OVERVIEW:
The Heating, Ventilating and Air Conditioning (HVAC) series is comprised of six classifications with varying levels of responsibility for the operation, maintenance and repair of HVAC and refrigeration equipment/systems and related building automation systems. Incumbents in this series also install, maintain, service, inspect and repair the mechanical, electrical, electronic and digital controls associated with these systems, either in a centralized plant or in decentralized centers across a campus.

All incumbents must be able to proficiently use building automation systems to diagnose and troubleshoot problems; estimate cost, time and materials for projects; participate in the maintenance and operations of applicable heating and air conditioning systems and equipment; maintain and service tools and equipment used in the performance of duties; perform all work in accordance with established safety procedures and maintain a safe and clean work environment; maintain records and logs; retrieve data related to work performed using manual and/or computerized record-keeping systems; prepare standard reports; and consult and work with other trades workers. Work may involve exposure to hazardous materials and some positions will require EPA approved certification in refrigerant recovery.

Examples of typical activities for each classification are not meant to be all inclusive or restrictive; incumbents may perform related work activities.

OPERATING ENGINEER

The Operating Engineer primarily is responsible for the operation, maintenance and repair of boilers and chillers for the heating and cooling systems on a campus or major facility. Incumbents also may be responsible for the operation, service and repair of power plants involving low, medium or high speed revolution cogeneration equipment. The Operating Engineer is distinguished from the Building Service Engineer in that the Operating Engineer typically works with stationary or more central equipment, while the Building Service Engineer must service a wider range of HVAC systems and equipment.

Under general supervision, incumbents monitor, operate, and maintain boiler and chiller systems and their components (including underground components), power plant equipment (such as reciprocating engines), and fire and secure high pressure boilers; respond to calls; manipulate features of building automation systems to adjust space temperatures and air intake to optimize comfort while conserving energy; affect building automation programming schedules for the heating and cooling of campus facilities; conduct chemical analyses for water treatment for both chillers and boilers; switch plant to manual operation in case of a power failure; perform some soldering and welding on plant equipment and pipelines; and may provide work direction to semi-skilled and unskilled assistants.
TYPICAL QUALIFICATIONS:

Knowledge:
Work requires thorough knowledge of high and low pressure boiler and chiller systems, electrical distribution and transfer systems and equipment, and auxiliary equipment; thorough knowledge of the methods, materials and tools used in the operation of applicable systems; working knowledge of system water testing and treatment procedures; and working knowledge of applicable building automation systems and interfaces.

Abilities:
Must be able to operate boilers and chillers safely and efficiently; quickly identify and correct malfunctions; monitor energy consumption and adjust equipment and system features; operate computer-based energy management systems and interfaces with main building automation system; read, interpret and work from blueprints, manuals, diagrams and operating procedures; estimate cost, time and materials of projects; maintain logs and records; retrieve data related to work performed using manual and/or computerized record-keeping systems; prepare standard reports; provide instruction to unskilled assistants; analyze and respond appropriately to emergency situations; read and write at a level appropriate to the position; and perform arithmetic calculations as required by the position.

Experience:
These abilities normally would be acquired through the equivalent to two years of hands-on experience in the operation, maintenance and repair of boiler and chiller systems, cogeneration systems, and/or related mechanical equipment. Completion of a certificate or other vocational training may be substituted for hands-on experience.

BUILDING SERVICE ENGINEER

Under The Building Service Engineer is distinguished from an Operating Engineer by the independent and on-going performance of maintenance and repair work on a wider range of heating, ventilating, plumbing, electrical, mechanical, refrigeration, air conditioning, and water systems. Compared to the Air Conditioning/ Refrigeration Mechanic, the Building Service Engineer performs less sophisticated and comprehensive work on complex refrigeration and air conditioning systems. The work of an Air Conditioning/Refrigeration Mechanic requires a more comprehensive knowledge of these systems and the applicable regulations.

Under general supervision, incumbents operate, maintain, repair and inspect heating, ventilating, air conditioning, refrigeration and water systems and equipment; test, adjust, and calibrate boiler and air conditioning machinery and mechanical, electrical, pneumatic, and/or microprocessor control instruments; test and chemically treat boiler, condenser, and cooling tower water and water from other systems; maintain, inspect, diagnose and make emergency repairs to steam, natural gas, water, refrigerant, air and oil distribution systems; regularly use features of building automation systems to diagnose and troubleshoot problems in the HVAC systems while optimizing energy usage; monitor building automation systems data and adjust system accordingly; respond to service requests to adjust air flow, temperature and humidity balances for individual rooms, building areas or buildings; maintain swimming pools; maintain logs of maintenance and repairs using manual and computerized record-keeping systems; and may instruct and lead semi-skilled or unskilled assistants. Incumbents also repair and replace bearings, shafts, seals, rings and electrical wiring and install central system parts, gauges, valves and pipes which requires the application of journey-level skills in one or more of the applicable trades. Additionally, incumbents may rotate through various shift assignments at stations either in a central plant or in the utilities centers of individual buildings or campus centers for the operation, service and repair of low, medium or high-speed revolution cogeneration equipment.

TYPICAL QUALIFICATIONS:

Knowledge:
Work requires thorough knowledge of high and low pressure boilers, and heating, pneumatic, ventilating, air conditioning, refrigeration and other mechanical equipment; thorough knowledge of the methods, tools and materials used in the operation, maintenance and repair of such equipment; general knowledge of ventilation principles, thermal dynamics, and closed water systems; working knowledge of energy management systems including the ability to understand and use system features; and a general knowledge of the applicable state and federal safety codes and regulations pertaining to mechanical and HVAC systems.
**Abilities:**
Must be able to install, operate and repair HVAC equipment and systems; demonstrate a high degree of mechanical skill equivalent to journey-level in one or more related trades such as plumbing, pipe fitting, electrical, or air conditioning; read, interpret and work from blueprints, plans, drawings and specifications; make rough sketches; estimate cost, time and materials of mechanical work; maintain records and retrieve data related to work performed using manual and/or computerized record-keeping systems; prepare instruction to unskilled and semi-skilled assistants; analyze and respond appropriately to emergency situations; read and write at a level appropriate to the position; and perform arithmetic calculations as required by the position.

**Experience:**
These abilities normally would be acquired through two years of journey-level experience in the operation, maintenance and repair of boiler, heating, ventilating, refrigeration and air conditioning equipment and systems or the equivalent combination of formal course work in mechanical technology and hands-on experience.

**AIR CONDITIONING/REFRIGERATION MECHANIC**

The Air Conditioning/Refrigeration Mechanic is distinguished from other classifications in the series by responsibility for the full range of service, maintenance and repair on more complex refrigeration and associated HVAC systems and equipment. The work of an Air Conditioning/Refrigeration Mechanic requires a more comprehensive knowledge of refrigeration and air conditioning systems than the refrigeration and air conditioning work performed by the Building Service Engineer. Incumbents in this classification must be thoroughly familiar with all safety codes and regulations related to the installation and operation of refrigeration and air conditioning systems. Positions in this classification require certification from the Environmental Protection Agency in the use and disposal of compressed refrigerants.

Under general direction, incumbents install, troubleshoot, calibrate, service, repair and maintain refrigeration and HVAC systems, equipment, instruments and controls using electrical, electronic, pneumatic or digitally controlled systems; oil, clean, adjust, overhaul, and repair motors, condensers, compressors, oil and vacuum pumps, and similar equipment; perform major overhauls involving disassembly and inspection of all parts, replacement of defective and worn parts, reassembly of equipment instruments and/or controls, and the testing of equipment to ensure proper functioning; locate and diagnose malfunctions using a wide variety of test equipment and instruments; analyze the efficiency of campus refrigeration and air conditioning systems and recommend action for improvement; respond to service requests; diagnose problems in the distribution of air to individual rooms and buildings and make necessary adjustments; use building automation system to diagnose and troubleshoot problems in HVAC and refrigeration systems; maintain inventory and records; order parts and supplies; and train and provide work direction to skilled and semi-skilled workers.

**TYPICAL QUALIFICATIONS:**

**Knowledge:**
Work requires thorough knowledge of the theory and operation of major types of refrigeration and air conditioning equipment and of the materials, equipment and techniques used in the repair and maintenance of such equipment; and working knowledge of electrical voltage, plumbing refrigeration, electrical and plumbing codes, thermodynamics and automated energy/environmental management systems.

**Abilities:**
In addition to the abilities required of a Building Service Engineer, the Air Conditioning/Refrigeration Mechanic must be able to use judgment and discretion in determining the methods and priorities of work orders; perform skilled electrical and plumbing work; diagnose and repair major malfunctions in the complex multi-zone air conditioning systems; devise and control air distribution efficiently with maximum comfort; and diagnose and repair the full range of refrigeration equipment including centrifugal and absorber equipment and/or screw, scroll and reciprocating refrigeration equipment.

**Experience:**
These abilities normally would be acquired through progressively responsible experience in the installation, adjustment, maintenance and repair of commercial and domestic refrigeration and air conditioning systems involving modulatory and safety controls, thermostats, humidifiers and duct stats as well as one year of experience in the installation and repair of central multi-zone air conditioning systems. In addition, journey-level
skill equivalent to that acquired through the completion of a refrigeration or air conditioning mechanic’s apprenticeship program is required.

Special Requirements:
Incumbents typically must possess certification in the use of refrigerants.

FACILITIES CONTROL SPECIALIST

This classification is designed for those positions primarily responsible for the installation, maintenance, adjustment and repair of electric, electronic, pneumatic and digitally controlled building automation systems which manage the most complex HVAC and refrigeration systems. Incumbents monitor, troubleshoot, design, modify, calibrate and program system features; and respond to technical and mechanical problems, either remotely or on-site. Incumbents must be thoroughly conversant in the software operation of the applicable building automation system and have journey-level skills and experience to allow them to diagnose, repair and maintain complex HVAC systems and their components. The Facilities Control Specialist is distinguished from the Building Service Engineer and Air Conditioning/Refrigeration Mechanic in that the primary focus of this classification is on the monitoring and maintenance of building automation systems rather than on the operation, maintenance and repair of these systems. While some manual repairs and adjustments may be performed directly on HVAC and refrigeration systems and equipment, these are ancillary rather than primary duties for the Facilities Control Specialist.

Under limited supervision, incumbents install, modify and adjust computer-based heating, ventilation and air conditioning equipment and systems; fabricate and implement programs or building control strategies for digitally controlled or global supervisory controlled systems; troubleshoot, design and modify programs for building automation systems; repair and maintain individual hardware and software components of applicable systems; perform major-to-minor overhauls which include disassembling and inspecting of all parts, replacing worn and defective parts, reassembling of all equipment and controls, and testing to ensure proper function; perform major-to-minor repairs of microprocessor-based automation system that monitors and controls building environments; respond to requests for service; diagnose and troubleshoot system problems and correct as necessary; may serve as the department specialist on building automation systems; and train others on the troubleshooting, overhaul, repair, calibration, and testing of controls to facilitate the maintenance of systems.

TYPICAL QUALIFICATIONS:

Knowledge:
In addition to the knowledge requirements of the Building Service Engineer and/or Air Conditioning/Refrigeration Mechanic, the Facilities Control Specialist must possess a thorough understanding of electric, electronic, pneumatic and digitally controlled building automation systems, including a thorough knowledge of assigned building automation systems.

Abilities:
In addition to the abilities of the Building Service Engineer and/or Air Conditioning/Refrigeration Mechanic, the Facilities Control Specialist must be able to use of the building automation system’s programming features to design, modify and implement programs to achieve facilities management’s goals, as well as to perform remote and hands-on troubleshooting, intervention and repair, as needed.

Experience:
In addition to the experience required of the Building Service Engineer and/or Air Conditioning/Refrigeration Mechanic, the abilities of a Facilities Control Specialist normally would be acquired through four or more years of experience in the following areas:

a) Progressively responsible skilled journey-level experience diagnosing, repairing and maintaining large, complex and sophisticated heating, ventilation, refrigeration and air conditioning and water treatment systems.
b) Experience installing, inspecting, servicing, repairing, replacing and calibrating building automation and control systems.
c) Experience using programming features of building automation systems.
LEAD BUILDING SERVICE ENGINEER

Under general supervision, the Lead Building Service Engineer (Lead BSE) works with and provides lead work direction to a small group or crew of skilled and semi-skilled workers involved in the installation, operation, preventive maintenance and repair of mechanical systems related to heating, ventilating, air conditioning (HVAC), refrigeration, energy management, electronic controls, power, water and sewer systems and equipment as related to HVAC and/or Mechanical systems throughout a campus. The Lead BSE is distinguished by the additional responsibilities of providing lead work direction to multiple and diverse journey-level crafts workers and semi-skilled assistants, laying out and coordinating the work flow for jobs, and preparing materials lists and ordering supplies for jobs. Unlike the Supervising BSE, the Lead BSE spends the majority of time working as a Building Service Engineer or in related HVAC trade while performing lead work coordination and project planning responsibilities for a work crew and typically is not overseeing the work of multiple work crews.

Incumbents typically prioritize and coordinate the work of a small work group or crew including providing direction for work sequencing and technical expertise and leadership; ensure necessary materials, supplies and equipment are available to complete assigned work orders and perform preventive maintenance; instruct staff on work and safety rules and ensure that they are observed; inspect work to ensure it meets quality requirements and specifications; provide input on performance evaluations; establish and maintain effective working relationships; and maintain computerized maintenance management systems, including accounting for labor, materials and purchasing, as well as prepare reports. On specific projects, work may involve coordinating with other departments and coordinating the work of other skilled crafts workers.

TYPICAL QUALIFICATIONS:

Knowledge:
In addition to the knowledge required of the Building Service Engineer or related HVAC trade, the Lead BSE must possess a more thorough mechanical and technical knowledge; a working knowledge of effective supervisory practices and techniques; working knowledge of project sequencing; and a thorough knowledge of the applicable state and federal safety codes and regulations pertaining to mechanical and HVAC systems.

Abilities:
In addition to the abilities required of a Building Service Engineer or related HVAC trade, the Lead BSE must be able to lead, instruct and coordinate the work of a small group or crew of skilled and semi-skilled workers; provide direction on the interpretation and use of blueprints, plans, drawings, and specifications to the work crew; accurately estimate costs, supplies and materials needed for jobs and projects; prepare materials lists; ensure work is performed in sequence; inspect and assess work to ensure it meets requirements and specifications; analyze and respond appropriately to emergency situations; and maintain computerized maintenance management systems and records and prepare more complex reports.

Experience:
In addition to the experience required of the Building Service Engineer, the abilities of a Lead BSE would normally be acquired through two or more years of experience as a journey-level Building Service Engineer that included some work or project coordination responsibilities.

SUPERVISING BUILDING SERVICE ENGINEER

Under general supervision, the Supervising Building Service Engineer primarily is responsible for supervising and working with one or more small groups or crews of skilled and semi-skilled workers involved in the installation, operation, maintenance, and repair of mechanical systems including heating, ventilating, refrigeration, air conditioning, power, water and sewer systems and equipment as related to HVAC and/or Mechanical systems throughout a campus. The Supervising Building Service Engineer is distinguished from the other trade and lead classifications in the HVAC Series by the scope of supervisory, project planning and coordination duties and the greater amount of time devoted to these activities.

Incumbents typically prioritize and coordinate the work of multiple crews or projects; assign work to qualified crew members; provide overall technical leadership; determine necessary materials, supplies, equipment and staffing to meet work orders and preventive maintenance schedule; provide work and safety instructions; provide on-the-job training and instructions to less skilled workers in trade and safety practices; provide written input on performance evaluations; prepare and issue written or oral work directives; monitor work in progress; inspect
completed work to ensure it is in compliance with specifications, special instructions and sound trade practices; maintain computerized maintenance management systems, including accounting for labor, materials and purchasing, as well as prepare reports.

Work on new construction and remodels requires: collaborating with engineering and design departments; interpreting complicated plans and drawings; coordinating work schedules and work assignments to meet the overall construction/modification objectives; sequencing of work; ensuring the availability of required materials and equipment; analyzing operations; preparing cost and time estimates; and providing a high level of inspection to ensure appropriate building and safety codes are met. Incumbents also may design minor tenant improvements and coordinate and supervise the work of related trades workers on specific projects.

TYPICAL QUALIFICATIONS:

Knowledge:
In addition to the knowledge required of the Lead Building Service Engineer, the Supervising Building Service Engineer must possess a thorough knowledge of effective supervisory practices and techniques; working knowledge of job design and work sequencing related to renovation and installation projects; and thorough knowledge of the applicable state and federal safety codes and regulations pertaining to mechanical and HVAC systems.

Abilities:
In addition to the abilities required of the Lead Building Service Engineer, the Supervising Building Service Engineer must possess journey-level skills in a mechanical and/or related HVAC trade. Also, incumbents must be able to maintain currency in applicable industrial safety orders and regulations pertaining to facilities, HVAC and related equipment; plan and direct the work of skilled crafts workers and semi-skilled workers; determine and coordinate staffing, material and equipment needs for multiple jobs and projects; perform basic design work; read blueprints and work from plans and specifications; prepare rough sketches; read and interpret complex operating manuals; analyze and respond appropriately to emergency situations; ensure accuracy and maintenance of assigned record-keeping systems; prepare more complex reports; read and write at a level appropriate to the position; and perform arithmetic calculations as required by the position.

Experience:
In addition to the experience required of the Lead Building Service Engineer, the abilities of the Supervising Building Service Engineer normally would be acquired through three or more years of experience working as a journey-level crafts worker in one or more applicable mechanical or related trades, including one to two years in a lead/supervisory capacity.