



GUIDELINE

**ASHRAE Guideline 22-2012
Supersedes ASHRAE Guideline 22-2008**

Instrumentation for Monitoring Central Chilled-Water Plant Efficiency

Approved by the ASHRAE Standards Committee on July 20, 2012, and by the ASHRAE Board of Directors on July 26, 2012.

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NOTE

Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD

Guideline 22 was developed by ASHRAE to provide a source of information on the instrumentation and collection of data needed for monitoring the efficiency of an electric-motor-driven central chilled-water plant. A minimum level of instrumentation quality is established to ensure that the calculated results of chilled-water plant efficiency are reasonable. Several levels of instrumentation are developed so that the user of this guideline can select the level that suits the needs of each installation.

The basic purpose served by this guideline is to enable the user to continuously monitor chilled-water plant efficiency in order to aid in the operation and improvement of that particular chilled-water plant, not to establish a level of efficiency for all chilled-water plants. Therefore, the effort here is to improve individual plant efficiencies and not to establish an absolute efficiency that would serve as a minimum standard for all chilled-water plants.

It is recognized that there are different needs for monitoring the efficiency of a chilled-water plant. In most cases, the principal objective is to maintain and improve the efficiency of the chilled-water plant. There are also cases where greater accuracy is desired for monitoring chilled-water plant efficiency. The instrumentation section allows the user to determine the required accuracy for the application.

The user of this guideline should be aware that the quality of the instrumentation directly affects the results obtained and, therefore, the accuracy of the chilled-water plant efficiency. As a result, special attention should be given to the selection of instrumentation in order to ensure that the expected result is delivered.

Chilled-water plant efficiency is expressed in different terms. This guideline uses the recognized term for chilled-water plant efficiency, which is coefficient of performance (COP). While the guideline uses COP, it is understood that in areas using inch-pound (I-P) units, kW/ton is the common term for determining chilled-water plant efficiency. Appendix B of this guideline provides the information necessary to derive chilled-water plant efficiency when using kW/ton. Also, in Appendix E, an example specification is provided for designers of chilled-water plants who wish to incorporate the monitoring of COP or kW/ton into specifications for new plants or modifications of existing plants.

It should be pointed out that this guideline does not offer any information on the design of a chilled-water plant. It is applicable to all electric-motor-driven chilled-water plants regardless of their configuration or types of chillers, cooling towers, pumps, and other parasitic electric chilled-water plant loads. This guideline is designed to help plant managers and operators achieve and maintain a desired level of efficiency for their chilled-water plants.

This is a revision of ASHRAE Guideline 22-2008. This guideline was prepared under the auspices of ASHRAE. It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a

voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.

The changes made for the 2012 revision are as follows:

- Updated references
- Minor editorial changes

1. PURPOSE

This guideline defines recommended methods for measuring chilled-water plant thermal load and energy use and for calculating chilled-water plant efficiency.

2. SCOPE

2.1 This guideline includes

- a. recommendations for methods and devices used to measure electrical usage, fluid flow, and temperature, and
- b. procedures for acquiring the necessary data and calculating system efficiency.

2.2 These procedures are for site-specific application. They do not discuss the comparison of collected data between different sites, nor do they recommend that data obtained be applied in this manner.

2.3 The procedures also do not discuss

- a. any plants except electrically driven chilled-water plants,
- b. design and operation of central chilled-water plants, except for recommending the instrumentation used to determine plant efficiency, or
- c. selection, application, or operation of system components.

3. DEFINITIONS

For the definitions of key terms used in this guideline, refer to *ASHRAE Terminology of Heating, Ventilation, Air Conditioning, and Refrigeration*.¹

4. UTILIZATION

4.1 This guideline allows the user to monitor chilled-water plant efficiency and to make modifications to the setpoints of the system such that the overall efficiency of the chilled-water plant is improved. In order to properly evaluate the efficiency of the chilled-water plant, it is first necessary to accurately measure the variables that will determine this efficiency.

The efficiency of the chilled-water plant, which is defined in this guideline as coefficient of performance (COP), is dependent upon the energy use of a number of different pieces of equipment, including, but not limited to, the following:

- chillers,
- evaporator pumps,
- condenser pumps, and
- cooling towers.

Each piece of equipment can have a significant impact on chilled-water plant efficiency.