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Pellet Fuels Institute Residential/Commercial Densified Fuel QA/QC Handbook

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1 QA/QC HANDBOOK BACKGROUND AND GOAL 4

2 APPLICABILITY 4

3 REFERENCE DOCUMENTS 5

4 DEFINITIONS 5

4.1 Additives 5

4.2 Chemically Treated Materials 6

4.3 Prohibited Fuel Types 6

5 PRODUCT QUALITY GRADE CLASSIFICATIONS 6

6 QUALITY MANAGEMENT OF DENSIFIED FUEL PRODUCTION 6

6.1 Overview 6

6.2 Quality Responsibility and Authority 7

6.3 Training 8

6.4 Documentation 8

6.5 Records 9

6.6 Management of Change 9

6.7 Raw Material Control 9

6.8 Equipment and Operating Processes 9

6.9 Quality Control and Quality Assurance Testing 10

6.10 Third Party Inspections and Monitoring 11

6.11 In-House Laboratory and QA/QC Requirements 11

6.12 Inspection and Reinspection Conformance Criteria 12

6.13 Nonconforming Materials 12

6.14 Corrective Action Requests 13

6.15 Product Storage, Handling, and Delivery 13

7 CERTIFICATION OF RESIDENTIAL/COMMERCIAL DENSIFIED FUEL PRODUCTION FACILITIES 14

8 CERTIFICATION SUSPENSION OR REVOCATION 14

1 QA/QC HANDBOOK BACKGROUND AND GOAL

The goals of the *PFI Residential/Commercial Densified Fuels Standards Program* (hereafter **PFI Standards Program**) are to assure the supply of residential/commercial densified fuel that meets specific grade requirements and is manufactured from acceptable materials for use in residential/commercial densified fuel combustion appliances. To assure these goals are met, this product certification scheme includes the setting of specifications for various grades of densified fuel pellets, the evaluation of raw materials to assure only appropriate materials are used, it sets minimum requirements for quality management and finished product quality verification, it establishes a third-party oversight structure based on ISO 17065 product certification, and it provides requirements for the labeling of compliant product with a **Quality Mark**.

The *PFI Residential/Commercial Densified Fuels QA/QC Handbook* (hereafter **PFI QA/QC Handbook**) provides the minimum requirements for the quality management system maintained by certified production facilities and establishes the third-party inspection and testing requirements.

This document is to be used in conjunction with the *PFI Residential/Commercial Densified Fuel Standards Program Regulations* (hereafter **PFI Standards Program Regulations**), which defines the overall structure of the PFI Standards Program, requirements for the labeling of compliant product, and covers administrative components such as complaint procedures and program review.

This document is also to be used in conjunction with the *PFI Residential/Commercial Densified Fuel Standard Specifications* (hereafter **PFI Standard Specifications**), which defines densified fuel grades, grade requirements, applicable test methods, as well as other fundamental rules and/or practices of the PFI Standards Program.

Three densified fuel grades are defined within the PFI Standard Specifications. It is the intent of this document that certified production facilities identify the grade(s) they intend to produce and develop appropriate QA/QC practices using this manual as a guide to assure the minimum QA/QC requirements are met and to assure that the final product is in compliance with the requirements of the intended grade(s).

It is also intended that this document be used by PFI approved Certification Bodies and Inspection Bodies in establishing procedures for providing third-party oversight.

2 APPLICABILITY

The PFI QA/QC Handbook applies to all certified fuel producers, to producers who wish to become certified, to PFI approved Certification Bodies, and to PFI Approved Inspection Bodies.

For densified fuel producers that have more than one production facility, each production facility shall have its own quality management program and is required to certify independently.

3 REFERENCE DOCUMENTS

PFI Residential/Commercial Densified Fuel Standards Program Regulations
(Also referred to as PFI Standards Program Regulations)

PFI Standard Specifications for Residential/Commercial Densified Fuel
(Also referred to as PFI Standard Specifications)

PFI Residential/Commercial Densified Fuel QA/QC Handbook
(Also referred to as PFI QA/QC Handbook)

4 DEFINITIONS

4.1 Additives

Any substance other than cellulosic material that has been intentionally introduced into the fuel feed stock prior to pellet extrusion (except steam/water). Grease or other lubricants that are introduced into the fuel processing stream as part of normal mill operations are not considered additives. Additives may not exceed two percent by weight and the additive type must be disclosed to the accreditation body and accredited auditing agency. Chemically treated materials as defined in section 4.2 and prohibited fuel types as defined in section 4.3 may not be included as additives.

4.2 Chemically Treated Materials

Any feed stock material that contains any bonding agent, resin, preservative, surface coating or other finish, or any other chemical compound that has been added to the material is not acceptable. Grease or other lubricants that are introduced into the fuel processing stream as part of the manufacturing equipment maintenance operations are not considered as chemically treated materials. Incidental chemical contamination from the marking of logs and lumber is not considered as chemically treated.

4.3 Prohibited Fuel Types

EPA's Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced Air Furnaces contain provisions regarding "prohibited fuel types" in 40 C.F.R. 60.532(f) and 60.5474(f). To the extent that these requirements apply to pellet fuel manufacturers, these materials are considered prohibited for the purpose of the *PFI Residential/Commercial Densified Fuel Standards Program* with the exception of "Unseasoned wood"

which PFI was informed is acceptable as feedstock material when dried for the production of wood pellets.

5 PRODUCT QUALITY GRADE CLASSIFICATIONS

The PFI Standard Program provides three grades of densified fuel, which are defined in Table 1 of the PFI Standard Specifications. As the basis for any densified fuel production facility's quality management program, it is imperative that the facility identify the grade(s) intended for production. Grade classifications are as follows:

- Premium
- Standard
- Utility

If a certified production facility decides to produce more than one grade of product, the quality management system shall account for the differences in materials, production requirements, inspections, testing requirements, documentation, record keeping, etc. This does not apply to multiple product brands (e.g., if the same grade of product is marketed under two or more brands).

6 QUALITY MANAGEMENT OF DENSIFIED FUEL PRODUCTION

6.1 Overview

It is required that each densified fuel production facility that intends to participate under the PFI Standards Program develop a written quality management program that is approved by a PFI approved Certification Body for monitoring the production process and verify through testing and inspection that final product meets the specifications of the intended grade(s) as outlined in the PFI Standard Specifications. The essential components of a quality management program for densified fuel production facilities include:

- Defining responsibility and authority throughout the organization
- Training of affected employees
- Documentation to track processes and test data
- Record keeping
- Managing changes to the programs
- Controlling the quality of raw materials
- Defining necessary equipment and operating processes

- Quality control and quality assurance processes
- Third party inspections and monitoring
- Disposition of nonconforming materials and products
- Corrective actions for identified deficiencies
- Requirements for proper packaging, storage, handling, transport, and delivery
- Labeling of quality marked product

6.2 Quality Responsibility and Authority

Production facility management is responsible for establishing densified fuel production quality policy. Management shall have a means of measuring quality performance and monitoring applicable quality standards. Production facility management shall appoint an employee, trained in quality control procedures, as a quality manager. To minimize conflicts of interest, the quality manager should not be in charge of production or finance.

The quality management program shall identify who makes decisions if the quality manager is absent as well as outline a hierarchy of the reporting structure.

6.3 Training

The quality management plan shall specify that quality training is required on an as needed basis, at a minimum annually, for all involved employees. Training shall cover production requirements as well as applicable standards and specifications.

6.4 Documentation

The quality manager shall ensure the orderly documentation of operating processes that have an effect on the quality of the densified fuel produced. Documentation shall encompass the following components:

- Administrative: organizational structure, job descriptions outlining quality responsibilities, training records
- Raw materials receiving: date, quantity, name of the supplier, type of material, origin, inspection status – meets or does not meet raw material requirements, free of chemically treated materials and/or prohibited fuel types, material accepted or rejected

- The production process: date, time/hours of operation, tons produced, raw material characteristics, additives used (type as well as dosage), equipment used, quality control monitoring inspection results, description of any nonconformance, disposition of nonconforming product, description of mechanical deficiencies (type of malfunction, measures taken, etc.)
- Quality verification of finished product: test results demonstrating product is in compliance with grade requirements, disposition of product that does not meet grade requirements
- Periodic inspections: equipment inspections, inspections for contaminants or moisture intrusion, inspections of product storage areas
- Customer complaints: date, description of complaint, investigation findings, measures taken to remedy any deficiencies, etc.

Documentation shall be kept up-to-date and regularly presented to management. Discovered defects are to be immediately disclosed to the responsible employees and to be remedied.

6.5 Records

Information to be recorded includes all quality documents, forms, inspection instructions, standard operating procedures, testing procedures, testing reports, and data generated to provide the above listed documentation as well as any additional records necessary to demonstrate the effective operation of the quality management system. Records shall be available for review for auditing purposes (internal or external).

Records shall be retained for a minimum of 5 years. Storage containers shall be clearly marked as to contents and retention dates.

6.6 Management of Change

Changes to product specifications and production practices shall be documented. The quality manager shall assure that all affected employees are informed and trained accordingly.

6.7 Raw Material Control

When raw materials are received their adequacy shall be checked by a receiving inspection to verify that they are in compliance with the minimum specifications deemed necessary for the densified fuel producer to meet the intended grade requirements. Adequacy may also be demonstrated through supplier certification to the minimum specifications. Chemically treated materials as defined in section

4.2 and prohibited fuel types as defined in section 4.3 shall not be accepted as raw material for PFI quality marked densified fuel.

6.8 Equipment and Operating Processes

The production facility shall have adequate equipment for the production of densified fuel at its disposal. The function and condition of this equipment shall be regularly inspected.

Contaminates of the raw materials or final product by foreign substances such as soil, stones, or other debris shall be excluded. Handling areas, silos, conveyor equipment, storage containers, and transport vehicles shall be regularly checked for soil and/or debris. Equipment is to be cleaned if necessary to prevent contamination. This also applies to co-mingling of densified fuel products. Quality marked densified fuel shall not be allowed to co-mingle with non-quality marked product. Quality marked densified fuel of one grade co-mingled with another grade shall be quality marked to the lowest quality grade present.

In the case of malfunctions in the production process, it shall be identified as to what quantity of densified fuel was produced up until the malfunction was noticed. This densified fuel shall be evaluated for grade compliance or it shall not be allowed to be sold as quality marked product. After maintenance work has been completed, the densified fuel shall undergo a quality inspection as defined in section 6.9.

6.9 Quality Control and Quality Assurance Testing

Quality control and quality assurance testing shall be performed to demonstrate densified fuel compliance with the intended grade specifications. Quality control testing may be performed at the production facility provided appropriate laboratory testing equipment is provided to assure compliance with the established methods and provided an accredited testing laboratory is periodically used (at least twice annually) as a quality assurance measure to verify the accuracy of in-house testing equipment and methods. Conversely a PFI approved Testing Laboratory shall be used for quality control and quality assurance testing if in-house laboratory testing equipment is not provided. Fines content is to be determined at the production facility by the fuel producer. The fines determination shall reflect the amount of fines at the mill gate as product is shipped. This is to be done by measuring the fines content of bagged product and/or through bulk load outs.

The frequency and location of sampling and testing for quality control purposes shall be sufficient to mitigate reasonable doubts concerning pellet quality compliance with grade specifications. When reasonable doubts concerning the pellet quality exist, the PFI approved Certification Body may stipulate more frequent internal inspections.

Testing for in-house quality control purposes should be conducted in accordance with the methods outlined in the PFI Standard Specifications, however alternate test methods may be used to expedite production data provided the alternate test methods used are periodically cross-checked (at least twice annually) with established methods for accuracy. Testing for quality assurance purposes shall be conducted in accordance with the methods outlined within the PFI Standard Specifications.

All measuring and test equipment used at the densified fuel production facility to determine densified fuel conformance to specified grade requirements shall be maintained and calibrated in accordance with manufacturer specifications and/or other applicable standards.

6.10 Third Party Inspections and Testing

Densified fuel production facilities shall submit to third-party inspections.. Third-party inspections are to be performed by a PFI approved Inspection Body on a monthly basis. Inspection bodies shall collect samples at a frequency of one sample per thousand tons of product produced since the last audit, but not less than one sample per audit. Samples shall consist of one (1) bag of densified fuel taken directly from the bagging line and/or other recent production (produced since the last audit). Audit samples shall be collected evenly throughout inventory that has been produced since the last audit. For bulk shipments, samples shall be collected at transfer points after the pellet cooler.

Inspection Body samples submitted to Testing Bodies shall be a full bag of product or the sample may be reduced in size using the sample preparation techniques outlined in section 7.1 of the PFI Standard Specifications. The minimum sample size to be submitted for analysis by the testing laboratory is 15 pounds. If the sample material is to be reduced in size then the sample reduction process shall be witnessed by the Inspection Body. In such instances, the material to be tested shall be placed back in the original bag and the bag sealed by the Inspection Body.

All samples collected by the Inspection Body are to be analyzed by a PFI approved Testing Laboratory for all normative properties as specified in Table 1 of the PFI Standard Specifications with the exception of heavy metals, which are to be tested at a minimum of once annually. Additional samples may be tested for heavy metals at the Certification Body's or Inspection Body's discretion if either suspects the use of chemically treated materials and/or prohibited fuel types as defined in

sections 4.2 and 4.3 of this document. The minimum annual test for heavy metals is to be conducted at a time of the Certification Body's and/or Inspection Body's choosing, however the test is to be invoiced at the beginning of the year and results are not to be disclosed until the end of the year unless results are failing, which would initiate further investigation and/or corrective actions. Passing results are kept blind so as not to alert the certified production facility that their annual metals testing has been conducted. A heavy metals test is also required as part of the initial certification of the densified fuel production facility.

Informative properties may be tested as desired. All testing is to be conducted in accordance with the testing methods outlined in the PFI Standard Specifications.

Verification of material type (feedstock materials consist only of woody biomass) and additive use is conducted through visual inspection of materials at the site as well as through receiving records.

If at any time the test results of a sample collected by an Inspection Body exceed the limits provided in Table 1 of The PFI Standard Specifications the affected materials will be further evaluated to potentially include the testing of additional samples. If the failed parameter is one of the heavy metals, then the producer will be required to have at least one sample tested for heavy metals each month until there are 3 consecutive months where no exceedances of heavy metals are found. Affected product will be dispositioned based on the inspection and reinspection conformance criteria outlined in section 6.12.

If three consecutive months of unannounced inspections demonstrate the production facility to be within full compliance of the PFI Standards Program, including all program documents, and incorporate the use of an in-house laboratory as outlined in section 6.11, then the sampling frequency shall drop to consist of one sample per inspection as a minimum and one additional sample for every 5,000 tons of production. For example, if a facility produces 4,999 tons or less in a single inspection period then 1 sample is pulled, if the facility produces between 5,000 and 9,999 tons within a single inspection period then two samples are pulled, if a facility produces between 10,000 and 14,999 tons within a single inspection period then three samples are pulled etc. If after reducing the sample frequency non-conformances are identified through the monthly inspection and/or through inspection samples then the testing frequency will return to one sample per 1,000 tons of production until the producer again demonstrates compliance over three consecutive monthly unannounced inspections without deficiencies.

Program requirements including inspection and/or testing frequencies will be reviewed at least every 5 years to assure a proper level of program oversight. Program requirements will ultimately be based on the level of conformance that can be achieved by the production facilities.

6.11 In-House Laboratory and QA/QC Requirements Necessary to Qualify for and Maintain Reduced Audit Sample Testing Frequencies

In order to qualify for and maintain the reduced Inspection Body sample testing frequencies specified in section 6.10, production facilities shall establish an in-

house testing lab that is capable of testing for bulk density, fines, length, diameter, durability, and moisture. All tests must be verified to provide accurate results by cross checking with a PFI approved Testing Laboratory as outlined in section 6.9. In addition, the in-house test data shall also demonstrate that the facility is within compliance of the grade requirements. Samples shall be collected at least twice per day or once per shift whichever generates the larger number of samples. Samples shall consist of bags of product as would typically be shipped or directly from a bulk load out if bulk delivery is performed. Further, all data is to be provided in a format that is easy to review and made available to the inspector during monthly inspections.

6.12 Inspection Conformance Criteria and Tolerance Limits

For the purpose of Inspection Body samples, the densified fuel producer shall be considered conforming if 90% of the certified producer's production is in compliance with all grade criteria as defined in Table 1 of the PFI Standard Specifications. If up to 10% of the densified fuel producer's product does exceed the range specified in Table 1 of the PFI Standard Specifications it may not exceed the range by more than 10% with the exception of durability, which may not exceed the lower limit by more than 2%, and length, which may not exceed the upper limit by more than 25%.

6.13 Nonconforming Materials

All raw materials and finished products that are found to be nonconforming against specified requirements shall be identified, documented, segregated, evaluated and dispositioned to prevent unintended use or delivery. This applies to raw materials, in-process product, final product, and customer returned product.

If after the production facility has been certified and the PFI Quality Mark has been applied to product, which is later discovered to be non-conforming, then the following assessment shall be made.

- If the failing parameter(s) is outside of the PFI limit as per Table 1 of the PFI Standard Specifications but is within the tolerance limits as described within section 6.12 of this document, then the PFI Quality Mark can remain on the product provided an assessment is made in regard to the total tonnage impacted and the total tonnage impacted does not exceed 10% of the Certified Production Facility's annual production volume.
- If the failing parameter(s) is outside of the PFI limit as per Table 1 of the PFI Standard Specifications and is also above the tolerance limits as described within section 6.12 of this document, then the PFI Quality Mark shall be obliterated from the product packaging and the material dispositioned as non-certified material. This may necessitate the recalling of product that has been shipped.
- If the failing parameter(s) is outside of the PFI limit as per Table 1 of the PFI Standard Specifications but is within the tolerance limits as described within section 6.12 of this document and the Certified Production Facility has

already used up its allowance for the amount of material that can be within the tolerance limits (not more than 10% of the annual production), then the PFI Quality Mark shall be obliterated from the product packaging and the material dispositioned as non-certified material.

6.14 Corrective Action Requests

A Corrective Action Request (CAR) may be the result of internal or external observations affecting product quality. A CAR form shall be initiated as promptly as practicable to correct assignable conditions that could result in defective product.

Findings that identify assignable conditions that are averse to quality must be corrected on an expedited, high priority basis.

The quality manager shall monitor progress of the corrective action. Initial review of the adequacy of improvements and corrections and the monitoring of the effectiveness of actions taken shall be recorded. The review and monitoring schedule shall be determined by the quality manager.

6.15 Product Storage, Handling, and Delivery

To assure the consistent quality of densified fuel leaving the production facility, quality marked product shall be packaged, stored, handled, transported, and/or delivered in a manner that will maintain the integrity of the densified fuel produced. The minimum requirements for quality marked densified fuel packaging, storage, handling, transport, and delivery are as follows:

- Densified fuel shall not be exposed to moisture, e.g., through contact with condensed water, rain or snow.
- Handling areas, silos, conveyor equipment, storage containers, and transport vehicles shall be regularly checked for soil and/or debris. Equipment is to be cleaned if necessary to prevent contamination.
- Quality marked densified fuel shall not be allowed to co-mingle with non-quality marked product. Quality marked densified fuel of one grade co-mingled with another grade shall be quality marked to the lowest quality grade present.

7 CERTIFICATION OF RESIDENTIAL/COMMERCIAL DENSIFIED FUEL PRODUCTION FACILITIES

Upon completion of the implementation of a written quality management system based on The PFI QA/QC Handbook, densified fuel production facilities can pursue certification through PFI approved Certification Bodies. A list of PFI approved Certification Bodies can be found on PFI's website at the following web address:

www.pelletheat.org

To gain certification, prospective densified fuel production facilities shall enter into an agreement with a PFI approved Certification Body. The Certification Body will issue an application. The densified fuel production facility must complete and submit the application to the Certification Body. Upon approval of the application by the Certification Body an initial inspection of the densified fuel production facility shall be performed by an Inspection Body appointed by the Certification Body to verify compliance with the PFI Standards Program, and the facility's written quality management system. If deficiencies are found during the inspection the applicant must demonstrate to the Certification Body that corrective measures have been taken.

The initial evaluation conducted by the Certification Body shall also include an assessment of testing data provided by a PFI approved Testing Laboratory. Testing data shall assure conformance with the product grade(s) being requested for certification.

Once all deficiencies have been corrected the Certification Body shall issue a "Certificate of Conformance" to the applicant and provide a licensing agreement for use of the PFI Quality Mark. Upon signing of the licensing agreement and payment of any fees the densified fuel producer will now be referred to as a "Certified Production Facility".

Certified production facilities are monitored by the Certification Body on an on-going basis through monthly inspections and testing coordinated through PFI approved Inspection Bodies and Testing Bodies.

8 CERTIFICATION SUSPENSION OR REVOCATION

When a violation(s) of the regulations of the PFI Standards Program occurs or when noticed defects continue despite repeated requests to correct them, the production facility's "Certified" status may be suspended or revoked.

Certification Bodies shall perform the duty of suspending or revoking "Certified" status from production facilities that they are under contract with.

For densified fuel producers that have several locations, the "Certified" status shall only be suspended for the location(s) where the defect(s) has been assessed. All other production facility locations shall remain in good standing.

Certification suspension is intended for situations where a Certified Production Facility falls out of compliance but is expected to be able to again achieve compliant status. During a suspension the production facility shall not claim itself as certified and shall not make use of the PFI Quality Mark. Once the deficiency(s) is addressed the suspension can be lifted and the facility placed back into good standing.

Certification Revocation is intended for situations where a Certified Production Facilities fall out of compliance and is not expected to be able to regain compliance within a reasonable amount of time. Revocations may also be the result of fraudulent activities and/or other forms of misuse.

If a production facility does have its certification revoked, the production facility can re-apply when the prior issues have been resolved.