



1991 STANDARD for

FORCED- CIRCULATION AIR-COOLING AND AIR-HEATING COILS



AIR-CONDITIONING
& REFRIGERATION
INSTITUTE

Standard 410

IMPORTANT

SAFETY RECOMMENDATION

It is strongly recommended that the product be designed, constructed, assembled and installed in accordance with nationally recognized safety requirements appropriate for products covered by this standard.

ARI, as a manufacturers' trade association, uses its best efforts to develop standards, employing state-of-the-art and accepted industry practices. However, ARI does not certify or guarantee safety of any products, components or systems designed, tested, rated, installed or operated in accordance with these standards or that any tests conducted under its standards will be non-hazardous or free from risk.

ARI CERTIFICATION PROGRAM PROVISIONS

Scope of the Certification Program

The certification program includes forced-circulation air-cooling coils for application under non-frosting conditions, and forced-circulation air-heating coils, as defined in the standard are included in this program.

Coils Included. This program applies only to coils intended:

For field installation (built-up systems)

For use in central station air-conditioning units

For use in central station heating or heating and ventilating units

Exclusion. It does not include:

- a. Coils sold to original equipment manufacturers for inclusion in packaged units
- b. Coils installed in packaged air-conditioning or heating units by the manufacturer
- c. Special coils—Coils of fin or tube material of special configuration not having cataloged performance data

*For the purpose of this program, a packaged unit is an assembly of components including coil(s) whose rating is based on a test of the complete assembly.

Certified Ratings

The following certification program ratings are verified by test.

1. Capacity Btuh [W]
2. Air-Side Friction in. water [Pa]
3. Tube-Side Friction ft. water [kPa]

This Standard supersedes ARI Standard 410-87

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FORCED-CIRCULATION AIR-COOLING AND AIR-HEATING COILS

Section 1. Purpose

1.1 Purpose. The principal purpose of this basic method of rating is to provide a fundamental means for establishing performance of air coils by extension of test data, as determined from laboratory tests on a prototype coil or coils, to operating conditions other than test, and for different coil sizes and row depths of a particular surface design and arrangement. The intent is to provide a uniform, fundamental means for determining air coil ratings for the industry which shall serve as a reference base for gauging the compliance of published application ratings with this standard.

In addition, this standard establishes: definitions and nomenclature; descriptions of standard equipment; and methods of testing and rating.

1.1.1 This standard is intended for the guidance of the industry, including manufacturers, distributors, specifying engineers, contractors, and users.

1.1.1 This standard is subject to review and amendment as the technology advances.

Section 2. Scope

2.1 Scope. This standard applies to forced-circulation air-cooling and air-heating coils, as defined and classified in Section 3 of this standard, and for application under non-frosting conditions.

Section 3. Definitions, Terminology and Classification

3.1 Forced-Circulation Air Coil. A coil for use in an air stream whose circulation is caused by a difference in pressure produced by a fan or blower.

3.1.1 Forced-Circulation Air-Cooling Coil. A heat exchanger, with or without extended surfaces, through which either chilled water, ethylene glycol solution or volatile refrigerant is circulated, for the purpose of total cooling (sensible cooling plus latent cooling), of a forced-circulation air stream.

3.1.2 Forced-Circulation Air-Heating Coil. A heat exchanger, with or without extended surfaces, through which either hot water, ethylene glycol solution or steam is circulated for the purpose of sensible heating of a forced-circulation air stream.

3.2 Coil Line. For the purpose of this standard, a coil line is defined as having the following in common:

- a. Fluid (Volatile Refrigerant, Water, Steam, or Ethylene Glycol Solution)

- b. Tube size, spacing, arrangement (in-line or staggered), or internal construction
- c. Fin configuration (not spacing)

Examples of coil lines are:

3.2.1 Volatile Refrigerant. Direct expansion coil with flow controlled by thermal expansion valve

3.2.2 Steam single-tube

3.2.3 Steam distributing

3.2.4 Water. If conditions b and c of 3.2 are satisfied, the following are types which may be part of one line:

- a. Continuous circuit type
- b. Self-draining type
- c. Cleanable type

3.2.5 Ethylene Glycol Solution

- a. Continuous circuit type
- b. Self-draining type
- c. Cleanable type

3.3 Coil Ratings. Coil ratings consist of performance data corresponding to specified operating conditions. These are determined by extension of test data to operating conditions other than test and for different coil sizes and row depths of a particular coil line by the methods established in this standard.

3.3.1 Application Ratings. Data derived from coil ratings (See 3.3) contained in manufacturers' computer output and/or literature in the form of instructions and/or curves, tables, and charts, to be used for the selection of coils to meet specific application requirements.

3.3.2 Standard Ratings. Ratings which lie within the range of conditions in Table 1 and which are accurate representations of test data.

3.4 Standard Coil Orientation. The standard coil position is that of horizontal tubes and vertical coil face with horizontal airflow. Coil ratings under this standard are established on this orientation.

3.5 Standard Air. Standard air is air having a density of 0.075 lb per cu ft [1.2 kg/m³], which approximates dry air at 70F [21.1°C] and a barometric pressure of 29.92 in Hg [101.1 kPa].

3.6 Turbulators. Mechanical devices inside tubes used to increase turbulence of fluids.

3.7 Test. A recorded group of readings of test variables.