ Small areas that are disturbed should be replaced with sod. Any slopes shall be specified to be sod.
- ✧ Use of rock mulch is permissible where appropriate. When using rock mulch, all installations to be 4" depth installed over Dewitt's Pro 5 or equal weed barrier and use the following rock:
 - ▲ 1"-3" California Gold
 - ▲ 60% 1"-3" & 40% 4"-8" Sierra Rock Cobble
 - ▲ Baja Cresta palletized rubble
- ✧ Decomposed granite shall be Brimstone Gold w/binder and installed over Dewitt's Pro 5 or equal weed barrier.
- ✧ All areas that are to receive rock mulch and/or decomposed granite are to be prepped with weed kill such as Roundup or equal. Any product to be applied must be per the manufacturer's instructions prior to installation of weed barrier and new material.

PAINT

- ✧ No interior flat paint except ceilings.

- ✧ All interior paint to be a three-coat semi-gloss system on walls; gloss on metals and doors. Any sprayed surfaces must be specified to be back rolled for ease of touch up.
- ✧ See FPDC approved standard finishes for color options.

MASONRY

- ✧ All masonry shall be sealed against moisture penetration.

CONCRETE SIDEWALKS

- ✧ All concrete sidewalks to be 6'-0" wide x 4" thick 3000 PSI minimum with fiber stealth (unless otherwise designed and noted).
- ✧ Compact sub-grade of all concrete surfaces to 95%.
- ✧ Color to be grey with medium broom finish.
- ✧ Expansion joints with felt "A" cap to be installed every 50'-0" O.C. Once installed and cured, remove plastic zip strip and caulk joint and cover with silica sand.
- ✧ When joining adjacent concrete surfaces, dowel into them using #3 rebar set in epoxy with 6" minimum embed on each side placed every 12" O.C.
- ✧ All concrete subject to pedestrian traffic shall comply with all current CBC / ADA requirements.

DOORS & HARDWARE

- ✧ Wind at CSUSB is a real problem. 90 MPH Exposure C design.
- ✧ No north facing doors.
- ✧ All store fronts to be wide style minimum (5 ½"). All to have a minimum (6") center muntin, 125 extrusions with minimum glass size to strengthen doors.
- ✧ No exterior doors to be over 7'0".
- ✧ All exterior and interior double doors to have a key removable center mullion.
- ✧ All doors to have active trim.
- ✧ Exit panic devices to have hex key dogging.
- ✧ Schlage or Sargent locks are campus standard.
- ✧ S/S hinges on all exterior doors with NRP and studs.
- ✧ Exterior doors to be Primus Classic, Primus Everest or Sargent Signature equal. Primus and Signature side bitting will conform to campus' existing side bitting.
- ✧ Closers to be LCN 4041.
- ✧ Template closers on all doors to open 180 degree. Set back check as required to prevent door from opening into any obstruction.
- ✧ Handles on locksets to be Schlage 17A or Sargent equal.
- ✧ All stairwells and well-used interior doors (except bathrooms) shall have electronic hold opens tie to existing fire alarm systems.
- ✧ All bathrooms to have hospital latches (mounted vertically).
- ✧ No concealed vertical rods on panic hardware. Panic hardware with surface mounted vertical rod is not acceptable. Panic hardware with surface

mounted vertical rod with less bottom rod (LBR) is acceptable in areas where security is not an issue.

- ✧ All panic hardware to be rim panic only: Von Duprin 99/98 series or Sargent 80 series.
- ✧ All locksets to have large format IC cores.
- ✧ All exterior doors to be Schlage Primus or Sargent Signature keyway for security (check with campus for exact keying).
- ✧ Campus locksmith to meet with hardware consultant to approve all hardware to match campus standards.
- ✧ All hardware to be inspected and certified by a certified Architectural Hardware Consultant (AHC).
- ✧ All locks on exterior doors to be added to campus electronic Schlage SMS system. Schlage AD Series electronic access locks with multi-technology readers. See campus locksmith for specifications.
- ✧ Doors to have metal kick plates on push side.
- ✧ Marble thresholds installed at all restroom entry doors. Threshold to comply with all CBC / ADA requirements.
- ✧ Door frames to be 14 exterior, 16 gauge interior Curries, Ceco or Door Components cold rolled steel. Frames to be furnished one piece and have heavy reinforcement with interlocking tabs on jambs and head of each mitered corner. Prep and prime for paint.
- ✧ Metal doors: Ceco, Curries or Door Components. Exterior doors to be seamless with flush top caps sealed and seamless.
- ✧ Wood doors to be VT, Graham or equal solid core birch. Doors to be prepped for either mortise or cylindrical hardware depending on the building.
- ✧ Auto door operators: Low energy only – Besam SW200i, LCN Senior Swing. Knowing act activation only to comply with ANI 156.19.
- ✧ All doors on any facility must be opened with no more than 5 pounds of opening force to be access compliant.

ROOFS

California State University, San Bernardino requires the following items to be included in the specifications and covered within all roofing warranties:

- ✧ All roof designs must comply with wind speeds as identified in UBC 80 exposure C and Class 1A-90.
- ✧ All roofs must be warrantied to be completely weather tight without monetary limitations for a period of 25 years.
- ✧ All materials that make up the roof system must be included in the roof warranty whether the manufacturer of the roof manufacturers the components or not.
- ✧ The roof warranty must cover the roofing and accessories from outside of parapet to the outside of the parapet. All penetrations, seismic joints, roof hatches, sheet, metal details, mechanical pads, mechanical/plumbing/electrical penetrations, are all to be covered under the roofing

- manufacturer's warranty. Any details of other trades must be approved and accepted by the roofing manufacturer.
- ✧ Installers must be approved by the manufacturer of the roofing system.
 - ✧ All roofing manufacturers must be ISO 9001 registered for the last five years. The roofing manufacturer has a design responsibility to ensure that all details meet their minimum requirements. The manufacturer will provide complete shop drawings showing the roof plan indicating every roof detail; elevations, sections, details and all attachments to other work at every location. Any details that are not indicated by the architect are to be detailed by the manufacturer using standard NRCA approved detailing. Details indicated by the architect that do not comply with the manufacturers standard approved details will be changed to comply with the manufacturers details at no additional charge.
 - ✧ The manufacturer will employ a full time technical representative to inspect the installation.
 - ✧ The manufacturer will provide the following services at no additional cost to the owner in years 2,5,10,15 and 20:
 - ▲ Inspection by a technical service representative and delivery of a written report documenting the roof conditions.
 - ▲ Preventative maintenance and necessary repairs, including splits, tears, or breaks in the roofing membrane systems and flashings which threaten the integrity of the roof system and are not exempt due to neglect or vandalism.
 - ▲ General roof top housekeeping and clean up.
 - ✧ The manufacturer must provide a roof system that complies with FMG 4450 and FMG 4470. All components of the roofing system must comply with these systems.
 - ✧ Warranties must be written in a manner to cover all the above items.
 - ✧ Metal roofs must also comply with the above listed items. Metal roofs must be designed and built to comply with all the above requirements.

ROOF TYPES

- ✧ All built up roofs to be cold applied with a minimum base and three plies.
- ✧ All metal roofs to have 25 year warranty to include all flashings.
- ✧ Single membrane roofs to be Sarnafil or equal.

ELEVATORS

- ✧ All entrances must have detector edges with infrared beams. Beams on doors must cover all angles.
- ✧ All controls to be vandal proof.
- ✧ All controllers to be "motion controller". No propriety manufacturers controls.
- ✧ All hydraulic elevators to have pit pumps.
- ✧ All doors to be stainless steel or brass. No painted doors.
- ✧ All phones to be access code compliant hands free speakerphones.

- ✧ All elevators must include a 12 month maintenance period and 24 hour emergency call back at no extra charge.

ELECTRICAL

- ✧ Parking lots and ALL exterior lighting should be VISIONAIRE LED lighting with eXergy controls tied into the campus standard control system (campus standard).
- ✧ Any time clocks should be integrated into the campus EMS at the central plant.
- ✧ Motion sensors to be installed in all offices and classrooms. Motion sensor to be manufactured by The Watt Stopper, ceiling mounted type: CX-100.
- ✧ Day lighting controls to be included with lighting sensors.
- ✧ LED lighting is the campus standard.
- ✧ No incandescent fixtures or lamps.
- ✧ Provide dimming capabilities for classrooms so that lights can be dimmed to save energy.
- ✧ All lighting must be on A&B switching.
- ✧ Lights must be accessible without the use of special equipment. Ladders are acceptable.
- ✧ Use remote ballasts/LED drivers in lecture halls where access is hard above fixed seating.
- ✧ All outlets and switch plates to have panel and circuit designation engraved on the face plates.
- ✧ All equipment to be energy star rated.
- ✧ All substations to be power ready for emergency generator hook ups.
- ✧ All underground and interior wire shall be copper and run through conduit. BX not acceptable.
- ✧ Flex conduit should only be used for short connections to lights or equipment.
- ✧ Minimum size conduit $\frac{3}{4}$ inch. Only use steel conduit compression couplings/connectors on all conduit work. All substations and distribution systems shall be designed based on life cycle costing.
- ✧ All transformers shall be copper wound.
- ✧ All switchboards, distribution boards and sub panels are to have copper bussing. Aluminum bussing is not acceptable.
- ✧ Consideration should be given to upsizing conductors to reduce electric loss.
- ✧ All parking lot and walkway lighting to be double fused and separate circuits for every other fixture.
- ✧ Every exterior light pole will be numbered to match existing standards.
- ✧ Use high efficiency lighting that provides high lumens per watt of energy used.
- ✧ Use LED lighting for exterior lighting.
- ✧ All lighting to be 277v and equipment to be 480v.
- ✧ Each exterior fixture shall be controlled wirelessly by our campus standard eXergy controls.

- ✧ Lighting designer shall design and follow campus standard using VISIONAIRE lighting.
- ✧ Design should be energy efficient to at least Enhanced Title 24.
- ✧ All time clocks to be Intermatic next generation ET70215CR clocks with Astro and momentary feature on all circuits.
- ✧ All exterior lighting to be designed to meet or exceed IES standards. All exterior lighting to produce minimum .25 foot-candle (fc) on all walkways.
- ✧ All buildings must have smart meters for water, gas and electric. Campus standard square D for electric.
- ✧ A brass disc shall be epoxied on the sidewalk indicating all sleeve locations under hardscape areas.
- ✧ All corridor lighting to be on motion sensors, daylight controls and time clocks.
- ✧ All corridors to have dedicated outlets for custodial machines and soda machines.

ARCFLASH

- ✧ Requirements for Electrical Installations
 - ▲ **Flash Protection Markings:** Switchboards, panel boards, industrial control panels, meter socket enclosures, and motor control centers that are for other than dwelling occupancies shall be marked to warn persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to persons before those persons have to approach the equipment for examination, adjustment, servicing, or maintenance of the equipment. All markings shall comply with NFPA 70E-2004, *Standards for Electrical Safety in the Workplace*, the National Electrical Code Articles 110 *Requirements for Electrical Installations*, and the Federal OSHA standard 29 CFR Part 1910 Subpart S. Signage and markings must follow the standards established by ANSI Z535.4-1998 *Product Safety Signs and Labels* which provides guidelines for the design of safety signs and labels for application to products.

PLUMBING

- ✧ All faucets to be Zurn and be motion activated (campus standard).
- ✧ All flush valves to be Zurn (campus standard). Minimum 1.5 gallon flush on toilets.
- ✧ American Standard or Kohler toilets (campus standard).
- ✧ 1 pint flush valves on urinals.
- ✧ Urinal cleanouts to be placed above the flush valve.
- ✧ All shower heads to be maximum 1.5 GPM.
- ✧ Apollo (not Apollo International) ball valves to be used for all shut offs in lieu of gate valves.
- ✧ No sweated joints on valves. Unions must be used for ease of replacement.

- ✧ Each restroom must have a valve to isolate each the hot and cold water for the room and valves on hammer arrestors.
- ✧ Isolation valves for each floor.
- ✧ Each drinking fountain must have a clean out and isolation valve.
- ✧ Clean outs must be installed per code. A clean out must be placed at each end so that banks of fixtures can be cleaned out.
- ✧ TNS brass faucets for labs.
- ✧ Access panels must be installed in any inaccessible ceiling that has wet pipes passing through unless there are no joints.
- ✧ All back flows must be certified.

MECHANICAL

GENERAL

- ✧ Cooling coils 24 degrees delta.
- ✧ High temp hot water valves shall be class 300 lb. (450 PSIG at 450 degrees F).
- ✧ Connect to central plant wherever possible (CHW, HTHW, domestic hot water).
- ✧ All hydronic system piping shall be provided a means of compensation for thermal expansion and contraction. Comply by the use of braided "U" joints for piping 2" and below and ball joint systems for piping above 2". Special attention must be considered at utility tunnel connections. All high temperature piping and fittings are to be 300 pound class.
- ✧ Pipe insulation shall be full metal jacketing on roof top insulations and exposed in equipment rooms.
- ✧ The use of PTS plugs (pressure /temperature) on coils, heat exchangers etc. is prohibited. Use only thermometers and bourdon tube pressure gauges w/ ball valve gauge cock.
- ✧ Condensing units are required to have hose bib within 25 feet.
- ✧ All louvered openings in mechanical rooms need at least 2" filter rack and filters installed.

CONTROLS

- ✧ Buildings shall have all utilities metered (electric, gas, water, cooling BTUs and heating BTU's) and connected to the appropriate Energy Management System (EMS).
- ✧ Measured utility data shall be trendable, totalized and archived by the appropriate EMS.
- ✧ Campus standard electric metering system is Square D ION system. All meters are IP addressed and model ION 7350 or better.
- ✧ All electric meters shall connect to and be accessed by the campus ION server.
- ✧ Campus EMS is Tritium based on the Niagara Platform.

- ✧ Campus standard is TAC I/A Series, Invensys, and Controls Technology are local representative; all controls to be seamlessly interfaced.
- ✧ Connection is Internet Protocol (IP) via ENC (Enterprise Network Controller). Individual device connect via ASD bus, BACnet or Lon-works communication protocol.
- ✧ Access is provided by protected V-LAN internet browser.
- ✧ Building control shall have the capacity to stand alone operating fully in the event of loss of communication with the EMS.
- ✧ Graphical User Interface (GUI) shall provide the same detail as existing, (i.e. College of Education installation as standard).
- ✧ Air handling systems shall be variable air volume (VAV) systems and utilize Variable Speed Drives (VSD) at the air handlers with premium energy efficient motors.
- ✧ VAV system supply fan speed shall utilize Most Open Damper control sequence to reset fan speed.
- ✧ VAV system return fan speed shall tract supply fan speed minus "XX" percent.
- ✧ VAV system fan speeds shall utilize high air flow strategy for extreme heating situations.
- ✧ All zones to be DDC.
- ✧ All sensors (thermostats) are to be electronic with no local operation.
- ✧ All actuators shall be weather tight digital/electronic with feedback capability.
- ✧ Outside air economizers and strategies shall be employed.
- ✧ All control wiring must be installed in conduit.
- ✧ Control point list and sequence of operation will be developed jointly with owner and designer.
- ✧ VSDs shall be used on ALL motors 5 horse power and greater. VSDs shall be controlled via the EMS with data feedback to the EMS.

AIR HANDLERS

- ✧ Cooling coils shall be 24 degree F differential, 40 degree F inlet, 64 degree F outlet.
- ✧ 100% OSA units shall be true thermal break construction with no through metal and fasteners from inside to outside of casing.
- ✧ 2" casing insulation with a thermal conductivity K of .20. Fan sections shall have 4" insulation.
- ✧ Minimum G90 grade galvanized steel throughout the unit. No G60.
- ✧ Standing seam roof panels attached with bolts and nuts (not screws) to ensure no leakage. Sloped roof installation on outdoor units.
- ✧ Double wall construction casing: 22 gauge perforated liner in fan sections, 22 gauge solid liners in all other sections.
- ✧ Minimum 14-gauge G90 galvanized steel floors with 4" under floor.
- ✧ Insulation and 20/22 gauge solid G90 galvanized steel under liner.
- ✧ Floor seams shall be smooth with no standing seams, and shall have full gaskets and covered with a continuous cap, or continuously welded, to

- insure perfect seal and wash down floors. Exposed screws on the floor are not acceptable.
- ✧ 304 stainless steel 14-gauge floor downstream of drain pan section.
 - ✧ Minimum 2"x6" 12 gauge structural tubular G90 galvanized steel base. 2"x5" bases are not acceptable.
 - ✧ Casing: powder coated, electrostatic baked on paint which passes the 1500 hour ASTM B-117 Salt Spray standard with 1/8" average creepage @ scribe and passes the 1500 hour ASTM D-2247 Salt 100% Humidity standard with 0" average creepage @ scribe.
 - ✧ Fans to be certified for AMCA 210 performance and AMCA 300 for sound and carry the AMCA seal for both standards.
 - ✧ Fans to have airfoil aluminum blades.
 - ✧ Fans to be Class 2 construction minimum.
 - ✧ Fan inlet screen.
 - ✧ Fan inlet airflow measuring station with a factory mounted transmitter.
 - ✧ Tool operated safety latch on fan section access doors.
 - ✧ Premium efficiency TEFC motors.
 - ✧ Fully housed, CA seismic Level 4 certified spring isolators for the fans and motors, 1" deflection for up to 24" diameter fans, 2" deflection for fan diameters 27" to 49", 3" deflections for fan diameters 54" and larger.
 - ✧ Thrust restraints on the fan bulkhead wall.
 - ✧ Cast iron (for minimum vibration) powder baked-on coated fan bases for fans from diameter size 36" and up, 12 gauge steel bases on fans up to 33" diameter.
 - ✧ 2" thick man size access doors in service sections, minimum 24" wide by 72" high if unit size allows.
 - ✧ 304 stainless steel door hinges.
 - ✧ Ventlock 310 cast aluminum non-corrosive door latches with pressure release catch.
 - ✧ EPDM door gaskets.
 - ✧ Extruded aluminum door frames and door perimeter for maximum rigidity and tightness.
 - ✧ 12x12 wired tempered glass view window in fan section doors.
 - ✧ Doors to open against pressure, unless there exists an obstruction behind the door (typically on small units).
 - ✧ Doors shall be operable from both inside and out.
 - ✧ Marine lights in all service sections.
 - ✧ Copper fins on coils in 100% OSA units.
 - ✧ 304 stainless steel casing on all cooling coils.
 - ✧ Double sloped drain pans with 304 SS drain pan connection.
 - ✧ Sloped (not flat) intermediate drain pan between coils (when stacked).
 - ✧ Coils to have red brass connections (not steel or copper).
 - ✧ Face loaded filters, 304 stainless steel Type-8 frames as manufactured by Farr, no equal (not side loaded).
 - ✧ Filter types, efficiencies: 2" Pleated MERV 8 plus 12" cartridge box type MERV13.

- ✧ All wiring to be in unit roof perimeter raceway and EMT conduits.
- ✧ Ruskin CD50 AMCA certified dampers with Airfoil, extruded aluminum frames and extruded aluminum low-leak blades, Class 1A leakage rated.
- ✧ Ruskin AMCA certified Louvers with extruded aluminum non-corrosive painted frames and blades (not steel).
- ✧ Variable Frequency Drives (VFD) are factory mounted, installed in recessed enclosures and ventilated with clean, conditioned air with piping from both the positive and suction side of the unit.
- ✧ Factory mounted temperature controls (TC). TC contractor will furnish all the controls including the sensors, the damper actuators and the TC panel, ship them to the AHU manufacturer for factory mounting and wiring, making field conduit runs and unit penetrations by the TC contractor unnecessary.
- ✧ Equipment shall be certified by OSHPD special seismic certification preapproval (OSP). Equipment shall be manufactured in accordance with the special seismic certification requirements of IBC 2012, CBC 2013, ASCE 7-05 and 7-10 Chapter 13, ICC ES AC156 2007 and 2010, and the equipment manufacturers Seismic Qualification Test Report. Equipment shall have a component importance factor I_p , equal to 1.5. Equipment shall have been shown to be fully functional after shake table tests with a minimum design short period spectral acceleration, $SDS = 2.5g$ in a rigid base mount configuration. A third party test report shall be available for inspection by the engineer.
- ✧ Air handling units shall be manufactured in the United States of America.
- ✧ ETL listed and labeled AHU.

DUCT-WORK

- ✧ Ducts: Formed on flanges, construct according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," Figure 1-4, using corner nut, bolt, and gasket, no cleats allowed. (6/7/04).
- ✧ Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- ✧ Duct systems shall have access doors within 4 inches of upstream side of coil.
- ✧ Volume damper handles shall be installed on bottom or side of ducts.

VARIABLE FREQUENCY DRIVES (VFD)

- ✧ Variable Frequency Drives (VFD) shall be model Z1000 as manufactured by Yaskawa Electric, or equal by Danfoss if compliant with below standards. Drives shall be assembled in the USA.
- ✧ Built-in 5% line impedance for input harmonic distortion.
- ✧ On board EMI/RFI filter compliant with IEC-61800-3 restricted distribution for first environment.
- ✧ Embedded BACnet (BTL certified), Modbus/Memobus communications.
- ✧ BACnet communications shall be achieved via a single twisted pair and shall make power, KWH, RPM feedback and alarm faults with date and time stamps available to the campus DDC control interface.

- ✧ UL Plenum Rating (UL 1995).
- ✧ Seismically rated to IBC 2006-certification 12/2011.
- ✧ Sealed heat sink which allows for drive to be mounted in a NEMA12 enclosure with heat sink external.
- ✧ Made with RoHs compliant materials.
- ✧ Hard wired: Start/Stop, Speed, and Fire Alarm Shut Down.
- ✧ Serial communications: Fire Alarm feedback, KWH, Power, Speed.
- ✧ Factory mounted disconnect, wired to motor.
- ✧ Factory certified start-up.

FAN COILS AND VARIABLE AIR VOLUME (VAV)

- ✧ Minimize use of fan coil units in attics.
- ✧ Fan coil and VAV units in attic shall have minimum 24 inch clearance to access valves, motors and controls.
- ✧ All VAV's shall have reheat coils for uniform temperature control.
- ✧ Reheat coil valves shall be on same side as VAV control panel for ease of accessibility.
- ✧ Actuators shall be positioned so they are accessible.
- ✧ All VAV's shall have discharge air sensors installed downstream from reheat coils.
- ✧ Reheat coils shall have a strainer with blow-down valve and hose cap.
- ✧ Support and hangers shall be within 12 inches of control valves and strainers.
- ✧ Unions required to be installed next to unit on all condensate drain pipes.
- ✧ Provide dampers upstream of VAV branches on each branch duct downstream of the VAV.

EXHAUST FANS

- ✧ Air foil design.
- ✧ Shall be controlled and monitored by the EMS.

BUILDING CHILLED WATER (CHW) SYSTEM

- ✧ Campus standard for chilled water systems is 24 degree delta with 40 degree F supply.
- ✧ Most Open Valve (MOV) control shall be employed for building CHW system.
- ✧ Use redundant pumping; a three pump system (60%, 60% + 60% backup) is preferred.
- ✧ All control valves are to be modulating two way in design. No bypass features are permitted.
- ✧ Isolation and control valves shall be flanged or threaded fit.
- ✧ Isolation valves shall be required for each floor branch lateral.
- ✧ Ball valves shall be used for all isolation valves for system piping sized 2" and smaller.

- ✧ Install piping to permit valve servicing.
- ✧ Install piping to allow application of insulation.
- ✧ Install dielectric unions and flanges to connect piping materials of dissimilar metals.
- ✧ Chilled water piping passing through walls shall be provided with sleeves large enough to allow both pipe and insulation to pass through.
- ✧ Insulation shall be continuous through sleeve.
- ✧ Vapor barrier on chilled water piping shall be continuous.
- ✧ Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

BUILDING HEATING HOT WATER (HHW) SYSTEMS

- ✧ Design shall employ redundant heat exchangers.
- ✧ Heat exchangers shall be 300 pound class rating tube side and 150 pound rating on the shell side.
- ✧ Campus standard is 150 degree F delta (primary) with a 400 degree F inlet temperature.
- ✧ Campus standard is 60 degree delta (secondary) with a 180 degree F supply temperature, resettable from outside air temperature, with adjustable lockout temperature set point.
- ✧ Use redundant pumping. A three pump system (60%, 60% + 60% backup) is preferred.
- ✧ Do not use three way control valves for recirculating HHW systems.
- ✧ Heating system shall utilize differential pressure relief control valve at extremity of loops to provide minimum flow rate during low demand periods (similar to Cla-Val Model 250-01 with Viton rubber parts option).
- ✧ Isolation and control valves shall be flanged or threaded fit.
- ✧ Isolation valves shall be required for each floor branch lateral.
- ✧ Ball valves shall be used for all isolation valves for system piping sized 2" and smaller.
- ✧ Provide a means of compensation for system thermal expansion and contraction by the use of braided "U" joints to prevent stress on system piping and fittings. Special attention must be considered with straight pipe runs in excess of 75 feet.
- ✧ Install piping to permit valve servicing.
- ✧ Install piping to allow application of insulation.
- ✧ Install dielectric unions and flanges to connect piping materials of dissimilar metals.
- ✧ HHW water piping passing through walls shall be provided with sleeves large enough to allow both pipe and insulation to pass through.
- ✧ Insulation shall be continuous through sleeve.
- ✧ Relief valves shall be piped to nearest floor sink, and to have union installed near the valve discharge.
- ✧ Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- ✧ HHW strainer shall have a drain valve with union piped to nearest floor sink.

COOLING TOWERS

- ✧ Tower shall be constructed so that all wet areas, or areas that have the potential to become wet, are of stainless steel construction.
- ✧ Water chemistry system controller shall be included as part of the tower system.
- ✧ Chemistry controller shall control Total Dissolved Solids (TDS), PH, Inhibitor injection and biocide treatments.
- ✧ Make up water control shall utilize electronic level control; IE ultrasonic.
- ✧ Make up water shall be metered and connected to the EMS for trending and archiving.
- ✧ Tower fan shall be gear driven when possible.
- ✧ Basin water temperature control shall be based on wet bulb calculation.
- ✧ Cooling tower fan speed shall be via VSD resetting from basin temperature control logics.

WATER CHILLERS

- ✧ Campus standard is 24 degree F Delta with a 40 degree supply temperature.
- ✧ Water chiller shall be designed to have a final effluent temperature of 40 degrees F with a 24 degree F overall differential.
- ✧ Water chillers should be direct drive, variable speed, and low pressure.
- ✧ Condenser water flow control shall be a function refrigerant lift pressure across the compressor.
- ✧ Evaporate water flow control shall be a function calculated system turnover and low flow limits of the chiller.
- ✧ Water chiller controls shall be fully integrated with the EMS and controllable from the GUI.

BOILERS

- ✧ When practical all heating and required boiler work shall be connected to and a function of the campus high temperature centralized system.
- ✧ All boilers shall be compliant to all current emission standards. New equipment shall take into consideration upcoming rules and changes.
- ✧ Boilers shall utilize economizers; temperature reset strategies, and temperature lockout set points.
- ✧ All boiler and unit heaters shall be fully integrated with the campus EMS.

AIR CONDITIONING UNITS

- ✧ When practical all air condition units shall be a function of the campus main centralized systems.
- ✧ Air conditioning units shall have a SEER of 16 or better.
- ✧ Air conditioning unit shall be monitor and controller via the EMS.

TELECOMMUNICATIONS

- ✧ All telecommunication closets to be on emergency power.
- ✧ All closets to have a minimum of two 30 amp circuits.
- ✧ See other telecom standards produced by P2S engineering.

SOLID WASTE AND RECYCLING PROCEDURES (SPECIAL CONDITIONS)

CSU San Bernardino Construction & Demolition Debris Removal Standards

The contractor shall not allow the accumulation of rubbish in or around the area in which work is to be performed; he shall remove the debris at least daily and more often if necessary. Upon the completion of the specified work, the contractor shall remove all temporary structures, waste materials and rubbish around the equipment or upon the site.

The contractor shall be responsible for submitting a complete California State University, San Bernardino (CSUSB) Solid Waste Reporting Form to Facilities Management. This shall show the weight in pounds of the waste generated over the course of the entire project. All areas affected by the project shall be left clean and in the condition found prior to construction.

AB-75 (Strom-Martin, 1999) took effect on January 1, 2000. This bill mandates that each state agency or large state facility track its waste stream and divert at least 25% of its solid waste from landfills or transformation facilities by 2002, and 50% by 2004.

In keeping with this legislation, CSU San Bernardino requires that all construction, renovation and demolition wastes are monitored (by weight) and that all recyclable or reusable construction, renovation and demolition wastes are diverted from landfills and combustion/transformation facilities.

Contractors are required to submit tonnage receipts for all materials disposed or diverted from disposal at any project site on the CSUSB campus. Exempted from this reporting requirement are projects whose total disposal and diversion activities are less than 0.1 tons (200 lbs). These receipts will be submitted with the summary form provided in this contract. These receipts must be received by the CSUSB Facilities Management department before final payment is authorized.

CSUSB recognizes that, in certain instances, weight receipts are not available (for example, if waste is collected in a 6-yard or smaller container which is not removed from the job site, and is collected by a waste hauler as part of a larger route). In instances in which weight receipts are not available, upon written approval from CSUSB Facilities Management, the

contractor may submit an alternative waste report which details the volume of all waste removed from the project site.

Contractors are also required to divert at least 50% of all potentially divertible materials from a project site. Materials to be diverted include, but are not limited to corrugated cardboard; pallets; scrap metal; asphalt, brick & concrete; scrap wood; and sheetrock.

A complete list of scrap metal recyclers is available in the scrap metal or recycling heading of the local yellow pages. Other construction and demolition recyclers are listed by the California Integrated Waste Management Board (CIWMB) on their website at www.ciwmb.ca.gov/condemo.

California State University San Bernardino Facilities Management
Renovation/Construction/Demolition Projects
Solid Waste Disposal/Diversion Reporting Form

Please submit one form for all work completed on a project during a calendar year. If a project continues into a new calendar year, please submit a separate form for materials generated in each year. Summarize the weights in pounds or the cubic yards for all materials generated during the designated project in the table below, and attach documentation, such as certified weight tickets or receipts from landfill or recycling facility, for all materials listed.

Date Form Submitted: _____

Time Period Materials Generated (mm/yy – mm/yy): _____

Project Description/Campus: _____

Contractor Name, City, State: _____

Contact Name, Title: _____

Contact Phone & E-mail: _____

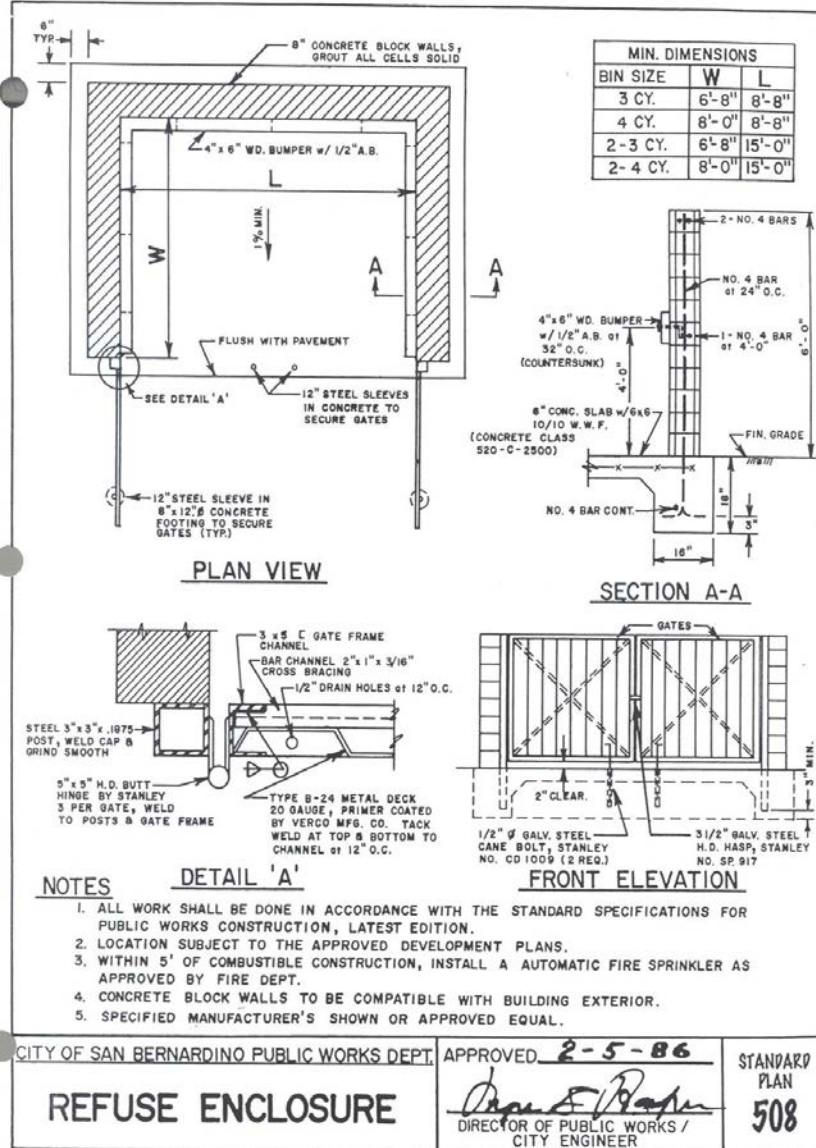
Signature: _____

Material Generated	Weight (pounds) or CY
Trash sent to landfill	
Cardboard diverted for recycling	
Scrap metal diverted for recycling	
Concrete diverted for recycling	
Asphalt diverted for recycling	
"Clean" wood diverted for recycling/composting	
Materials diverted for reuse	
Other:	

Please return this form completed to:

Recycling Coordinator, California State University, Heating & Air Conditioning
 5500 University Parkway, San Bernardino, CA 92407
 Fax 909.880.7082 – Phone 909.537.3797 – recycle@csusb.edu

REFUSE ENCLOSURE



CITY OF SAN BERNARDINO PUBLIC WORKS DEPT.

APPROVED 2-5-86

STANDARD
PLAN
508

REFUSE ENCLOSURE

David E. Bohn
DIRECTOR OF PUBLIC WORKS /
CITY ENGINEER