

# Facility Services Procedural Guidelines



**Title: Cal Poly Facility Services Utilities Policies and Procedures - Air Conditioning**

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Facility Services receives a large number of requests for the installation of air conditioning systems. The proliferation of air conditioning systems on campus has a significant impact on energy consumption, overloading of electrical circuits, maintenance workload, and campus operating budgets. This procedure is intended to guide project managers and clients in the proper application of air conditioning systems in campus buildings.

## **Governing Policies:**

The CSU operates under a number of state policies, codes, and regulations that govern the design, construction, and operation of air conditioning systems. These include, but are not limited to:

**CSU Executive Order 987:** This document is the CSU Policy Statement on Energy Conservation, Sustainable Building Practices, and Physical Plant Management. It establishes best practices and goals including:

- Campuses implement energy conservation projects on a continuous basis to reduce energy consumption by 15% per square foot every five years. Since air conditioning equipment uses a significant amount of electrical energy, new installations must specify the most efficient air conditioning equipment and systems that are economically feasible.
- Air conditioning systems must be selected based on life cycle cost analysis, which includes capital cost, energy cost, maintenance, and replacement cost over its lifetime. Energy is usually the largest single cost in this analysis.
- Major Capital renovation projects must exceed California Title 24 Energy Code by 10%. This sets minimum efficiency standards for equipment (see below).
- Campuses will not heat spaces above 68 degrees, or cool them below 78 degrees, except in areas where more stringent temperature control is required by law or specialized needs of equipment or experimentation.
- Air conditioning systems are to be shut off at night, on weekends and holidays, unless required for approved programmatic needs.
- Buildings shall have their windows closed and as secure as possible when buildings are using heating or cooling, or shall have an interlock switch to disable heating/cooling when windows are open.
- View EO 987 at <http://www.calstate.edu/eo/EO-987.html>

## **Governor's Executive Order S-20-04:**

In addition to numerous guidelines similar to CSU EO 987, Governor's Executive Order S-20-04 requires the purchase of Energy Star rated electrical equipment whenever cost effective. View S-20-04 at:

<http://www.dot.ca.gov/hq/energy/ExecOrderS-20-04.htm>

**California Title 24 Energy Code:**

This code is a state legal requirement that sets energy standards for buildings in California, both for new construction and renovations. It specifies minimum efficiency ratings for air conditioning systems and equipment, which are condensed and summarized in the table below:

<b>Minimum Energy Efficiency Ratings of Air Conditioning Equipment</b>		
Equipment Type	Min EER, Title 24	Min EER, Title 24 +10% (EO 987)
Room/window AC unit	9.8	10.8
Room/window Heat Pump	9.0	9.9
Split system AC Unit/Heat Pump	13.0	14.3
Package AC Unit/Heat Pump	13.0	14.3
Water cooled AC Unit/Heat Pump	12.1	13.3
<b>Minimum Efficiency Ratings of Gas Fired Equipment</b>		
Gas furnace/gas pack AC unit	80%	88%

In addition, Title 24 requires that all air conditioning units larger than 75,000 Btuh (6.25 tons) are equipped with an economizer to allow free cooling using outside air when temperatures outside are moderate or cool. View the entire Title 24 Energy Standards at <http://www.energy.ca.gov/title24/>

**Window AC Units:**

Facility Services has evaluated and does not allow the installation of window AC units because they:

- Have the lowest energy efficiency ratings of all AC systems and thus do not meet Executive Order efficiency standards.
- Higher energy costs burden University funds and thus do not meet Executive Order standards for Life Cycle Cost Analysis.
- Are unsightly when installed in building exterior windows.
- Overload existing electrical circuits that were not sized to supply AC units.
- Can jeopardize building security due to windows being left unsecured.
- Can cause rain water intrusion into buildings through unsecured windows.
- Can cause slip hazards on outside walkways due to dripping condensate.

## Facility Services Project Manager's Guidelines:

When a project request for air conditioning is received, it is the project manager's responsibility to:

- Meet with the client to understand the need for air conditioning, any special equipment needs, temperature requirements, and hours of operation.
- Make the client aware of the impact of increased air conditioning and the energy efficiency mandates and space temperature standards the campus must comply with.
- Auxiliaries will be billed for the energy used by AC systems through the normal utility billing process. This also applies to Corporation controlled research areas in state buildings – check with the Energy Manager to see if any special metering equipment will be needed for auxiliary operations within state buildings.
- Verify that air conditioning is actually needed for the space and that the existing HVAC system is performing properly – a work order should be issued to Engineering Services to check and inspect the existing system and report any deficiencies. A data logger should be used to verify space conditions against EO987 guidelines (68 to 78 degrees).
- Size the new system based on engineering load calculations to ensure that systems are not oversized – oversizing significantly reduces system efficiency and equipment service life due to unnecessary cycling.
- Evaluate the possible AC systems that could meet the client's needs, and select the one with the lowest life cycle cost. This will typically result in a high efficiency AC unit. Manufacturers are currently offering units with EER ratings up to 17, which use 40% less energy than a minimally title 24 compliant window unit. If the space is capable of being cooled using central plant chilled water, this is the most energy efficient option of all. The life cycle cost of cooling provided by the central plant is half the cost of distributed air conditioning systems. See Life Cycle Cost Analysis Worksheets at [http://www.calstate.edu/cpdc/AE/Life\\_Cycle\\_Cost\\_Worksheet.xls](http://www.calstate.edu/cpdc/AE/Life_Cycle_Cost_Worksheet.xls), or <http://www.green.ca.gov/LCCA/default.htm>
- Ensure that the AC system is designed in accordance with all applicable building codes and Campus Standards.
- Ensure that ventilation rates meet the ASHRAE 62.1 standard of 15 cfm of fresh air per person.
- Ensure that simultaneous heating and cooling of the space cannot occur.
- Specify economizers for any system of 5 tons capacity or larger. Evaluate the use of economizers for any 24 hour load (i.e. server rooms, telecom rooms) for systems of 2 tons capacity or larger.
- In order to provide for such control functions as remote monitoring and operation, alarming, scheduling, weekend and holiday shutdown, and load shedding capability, EMS controls shall be specified on AC units of 5 tons or larger, and on all HVAC units utilizing central plant chilled water, regardless of size. For AC units smaller than 5 tons, EMS controls shall be evaluated based on cost/benefit, and criticality of the load being served, such as server or telecom rooms. When EMS controls are used, they shall control fan start/stop, call for heating, call for cooling, and heating and cooling setpoint, and shall monitor unit status and room temperature.
- Should the cost benefit analysis show that full EMS controls are not justified on an AC unit, the project manager shall at a minimum, specify a 7 day programmable thermostat, which will retain its memory and programming for a minimum of 10 hours in the event of a power failure, without the use of batteries. IP Addressable thermostats may be specified where remote monitoring and control is desirable, but connection to the Siemens EMS system is not feasible.
- Before equipment is ordered or construction started, provide a complete set of submittals showing material and equipment selection with manufacturer's cutsheets, ductwork layout, electrical, controls, anchoring, seismic bracing, and a written sequence of operation for review and approval by the Building Inspector, Energy Manager, MEP Manager, and Engineering Services Supervisor.