

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

FARMSTEAD ENERGY IMPROVEMENT

(No.)

CODE 374

DEFINITION

Development and implementation of improvements to reduce, or improve the energy efficiency of on-farm energy use

PURPOSE

This practice may be applied as part of a conservation management system to reduce energy use.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies to non-residential structures and energy using systems where reducing energy use is the identified goal.

CRITERIA

General Criteria Applicable to All Purposes

Implement recommendations for components of a current energy audit performed in accordance with the American Society of Agricultural and Biological Engineers (ASABE) Standard S612, Performing On-farm Energy Audits.

Where required, certify that the replacement or retrofit system and related components or devices meet or exceed currently applicable federal, state, and local standards and guidelines. Components of major activities by farm enterprises defined in ASABE S612 shall meet the appropriate NRCS or industry standard, such as:

- GA NRCS Conservation Practice Standard, Pumping Plant (Code 533)
- GA NRCS Conservation Practice Standard, Combustion System Improvement (Code 372)
- Heating Ventilating and Air Conditioning (HVAC) per American Society of Heating, Refrigerating and Air Conditioning Engineers Standard 90.1-2010
- Ventilation fans per ASABE EP 566.1
- Greenhouse HVAC per ASABE EP406.4
- Motor efficiency per National Electrical Manufacturers Association MG 1-2009, Rev. 2010

CONSIDERATIONS

Energy conservation and energy efficiency improvements should consider greenhouse gas emissions and ambient air pollutants. Methods may be implemented to account for greenhouse gas emissions credits, if applicable. Actual greenhouse gas emission reductions would require separate documentation.

In order to reduce energy imported onto a farm, consider possible use of renewable energy resources.

<p>Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the Field Office Technical Guide.</p>

NRCS, Georgia
October 2016

Plan progressive implementation of energy measures with ranking metrics such as life-cycle energy savings, payback period, or cost-effectiveness, etc., based on the landowner's goals and objectives.

PLANS AND SPECIFICATIONS

Plans and specifications to implement the energy conservation and efficiency measures shall be in accordance with this standard and describe the requirements for properly installing the practice to achieve its intended purpose. Plans and specifications shall:

- include written specifications that describe the site specific details of installation.
- identify and describe the existing system and related components or devices.
- identify and describe the replacement or retrofit system and/or related components or devices.
- document system energy usage and resulting potential energy savings from the implementation of this practice.
- include a plan view showing the location of the measures in relationship to other structures or natural features where appropriate.
- detail drawings of the measures and appurtenances, such as piping, inlet and outlet connections, mounting, foundations, and other structural components where appropriate.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of this practice, its intended life, and safety requirements.

Replacement or retrofit systems and related components or devices shall be operated and maintained in accordance with the manufacturer's recommendations.

Maintain records to document the implementation of energy improvements. Retain and update records for a minimum of five years from the beginning of operation of measure implementation.

Recommended records to be retained include:

- monthly utility bills, fuel purchases, and yield of agricultural commodities.
- documentation of maintenance conducted on the replacement, or retrofitted system and related components or devices.

COMMON ASSOCIATED PRACTICES

GA NRCS Conservation Practice Standard, Pumping Plant (533)

GA NRCS Conservation Practice Standard, Combustion System Improvement (372)

REFERENCES

American Society of Agricultural and Biological Engineers. 2003. Heating, ventilating and cooling greenhouses. ANSI/ASAE EP406.4 JAN2003 (R2008). ASABE, St. Joseph, MI.

American Society of Agricultural and Biological Engineers. 2008. Guidelines for selection of energy efficient agricultural ventilation fans. ASAE EP566.1 AUG 2008. ASABE, St. Joseph, MI.

American Society of Agricultural and Biological Engineers. 2009. Performing On-Farm Energy Audits. ANSI/ASABE S612 JUL2009. ASABE, St. Joseph, MI.

American Society of Heating, Refrigerating and Air Conditioning Engineers. 2010. Energy standard for buildings except low-rise residential buildings. ANSI/ASHRAE/IES, Standard 90.1. ASHRAE, Atlanta, GA.

National Electric Manufacturing Association. 2006. Motors and generators. NEMA MG1 – 2009 (R2010). Rosslyn, VA

NRCS, Georgia

October 2016

NATURAL RESOURCES CONSERVATION SERVICE
GEORGIA
OPERATION AND MAINTENANCE REQUIREMENTS
FARMSTEAD ENERGY IMPROVEMENT
CODE 374

Land Owner/Operator _____

County _____ SWCD _____

Prepared By _____ Date _____

Practice Location _____ Farm/Tract No. _____
(Latitude/Longitude or UTM Coordinates)

OPERATION AND MAINTENANCE ITEMS

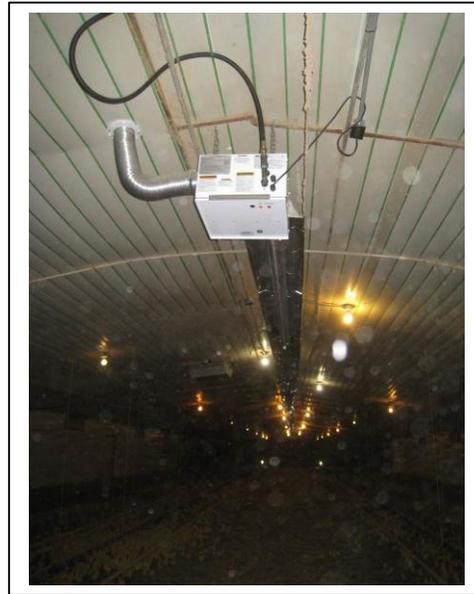
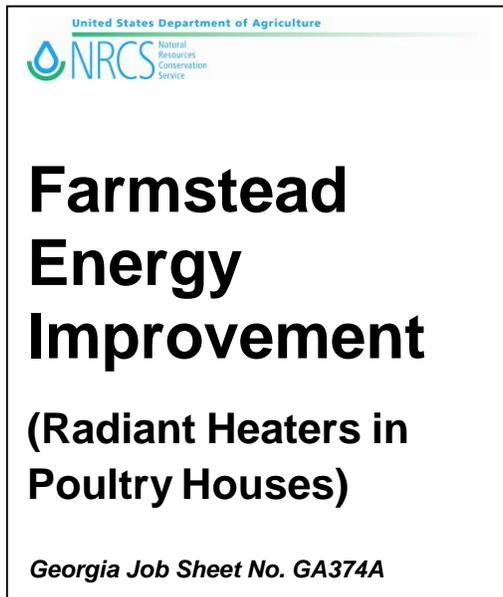
The installation of new, replacement or retrofit system components and devices were designed to reduce energy use on-farm while maintaining or improving the air quality resource for greenhouse gases and ambient air pollution. Estimated life span of this installation is at least 10 years. The life of the system can be assured and usually increased by developing and carrying out a systematic operation and maintenance program.

Failure to operate and maintain this system could result in actions to reclaim cost share and/or loss of any future financial or technical assistance.

This practice will require periodic maintenance and may also require operational items to maintain satisfactory performance. Your operation and maintenance program includes:

- Maintain and operate the new, replaced, or retrofit on-farm system and related components or devices according to the manufacturer's recommendations.
- Maintain records to document the implementation of energy improvements.
- Retain and update records for a minimum of five (5) years from the beginning of operation of measure implementation.
- Records should include the following:
 - Monthly utility bills, fuel purchases, and yield of agricultural commodities
 - Documentation of maintenance conducted on the replacement, or retrofitted system and related components or devices.

Additional Operation and Maintenance Requirements Specific to this Plan:



Definition

A propane or natural gas fired radiant heater burns gas and converts most of the energy into infrared rays that are directed downward into the floor of the poultry house. This newer type heater is much more efficient at converting gas into heat that is more beneficial to poultry at the floor level.

General Information

Old forced-air convection heaters (box heaters) and old pancake heaters do a good job at heating the air, but hot air rises from these units away from the poultry on the floor. New radiant heating appliances do a much better and more efficient job by converting the majority of the heat into radiant heat that is directed to the floor of the house. New radiant heating appliances consist of radiant brooders, radiant tubes, radiant mini-U-tubes, and Quad radiant (TM) units

Radiant brood heaters are usually hung about head-high in the poultry house while radiant tube heaters are placed near the ceiling. Usually, about 4 radiant tube heaters are needed in the brood end of a house while about 14 radiant brood heaters would be used. In the off-end of the house, usually about 3 radiant tube heaters are needed or about 8 radiant brood heaters.

Radiant tube heaters consist of a fire box connected to a metal tube, usually 40 – 50 feet long, running lengthwise in the house. The tube heater draws combustion air from outside the house with a small horsepower motor that pushes the heated air from the firebox into the tube. The tube then radiates that heat downward to the birds and the litter pack. Reflectors above the tubes protect the ceiling and bounce the heat rays coming from the top of the tube back toward the house floor.

The advantage of radiant tube heating over radiant brooders is that the heat source is mounted much higher in the house. This is very convenient, because the heaters are out of the way and do not have to be raised or lowered. The floor area being heated is much greater too. Birds are generally more spread out in a house with radiant tube heaters. However, a larger number of radiant brood heaters generally provide more opportunities for birds to find their most comfortable area.

Different integrators prefer different forms of radiant heat appliances depending on house style, bird size, etc., so it is imperative that the integrator be heavily involved in appliance selection.

Farmers cannot receive federal funds from two sources to pay for new heaters.

Installation

Installation of new heaters often requires new plumbing of gas lines and electrical control. This work must be certified by the contractor performing the installation. Heaters must be properly located to ensure the radiant heat creates as uniform heat pattern on the house floor as possible. Thermostats or temperature sensors for the new heat system must be properly located.

For radiant tube heaters, these should be placed about halfway between the outside water line and the feed line, lined up at the midpoint of the tube heater, and raised about a foot or so off the floor. It is preferable for each heater to have its own thermostat or electronic controller sensor.

Operation and Maintenance

Heaters and especially the reflectors must be kept clean. All clearance distances specified by the manufacturer must be maintained. The combustion air blower of tube heaters will need periodic cleaning.

References

NRCS GA Conservation Practice Standard, Code 374 – Farmstead Energy Improvement

Radiant Tube Heating – Questions and Answers, Issue No. 26 , National Poultry Technology Center, Auburn University, November 2003.

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Heater Replacement

Poultry Farmer: _____ County : _____ Date: _____

Integrator: _____ Number of houses: _____

Farm No.: _____ Tract No.: _____ Location: _____

Designed : _____ Checked: _____ Approved: _____ JAA: _____

House No(s). _____ (Add more sheets as needed)

Design

Number of old pancake heaters to be replaced: _____

Number of old forced-air box heaters to be replaced: _____

Number of new radiant brood heaters to be used: _____
(generally 14 per brood end of house and 8 in the off-end of the house)

Number of radiant tube heaters to be used: _____
(generally 4 per brood end of house and 3 in the off-end of the house)

Other new radiant heaters: Type _____ Number _____

Are all houses the same () yes () no. If no, make same calculations for each house.

Total Quantities Installed (All houses)

Radiant brood heaters: _____

Radiant tube heaters: _____

Other radiant heater: _____ Type Specified: _____

Certification

Farmer Certification:

I certify that I am not receiving other federal funds for new heaters (USDA RD Rural Energy for America Program).

 Signature Date

Installation Certification:

I certify that the heater installation in the poultry houses on this farm was completed according to this design and sound industry standards.

 Signature Date

Designer Certification:

As Built Certification:

I certify that this project was designed according to the applicable NRCS standards.	I certify that this project was constructed according to the design.

Signature

Date

Signature

Date

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Farmstead Energy Improvement

(Stir Fans in Poultry Houses)

Georgia Job Sheet No. GA374B



Definition

Heat has a tendency to rise. The addition of stir fans in a poultry house can provide uniform heat distribution from ceiling to floor causing the heating system to operate less frequently and thereby saving the farmer energy costs.

Stir fans are used to complement the ventilation system by improving moisture removal from litter, causing floor conditions to be more uniform, improving the ventilation efficiency, and increasing bird performance.

General Information

The addition of stir fans in a poultry house can result in heating fuel savings of 5 – 25%.

Stir fans are either recirculating type fans which consist of basket or orifice fans that push air horizontally, or paddle fans sometimes referred to as Casablanca fans that push air vertically.

For a typical drop-ceiling type poultry house, about 6-8, 18-20 inch recirculating fans should be adequate to circulate the heated air (3-4 in the brood end and 3-4 in the off-end of the house). For older high-ceiling houses, one fan between each baffle should be installed in the brooding chamber or about 8 paddle fans can be used (5 in the brood end and 3 in the off-end of the house). As a general rule-of-thumb, stir fans should be capable of moving about 10% of the air volume in the house.

Some stir fans are equipped with variable speed control to calibrate fans for desired airflow and mixing.

Fans must have high quality bearings, be rated for poultry house use, and have an agricultural rating by the Underwriter's Laboratories.

Installation

Installation of stir fans require proper placement of fans and new electrical work. The installation should be certified by the contractor doing the installation.

Paddle fans should be installed to move air toward the ceiling and not down toward the birds. Recirculating fans should be positioned to move air toward the end wall in each chamber. The recirculating fan located in the brooding chamber closest to the brood curtain may be pointed toward the brooding curtain.

Stir fans can be controlled by electronic controller to run between ventilation cycles or run continuously. Fans not operated by controller can be equipped to operate with thermostats or sensor controls located in the ceiling and set approximately 5 degrees above the target temperature.

Fans in the brood chamber and grow out (off- end) area are generally wired to allow separate operation.

Some fans may require additional supporting structure in the ceiling as well as a means to easily move the fans out of the way during clean-out and catch.

Operation and Maintenance

Adjust the variable rate of the fans to achieve the desired results.

Fans and fan cages must be kept clean with routine maintenance.

References

NRCS GA Conservation Practice Standard, Code 374 – Farmstead Energy Improvement

Paddle and Recirculating Fans – A Progress Report, Issue No. 13, National Poultry Technology Center, Auburn University, September 2001.

Stir Fans

Poultry Farmer: _____ **County:** _____ **Date:** _____
Integrator: _____ **Number of houses:** _____
Farm No.: _____ **Tract No:** _____ **Location:** _____
Designed: _____ **Checked:** _____ **Approved:** _____ **JAA:** _____

House (s): _____

Type fan: _____ Number: _____

Are all houses the same () yes () no. If no, make same calculations for each house.

Total stir fans (all houses):

Type fan: _____ Number: _____

Type fan: _____ Number: _____

Type fan: _____ Number: _____

Farmer Certification:

I certify that I am not receiving other federal funds for new stir fans (USDA RD Rural Energy for America Program).

Signature Date

Installation Certification (Contractor):

I certify that the stir fan installation in the poultry houses on this farm was completed according to this design and sound industry standards.

Signature Date

New Wiring Certification:

Signature License # Date

Designer Certification:

As Built Certification:

I certify that this project was designed according to the applicable NRCS standards.	I certify that this project was constructed according to the design.

Signature Date Signature Date

Quality Assurance Plan (QAP)

Landowner/Project: _____ Engineering Job Class^{1/}: _____
 Service _____
 Center: _____ County _____
 Conservation Practice(s) & Engineering Job Class Included in this Job: Farmstead Energy Improvement, 374 _____
 QAP Prepared By: _____ Job Approved By _____
 Est. Construction Start Date: _____ Est. # Site Visits: _____ Est. # QA Hours: _____

^{1/}The engineering job class for a given job will be based on the most restrictive element or conservation practice included in the job.

Certification Statements

I certify that the items, intensity, and inspection requirements listed in Table 1 is adequate quality assurance (QA) for this project.

Approver of Engineering Plans (Signature)

Date

I certify that _____ has the experience necessary to perform the construction inspection for the items shown in Table 1 and has the qualifications as shown in Table 2 for this project. I support this individual as the construction inspector and will allow the individual adequate staff time to perform the QA inspection for this project.

Line Supervisor (Signature)

Date

I certify that I have reviewed the engineering plans and specifications and fully understand the QA requirements of the subject project. I will contact the Project Approver if I have any questions or concerns regarding the QA activities and will notify and obtain approval from the Project Approver if there is need to make any changes to the plans and/or specification during construction.

QA Inspector (Signature)

Date

Table 1 - Items to be Inspected and Verified

Items ^{2/}	Intensity ^{3/}	Inspection Requirements ^{4/}
Preconstruction Meeting	NA	Meet with landowner and contractor, discuss project, sign and date documents; provide all applicable documents including drawings and specifications.
Permits	NA	Verify that the landowner has obtained all required permits prior to construction.
Pollution Control	P/F	Inspect to verify that any construction debris has been disposed of properly.
Quantity Computation	P/F	Perform quantity computations for payment purposes as per the payment schedule and specifications. Quantity computations shall be recorded on standard NRCS forms or NRCS-ENG-523A and <u>checked</u> and <u>initialed</u> by a second person.
Photographs	P	Take photographs of the site, before, during and after construction.
As-built Drawings	P	Keep drawings current during construction and prepare as-built drawings within 14 days of final construction.
Survey Notes	P	All construction checks taken including inventory of bulbs, placement of fans, replacement of plumbing, etc., shall be recorded on loose leaf survey notes (form ENG 28, 29) or in a bound survey field book.

^{2/} Include items that require quality assurance.

^{3/} Intensity of inspection: NA – Not Applicable, C – Continuous, P – Periodic, F– Final. The inspector shall immediately notify the approver of the job if continuous inspection is required and cannot be performed with available staff.

^{4/} Inspection requirements shall be to the degree necessary to certify that the project is installed in accordance with the plans and specifications.

Table 2 – Required QA Qualifications for Construction Inspector

QA Qualifications
1. Appropriate EJAA for the engineering job class for construction of the conservation practices to be installed.
2. Knowledgeable of the following references: <ul style="list-style-type: none"> a) National Engineering Manual (NEM) Part 512 – Construction b) National Engineering Handbook, Part 645, Construction Inspection

STATEMENT OF WORK
Farmstead Energy Improvement (374)
NRCS, GA

These deliverables apply to this individual practice. For other planned practice deliverables refer to those specific Statements of Work.

Licensure

Georgia Code Title 43, Professions and Businesses, Chapter 15, Professional Engineers and Land Surveyors, regulates the practice of engineering in Georgia and provides the definition of engineering in Chapter 15 §2(11). Technical assistance for this engineering conservation practice may be considered the practice of engineering and subject to licensure requirements of Georgia Code Chapter 15. It is the responsibility of the individual providing technical assistance to determine and verify whether this practice is subject to Georgia Code Chapter 15.

DESIGN

Deliverables:

1. Design documents that demonstrate criteria in NRCS practice standard have been met and are compatible with planned and applied practices
 - a. Practice purpose(s) as identified in the conservation plan.
 - b. List of required permits to be obtained by the client and regulations to be met
 - c. List of facilitating practices
 - d. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to:
 - i. Targeted emissions and source
 - ii. Emission reductions requirements, if needed
 - iii. Reduction calculations, analysis, etc.
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describes the requirements to install the practice and obtain necessary permits.
3. Operation and maintenance plan
4. Certification that the design meets practice standard criteria and comply with applicable laws and regulations
5. Design modifications during installation as required

INSTALLATION

Deliverables

1. Pre-installation conference with client
2. Verification that client has obtained required permits
3. Installation guidance as needed
4. Facilitate and implement required design modifications with client and original designer
5. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation
6. Certification that the installation process and materials meets design and permit requirements

CHECK OUT

Deliverables

1. Records of application
 - a. Extent of practice units applied
 - b. Actual materials used
2. Certification that the application meets NRCS standards and specifications and is in compliance with permits
3. Progress reporting

REFERENCES

- NRCS Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard Farmstead Energy Improvement - 374
- NRCS National Environmental Compliance Handbook
- NRCS Cultural Resources Handbook