

COOLING TECHNOLOGY INSTITUTE

Operations Manual for Thermal Performance Certification of Evaporative and Air-Cooled Heat Rejection Equipment



October 2021

STD-201OM (21)

This document was developed using the consensus procedure outlined in the CTI Operating Procedure 304
and has been approved for publication by the CTI Board of Directors

FOREWORD

This Cooling Technology Institute (CTI) publication is published as an aid to cooling tower, evaporative closed circuit cooler, dry fluid cooler, and evaporative condenser purchasers and designers. It may be used by anyone desiring to do so, and efforts have been made by CTI to assure the accuracy and reliability of the data contained herein. However, CTI makes no warranty of fitness for particular purpose or merchantability nor any other warranty expressed, implied or statutory. In no event shall CTI be liable or responsible for Incidental, Consequential or Commercial losses or damage of any kind resulting from this publication's use; or violation of any federal, state, or municipal regulation with which this publication may conflict or for the infringement of any patent resulting from the use of this publication.

All CTI codes and standards are copyrighted with all rights reserved to CTI. The reproduction of any part of this or any other CTI code or standard is a violation of Federal Law. One must recognize and appreciate commitment by a number of volunteer members who donate their time to develop and update CTI codes and standards. The monies spent for code development, administrative staff support and publication are essential and constitute a substantial drain on CTI. The purchase price of these documents helps to offset these costs. Reproduction and distribution by others, in addition to being unethical, undermines this system and constitutes a further financial drain on CTI. When copies are needed, you are requested to call or write the Cooling Technology Institute, P.O. Box 73383, Houston, Texas 77273, (281) 583-4087. Please request that your associates buy the required codes and standards rather than copy them. Your cooperation in this matter is greatly appreciated.

Nothing contained herein is to be construed as granting any right for the manufacture, sale or use in connection with any method, apparatus, or product covered by letters patent, nor as insuring anyone against liability for infringement of letters patent.

This guideline document summarizes the best current state of knowledge regarding the specific subject. This document represents a consensus of those individual members who have reviewed this document, its scope and provisions. It is intended to aid all users or potential users of cooling towers, evaporative closed circuit coolers, dry fluid coolers, and evaporative condensers.

Approved by the CTI Executive Board.



To assure CTI Standard STD-201-OM, *Operations Manual for Thermal Performance Certification of Evaporative and Air-Cooled Heat Rejection Equipment*, remains current with advancing technologies and to quickly address newly recognized concerns, it has been placed under continuous maintenance by the standing CTI Task Group on STD-201. Such designation provides for timely consideration of requests for change to any part of the standard and, as may be necessary, publication of addenda or revisions adapted by the Task Group as the result of such a request.

Approved by the CTI Executive Board

Copyright 2021 by Cooling
Technology Institute Printed in U.S.A.

STD-201OM (21)

Operations Manual for Thermal Performance Certification of Evaporative and Air-Cooled Heat Rejection Equipment Heat Rejection Equipment

Content

Section/Title	Page
1 Program Overview	5
2 Definitions	5
3 Compliance	6
4 Operation of Program	6
5 Certification Program Committee	8
6 Testing Procedures	9
7 Compliant Procedures	9
8 Conformance	11
9 Cost of Program	13
Appendices	
A Test Failure (Figure 1)	14
A Test Failure (Figure 2)	15
B Certification Approval	16
C Certification Label Design	16
Appendix: Revision History (Informative)	17

Operations Manual for Thermal Performance Certification of Evaporative and Air-Cooled Heat Rejection Equipment

1. Program Overview

- 1.1 Applicable Rating Standard. It is mandatory for program Participants to comply with the provisions of the latest edition of either CTI Standard 201, Performance Rating of Evaporative Heat Rejection Equipment, hereafter referred to as 201 RS, or CTI Standard 201, Performance Rating of Dry Fluid Coolers, hereafter referred to as 201 Dry RS.

2. Definitions

2.1 Product Definitions

2.1.1 Open Circuit Cooling Towers. Direct heat rejection whereby heat is removed from exposed water directly to the air

2.1.2 Closed Circuit Cooling Towers. Indirect heat rejection whereby heat is removed from a process liquid in a closed circuit by an external fluid circuit(s) through a heat exchanger in forms including but not limited to:

2.1.2.1 An external circuit in which recirculating evaporative water is exposed to atmospheric air flow and cascades in direct contact with the outside surface of a heat exchanger and in which the process fluid to be cooled is circulated inside the interior of that heat exchanger.

2.1.2.2 A factory standard open cooling tower coupled to a heat exchanger integrally packaged on a common skid containing two separate fluid circuits: an external circuit in which recirculating evaporative water is exposed to atmospheric air flow in the factory standard tower and which passes through one side of the heat exchanger and the process fluid is circulated in the alternate side of the heat exchanger.

2.1.3 Evaporative Condensers. Indirect heat rejection whereby heat is removed from a condensing refrigerant vapor in a closed circuit of a condensing coil that is continually wetted on the outside surface while air is simultaneously directed over the coil causing a small portion of the water to evaporate.

2.1.4 Dry Fluid Cooler. Dry coolers, or air cooled fluid coolers, consist of a closed fluid circuit, an air moving device, and a structure. In operation, heat flows from the hot process fluid in the closed circuit through the wall of the heat exchange surface to the

cooling airstream that is circulated by the air moving device, or fan.

The wall of the heat exchange surface may include internal and / or external fins or other enhancement features to improve heat transfer rates. The entire external surface of the closed circuit is dry and as such the heat transfer process for dry coolers is strictly sensible cooling.

- 2.2 *Manufacturer.* As used in this Standard pertains to the party offering the product for sale

2.2.1 Original Equipment Manufacturer (OEM). The actual producer of the product responsible for the generation of thermal performance ratings for a given product line. The OEM shall pay product line administration fees, initial testing and annual re-verification testing charges. The OEM shall be a voting member of the program committee.

2.2.2 Private Brand Label Manufacturer (PBL). Supplier of a private brand labeled product line which is produced by an OEM and which is certified under the program. The PBL may initiate a separate certification for this product line. A PBL shall pay product line administration fees and shall not have voting rights on the program committee.

2.2.3 Consultant. Technical adviser assisting the Manufacturer in support of Manufacturer's certification efforts, whose services may include but are not limited to support of Data of Record compilation for submission, coordination of required testing by the CTI Licensed Test Agents, as well as translation and communication services, as requested by the Manufacturer.

- 2.3 *Line or Product Line.* As used in this Standard, applies to a Manufacturer's grouping of products, models, or units, all of which are of consistent type and design in that they employ the same design configuration (induced draft crossflow, forced draft counter-flow, etc.), plus any other optional design or application considerations (such as range of capacities) as the Manufacturer may employ, and for which the Manufacturer issues a unique catalog, other sales literature or software providing a physical description and dimensions for all products, models, or units and a selection procedure/ratings.

3. Compliance

- 3.1** Compliance with this Standard requires all models of the product line to be certified. All models comprising the line shall include as part of their model designation a descriptor unique to that line, and that line only (e.g., A certified line employs model designation such as XYZ-123 where "XYZ" is the unique descriptor for the line. That particular descriptor shall not be used as part of the model designation of a non-certified line.)
- 3.2** When prefixes or suffixes are added to the basic model numbers for the certified models, they shall only be used to denote changes made to a certified model, such as the addition of an accessory or special construction (see Para. 3.6). Prefixes or suffixes shall not be used to designate the certification status of a product line or series.
- 3.3** A Manufacturer participating in this certification program shall not publish a different set of performance ratings for a line having the same or substantially the same data of record information as the certified line. This shall apply whether or not the unique descriptor of the certified line is used for the non-certified version.
- 3.4** Compliance with this Standard requires initial qualification testing and annual reverification testing individual models selected from the line by the CTI Certification Administrator.
- 3.5** Certifications issued by CTI in accordance with the provisions of this Standard shall apply only to the exact products described in the approved certification report as maintained by the CTI Certification Administrator.
- 3.6** When optional accessories available from the Manufacturer affect the thermal performance of the product and compensation must be made in the selection, the certification is no longer applicable unless certified as a separate model. This fact shall be clearly specified in all published literature and submittal documents pertaining to the certified line. The use of a hyphenated suffix is suggested to clearly show the accessory.
- 3.6.1** When optional accessories or custom modifications must be made to the product to meet the needs of the customer and those modifications or accessories void the certification:
- (a) The certification label shall not be placed on the unit.
 - (b) A unique and clearly identified suffix shall be added to the model number to clearly denote the unit has special modifications or accessories that exclude it from certification.

- 3.7** The Manufacturer of a line of products certified under the provisions of this Standard shall not make any implication that the certification applies to any other line of products not duly certified under the provisions of this Standard.

3.7.1 Sales literature and product bulletins providing descriptions, dimensional data and/or ratings for a line of products certified under this standard shall be unique to that product line and contain no references to other, uncertified, products.

- 3.8** Manufacturer applicants and program participants in the CTI Thermal Certification Program, and Manufacturer's Consultant(s), if applicable and as defined in Section 2.2.3, are subject to the rules governing CTI certification as defined in this standard and to the CTI Code of Ethics. Ethical violations as determined by the Thermal Certification Administrator or by the CTI Administrator (appealable to the CTI Board of Directors) may result in penalties as herein defined, or as defined by the CTI Bylaws.

4. Operation of Program

- 4.1** This certification program shall be administered by the CTI Certification Administrator who shall be appointed by and serve at the discretion of the CTI Board of Directors.
- 4.2** The Manufacturer requesting certification of a product line shall submit an application for certification to the CTI Certification Administrator.
- 4.3** Included in the Manufacturer's application shall be:
- (a) A general description of the product line to be certified, including catalogs, if available.
 - (b) The thermal performance capability for each model comprising the line.
 - (i) The thermal performance data submitted must be in a form suitable for the Certification Administrator to accurately calculate the capacity of the model at any condition for all process fluids within the certification limits.
 - (ii) For closed circuit cooling towers and dry fluid coolers, the heat exchanger pressure drop data must also be in a form suitable for the Administrator to be able to determine the corresponding process fluid pressure drop through the heat exchanger for each flow condition for all the process fluids within the certification limit.
 - (iii) Acceptable forms of data include the Manufacturer's selection software, equations, and tables of numerical data sufficiently descriptive for interpolation