ALLANA BUICK & BERS
Making Buildings Perform Better

BY ALLANA BUICK & BERS, INC.

CATEGORY: Alternative Energy / Solar Heating / Solar Thermal Energy

SOLAR THERMAL 101

AN INTRODUCTION TO SOLAR THERMAL ENERGY (STE)

Solar Thermal Energy (STE) is a type of solar technology used to collect solar energy to generate thermal energy (heat).

These types of collectors come in various technologies that are designed around low, medium or high heat solar collectors. The low heat types are generally used to heat swimming pools or space heating. The medium heat types are generally used for commercial or residential applications to heat hot water or space heating. It is commonly called solar domestic hot water (DHW). The high heat types are generally used to generate steam to run generators for electric generation and use concentrators, usually mirrors or lenses to reach very high temperatures. The common theme between all these technologies, is that it heats water to various stages of temperature depending on the requirement. The end result may be used for actual hot water use, generating electric power, space heating or process heat. There are both passive and active systems depending on the requirement.

The following describes types of solar water heating systems:

- Passive: relies on natural convection instead of electric power to circulate the water.
- Active: requires electric power to activate pumps, controls and systems associated.
- Direct: heats potable water directly in the collector.
- Indirect: heats propylene glycol or other heat transfer fluid in the collector and transfers heat to potable water via a heat exchanger to then be used in either a commercial or residential application.

Solar thermal collectors are divided into the categories of low-, medium-, and high-temperature collectors:

- Low-temperature collectors provide low-grade heat (less than 110 degrees Fahrenheit), through either metallic or nonmetallic absorbers. They are used in such applications as swimming pool heating and low-grade water and space heating.
- Medium-temperature collectors provide medium-grade heat (greater than 110 degrees Fahrenheit, usually 140 to 180 degrees Fahrenheit), either through glazed flat-plate collectors using air or liquid as the heat transfer instrument or concentrator collectors that concentrate the heat of incident insolation to greater than "one sun,"[2]. They are mainly used for domestic hot water heating. Evacuated-tube collectors are also included in this category.
- High-temperature collectors are parabolic dish or trough collectors designed to operate at a temperature of 180 degrees Fahrenheit or higher and are primarily used by utilities and independent power producers to generate electricity for the grid. These also may be used for absorption chilling.

The solar thermal collector performance rating is an analytically-derived set of numbers representing the characteristic all-day energy output of the solar thermal collector under standard rating conditions, measured in Btu per square foot per day (Btu/ft2 day). In 2008, the average solar thermal performance rating for low-temperature collectors (metallic and nonmetallic) was 1,196 Btu/ft2 day, medium-temperature (air) was 864 Btu/ft2 day, medium-temperature (ICS/thermosiphon) was 894 Btu/ft2 day, medium-temperature (flat-plate) was 988 Btu/ft2 day, medium-temperature (evacuated-tube) was 958 Btu/ft2 day, medium-temperature (concentrator) was 1,173 Btu/ft2 day, and high-temperature (parabolic dish/trough) was 828 Btu/ft2 day.

High-temperature collectors shipped primarily for utility-scale concentrating solar power (CSP), totaled 388 thousand square feet, and represented more than 2 percent of total shipments in 2008. The outlook for substantial growth in high-temperature collectors is favorable. With increasing pressure to adhere to their stated renewable energy portfolio targets, U.S. utilities are looking to CSP as a way to generate renewable power on a large-scale. The California Energy Commission (CEC) is currently reviewing a number of CSP proposals that have been publicly announced or for which official declarations of intent have been made. And CEC is expecting more in the near future.

Advanced manufacturing technologies and plant production economies of scale have led to significant cost reductions in recent years for all the above solar thermal technologies.

About Us

Allana Buick & Bers, Inc. is an architectural engineering and forensic consulting firm. We have over 34 years of experience making building enclosure, roofing, and waterproofing systems perform better. We have 16 office locations nation-wide ready to deliver a locally managed streamlined response for new construction, renovation, and repair projects.

- Palo Alto, California
- Oakland, California
- Sacramento, California
- Los Angeles, California
- Irvine, California
- San Diego, California
- Mesa, Arizona
- Maui, Hawaii
- Maui, Hawaii
- Las Vegas, Nevada
- Charlotte, N. Carolina (dba ABBAE, Inc.)
- Tulsa, Oklahoma
- Portland, Oregon
- Coppell, Texas
- Chesterfield, Virginia
- Seattle, Washington

CONTACT ABB

bd@abbae.com
800.378.3405

ALLANA BUICK & BERS
Making Buildings Perform Better