Session III-B: Whole Buildings—Simulation/Regulations

Monday, December 6, 2004
3:00 p.m. to 5:00 p.m.
Grand Ballroom – Palm

Session Chair:
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3:30 p.m. to 3:40 p.m. Introduction
Wagdy Anis

3:40 p.m. to 4:00 p.m. *"Interactive Internet-Based Building Envelope Materials Database for Whole-Building Energy Simulation Programs"*
Azam Syed

4:00 p.m. to 4:20 p.m. *"Development of Revised Intercept Equations to Update the ASHRAE Standard 90.2-2001 Envelope Criteria"*
Merle McBride

4:20 p.m. to 4:40 p.m. *"A Case Study in Integrated Design: Modeling for High-Performance Façades"*
Susan Ubbelohde

4:40 p.m. to 5:00 p.m. *"Developing and Implementing an Energy Code with 20% Energy Savings Compared to ASHRAE/IESNA Standard 90.1"*
John Hogan

Interactive Internet-Based Building Envelope Materials Database for Whole-Building Energy Simulation Programs

Jan Kosny – *Oak Ridge National Laboratory*

Azam Syed – *Tennessee Technology University*

The concept of an interactive envelope materials database for whole-building energy simulation programs is presented in this paper. This database was developed to reinforce an accurate, fast, and simple energy analysis of building energy consumption in shell-dominated buildings. The main purpose of this database is to serve architects, system designers, and energy modelers by enabling detailed envelope analysis during whole-building energy simulations. However, it can also be utilized for performance comparisons between different envelope technologies. The user simply selects the material configuration and sets dimensions. Later, the Internet program calculates whole wall/roof or floor R-values, generates three-dimensional dynamic thermal characteristics, and calculates detailed air leakage for the selected building envelope system. This information is then converted into the format required by programs such as BLAST, DOE-2, or ENERGY PLUS.

Development of Revised Intercept Equations to Update the ASHRAE Standard 90.2-2001 Envelope Criteria

Merle McBride – *Owens Corning*

In order to update the envelope criteria in ANSI/ASHRAE Standard 90.2-2001, the Standard 90.2 Standing Standard Project Committee decided to make five major changes so the resulting standard would be acceptable in the code arena. This paper presents the development of the revised intercept equations that are used to determine the envelope criteria and addresses three of those changes. The economic analysis was changed from incremental life-cycle costs to simple payback periods. The ability to account for reductions in the first costs of the HVAC systems with improvements in the envelope was added. Finally, the climatic variable used for cooling was changed from CDH74 (CDH23) to CDD50 (CDD10) in order to be consistent with the U.S. Department of Energy proposal on climate simplification. The intercept equations presented in this paper were used to develop a proposal that updates the ASHRAE Standard 90.2-2001 envelope criteria.

A Case Study in Integrated Design: Modeling for High-Performance Façades

M. Susan Ubbelohde – *University of California, Berkeley*

George A. Loisos and Santosh V. Philip – *Loisos + Ubbelohde Associates*

This paper presents a case study of an 11-story, 267,000 ft2 (24,804 m2) office building for San Francisco, California. Integrating building performance consultants early in the design process enabled strategic use of thermal, daylighting, energy use, and comfort modeling to produce a sustainable building with a high-performance exterior envelope. Analytical techniques included site shading evaluation, physical test cells of advanced daylighting products, and energy modeling parametrics during schematic design and design development phases. A method to evaluate the thermal comfort performance of curtainwall alternatives was developed to quantify human comfort conditions within the perimeter zone. This method utilizes noncommercial thermal performance software, including WINDOW and THERM, DOE2.1e and UCBCOMFORT, as well as a newly developed method of calculating mean radiant temperature (MRT).

Developing and Implementing an Energy Code with 20% Energy Savings Compared to ASHRAE/IESNA Standard 90.1

John Hogan – *Seattle Department of Planning and Development*

In February 2001 the Seattle City Council passed Resolution 30280 directing the Seattle Department of Planning and Development (DPD, Seattle's Building Department) and Seattle City Light (the public utility) to propose Seattle Energy Code amendments to achieve a 20% improvement in energy efficiency for nonresidential buildings compared to ASHRAE/IESNA Standard 90.1. The Resolution 30280 goal is consistent with other city and national initiatives, as Seattle's Green Building Policy requires that all city buildings over 5,000 ft2 achieve a 20% improvement in energy efficiency and the goal for the next edition of the national standard is also to increase energy efficiency by 20%.

The Seattle Energy Code achieves increases in energy efficiency compared to Standard 90.1 in the areas of building envelope, mechanical systems, and lighting.

This paper will provide an overview of the adoption process, list the Seattle Energy Code requirements, compare them with ASHRAE/IESNA Standard 90.1, summarize the energy savings estimates, and describe implementation.