

# OPERATIONS MANUAL

## COMMERCIAL FINNED TUBE RADIATION CERTIFICATION PROGRAM

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**AHRI CFTR OM – DECEMBER 2019**

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## PREFACE

The following manual outlines the procedures and policies of the Performance Certification Program for Commercial Finned Tube Radiation (CFTR) operated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). This manual is to be used in conjunction with the AHRI General Operations Manual for AHRI Certification Programs. Where the AHRI General Operations Manual and this product-specific manual differ, this product-specific operations manual shall prevail.

The revision of this manual supersedes all previous revisions. The current edition of this manual, as well as the AHRI General Operations Manual, can be accessed through the AHRI website, [www.ahrinet.org](http://www.ahrinet.org).

The CFTR Certification Program by AHRI provides for independent verification of the CFTR manufacturers' stated equipment performance. Safety criteria are not within the scope of this program.

Participation in the program is voluntary. Any manufacturer, regardless of AHRI membership, may obtain approval of Program Ratings and use of the AHRI Certification Marks hereinafter referred to as the "Marks". The Mark is the Participant's public representation that the ratings of randomly selected units have been verified by an independent laboratory in accordance with test procedures prescribed by this operations manual. A Certification Agreement is executed between the manufacturer and AHRI specifying the conditions under which such Ratings and the Mark may be used. No manufacturer has the right to use Program Ratings or to state that their products have been tested in conformance with the procedures outlined in this Rating Procedure unless and until they have received written authority from AHRI to use the Marks as applied to the specific approved Program Ratings.

This Operations Manual has been prepared to assure that administration of the program is carried out in a uniform manner. It is an amplification of the Certification Agreements signed by licensees and AHRI. General information, procedural details, and copies of forms are included in this Operations Manual. Provisions of the Operations Manual may be amended as provided in the Certification Agreements.

This certification program complies with requirements of the ISO/IEC Standard 17065:2012, *General Requirements for Bodies Operating Product Certification Systems*.

### Note:

This manual supersedes the Commercial Finned Tube Radiation Operations Manual, October 2019.

**CERTIFICATION OPERATIONS MANUAL FOR**  
**COMMERCIAL FINNED TUBE RADIATION**

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## 1. Program Overview

1.1 Applicable Rating Standard. It is mandatory for program Participants to comply with the latest edition of AHRI Standard 1410, *Performance Rating of Commercial Finned Tube Radiation* (Standard). A copy of this standard is available for download from the AHRI website, [www.ahrinet.org](http://www.ahrinet.org).

1.2 Product Definitions. All terms in this document shall follow the AHRI General Operations Manual and the Standard definitions unless otherwise defined in this section.

1.2.1 Commercial Finned Tube Radiation. Steam or water heated room heaters composed of a finned tube element fabricated from metallic tubing with a plurality of metallic fins attached to the tubing by means of a mechanical or other type bond. These heaters are designed for installation bare, or with open type grills, covers, or enclosures having top, front, or inclined outlets.

1.2.1.1 Commercial Finned Tube Bare Element. Commercial Finned Tube Bare Elements shall apply to elements fabricated from metallic tubing with a plurality of metallic fins attached to the tubing by means of a mechanical or other type bond.

1.2.1.2 Commercial Finned Tube Assembly. Commercial Finned Tube Assembly shall apply to a steam or water heated commercial finned tube bare element with open type grilles, covers, or enclosures having top, front or inclined outlets. These assemblies do not have a back panel that touches the floor.

1.3 Program Scope. This program applies to Commercial Finned Tube Bare Elements, as defined in Section 1.2, for which published ratings are available.

1.3.1 Scope Exclusions. This program does not apply to:

- Residential Baseboard Radiation covered by the Residential Baseboard Radiation Operations Manual;
- Multiple-tier Commercial Finned Tube Bare Elements;
- Commercial Finned Tube Assemblies; and
- Convectors, which are designed only for installation in an enclosure.

1.4 Intended Market. The Intended Market for this certification program includes all products defined in Section 1.3 that are sold for use in North America (U.S., U.S. Territories, and Canada).

1.5 Basic Model Groups (BMGs). A Participant's listing shall be grouped by BMG. A BMG is a regular range of sizes of a similar type, design and construction, and having a common designation as catalogued. At a minimum, a BMG shall share an identical fin size, tube material, and fin material.

1.5.1 Further Optional Definitions of BMG. The Participant may further subdivide its BMGs. The following are examples of additional parameters, which may be used to subdivide BMGs:

- Fins per foot;
- Fin thickness;
- Tube size; and/or
- Number of tiers.

## 2. Qualification Process

2.1 Original Equipment Manufacturer (OEM) Applicants. With the additions noted below, the OEM qualification process shall proceed according to the AHRI General Operations Manual, Section 4.

STEP 2.1.1 Certification Application Package. In addition to the Application for AHRI Certification and Annual Sales Volume Form noted in the AHRI General Operations Manual, Section 4, STEP 4.1. Applicants shall submit the following documentation to AHRI:

- AHRI Directory Data;

- Test Reports/Data Sheets per AHRI 1410, Appendix I; and
- Published installation instructions in printed or electronic format.

Electronic forms shall be obtained from AHRI (available on [www.ahrinet.org](http://www.ahrinet.org) under the Product-Specific Certification Program).

STEP 2.1.2 Processing Application Package.

STEP 2.1.2.1 Performance Certification Agreement for Original Equipment Manufacturer (OEM Agreement). No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.2.2 Participation and Licensing Fee Invoice. Payment of the Participation and Licensing Fee is due within 30 calendar days of the invoice issue date. Testing shall not be conducted until the invoice is paid in full. No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.3 Selection and Acquisition of Test Samples.

STEP 2.1.3.1 Number of Qualification Tests. All BMGs shall be selected for qualification testing, with a minimum of one (1) model from each BMG. AHRI shall make a determination of the minimum number of tests required to rate each BMG. The samples selected by AHRI shall represent the end points of a linear interpolation line based on the parameters listed in Section 1.5.1. An example of interpolation based on minimum testing is shown in Appendix A.

An Applicant may elect to test greater than the minimum number of models required to rate the product line in order to support the ratings of a product line. An Applicant shall submit the proposed models for testing for AHRI approval.

STEP 2.1.3.2 Acquisition of Qualification Test Samples/Selection Criteria. Within 30 calendar days of a request from AHRI, the Applicant shall have samples available for selection. Samples shall be acquired in accordance with Section 3 of this manual.

STEP 2.1.4 Qualification Testing. The Independent Third-Party Laboratory Contracted by AHRI (Laboratory) shall conduct the testing of the sample(s) in accordance with the Standard.

The results from the qualification test(s) shall determine the BMG's certified rating(s). The BMG's certified rating shall be associated with the dimensional data submitted by the Applicant and validated by the Laboratory. The Applicant may select a rating not to exceed the value of the rating of the qualification test.

STEP 2.1.5 Welcome to the Program. No further action required beyond that listed in Section 4, STEP 4.5 of the AHRI General Operations Manual.

2.2 Private Brand Marketer (PBM) Applicants. The PBM qualification process shall proceed according to the AHRI General Operations Manual, Section 5.

### 3. Equipment Selection and Verification Testing

3.1 Annual Testing Requirement. 30% of a Participant's BMGs shall be tested annually, with a minimum of one (1) test. Fractional numbers shall be rounded up to the nearest whole number.

3.2 Testing Requirement for Introduction of New Models. Prior to being listed in the Directory, any new BMG introduced by the Participant shall undergo qualification testing as described in Section 2.

3.3 Testing Requirement for Voluntarily Changed BMGs. A BMG shall be considered voluntarily changed if the Participant makes a physical change(s) to any model within the BMG and continues to

market the product under the same designation as the product since its last submittal to AHRI. If the product has changed in such a way that may affect the BMG's certified ratings, the changed BMG shall undergo qualification testing.

3.3.1 *Notification of Voluntarily Changed Models.* Prior to introducing the changed product to the market, introducing Program Ratings for the changed product, or updating the Directory, the Participant shall notify AHRI, in writing, of the exact changes proposed, the date the changed product is expected to be introduced to the market, and the requested rating for the changed product. AHRI shall review the submitted materials and notify the Participant, in writing, if qualification testing is required. The Participant shall not implement the changes, publish ratings for the changed product, or update Directory ratings, until necessary AHRI testing is completed or AHRI notifies the Participant that the model is exempt from qualification testing.

3.3.1.1 *Changed Product Ratings.* If the Participant notifies AHRI that the product ratings shall change, or AHRI determines the product's certified ratings may be affected by the proposed change, the changed BMG shall be selected for qualification testing.

3.3.1.2 *Unchanged Product Ratings.* If AHRI determines a model's certified ratings are unaffected by the physical changes made to the product, the BMG shall be exempt from qualification testing.

3.3.1.3 *Proof That Product Has Not Changed.* At its discretion, AHRI may at any time request a Participant to provide proof that a product currently being produced and offered for sale as a rated product has not been changed. If within 20 calendar days after the request, the Participant has not furnished proof satisfactory to AHRI that the product has not been changed, the product shall be deemed a Changed Product Rating.

3.3.1.4 *Tolerances for Changed Products.* The sample shall meet the dimensions specified in Data Sheets per AHRI 1410, Appendix I and the detailed dimensional drawing within the tolerance listed within Table 1.

Table 1. Dimensional Tolerances	
Parameter	Tolerance
Fin size	$\pm 1/32''$
Fin thickness <ul style="list-style-type: none"> <li>• Aluminum</li> <li>• Cold rolled steel</li> <li>• All other materials</li> </ul>	ASTM B209 ASTM A568/A568M Latest ASTM
Fins per foot	+1.5% and -2.5% of catalogued number of fins per foot
Angle tolerance	$\pm 5^\circ$
All other dimensions described in Data Sheets per AHRI 1410, Appendix I, except active length	$\pm 1/8''$ from the manufacturer's specification

3.3.1.5 *Disposition of Changed Products.* In the event the sample deviates from the tolerances specified, the Participant has two (2) options:

- The sample shall be considered as a Changed Product Rating (refer to Section 3.3.1.1).
- The Participant may submit another sample to the Laboratory.

3.4 *Location of Test.* Testing shall be performed at the Laboratory and the sample shall be installed in the test facility in accordance with the Participant's published installation instructions in printed or electronic format.

3.5 Selection of Test Samples. Selections shall be made based on data contained in the Directory. AHRI shall inform the Participant, in writing, of the sample(s) selected for test.

3.6 Methods for Acquiring Test Samples. AHRI or the Laboratory personnel shall make a Random Sample Selection from the Participant's stock inventory within 30 calendar days of a model selection by AHRI. Selected samples shall be shipped to the Laboratory accompanied by the Participant's published installation instructions in printed or electronic format. Refer to Section 9 of the AHRI General Operations Manual.

3.7 Sample Acquisition Timeframe. The Participant shall deliver the selected sample(s) to the Laboratory within 14 calendar days of Random Sample Selection by Laboratory personnel. The Participant is responsible for shipping all proprietary components and components normally shipped with the sample at the same time the sample is shipped to the Laboratory.

3.8 Duties of Laboratory Personnel. Prior to the test, the Laboratory shall verify the dimensional data report, as submitted to AHRI by the Participant. This may require the tested unit to be dismantled and measured. The Laboratory shall notify AHRI immediately if the dimensional data acquired from the tested unit does not match the data submitted to AHRI for that model within the tolerances given in Section 3.3.1.4. The Laboratory representative may photograph any and all components of the tested sample and associated test equipment.

3.9 Certified Data. At conditions specified in the Standard, the following certified rating is verified by test:

- AHRI Steam Output Heating Capacity, Btuh per linear foot; and

3.10 Test Data. The Laboratory shall collect and submit the following data, for each Commercial Finned Tube unit tested, to AHRI at the conclusion of testing:

- A complete test report includes:
  - Dimensional Data (AHRI Standard 1410, Appendix I, CFTR-DS2);
  - Finned Tube Radiation Log Sheet (AHRI Standard 1410, CFTR-TR3); and
  - Finned Tube Radiation Test Report (AHRI Standard 1410, CFTR-TR1).

3.11 Tolerances and Testing Threshold. For annual testing, the Standard Rating shall be such that any Commercial Finned Tube Radiation selected at random and tested in accordance with the Applicable Rating Standard has a Steam Heating Capacity not less than 95% of the Standard Ratings.

In the event that the Steam Heating Capacity (at standard test conditions) determined by the Laboratory is more than 3% greater than the claimed Steam Heating Capacity, the Participant may submit a request for approval of increased ratings, based on the test data developed at the Laboratory. The Participant shall submit such request within 30 calendar days after AHRI has published the test report.

3.12 Test Failures.

3.12.1 Options Following First Sample Failure. When the Participant is notified of a first sample certified rating failure, the Participant has 7 calendar days to select one (1) of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results;
- Test second sample of the same model (sample shall be available within 45 calendar days following notification of failure); or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.



3.12.2 Options Following Second Sample Failure When the Participant is notified of a second sample certified rating failure, the Participant has 7 calendar days to select one (1) of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results; or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

#### 4. Challenge Tests

No further action required beyond that listed in Section 10 of the AHRI General Operations Manual.

#### 5. AHRI Directory of Certified Product Ratings

All certified products shall be listed in the Directory, [www.ahridirectory.org](http://www.ahridirectory.org). Certification shall not be implied nor claimed for any product not listed in the Directory. Except as noted below, the Participant shall follow the steps outlined in Section 11 of the AHRI General Operations Manual.

5.1 Publication of Ratings in Certified Directory. The following information pertaining to each model certified shall be published in the Directory:

- AHRI Certified Reference Number;
- Model Status;
- Brand Name of Model;
- Model Number(s) or Designation(s);
- Tube/Pipe Size (Nominal), in.;
- Tube Material;
- Fin Height, in.;
- Fin Width, in.;
- Fin Thickness, in.;
- Fin Material;
- Fin Finish;
- Fins per Foot;
- Tiers of Element;
- Installed Height, in.;
- Heating Effect, %; and
- AHRI Steam Output Heating Capacity, Btu/h–ft.

5.2 Data Forms. Each Participant shall list its products by BMG. OEM Participants shall submit/edit product data via the Directory.

#### 6. Assessment and Payment of Certification Fees

Refer to the AHRI General Operations Manual, Section 12.

#### 7. Issuance of Violations and/or Termination

Refer to Section 14 of the AHRI General Operations Manual.

### 8. Program Hierarchy, Complaints, and the Appeals Process

Refer to Section 15 of the AHRI General Operations Manual.

### 9. Proper Use of the AHRI Certification Marks and Claims to Certification

Refer to Section 8 of the AHRI General Operations Manual. Participants shall use the AHRI Certified Mark.

9.1. Definition of Program Ratings. All efficiency and performance measures that are certified and non-certified in accordance with the Standard and this Operations Manual.

9.2. Publication of Non-Certified Ratings. A Participant's printed or online material may contain non-certified ratings. The literature shall clearly distinguish between certified and non-certified ratings. The AHRI certified models shall be bold italicized (Refer to Section 9.4).

9.3. Rating and Testing Procedures for Establishing Certified and Non-Certified Program Ratings.


9.3.1 AHRI Steam Output Heating Capacity. AHRI Steam Ratings are determined from test data obtained in accordance with the procedure outlined in *Appendix A of AHRI's Testing and Rating Standard for Finned Tube Radiation.*

9.4. Minimum Data Requirements for Publication in Literature. The minimum data requirements listed below shall be published in all literature in which Certified Data are shown:

- Name and designation;
- AHRI Certified Mark;
- Each AHRI Certified unit and associated ratings are in bold italic type; and
- Each AHRI Rated unit line accompanied by arrows ( ▶ , ◀ ) to the left and right sides of the line. These shall also be placed at the bottom of the page surrounding the statement "Bold, italicized units are AHRI rated" and be accompanied by the AHRI Certified Mark. See Figure 1 below.

**FIGURE 1: Example of Commercial Finned Tube Radiation Certified Ratings**

MODEL: Brand X Series Top Outlet												
3-3/4"x 4-1/4" Aluminum Fins												
Heating Element Fin Spacing	Enclosure Height (in)	Rows of Element	Steam Ratings, 1 Psi	Hot Water Ratings (Btuh/ft of active finned length) for Average Water Temperature (°F)								
				210	200	190	180	170	160	150	140	
1" Copper 34 Fins/foot	▶▶▶ 12	1	1490	▶▶▶ 1420	▶▶▶ 1280	▶▶▶ 1160	▶▶▶ 1030	▶▶▶ 910	▶▶▶ 790	▶▶▶ 670	▶▶▶ 600	
	▶▶▶ 18	1	1620	▶▶▶ 1540	▶▶▶ 1390	▶▶▶ 1260	▶▶▶ 1120	▶▶▶ 990	▶▶▶ 860	▶▶▶ 730	▶▶▶ 650	
	▶▶▶ 24	1	1860	▶▶▶ 1770	▶▶▶ 1600	▶▶▶ 1450	▶▶▶ 1280	▶▶▶ 1130	▶▶▶ 990	▶▶▶ 840	▶▶▶ 740	
	18	2 @ 6"	2020	1920	1740	1580	1390	1230	1070	910	810	
24	2 @ 12"	2280	2170	1960	1780	1570	1390	1210	1030	910		

▶ Bold, italicized units are  ◀

- Fin size, nominal thickness, nominal spacing (fins per foot) and external finish of finned tube element, i.e., unpainted or painted (including color of paint).

Recommended installed height (the installed height upon which the AHRI Rating is based) or mounting height.

- In the case of multiple tier assemblies of finned tube elements, the distance between centers of the tiers on which the ratings are based, is measured at the mid-length of the units as installed.
- A statement that ratings are based on active length.
- The difference between active length and total length, expressed in inches.
- A cross sectional drawing indicating essential dimensions, including the height and depth of enclosure, size of inlet and outlet openings, and the location of the element with respect to the enclosure, specifically including the location on which the rating is based. The inlet opening height should not be specified as less than 3" unless the unit was tested at a lower height, in which case the tested height shall be the minimum.

**APPENDIX A**  
**INTERPOLATION METHOD FOR BARE ELEMENTS WITHIN ONE (1) BASIC MODEL GROUP**

Naming Convention\* of Variables – (TS)(FPF)(T), where

TS: Tube Size  
A = ¾"  
B = 1"  
C = 1¼"

FPF: Fins Per Foot  
1 = 34  
2 = 42  
3 = 50

T: Tiers of Element  
1=1  
2=2  
3=3

Features of a Bare Element							Variables	Rating Acquisition method (Measured or Interpolated from)**	Level of Interpolation
Tube Size (TS)	Fin Size (FS) (HxW)	Fins Per Foot (FPF)	Tiers of Element (T)	Fin Thickness	Fin Material Aluminum or Steel	Tube Material			
3/4"	2-3/4 x 4-1/4	34	1	0.18"	Aluminum	Copper	A11	Measured	-
3/4"	2-3/4 x 4-1/4	34	2	0.18"	Aluminum	Copper	A12	(A11 & A13)	1
3/4"	2-3/4 x 4-1/4	34	3	0.18"	Aluminum	Copper	A13	Measured	-
3/4"	2-3/4 x 4-1/4	42	1	0.18"	Aluminum	Copper	A21	(A11 & C31)	1
3/4"	2-3/4 x 4-1/4	42	2	0.18"	Aluminum	Copper	A22	(A12 & A32 or A21 & A23)	2
3/4"	2-3/4 x 4-1/4	42	3	0.18"	Aluminum	Copper	A23	(A13 & A33)	1
3/4"	2-3/4 x 4-1/4	50	1	0.18"	Aluminum	Copper	A31	Measured	-
3/4"	2-3/4 x 4-1/4	50	2	0.18"	Aluminum	Copper	A32	(A31 & A33)	1
3/4"	2-3/4 x 4-1/4	50	3	0.18"	Aluminum	Copper	A33	Measured	-
1"	2-3/4 x 4-1/4	34	1	0.18"	Aluminum	Copper	B11	(A11 & C11)	1
1"	2-3/4 x 4-1/4	34	2	0.18"	Aluminum	Copper	B12	(A12 & C12) or (B11 & B13)	2
1"	2-3/4 x 4-1/4	34	3	0.18"	Aluminum	Copper	B13	(A13 & C13)	1
1"	2-3/4 x 4-1/4	42	1	0.18"	Aluminum	Copper	B21	(A21 & C21) or (B11 & B31)	2
1"	2-3/4 x 4-1/4	42	2	0.18"	Aluminum	Copper	B22	(A22 & C22) or (B12 & B32) or (B21 & B23)	3
1"	2-3/4 x 4-1/4	42	3	0.18"	Aluminum	Copper	B23	(A32 & C23) or (B13 & B33)	2
1"	2-3/4 x 4-1/4	50	1	0.18"	Aluminum	Copper	B31	(A31 & C31)	1
1"	2-3/4 x 4-1/4	50	2	0.18"	Aluminum	Copper	B32	(A32 & C32) or (B31 & B33)	2
1"	2-3/4 x 4-1/4	50	3	0.18"	Aluminum	Copper	B33	(A33 & C33)	1
1-1/4"	2-3/4 x 4-1/4	34	1	0.18"	Aluminum	Copper	C11	Measured	-
1-1/4"	2-3/4 x 4-1/4	34	2	0.18"	Aluminum	Copper	C12	(C11 & C13)	1
1-1/4"	2-3/4 x 4-1/4	34	3	0.18"	Aluminum	Copper	C13	Measured	-
1-1/4"	2-3/4 x 4-1/4	42	1	0.18"	Aluminum	Copper	C21	(C11 & C31)	1
1-1/4"	2-3/4 x 4-1/4	42	2	0.18"	Aluminum	Copper	C22	(C21 & C23) or (C12 & C32)	2
1-1/4"	2-3/4 x 4-1/4	42	3	0.18"	Aluminum	Copper	C23	(C13 & C33)	1
1-1/4"	2-3/4 x 4-1/4	50	1	0.18"	Aluminum	Copper	C31	Measured	-
1-1/4"	2-3/4 x 4-1/4	50	2	0.18"	Aluminum	Copper	C32	(C31 & C33)	1
1-1/4"	2-3/4 x 4-1/4	50	3	0.18"	Aluminum	Copper	C33	Measured	-

\* For the purpose of this example only.

\*\* Model ratings may be interpolated from models with measured ratings or interpolated ratings.

Interpolation Calculation:

$$y_{int} = \frac{y_2 - y_1}{x_2 - x_1} \times (x_{int} - x_1) + y_1 \quad \text{where,}$$

- $x$  = dimensions of any one feature of a bare element; tube size, fin size, fins per foot, tiers of element;
- $y$  = AHRI steam ratings;
- subscript 1* = element with smallest dimensions;
- subscript 2* = element with largest dimensions; and
- subscript int* = element for which steam ratings need to be interpolated