

Category	Section	Description	Comments	Drawing	Manufacturers	Does Project Design Comply with Guideline? (Yes/No/Non-Applicable) If "No", provide explanation
Mechanical/HVAC	15720	Air Handling Unit	<ol style="list-style-type: none"> 1. HHW coils shall be installed upstream of CHW for freeze protection. 2. Provide interior vibration isolation and IAQ drain pans. Provide safety platform if system is to be installed above 3 feet from roof or ground level. 3. Provide insulated double walls. Provide moisture proof fluorescent light with timer switch for fan taller than five (5) feet. 4. Economizer dampers shall be opposed blades, double skin air foil design and have damper blades on stainless steel sleeve bearings with stainless steel drive shaft. 5. Provide actuator with pilot positioner for pneumatic system. 6. Premium efficiency motors US841 or equal approval shall be used, designed for VFD motor slide base, with starter and belt guard for motors larger than 5 HP. 7. Provide heavy duty sealed or pillow-block type bearings with grease line extensions and Zerk fittings. 8. Provide filter frame with seal gaskets. Filters should be selected for minimal pressure drop. 	MM-27	<ol style="list-style-type: none"> 1. AHU by Trane, McQuay, Carrier, Johnsons Control or HuntAir. 2. Dampers by Greenheck, Ruskin, Johnson Controls or Honeywell. 3. Pneumatic actuators by Johnson Controls or Honeywell. Electric actuators by Belimo Honeywell or Johnson Controls. 	
Mechanical/HVAC	15720	Fan Coils	<ol style="list-style-type: none"> 1. Provide external seismic isolator, cable and hangers. 2. No dielectric unions allowed; use brass transition nipples and threaded unions, or brass adapter unions. Use flexible connections to coils where applicable. 3. Follow detail of coil/VAV/Reheat for coil components. 4. Install electrical motor disconnect for service, using premium efficiency motor, compatible with VFD. 5. Provide UV protection and cover on flex duct for exterior units. 6. Provide heavy duty sealed or pillow-block type bearings with grease line extensions and Zerk fittings. 7. Provide filter frame with sealed gasket and 24"x24"x12" disposable pleated filter with MERV 13 level. 8. Provide full access for service. 		<ol style="list-style-type: none"> 1. Fan coil by McIntyre, Trane, Carrier or McQuay. 2. Pneumatic control valve by Johnson Controls or Honeywell. 3. Circuit setter preferred by B&G. 4. Strainer preferred by Watts. 5. Ball isolation valve preferred by Red and White with threaded type connection only. 	
Mechanical/HVAC	15851	Chilled /Hot Water Beams Active or Passive	<ol style="list-style-type: none"> 1. Beams are to be connected to water piping using braided flex hoses, with flare swivel ends. 2. If more than one beam in a control zone, all may be controlled by one control valve. 			
Mechanical/HVAC	15900	Chilled Water System	<ol style="list-style-type: none"> 1. Stanford's CHW system is different than a standard system fed from local chiller, Refer to MS-10 for CW interface layout. 2. Rosemount Measurement devices are used for Utility metering connected to EMCS. 3. Ten upstream and five downstream pipe diameters are required for mag flow tube installation. 4. Special cable, conduit and ground strap requirements for mag flow transmitter and flow tube. Refer to manufacturers installation instructions. 	MS-10	Instrumentation by Rosemount Measurement.	

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Mechanical/HVAC	15910	HVAC - EMCS and DDC Controls and Instrumentation	<ol style="list-style-type: none"> 1. CHW, steam, related equipment and main air handlers are controlled by EMCS. Zone temperature controls may be pneumatic or LON-Mark open protocol DDC. Contact Zone Engineer for DDC specifications. Refer to FDG 15900 for system architecture and EMCS control specifications and FDG 15910 for DDC specifications. 2. Many air handler systems have supply temperature reset, contact Zone Engineer for design criteria. 3. DDC system shall have web accessible graphics showing floor plan with room numbers and space temperature, clickable to graphic room controls. 4. Alarms and trending as directed. 5. Can over ride set point, damper, reheat or chilled water valve actuator. 6. Color change if the temperature is three degrees above or below set point. 		Distech or approved equivalent for new construction. Match existing or Distech for remodel.	
Mechanical/HVAC	15210	Air Compressors/Air Dryers Installation	<ol style="list-style-type: none"> 1. System needs to meet requirement for specific research. 2. Reference FDG Process Air and Gas Piping Section 15210. 3. Specify oil free compressors. 4. Specify premium efficiency motors. 5. Provide airless tank drains (Spectrix model CDE 1610) 6. Use schedule 80 metallic nipple for connection between pressure vessel and first isolation valves. 7. Install run hour meters. 8. Provide air dryer and final filters as required by lab spec. 9. Provide dry contacts for EMCS remote monitoring of alarms. 	MM-23	Quincy, Kobelco, Atlas Copco or Power Ex.	
Mechanical/HVAC	15510	Heating Water System	<ol style="list-style-type: none"> 1. Pump mounting details see drawings MM-16. 2. Isolation valves shall be installed per floor, per room and per fixture. 3. Install pot feeders (Griswold FB-15). 4. Install water meters (Hersey-Meters 400 series US.) 5. Install make-up water flow alarms with automatic shut off see drawings MM-29. 6. Install bladder expansion tank (B&G, Wessels or Taco). 	MM-16 & MM-17 & MM-29	Griswold FB-5, Hersey Water Meters 400 Series HS, expansion tank using B&G, Wessels or Taco.	
Mechanical/HVAC		Heating Hot Water System	<ol style="list-style-type: none"> 1. All heating coils shall be sized for $\leq 150^{\circ}\text{F}$ entering water temperature and $\leq 105^{\circ}\text{F}$ leaving water temperature. 			
Mechanical/HVAC	15210	Vacuum System	<ol style="list-style-type: none"> 1. System needs to meet requirement for specific research. 2. Provide submittal package to Stanford owners rep for distribution to approval group. 3. Provide adequate sectional isolation valves. 4. Ensure no single pass cooling to vacuum pump. 5. Dry screw type with On/Off setpoints with separator tank. 6. Provide EMCS connection to monitor system. 7. Provide a vacuum vent trap in buildings where solvents are used. 8. Vacuum exhaust to be vented to roof. 9. Install piping per FDG 15210. 		Busch, Nash or approved equal.	

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Mechanical/HVAC		DI Water System Installation	<ol style="list-style-type: none"> 1. System needs to meet requirement for specific research. 2. Make-up water to DI Systems to have back flow protection and water meter. 3. Consider if reject water can be reused within building for other purposes before discarding to drain. 4. Provide adequate sectional isolation valves. 5. Design serpentine system for cleaner product delivery. 6. Keep dead legs as short as possible. 7. Provide UV treatment, filtering, resistivity meter, high and low level alarms and pressure gauges. 8. Provide EMCS connection to monitor alarms. 9. All components to be compatible for DI Systems. 10. Ensure volute remains flooded when low water cut off alarm takes effect. 11. All components shall be accessible for maintenance. 		Siemens or GE.	
Mechanical/HVAC		Process Cooling Water (PCW) System Installation	<ol style="list-style-type: none"> 1. System needs to meet requirement for specific research. Recommend open tank style system. 2. Provide make-up water back flow protection, metering and automatic shut off. 3. At point of use provide full port size isolation, B & G circuit setter, flow meter on return pipe, temperature, pressure gauges and filter as required. 4. Provide EMCS connection to control system. 5. All distribution pump/motors to have VFD. 6. Use non-ferrous piping material only. 7. Provide unions or flange connections at HX with leak test drain & vent points between isolation valves. 8. Replaceable bladder pressure expansion tank needed for all closed loop PCW systems. 9. If PCW needs domestic water back up system, ensure proper drainage and emergency power to sump, if applicable. 	MM-03, MM-25 & MM-30		
Mechanical/HVAC	15830	Continuous Vibration Analysis	<ol style="list-style-type: none"> 1. Reference FDG HVAC Fans Section 15830. 2. Install continuous vibration monitoring devices on all critical equipment 		Equipment Manufacturer: SPM Vendor: US Bearing and Drives or Transcat Parts List: a) VMM Vibration Monitoring Module 1052.79.2105.58 b) SLD121F Vibration Transducer 227.85.911.40	
Electrical	16500	Exit Signs and Emergency Egress Lights	<ol style="list-style-type: none"> 1. Exit signs shall be LED with nickel-cadmium batteries. 2. Specify Dual-lite - with self-diagnostic electronics including 90-minute annual test. 3. Specify universal mounting with interchangeable single or dual faces. 4. Exit signs shall have green letters with optional directional arrows. 5. Specify emergency egress light Dual-lite Model EZ-21 with self-diagnostic electronics. 6. Specify Edge-lit Dual-lite with self diagnostic electronics for ceiling mounted clear sign fixtures. 7. If emergency generator is available connect exit signs to standby power. 		Dual-lite	

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Electrical	16500	Lighting Fixtures	<ol style="list-style-type: none"> Specify Manufacturer and model (at 4100K): GE F32T8/XL/SPX41/HL/ECO, Phillips F32T8/ADV841/ALTO and Sylvania FO32/841/XPS/ECO Specify high efficiency ballasts. Manufacturer and model: GE Ultramax (Max/Ultra), Advance Optanium (IOP), Sylvania QHE and Universal ULTim8 Incandescent lamps are not acceptable. Specify T-8 in lieu of T-5 lamps except as required by architectural considerations. Reference FDG Lighting Section 16500 and Outdoor Lighting Section 16520 for additional design information. 		GE, Sylvania or Phillips	
Electrical	16500	Lighting Controls	<ol style="list-style-type: none"> Lighting controls shall meet Title 24 requirements. Occupancy sensors to be installed in rooms with two or more lighting fixtures. Sensor type to be determined based on room configuration. All outside lighting fixtures to be controlled by photocells. 		Watt Stopper	
Electrical	16225	Common Motor Requirements	<ol style="list-style-type: none"> Motors over 5 HP shall be premium efficiency. Motors connected to VFD shall be inverter duty. Any motor controlled by a variable frequency drive shall incorporate a design to prevent arcing through the motor bearings: Insulated bearings, grounded motor shafts or add-on devices such as those manufactured by AEGIS Ground Shafting Ring (SGR), Shaft Grounding Systems or approved equal. Whenever possible, the ring shall be factory-installed. 		Baldor, US Motor or Lincoln	
Electrical	16442	Electrical Panels	<ol style="list-style-type: none"> For new construction, electrical panels shall be calculated and labeled for Arc Flash hazard warning. For existing electrical systems, panels must be labeled with generic Arc Flash warning. See FDG 16011 for details. Construction shall be hinged door with dead front panels with panel legend. 120/208 panels serving non-linear loads shall have grounded conductor sized 200% of un-grounded conductors. 		GE, Westinghouse, Cutler Hammer or Square D.	
Electrical	16011	Arc Flash Requirements	<ol style="list-style-type: none"> Reference FDG Arc Flash Hazard Protection Section 16011. 			
Electrical	16265	Variable Speed Drives (VFD)	<ol style="list-style-type: none"> VFDs shall be manufactured by ABB. ABB VFD shall include factory authorized start-up for extended two year warranty. VFD shall be fed from circuit breaker not from a motor starter. VFD shall be provided with electronic or manual bypass section for critical systems. Follow VFD installation detail (ES-29) for all new Construction 	ES-29	ABB	
Electrical	15820	Fire - Smoke Dampers - Specify Ruskin with positioners lights / test indicators	<ol style="list-style-type: none"> Specify Ruskin MCP2/24 with removable key type switch (For all smoke control systems) and Specify Ruskin MCP-4/44 with push button type switch (For buildings with no smoke control systems). See drawing MM-26 for additional details. Install switch above clear floor area for access by ladder. Install MCP2/24 below ceiling or install remote indicator lamp below ceiling. All damper assemblies must maintain UL approval. 	MM-26	Damper: Ruskin Actuator: Belimo	

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Electrical	16230 & 16231	Diesel Generators and ATS	<ol style="list-style-type: none"> 1. Reference FDG Generator Section 16230 and Automatic Transfer Switch Section 16231. 2. Provide load bank Cam-lok and circuit breaker with under voltage release to allow generator to be tested under load using a portable load bank. 3. Provide four auxiliary dry contacts for the remote monitoring of the generator alarms by EMCS. 4. Generators to meet Stanford emission requirements listed in FDG. 5. Size fuel tank to provide required hours of operation per Stanford requirements. 6. Follow UNIDOCs checklist for regulatory code compliance. 7. Install Knox box on exterior housing. Order form can be obtained from Stanford Zone Management BG&M. 8. Install minimum 20 BC fire extinguisher in weather rated cabinet within 30 ft. of generator. 9. All new generators installed at Stanford will require the completion of the Sustainability & Energy Management's Emergency Generator Application. The application form can be found here: http://bre.stanford.edu/sem/electric_service. 10. The Project Manager shall submit the Emergency Generator information to Sustainability & Energy Management Group, Environmental Health and Safety, and Buildings & Grounds Maintenance. 		Onan, Kohler & ASCO	
Electrical	16443	Switchboards and MCC's	<ol style="list-style-type: none"> 1. Reference FDG Panelboards Section 16442 and Motor Control Centers Section 16443. 2. Construction shall be hinged door with dead front panels with panel legend. 3. For new construction, switchboards shall be calculated and labeled for Arc Flash hazard warning. For existing electrical systems, panels must be labeled with generic Arc Flash warning. See FDG 16011 for details. 		GE, Westinghouse, Square D or Cutler Hammer	
Plumbing	15410	Sanitary Fixtures Selection Urinals, Water Closets, Sinks	<ol style="list-style-type: none"> 1. Provide submittal package to Stanford owners rep for distribution to approval group. 2. Provide 1.28 gal per flush toilets. 3. Provide 0.125 gal per flush urinals. 4. Floor drains to be provided with automatic trap primers. 5. Sink P-Traps to have plug type clean out. 6. Refer to: http://bre.stanford.edu/sem/sites/all/lbre-shared/files/docs_public/we_performance_goals_12.18.08.pdf 		Kohler, Chicago, Zurn, Sloan, Elkay or American Standard.	
Plumbing	15400	Isolation Valves Requirements	<ol style="list-style-type: none"> 1. Isolation valves shall be installed per floor, per room and per fixture. 2. Specify Red & White full port threaded Ball type up to 2" size and Mueller Resilient Seat Gate above 2.5" size as applicable for each system. 		Red and White, Nibco or Mueller	
Plumbing	15400	Automatic Trap Primers	<ol style="list-style-type: none"> 1. All trap primers to be installed with isolation valves and unions connected in locations where replacement is possible. 2. When required, provide trap primer with a timer. Normally closed solenoid valve shall be bronze with threaded connections and suitable for 120V, 60Hz operation. 		Sioux Chief, ASCO or PPP	

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Plumbing		Emergency Shower and Eye wash	<p>Shower</p> <ol style="list-style-type: none"> The supply pipe size shall be a minimum 1.25 inch. Deluge showers shall be supplied with an instant action stay open ball valve operated by a push-pull rod handle. Each shower shall be identified with a highly visible sign. Electrical apparatus or outlets should not be located within 18" either side of the shower, outlets within 6 ft shall be GFCI protected. Provide insulation for freeze protection and solar heat gain protection for water in outside applications. Shower equipment shall deliver tempered water per Stanford EH&S requirements. <p>Eye Wash</p> <ol style="list-style-type: none"> Ensure a controlled flow of potable of water is provided to both eyes simultaneously at a velocity low enough not to be injurious to the user. Eyewashes shall be supplied with twin feather heads, stay open valve, dual automatic pressure controls and dual protective dust covers. Electrical apparatus or outlets should not be located within 18" either side of the eye wash, outlets within 6ft shall be GFCI protected. Test drain fittings to be installed to allow a 5 gallon bucket basin. Eye Wash equipment shall deliver tempered water per Stanford EH&S requirements. <p>Refer to: http://www.stanford.edu/dept/EHS/prod/mainrencon/Labdesign/Section_1-2_Safety_Eyewash_Showers.pdf</p>	MM-09	Haws, Guardian or Bradley	
Plumbing		Domestic Water Automatic Shut-off and Leak Detection System	<ol style="list-style-type: none"> Heating water and process cooling water closed loop system to be provided with a domestic water make-up automatic shut-off control that automatically shuts down the domestic water make-up, shuts down the recirculation pumps and sends an alarm through the EMCS. Domestic water heaters to be provided with a leak detection device that shuts down the cold domestic water make-up in the event of a leak from the water heater. 	MM-29	ASCO, Dwyer & Water Cop	
Plumbing	15510	Heating water boilers and accessories	<ol style="list-style-type: none"> Pump mounting details see drawing MM-16. Shut-off valves on all plumbing and mechanical lines and equipment shall be provided as needed to isolate various buildings areas for maintenance or remodeling activity without interference with occupancy in other areas. Install pot feeders (Griswold FB-5). Install water meters (Hersey-Meters 400 series IIS) Install water make flow alarms see drawings MM-29 Install bladder expansion tank (B&G). 	MM-16 & MM-17 & MM-29	Ajax, Bryant, Parker, B&G, Griswold and Hersey-Meters	
Plumbing	15510	Domestic water heaters	<ol style="list-style-type: none"> Re-circulation pump mounting details see drawing MM-16. Shut-off valves on all plumbing and mechanical lines and equipment shall be provided as needed to isolate various building areas for maintenance or remodeling activity without interfering with occupancy in other areas. Install Bladder expansion tank (B&G). 	MM-16	A.O. Smith, HOYT, Taco, B&G, Wessels, Cemline or GE	
Plumbing	15195	Natural gas earthquake valve installation	<ol style="list-style-type: none"> Stanford requires all buildings with natural gas service to have automatic seismic gas shutoff valve installed outside the building and down stream of the pressure regulator. All earthquake valves to have a full port isolation ball valve installed directly after to isolate building allowing prompt and effective resetting of earthquake valve. 	MM-05	Pacific Seismic Products & Red and White ball valve	
Plumbing		Steam pressure relief valves & pressure reducing valves	<ol style="list-style-type: none"> Use union connections for pipe size up to 2", 2.5" and above to have flange connections. 	MM-04	Kunkle, Spirax Sarco or Armstrong	

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Plumbing	15051	Plumbing systems guidelines	<ol style="list-style-type: none"> 1. All buildings where water is used to directly support or back up research, prepare food or bathe, dual back flow preventers to be installed to allow testing without shutting down service. 2. All clean-outs must be accessible and those behind walls must be piped so that the bottom of the pipe is above the fixture flood rim level to avoid spillage of effluent into wall cavity when pipe is opened to clear blockages. 3. Chloramines filtering to be installed at vivarium facilities. 4. Isolation valves shall be installed per floor, per room, per fixture. 5. Domestic hot water shall have pumped return loops to minimize water waste. 6. Central hot water systems are preferred to point of use for life cycle cost and efficiency reasons. 7. No dielectric unions allowed, use brass transition nipples and threaded unions, or brass adapter unions. 8. Drain piping from sinks should rinse drain pipes from urinals and toilets, if possible. 9. All facilities designed to generate, collect and transport grease waste products to meet the requirements of the County of Santa Clara Grease Waste Ordinance, applicable plumbing codes and manufacturer's requirements such as access and maintainability. 10. For new construction or significant underground sanitary sewer rework, consider flushing all lines and videotaping the underground piping out to the first manhole. 			
Plumbing	15405	Food Service Establishments	<ol style="list-style-type: none"> 1. Reference FDG Fats, Oils and Grease Waste Management System Section 15405. 2. All new construction and renovation of existing commercial Food Service Establishments shall comply with the Palo Alto Sewer Use Ordinance 16.09. 			
Accessibility		Maintenance Accessibility	<p>Accessibility for maintenance, service and/or repair shall always be considered when installing equipment. Contractor shall ensure that installed equipment that requires maintenance, service and/or repair can be maintained easily according to industry best practices. Clearances specified by Codes and/or Regulations for installed equipment shall always be observed and adhered too.</p> <p>This item applies to AHU, Exhaust Fans, FCU, CHW Systems, PCW Systems, CDA Systems, Electrical Systems</p>			
Sustainability		Sustainability Guide	<p>Air Handlers</p> <ul style="list-style-type: none"> - Use straight fin coil banks instead of corrugated coil fins on heating and cooling coils - Improve filter efficiency using V bank filters instead of pre and final filters (Air handlers) - Utilize run-around coil heat recovery system for 100% OSA Systems - Include VFD on supply and exhaust fans - Utilize ultrasonic humidifiers in place of electrode or steam humidifiers - Allow Un-occupied Zone Space Temperature Setback with occupant room bypass capability - Allow HVAC Supply Air Temperature and Pressure Resets based on Zone Demand or Outside Air Temperature - Time schedule air-handlers off during unoccupied hours - Program economizer night flush operation where feasible <p>Electrical</p> <ul style="list-style-type: none"> - Specify Powersmiths High-efficiency Distribution Transformers <p>Energy Star</p> <ul style="list-style-type: none"> - Use Energy Star "Most Efficient" rated package units including heat pumps, and provide economizers <p>Fume Hoods</p> <ul style="list-style-type: none"> - Reduce minimum flow (volume) when hood sashes are closed per revised code <p>Fan Coil Units/ Controls</p> <ul style="list-style-type: none"> - Switch FCU Fan Mode to Auto - Install CO2 sensors in meeting and conference rooms - Increase zone setpoints for unoccupied rooms with fan coils - Install deadband thermostats - Install Fan Coil Units for rooms with different operational hours or greater heating or cooling requirements than the rest of the Building. <p>Heating Water System</p> <ul style="list-style-type: none"> - Utilize variable flow heating hot water system - Allow HHW Supply Temperature and Pressure Resets based on Out-Side Air Temperature. <p>Misc.</p> <ul style="list-style-type: none"> - Adjust minimum general exhaust air changes per hour (ACH) to meet current hazard level and EH&S lab design guidelines. - For servers and telecom rooms, refer to Stanford University Server/Telecom Rooms Design Guide - Install Windows and HVAC interlocks when both are available in the same space. - Allow Lab Spaces to be controlled based on Occupied/Un-occupied setting. 			