



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.

Custom improvements

For energy efficiency upgrades 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.

SUPPORTING DATA AND DOCUMENTATION

Field Data and Survey Notes

Provide the following:

1. An areal map of the site showing the location of all buildings, and other permanent features adjacent to the site;
2. Identify on the map, where and what is to be installed, including the number to be installed;
3. All information contained in the section, PLANS AND SPECIFICATIONS, located in the standard.

Design Data

Record on the appropriate AutoCAD template for energy practices. For guidance on the preparation of engineering plans see Chapter 1 of the National Engineering Handbook, Part 641. The following is a list of the minimum required design data:

1. Documentation of all site visits and any conversations the landowner or vendors on the CPA-6. Include the date, who performed the visit, specifics as to what was discussed, including all alternatives, and decisions made and by whom;
2. Copies of all required permits and documentation to be on file with the design information;
3. Plan view of the facility including, location map, all system components, material and construction specifications;
4. Construction drawings, and component details;
5. Job class on plan;
6. Design calculations appropriate for the type of system being designed;
7. List of quantities with supporting computations;

8. Show construction specifications on drawings.
9. Provide an operation and maintenance plan.

Construction Check Data

Record on the appropriate AutoCAD drawing for energy practices. Check off all items on the plans in red. The following is a list of minimum data needed for As-built:

1. Documentation of all site visits on CPA-6. Include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Actual dimensions of installed practices, if applicable;
3. Material certifications and photographs of certification markings and/or stamps;
4. A certification statement from the contractor(s), suppliers, licensed electricians, licensed plumbers or licensed heating contractor that they have constructed/assembled and installed all items in accordance with the plans and specifications, i.e. proprietary or manufactured items or products;
5. Red lined as-built and certification;
6. Sign and date checknotes and plans by a person with appropriate approval authority. Include statement that the practice meets or exceeds plans and NRCS practice standards.

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.

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