



Taylor Engineering

1080 Marina Village Parkway, Suite 501 ■ Alameda, CA 94501-6427 ■ (510) 749-9135 ■ Fax (510) 749-9136

MARK HYDEMAN, P.E., FASHRAE

Mr. Hydeman is a registered mechanical engineer with an MS and BS in Mechanical Engineering from Stanford University. He has over 20 years of experience in the design, commissioning, evaluation and optimization of HVAC systems for commercial and industrial buildings. He joined Taylor Engineering in July of 1999.

Mr. Hydeman is considered an authority on the design, evaluation and commissioning of energy efficient and cost effective HVAC and control systems. He is active in building science research and has developed software, guidelines and seminars to assist practitioners to optimize HVAC and control systems. For his contributions to the field, he was upgraded to Fellow in the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

Mr. Hydeman's design portfolio includes data centers, incarceration facilities, military facilities, manufacturing facilities, laboratories, underfloor air conditioning systems, educational facilities and central plants. He has extensive experience with new construction and retrofits as well as design/build and design/assist procurement. His designs are practical, efficient and easy to maintain.

Mr. Hydeman is renowned for his chilled water plant, controls and commissioning expertise. He conceived and managed the CoolTools™ market transformation project for the optimization of chilled water plants. He has assisted in the analysis of thousands of tons of chilled water capacity and with one project alone producing electrical savings of 6.4 GWh/yr that were verified through field monitored data. His chilled water plant clients include the State of California Department of General Services, U.C. Davis, San Jose State University and IBM Corporation. His software tools have been incorporated in the eQuest and EnergyPlus simulation programs.

Mr. Hydeman has extensive hands-on experience with control systems. He has designed and commissioned systems from a multitude of vendors and has developed master controls procurement strategies for governmental, commercial and institutional clients. Mr. Hydeman co-teaches a popular U.C. Berkeley Extension Service Course on HVAC Controls. He has contributed to ASHRAE's Technical Committee on controls and the BACnet Standards committee. He has also contributed to research on optimizing control algorithms and automated fault-detection and diagnostic (AFDD) systems.

During his tenure at the PG&E Pacific Energy Center Mr. Hydeman helped develop and manage the tool lending library services (<http://www.pge.com/pec/tooltoc/toollib.html>). During that time he tested field measurement equipment, assisted customers with field measurement projects, developed and presented hands-on measurement seminars and developed software to assist in measurement projects. He also conceived and developed the Universal Translator program (<http://www.utoonline.org/>) which manages and analyzes data from data loggers and trend data from energy management and control systems (EMCS). His commissioning experience includes data centers, laboratories, chilled water plants and manufacturing facilities.

Mr. Hydeman has been very active in the development and promulgation of commercial building energy codes including ASHRAE/IESNA Standard 90.1 and California's Title 24. He wrote a significant portion of the non-residential HVAC sections of these codes and currently serves as Vice-Chair of SSPC 90.1.



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MARK HYDEMAN, P.E., FASHRAE

Education

- 1982 - 1983: Stanford University, M.S. Mechanical Engineering
1978 - 1982: Stanford University, B.S. General Engineering with distinction

Registration

- 1990 - present State of California: Mechanical Engineer, M26724
2006 - present State of Arizona: Mechanical Engineer, 44027

Experience

- 1999 - present: Taylor Engineering, Alameda, CA
Principal. HVAC and control system design and commissioning computerized system energy simulation; support of energy service contracts; development of campus standards for central plants and controls; building science research; energy standards and codes.
- 1993 - 1999: PG&E Energy Center, San Francisco, CA
HVAC Program Coordinator. Served as in-house mechanical, controls and field measurement expert; management of the data collection tool lending library; development of CoolTools™ toolkit for the evaluation of chilled water plants (<http://www.hvacexchange.com/cooltools/>); development of the Universal Translator™ software for field data management and analysis; development of rebate programs; and produced and taught educational design seminars for mechanical engineers, energy engineers and facility managers.
- 1990 - 1993: Eley Associates, San Francisco, CA
Project Manager, Management of firm's design assistance consulting services. Participated in firm's work developing energy codes and technical design guides.
- 1988 - 1990: Glumac Associates, San Francisco, CA
Project Engineer. HVAC design, control design and project management for military, large commercial and industrial projects.
- 1987 - 1988: Design Engineering, San Francisco, CA
Design Engineer. HVAC and plumbing design for small commercial and multifamily residential projects.
- 1993 - present: University of California Extension, Berkeley, CA
Instructor. For both the HVAC Controls and HVAC design course that are part of the core curriculum for an ASHRAE/UCB co-sponsored certificate program.



Professional Associations

American Society of Heating, Refrigerating, and Air- Conditioning Engineers (ASHRAE):

Member 1990 to 2006, Fellow 2006

Distinguished Service Award

Technical Committee 9.9 "Mission Critical Facilities," Member

Technical Committee 1.5 "Computer Applications," Past Chair

Electronic Communications Committee, Vice-Chair.

Professional Development Committee, Founding Chair

Course Development Committee, Past Vice-Chair

Served on several ASHRAE Presidential Ad-Hoc Committees

SSPC 90.1, "Energy Code for Buildings Except Low-Rise Residential Buildings," Vice-Chair.

Region X past-webmaster and co-chair of the 2001 Region X Chapter's Regional Conference.

Golden Gate Chapter Past-President 1999-2000

Golden Gate Chapter/UC Berkeley cosponsored HVAC/R certificate program steering committee, founding member.

CoolSense National Forum on Integrated Chiller Plant Retrofits, Co-Chair 1997

Publications

Mark Hydeman and Guo Zhou. Optimizing Chilled Water Plant Controls. ASHRAE, Atlanta GA. June 2007.

Mark Hydeman. A Tale of Two Codes. ASHRAE, Atlanta GA. April 2006.

Mark Hydeman, Reinhard Seidl and Chuck Shalley. Staying Online: Data Center Commissioning. ASHRAE, Atlanta GA. June 2005.

Jeff Stein, Mark Hydeman. Development and Testing of the Characteristic Curve Fan Model ASHRAE, Atlanta GA. January 2004.

David Grumann, et. al. ASHRAE Green Guide. ASHRAE. 2003. ISBN 1-931862-41-9.

Mark Hydeman, Jeff Stein and Eric Kolderup. Advanced Variable Air Volume System Design Guide. California Energy Commission Publication #500-03-082-A-11. October 2003.

Mark Hydeman, Jeff Stein. A Fresh Look at Fans. May 2003. HPAC

Erik Kolderup, Mark Hydeman, Michael Baker, R. Lynn Qualmann. Measured Performance and Design Guidelines for Large Commercial HVAC Systems. August 2002. ACEEE Conference on Energy Efficiency.

Mark Hydeman, Nick Webb, Priya Sreedharan, and Steve Blanc. Development and Testing of a Reformulated Regression Based Electric Chiller Model. ASHRAE, Atlanta GA. HI-02-18-02.

Mark Hydeman; and Ken Gillespie. January 2002. Tools and Techniques to Calibrate Electric Chiller Component Models. ASHRAE, Atlanta GA. AC-02-9-01.

Mark Hydeman, Steve Taylor and Dave Winiarski. January 2002. Application of Cooling Tower Models for Standards Development: Life-cycle cost Analysis of 2-Speed Controls for ASHRAE/IESNA Standard 90.1-1989R. ASHRAE, Atlanta GA. AC-02-9-02.

Dudley Benton, Charles Bowman, Mark Hydeman and Paul Miller. January 2002. An Improved Cooling Tower Algorithm for the CoolTools™ Simulation Model. ASHRAE, Atlanta GA. AC-02-9-04.

Charles Eley, Mark Hydeman et al. June 2000. ASHRAE/IES Standard 90.1-1999 User's Manual. ASHRAE, Atlanta GA.



Steve Taylor, Paul Dupont, Mark Hydeman, Bruce Jones, Tom Hartman. 1999. The CoolTools™ Chilled Water Plant Design and Performance Specification Guide. PG&E Pacific Energy Center, San Francisco CA.

Ron Kammerud, PhD, Ken Gillespie, and Mark Hydeman. June 1999. Economic Uncertainties in Chilled Water System Design. ASHRAE, Atlanta GA. SE-99-16-3

Mark Hydeman, Steve Taylor, Carl Speck, and Ken Gillespie. May 1999. Commissioning Tools & Techniques Used in a Large Chilled Water Plant Optimization Project. Proceedings of the 7th National Conference on Building Commissioning. PECEI, Portland Oregon.

Mark Hydeman, Ken Gillespie, and Ron Kammerud, PhD. September 1997. PG&E's CoolTools Project: A Toolkit to Improve Evaluation and Operation of Chilled Water Plants. Presented at the CoolSense National Forum on Integrated Chilled Water Retrofits. Lawrence Berkeley National Laboratories, Berkeley CA.

Jim Chace, Marc Fountain, Mark Hydeman, Traci Grundon and Cris Benton. May 1998. Effective Market Transformation from Energy Centers. ACEEE Conference on Energy Efficiency.

Charles Eley and Mark Hydeman. September 1997. Designing Chilled Water Plant Retrofits with DOE-2. CoolSense National Forum on Integrated Chiller Plant Retrofits.

Margaret Suozzo, Jim Benya, Mark Hydeman, Paul DuPont, Steve Nadel and Neal Elliot. 1997. Guide to Energy-Efficient Commercial Equipment. American Council for an Energy-Efficient Economy (ACEEE).

Steve Taylor and Mark Hydeman. Spring 1997. Class Reader X470 Equipment Selection and Distribution System Design. UC Extension Service. Third printing.

Cris Benton, Mark Hydeman and Jim Chace. June 1996. Taking a Building's Vital Signs: a Lending Library of Handheld Instruments. ACEEE Conference on Energy Efficiency.

Marty Applebaum, Mark Hydeman et al. July 1995. Chiller Monitoring Protocols. PG&E,.

Charles Eley and Mark Hydeman, et al. November 1992. ASHRAE/IES Standard 90.1-1989 User's Manual. ASHRAE, Atlanta GA. #90349.

Charles Eley and Mark Hydeman, "WLHP Systems - Volume 1 Engineering Design Guide & Volume 2: California Compliance Guide," EPRI, TR101-134 V1 &2, December 1992.

Representative Projects

State Central Plant, Sacramento CA: Developed and implemented a 30 year master plan for the central heating and cooling plant that serves 23 State buildings in downtown Sacramento. Served as the lead consultant for specification and review of the controls, commissioning and energy efficiency measures on the plant. Services included development of a master procurement plan and standards for the EMCS system serving the plant and associated buildings, development of calibrated live models of the plant and chilled water/steam distribution systems, and life-cycle cost analysis of plant alternatives including thermal storage, co-generation and thermally-fired chillers.

Oracle Headquarters Control Integration, Redwood Shores, CA: Design and commissioning of a web-based front end and DDC control upgrade to integrate 8 buildings (~2 million square foot of conditioned space) through a single user interface. This system provides central demand shed capabilities and integrates into Oracle's computer aided facility management (CAFM) system.

Stauffer I Laboratory, Stanford University, Stanford CA: Designed and commissioned a mechanical and control retrofit of a laboratory building. Services included a new VAV fume exhaust system with proximity sensors and DDC to the zone level. This project is estimated to reduce the facility's energy usage by 50%.

Symantec Data Center, Tucson, AZ: Designed and commissioned mechanical and DDC control systems for a 20,000 data center in Tucson (one phase at 100 w/ft² and the second at 200 w/ft²). Design includes a unique control system that is directly reset by temperatures measured at the racks,



air-cooled variable speed primary-only chilled water plant, hydrogen detection panels and FM200 fire suppression.

Keck Laboratory, Stanford University, Stanford CA: Designed and commissioned a mechanical and control retrofit of a laboratory building. Services included upgrade to conversion of supply and exhaust to variable air volume, upgrade of controls to DDC to the zone level, development of aggressive reset for pressure and deck temperatures, and intertie with campus EMCS system. This project is estimated to reduce the facility's energy usage by 40%.

100 First Street DDC Controls Retrofit, San Francisco CA: Upgrade of DDC controls for a 27-story office building in down town San Francisco. Services included development of specifications, selection of bidders, construction administration and control system commissioning.

PG&E Building and Land Services, San Francisco CA: Developed master specification for interoperable controls based on the BACnet™ protocol. Applied the specification to two controls retrofits of existing PG&E facilities.

PG&E Chiller Analysis Program, San Francisco: Designed engineering service program to evaluate and develop low and now cost demand reduction measures for existing chilled water plants. Developed software for calibration of simulation models and analysis of chilled water plant controls, protocols for field measurement of existing plant performance, and training manual for subsequent contractors. Demonstrated the protocols on five pilot sites.

Palm, Inc. Corporate Campus, San Jose, CA: Principal in charge for a 1.6 million-ft² landmark green building. Design includes under-floor HVAC and evaluation of a unique double-effect indirect evaporative cooling system.

DiCon Fiberoptics, Inc., Richmond, CA: Principal in charge for a 203,000 ft² combined manufacturing, R&D (135,000 ft²) and office facility (68,000 ft²). Facility includes class 10,000 clean rooms, central computer room, manufacturing areas and research labs.

Enron Energy Services, Houston, TX: Provided engineering services both for up-sale and implementation of energy-service contracts. Projects include 10 million square foot of retail mall space and 3.8 million square foot high-tech computer disk fabrication facility. Services included site surveys, identification and evaluation of retrofit opportunities, mechanical engineering and technical support for corporate sales and implementation forces.

Bank of America, One South Van Ness, SF: Project manager for a complete gut-rehab including retrofit of a constant volume dual duct system to dual duct VAV with relocation of central supply fans to new penthouse at roof. 600,000 ft² building.

Contra Costa County Forensic Science Facility: Project manager for the HVAC design of a two-story facility with chemical laboratories and mortuary. Complex controls and fume exhaust system.

Alameda Naval Air Station, Turbine Coating Laboratory: Project manager for HVAC, life safety and control systems for a turbine coating laboratory. Included design of fume hoods for a chemical bath with both corrosive and explosive fluids.

Beale Air Force Base, Flight Training Facility. Designed central plant and building mechanical systems for a campus style facility with classrooms, flight simulators, dormitories, and secure meeting spaces.

UCSC Earth and Marine Science Building: Designed fume hoods and fume exhaust system for rock digestion laboratories. Designed hoods and dust collection system for rock grinders. Specified VAV fume exhaust system for classrooms and training laboratories.

Sun Microsystems, Palo Alto: Designed and managed the retrofit of existing built-up central air-handling systems in space constrained environment. Design included addition of air-side economizer system and redesign of central shafts to accommodate increased airflow. Provided on-site construction coordination.



IBM Cottle Road: Designed a state-of-the art tuned model of a 17,000 ton chilled water plant. The model predicted a 7.5 GWh/yr energy savings from a combination early chiller retirement and automation of the central plant control. 6.5 GWh/yr were subsequently verified. The model has been subsequently been used to commission chillers and purchase new chillers under a standard performance contract..

Ventura County Jail: Energy efficient features included: dual-fuel cooling plant, daylighting in the dayrooms and office spaces, extensive use of occupancy sensors, high efficiency lighting, evaporative cooling and heat recovery water heating, This project won an award from the California Energy Commission.

Santa Ana Sheriff's Facility: Landmark project in co-sponsorship from both the CEC and Southern California Edison. The features included heat recovery water heating from the condenser loop, high efficiency chillers, extensive daylighting, low-pressure building exhaust and indirect conditioning using the atria smoke exhaust fans, and ultrahigh efficiency lighting.

Genetech Vacaville: Utilized unique chilled water plant evaluation tools to evaluate chiller and tower bids. Demonstrated savings of 2.5 GWh/yr of electrical energy consumption and nearly 2 MW or demand on a 3,000 ton chilled water plant.

Representative Building Science Research

CoolTools™: Designed and managed a \$4,000,000 market transformation project to develop a suite of chilled water plant design and evaluation tools. Designed, program and tested modules for cooling towers, chillers and integrated central plant simulations.

PIER Sponsored Research for Built-Up VAV Systems: Principal Investigator in a 3-year research project on optimization of the design airside VAV systems. The program developed new simulation tools, energy code requirements, standards for testing VAV boxes and a popular design guide.

Universal Translator™: Designed and developed a prototype for a tool that imports and manages data from data loggers of different manufacturers. The application has routines that resample data from multiple channels for analysis.

PG&E Energy Center Tool Lending Library Automated Applications: Developed automated VBA applications to analyze data for a range of studies including: performance of air-side economizers; evaluation of time-based lighting controls; evaluation of occupant sensor lighting controls; runtime analysis of compressors; and statistical correlation of current to true rms power.

Representative Educational Programs

Chilled Water Plant Design: Mr. Hydemán has taught a variety of programs on the procurement, optimization, instrumentation and design of chilled water plants. He and Steve Taylor are the authors of ASHRAE Professional Development Series Course on chilled water plant design.

Non-Residential Energy Code Compliance: Mr. Hydemán has taught courses on compliance with both ASHRAE/IESNA Standard 90.1 and Title 24 including ASHRAE's Professional Development Series Course on 90.1.

Controls: Topics include retrofit of control systems, application of web-based control interfaces, application of EMCS systems for field monitoring and DDC system commissioning.

Simulation and Optimization: Topics include case-study based compliance with LEED and utility rebate programs, advanced modeling techniques using eQuest and DOE-2, comparison of simulation and load calculation tools, and optimization of control sequences using VBA code.