



**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**  
**ENERGY EFFICIENT AGRICULTURAL OPERATION**

**CODE 374**

**(no)**

**DEFINITION**

Onfarm facilities, equipment, and management strategies that provide increased energy efficiency.

**PURPOSE**

This practice is used to accomplish the following purpose:

- Improve energy efficiency for facilities, equipment, and/or processes.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to nonresidential structures, equipment, and other energy-using systems that support agricultural production and related enterprises except where another NRCS Conservation Practice Standard (CPS) is more appropriate.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Implement energy efficiency improvements of the equipment or facility to meet the intended purposes for each area, space, or function.

Plan, design, and implement improvements to meet all Federal, State, Tribal, and local laws, codes, and regulations.

Provide an analysis that demonstrates improved energy efficiency by documenting the estimate of probable energy savings and the assessment methodology.

Design improvements in accordance with sound engineering principles and industry standards. Install additional devices, add circuits, or modify wiring for electrical systems in accordance with National Fire Protection Association (NFPA) 70, "National Electrical Code," including Article 547, "Agricultural Buildings."

Follow manufacturer's instructions and guidelines when designing, installing, and initiating startup of equipment and systems. Use certified installers when required by the manufacturer.

**Utilities and permits**

The landowner is responsible for obtaining all permits and accurately identifying the location of all buried utilities, drainage tile, and other structural measures in the project area prior to the start of construction.

**Minimum control of heat transfer**

For energy efficiency improvements that support heating, ventilating, air conditioning, and refrigeration (HVAC&R), ensure the enclosed structures or areas within buildings meet the criteria in NRCS CPS Energy Efficient Building Envelope (Code 672) for air leakage, insulation, energy screens, and livestock curtains.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

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**Prescriptive upgrades**

Equipment and system upgrades included on the State-approved prescriptive list have been shown to improve energy efficiency and conform to relevant practice criteria. As such, design and implementation do not require additional specific analysis of energy efficiency performance parameters.

**Custom improvements**

For energy efficiency upgrades not included on the State-approved prescriptive list, or for those that do not have additional criteria below; academic, industry, manufacturer, or other energy efficiency performance parameters may be used to select equipment and system improvements that meet the criteria above.

**Additional Criteria for Heating, Ventilation, Air Conditioning and Refrigeration****Heating**

Where heating systems use fuel oil, propane, and other fossil fuel combustion technology, select equipment that meets the listed efficiency ratings below.

- Hydronic boilers, unit heaters, or other systems not otherwise identified.—Use steady-state combustion efficiencies of 90 percent or more.
- Steam boilers.—Use steady-state combustion efficiency of 82 percent or more.
- Infrared Radiant.—Select radiant heaters certified in accordance with American National Standards Institute (ANSI) Z83.19, “Gas-Fired High-Intensity Infrared Heaters” or ANSI Z83.20, “Gas-Fired Tubular and Low-Intensity Infrared Heaters.” Use radiant efficiency (radiant coefficient) of 60 percent or more when tested in accordance with ANSI 1330, “Performance Rating for Radiant Output of Gas Fired Infrared Heaters.”

For other heating systems, select equipment that meets the criteria in “General Criteria Applicable to All Purposes.”

**Ventilation**

Select fans from those included within the most energy efficient quartile of fans that satisfy required levels of service parameters (air flow, static pressure, etc.) tested by the Bioenvironmental and Structural System Laboratory (BESS Labs). Assess fan energy efficiency on volumetric efficiency ratio with typical units of measure rendered as cubic feet per minute per watt (CFM/W), cubic feet per minute per horsepower (CFM/HP), or pound-force per watt (Lbf/W).

**Cooling**

Select cooling equipment that meets or exceeds an energy efficiency ratio (EER) of 12.0 (Btu/h)/W.

**CONSIDERATIONS**

The benefits of energy conservation upgrades may be reduced if equipment and systems are unable to meet level of service requirements. Energy benefits may be compromised due to increased run-times, decreased useful life, the addition of less efficient equipment to compensate, or other actions.

To reduce energy imported on a farm, consider developing and using on-farm solar, wind, or other renewable energy resources.

Evaluate options that may improve reductions of greenhouse gas emissions and ambient air pollutants.

Consider using American Society of Agricultural and Biological Engineers S612, “Performing On-farm Energy Audits,” or equivalent, to prioritize energy conservation opportunities and estimate potential energy savings of improvements.

**PLANS AND SPECIFICATIONS**

Prepare plans and specifications to meet the requirements of this standard. As a minimum, include—

- Site-specific installation details.
- Identification and description of the existing system and related components or devices to be replaced.
- Identification and description of the replacement or retrofit system and/or related components or devices.
- Actions for proper disposal of any components to be removed.
- Location of the measures in relationship to other structures or natural features, where appropriate, in a plan view.
- Detailed drawings typical of the equipment and systems to be installed.
- Detailed construction drawings of the measures and appurtenances, such as piping, inlet and outlet connections, mounting, foundations, and other structural components, where applicable and appropriate.

## **OPERATION AND MAINTENANCE**

Prepare a site-specific operation and maintenance plan that is consistent with the purposes of the equipment, facility, or processes; its intended life; and safety requirements. Utilize manufacturer's recommendations to the extent practicable. At a minimum, include—

- Startup procedures per manufacturer's written instructions and other applicable forms or requirements.
- Items in need of periodic inspections (e.g., components, equipment, wiring, and controls).
- Components that are subject to routine replacement to ensure proper function.
- Appropriate service intervals and maintenance tasks to ensure expected useful life of the equipment.

## **REFERENCES**

American National Standards Institute and American Society of Agricultural and Biological Engineers. 2009(R2021). ANSI/ASABE S612, Performing On-farm Energy Audits. ANSI, Washington, D.C. ASABE, Saint Joseph, MI.

National Fire Protection Association. 2017. NFPA 70, National Electric Code. Boston, MA.

American National Standards Institute. 2017. ANSI Z83.19/CSA 2.35, Gas-Fired High-Intensity Infrared Heaters. Washington, D.C.

American National Standards Institute. 2020. ANSI Z83.20/CSA 2.34, Gas-Fired Tubular and Low-Intensity Infrared Heaters. Washington, D.C.

American National Standards Institute. 2015. CAN/ANSI/AHRI 1330, Performance Rating for Radiant Output of Gas Fired Infrared Heaters, Washington, D.C.

Bioenvironmental and Structural Systems Laboratory, Department of Agricultural and Biological Engineering, The University of Illinois at Urbana-Champaign. 2019. Agricultural Ventilation Fans Performance and Efficiencies. Urbana, IL. <http://bess.illinois.edu/>