AHRI Guideline T (SI)

2017 Guideline for

Specifying the Performance of Cool Thermal Storage Equipment

Air-Conditioning, Heating, and Refrigeration Institute

2111 Wilson Boulevard, Suite 500
Arlington, VA 22201, USA
www.ahrinet.org

PH 703.524.8800
FX 703.562.1942

Documents
Document Sharing Hub

Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment

IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under the standards/guidelines will not be non-hazardous or free from risk.

Note:

This guideline supersedes AHRI Guideline T (SI)-2013.

For I-P, see AHRI Guideline T (I-P)-2017.

FOREWORD

Cool thermal energy storage (TES) is a proven technology which enables the use of lower cost, off-peak electricity (usually at night) to produce and store cool energy. This cool energy in storage is used the next day for air-conditioning or process cooling. With TES, relatively small equipment operates at night, reducing the use of expensive electricity during the day.

The types of equipment used in connection with this technology may vary widely.

Unlike most air-conditioning and refrigeration equipment, Cool Thermal Storage Devices have no sustained, steady-state operating point which can be used to characterize the product performance.

Similarly, the usable capacity of a particular Cool Thermal Storage Device may vary appreciably with the application. For example, very high loads discharged over a short period, and/or relatively low discharge temperatures may reduce the usable capacity to a fraction of the theoretical value.

These intrinsic characteristics of Cool Thermal Storage Equipment can add complexity to the tasks of rating, selecting and specifying such devices. This guideline has been prepared by the Air-Conditioning, Heating and Refrigeration Institute to establish a common, consistent nomenclature and terminology for the industry, and to set forth the minimum performance information that designers should include in their specifications and manufacturers should provide in their proposals for Cool Thermal Storage Equipment. In addition, all of the member manufacturing companies in the AHRI Thermal Storage Equipment Product Section are available to assist the designer in properly specifying the product. To obtain the list of member companies refer to AHRI website at www.ahrinet.org/TSE.aspx.

Price $15.00 (M)/$30.00(NM)
Printed in U.S.A.

©Copyright 2017, by Air-Conditioning, Heating, and Refrigeration Institute
Registered United States Patent and Trademark Office

Documents
Document Sharing Hub

Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment

TABLE OF CONTENTS

SECTION		PAGE
Section 1.	Purpose	1
Section 2.	Scope	1
Section 3.	Definitions	1
Section 4.	Classifications	3
Section 5.	Minimum Information Recommendations	4

TABLES

Table 1.	Classification of Cool Thermal Storage Equipment	3

FIGURES

Figure 1.	Cool Thermal Storage System	3

APPENDICES

Appendix A.	References - Normative	7
Appendix B.	References - Informative	7
Appendix C.	User-specified Application Recommendations Data - Informative	8
Appendix D.	Sample User-specified Applications Recommendations Data - Informative	9
Appendix E.	Supplier-specified Thermal Performance Data - Informative	10
Appendix F.	Supplier-specified Thermal Performance Data for Unitary Thermal Storage Systems - Informative	12
Appendix G.	Sample Supplier-specified Thermal Performance Data - Informative	13
Appendix H.	Supplier-specified Thermal Performance Data for Unitary Thermal Storage Systems - Informative	15

Documents
Document Sharing Hub

Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment

TABLE OF CONTENTS (Continued)

TABLES FOR APPENDICES

Table C1. Recommended Specification Information – Example 8

Table C2. Preferred User-specified Data – Example Design Day 8

Table D1. Recommended Specification Information – Sample 9

Table D2. Preferred User-specified Data – Sample Design Day 9

Table E1. Supplier-specified Data 10

Table F1. Supplier-specified Data 12

Table G1. Supplier-specified Data - Sample 13

Table H1. Supplier-specified Data 15

Documents
Document Sharing Hub

Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment

GUIDELINE FOR SPECIFYING THE PERFORMANCE OF COOL THERMAL STORAGE EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this guideline is to establish for specifying thermal performance data for Cool Thermal Storage Equipment: definitions; classification; minimum information recommendations (user-specified application recommendations and supplier-specified thermal performance data).

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

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

Section 2. Scope

2.1 *Scope.* This guideline applies to Cool Thermal Storage Equipment, for use in cooling systems, which may be charged and discharged with any of a variety of heat transfer fluids, and is either fully factory assembled, assembled on site from factory supplied components or field erected in accordance with pre-established design criteria, all as further described in Sections 3 and 4.

2.2 *Exclusions.* This guideline does not apply to Cool Thermal Storage Equipment with thermal storage capacities of 25 kW·h or less.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Terminology* website (https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology) unless otherwise defined in this section.

3.1 *Ambient Air.* The air in the space surrounding the Cool Thermal Storage Device.

3.2 *Ambient Heat Load.* The load (typically expressed in kW) imposed on the storage device due to heat gain from the ambient.

3.3 *Charge Fluid.* The heat transfer fluid used to remove heat from a Cool Thermal Storage Device.

3.4 *Charge Period.* The period of time when energy (heat) is removed from the Cool Thermal Storage Device.

3.5 *Charge Rate.* The rate (typically expressed in kW) at which energy (heat) is removed from the Cool Thermal Storage Device during the Charge Period.

3.6 *Cool Thermal Storage Device (Cool Thermal Storage Device).* Equipment which stores cooling capacity using sensible and/or latent heat. May consist solely of a storage means or be packaged with one or more components of a mechanical refrigeration system.

3.7 *Cool Thermal Storage Equipment (Cool Thermal Storage Equipment).* Any one of, or a combination of, Cool Thermal Storage Devices and/or generators, that may include various other components of a mechanical or absorption refrigeration package, as indicated in Section 4.

3.8 *Cool Thermal Storage System (Cool Thermal Storage System).* All of the equipment installed to meet a specified Cool Thermal Storage System Load which may include mechanical or absorption refrigeration equipment, see Figure 1.

3.9 *Cool Thermal Storage System Load (Load).* A specified cooling load to be met by the Cool Thermal Storage System. Typically, it is expressed in kW.

3.10 *Discharge Fluid.* The heat transfer fluid used to add heat to the Cool Thermal Storage Device.

Documents
Document Sharing Hub
Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment

3.11 *Discharge Period.* The period of time when energy (heat) is added to the Cool Thermal Storage Device.

3.12 *Discharge Rate.* The rate (typically expressed in kW) at which energy (heat) is added to the Cool Thermal Storage Device during the Discharge Period.

3.13 *Initial Charge Cycle*. The elapsed time required to bring the storage device from ambient conditions to its fully charged condition and the minimum temperature of the heat transfer fluid attained during the cycle.

3.14 *Latent Heat.* The change in enthalpy accompanying the conversion of a unit mass of a solid to a liquid at its melting point at constant pressure and temperature.

3.15 *Net Storage Inventory*. Net accumulated measured storage capacity at a given period of time during a 24-hour cycle.

3.16 *Net Usable Storage Capacity.* The amount of stored cooling, that can be supplied from the storage device at or below the specified cooling supply temperature for a given Charge and Discharge Cycle, typically expressed in kW·h.

3.17 *Parasitic Electrical Input*. The energy generated by the accessories (e.g., air compressor, dedicated recirculation pump).

3.18 *Phase Change Material (PCM).* A substance that undergoes changes of phase while absorbing or rejecting thermal energy, normally at a constant temperature.

3.19 *Saturated Evaporator Temperature.* The dew point temperature of the refrigerant corresponding to the saturation pressure at the outlet connection of the evaporator.

3.20 *Saturated Suction Temperature*. The dew point temperature of the refrigerant corresponding to the saturation pressure at the inlet of the refrigeration equipment.

3.21 *Secondary Coolant.* Any liquid cooled by a refrigerant and used for heat transmission without a change in state, having no flash point or a flash point above 66 °C.

3.22 *Sensible Heat.* Heat that causes a change in fluid temperature.

3.23 *Should.* This term is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.24 *Ton-hour.* A quantity of thermal energy equal to 3.5 kW of refrigeration provided for one hour.

3.25 *Unitary Thermal Storage System (UTSS).* An assembly of components including a Cool Thermal Storage Device and refrigeration equipment for charging, whose overall performance as a Unitary Thermal Storage System is rated by the manufacturer.

Documents
Document Sharing Hub
Full document details: AHRI Guideline T-2017 (SI) - Specifying the Performance of Cool Thermal Storage Equipment