

Frequently Asked Questions

Q Can I use re-heat in perimeter zones?

A Maybe. Several exceptions apply. The most common exception involves constant volume systems in zones with 300 cfm of peak supply air. See section 1313.3.3.1 of the code.

Q The HVAC unit we're specifying has a rated capacity of 5 tons. But the manufacturer's specifications say that it will not cool more than 4.4 tons under my design conditions. Do we need to install an economizer?

A Yes. Economizer requirements are based on rated size of the cooling unit. Code requires air economizers on systems with a rated cooling capacity greater than 54,000 Btu/hr. Economizers are one of the most cost-effective conservation measures in Oregon.

Q Do I need to insulate the supply air plenum of my complex system where it is located above the dropped ceiling tile?

A Yes. The level of insulation is determined by the temperature difference of the air in the duct and the air around the duct at design conditions. In most cases, the temperature difference is greater than 15°F but less than or equal to 40°F, and R-3.3 insulation is required. Table 13-H in the Code Compliance Forms Manual shows the level of insulation required for other temperature differences.

Find Out More

This brochure is not intended to replace the code. Additional information is available at your local library, technical bookstore or from the following organizations:

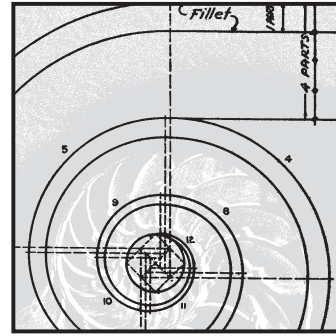
Copies of code:

Oregon Building Officials Association
phone: (503) 873-1157 • fax: (503) 373-9389

Technical support:

Oregon Office of Energy
625 Marion St. NE, Salem, OR 97301
phone: (503) 378-4040 • toll-free: 1-800-221-8035
fax: (503) 373-7806 • www.energy.state.or.us

Funding for this brochure is provided by the Northwest Energy Efficiency Alliance, a non-profit utility-funded consortium whose mission is to transform markets for energy-efficient goods and services, and by the U.S. Department of Energy, Grant No. DE-FG51-96R020761. However, any opinions, findings, conclusions or recommendations expressed herein are those of the author and do not necessarily reflect the views of the Alliance or USDOE.



Oregon Non-Residential Energy Code

MECHANICAL SYSTEMS



Introduction

This brochure will help you become familiar with **mechanical system requirements** for non-residential buildings and may help you speed up the permit process.

Oregon law requires that all applicants for non-residential buildings complete the forms provided in the Code Compliance Forms Manual. It's available at your local building department and on the Oregon Office of Energy Web site (www.cbs.state.or.us/external/ooe/cons/ecode1.htm). The manual provides all the information you need to design your building to meet energy code and to demonstrate compliance with code requirements.

What Is the Energy Code?

The Non-Residential Energy Code is part of Chapter 13 of the Oregon Structural Specialty Code. It applies to all construction, additions and alterations, **except the following**: one- and two-family dwellings, hotels, motels, apartment houses and boarding houses three stories or less.

The Oregon Non-Residential Energy Code was last revised in 1996. Code requirements are simple, easy to enforce and allow flexibility in design.

The code requires all new buildings, including speculative buildings, to meet a minimum level of energy efficiency. It helps ensure that future occupants don't get stuck paying high energy bills because the building wasn't designed to be energy-efficient.

The cost of conservation measures required by code generally pays for itself quickly through energy savings.

Know the Code

Oregon's energy code consists of three primary areas:

- Envelope Requirements
- Mechanical System Requirements
- Lighting Requirements

You will need to demonstrate compliance or a permitted exception with these requirements to obtain a building permit. The Code Compliance Manual describes requirements for each of these areas in detail and includes forms to guide you.

Construction

If an examiner rejects a set of plans or forms, make sure you understand why so you can make required corrections. Clear communication between the owner, the builder, the subcontractors and the building department is essential to meeting specifications of *approved plans* during construction.

Keep in mind that a plans examiner cannot tell you how to build your building, only how it fails to meet the code. Don't expect the plans examiner to act as a design consultant.

If inspectors find details that do not meet code, they may require compliance with the code before they issue a certificate of occupancy.

To avoid unnecessary expense and stress, **do not make any changes in the field to the approved plans without prior approval from the building department.**

HVAC Requirements

Mechanical system requirements are divided into two categories:

Simple Systems are defined as: 1) air cooled, constant volume systems that provide heating, cooling, or both and require only external connection to ductwork and energy services; 2) air cooled, constant volume split systems that provide heating, cooling, or both with cooling capacity of 54,000 Btu/hr or less; or 3) heating only systems with 5,000 cfm maximum airflow or minimum outside air supply of less than 70 percent of the total air circulated.

Complex Systems are defined as all other systems. Most, if not all, site built systems fit into this category.

Following are some of the significant code requirements for simple and complex systems:

- Air economizers capable of providing up to 85 percent of the design supply air with outdoor air are required on all cooling systems with capacity greater than 4.5 tons.
- Each zone must have a thermostat with automatic controls for set-back during periods of non-use.
- Controls must be capable of preventing simultaneous heating and cooling of a zone.
- Insulation is required on all ducting outside the building envelope and, for some complex systems, inside the building envelope.
- Equipment efficiencies (EER, SHGF, COP) must meet minimum ASHRAE 90.1-1989 standards.
- Fan or pump motors 25 hp and greater which serve variable-flow systems must be controlled by a variable speed drive.

Forms and Worksheets

Forms are a guide for you and a review tool for building jurisdictions. Code requirements are clearly displayed on code forms. The instructions included with the forms cover exceptions and other important information.

Worksheets give the plans examiner additional information about each HVAC component in your building.

Getting a Permit

1 Make sure your building design complies with the energy code. Reading the Code Compliance Forms Manual is the easiest way to learn code requirements. Code compliance forms specify requirements for each HVAC component. Take time to understand the basic requirements of the code before you finalize the design.

2 Make sure your plans show compliance with the energy code. Your plans should indicate what equipment and controls are going to be used, and where they will be used. Include with the building specifications copies of manufacturer “cut sheets” which display energy performance numbers for the equipment you have chosen.

3 Make sure you submit complete and accurate code compliance forms and worksheets. You must submit Form 4a to show compliance with the energy code. If your building uses complex systems, you must submit Form 4b, too. You also must complete worksheets for all of the heating and/or cooling equipment your building will use. Worksheets include:

- 4a Unitary Air Conditioner - Air Cooled
- 4b Unitary Air Conditioner - Water Cooled
- 4c Unitary Heat Pump - Air Cooled
- 4d Unitary Heat Pump - Water Cooled
- 4e Unitary AC - Evaporatively Cooled
- 4f Packaged Terminal AC - Air Cooled
- 4g Packaged Terminal Heat Pump - Air Cooled
- 4h Water Chilling Pkgs. - Water and Air Cooled
- 4i Boiler - Gas-Fired and Oil-Fired
- 4j Furnaces and Unit Heaters - Gas and Oil-Fired



You'll get through the permit process faster if your plans and specifications clearly show component performance.

Form 4a Project Name: Page:

SYSTEMS - GENERAL

1. Exceptions (Section 1313)

No HVAC. The building plans do not call for an HVAC system. Skip to Item 12 below

Exception. The building or part of the building qualifies for an exception from the code requirements. The applicable code exception is: Section 1313, Exception _____, Portion of building which qualify:

2. Simple or Complex Systems (Section 1313.2)

Simple System. The planned HVAC system qualifies as a Simple System. If true, complete Form 4a and equipment efficiency worksheets as required. Form 4b is not required.

Complex System. The planned HVAC system does not qualify as a Simple System. Complete Form 4b and equipment efficiency worksheets as required.

3. Economizer Control

No Cooling. The building does not require cooling.

Complies. The new fan return dampers to provide outdoor air.

Exception - Simple code exception is: See building which qualify.

Exception - Complex code exception is: See building which qualify.

4. Economizer Control

No Economizer. The building does not require an economizer.

Complies. The drawing that will exhaust the economizer is capable of providing the remainder of the load.

Exception. The new fan return dampers to provide outdoor air.

5. System and Design

Complies. All new HVAC systems within the building envelope.

Exception. The new fan return dampers to provide outdoor air.

6. Control Capabilities

Complies. Zone thermostat is provided in each zone providing a temperature setpoint for heating and cooling.

Exception. The building does not meet the code exception.

See a discussion of qualifying exceptions on p. 4-14

See p. 4-14 for a discussion of simple vs. complex systems.

See p. 4-19 for a discussion of equipment ratings and equipment definitions

See a discussion of qualifying exceptions on p. 4-16.

See a discussion of qualifying exceptions on p. 4-16.

MEX-2-GO Restaurant HVAC Systems

MECHANICAL SCHEDULE

PU1 Rooftop Heat Pump - 64,000 Btu/h, VAV Dual Zone Control, Air Economizer
SEER = 9.8, 100,000 Btu/h Heating Capacity HSPF = 6.9

SS1 Refrigerator Compressor/Evaporator System, 48,000 Btu/h, EER = 8.5

| Equip. ID | Model Designation | Cooling Capacity (Btu/h) | Proposed Performance | | | | Compliance Schedule (A-D) |
|-----------|-------------------|--------------------------|----------------------|-----|------|------------|---------------------------|
| | | | SEER | EER | HSPF | COP (47°F) | |
| PU1 | ACME-64 | 64,000 | 9.8 | | 6.9 | | |

| Compliance Schedule | Equipment Type | Cooling Capacity (Btu/h) | | Minimum Cooling Performance | | Minimum Heat/g Performance | | |
|---------------------|--|--------------------------|--------------|-----------------------------|-----------------------|----------------------------|------------|------------|
| | | Over | But Not Over | EER | Seasonal or Part Load | HSPF | COP (47°F) | COP (17°F) |
| A | Single Package Without a Heating Section | 0 | 65,000 | - | 9.7 SEER | 6.6 | - | - |
| | | 65,000 | 135,000 | 8.9 | 8.3 IPLV | - | 3.0 | 2.0 |
| | | 135,000 | 760,000 | 8.5 | 7.5 IPLV | - | 2.9 | 2.0 |
| | | 760,000 | - | 8.7 | 7.5 IPLV | - | 2.9 | 2.0 |
| B | Split System Without a Heating Section | 0 | 65,000 | - | 10.0 SEER | 6.8 | - | - |
| | | 65,000 | 135,000 | 8.9 | 8.3 IPLV | - | 3.0 | 2.0 |
| | | 135,000 | 760,000 | 8.5 | 7.5 IPLV | - | 2.9 | 2.0 |
| | | 760,000 | - | 8.7 | 7.5 IPLV | - | 2.9 | 2.0 |
| C | Single Package With a Heating Section | 0 | 65,000 | - | 9.7 SEER | 6.6 | - | - |
| | | 65,000 | 135,000 | 8.9 | 8.3 IPLV | - | 3.0 | 2.0 |
| | | 135,000 | 760,000 | 8.3 | 7.3 IPLV | - | 2.9 | 2.0 |
| | | 760,000 | - | 8.5 | 7.5 IPLV | - | 2.9 | 2.0 |
| D | Split System With a Heating Section | 0 | 65,000 | - | 10.0 SEER | 6.8 | - | - |
| | | 65,000 | 135,000 | 8.9 | 8.3 IPLV | - | 3.0 | 2.0 |
| | | 135,000 | 760,000 | 8.3 | 7.3 IPLV | - | 2.9 | 2.0 |
| | | 760,000 | - | 8.5 | 7.5 IPLV | - | 2.9 | 2.0 |

Meets Code Requirements

Code Efficiency Requirements

(1/96) Forms & Worksheets 4-0