

2001 STANDARD for

LIQUID TO LIQUID HEAT EXCHANGERS



AIR-CONDITIONING &
REFRIGERATION
INSTITUTE

Standard 400

IMPORTANT

SAFETY RECOMMENDATIONS

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 test conducted under its standards will be non-hazardous or free from risk.

Note:

This is a new standard.

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LIQUID TO LIQUID HEAT EXCHANGERS

Section 1. Purpose

1.1 Purpose. The purpose of this standard is to establish for Liquid to Liquid Heat Exchangers: definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and conformance conditions.

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

1.1.2 Review and Amendment. This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 Scope. This standard applies to Liquid to Liquid Heat Exchangers as defined in Section 3, which includes the following types of heat exchangers:

- a. Plate Heat Exchangers
- b. Shell-and-Tube Heat Exchangers, Shell-and-U-Tube Heat Exchangers, and Shell-and-Coil Heat Exchangers
- c. Counter flow Shell-and-Tube Heat Exchangers

2.2 Exclusions. This standard does not apply to heat exchangers used for change of phase or non-liquid heat transfer applications.

Section 3. Definitions

All terms in this document shall follow the standard industry definitions in the current edition of *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration*, unless otherwise defined in this section.

3.1 Clean Capacity. The total heat transfer rate of the heat exchanger with clean heat exchanger surfaces.

3.2 Cold Stream. The liquid stream with the lower inlet temperature.

3.3 Counter Flow Shell-and-Tube Heat Exchanger. A baffled shell and tube heat exchanger, circuited such that the shellside and tubeside liquids flow countercurrent to one another.

3.4 Field Fouling Allowance. Provision for anticipated fouling during use.

3.4.1 Fouling Factor. The thermal resistance due to fouling accumulated on the heat transfer surface.

3.5 Hot Stream. The liquid stream with the higher inlet temperature.

3.6 Liquid to Liquid Heat Exchanger. A heat transfer device used to exchange heat between two liquid streams that are single phase fluids.

3.7 Number of Transfer Units (NTU). A dimensionless coefficient representing the magnitude of thermal demand. The equation for *NTU* is given in Appendix C.

3.8 Plate Heat Exchanger. Heat transfer device that typically utilizes corrugated metal plates in a bolted frame. An alternate way is to have the plates have elastomer gaskets that seal the unit and direct the heat transfer stream in countercurrent flow. The corrugated plates can also be brazed together using a sacrificial alloy thus avoiding the need for a bolted frame.

3.9 Published Rating. A statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal capacity and type (identification) produced by the same manufacturer. As used herein, the term Published Rating includes the rating of all performance characteristics shown on the unit or published in specifications, advertising or other literature controlled by the manufacturer, at stated rating conditions.

3.9.1 Application Rating. A rating based on tests performed at Application Rating Conditions (other than Mapped Rating Conditions).

3.9.2 Mapped Rating(s). Ratings falling within certain specified limits that are based upon tests performed across a range of operating conditions as defined by the product manufacturer.

3.10 "Shall" or "Should". "Shall" or "should" shall be interpreted as follows:

3.10.1 Shall. Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.