

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all TC/TG/TRG Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO.: TC 4.1 DATE: June 18, 2012

TC/TG/TRG TITLE: LOAD CALCULATION DATA AND PROCEDURES

DATE OF MEETING: January 28, 2013 LOCATION: Dallas, TX

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Voting Rolando Legarreta Chip Barnaby Dan Fisher Glenn Friedman Doug Hittle Suzanne LeViseur Som Shrestha Bob Doeffinger Non-Voting Stephen Roth Jeff Spitler Chris Wilkins Steve Bruning Jim Pegues Larry Sun Fred Bauman	2012 2010 2011 2009 2011 2011 2012 2012	Voting [none] Non Voting Lucy Armankwah David Ariyo Andrew Braum Jui-Chen Roger Chang Charlie Curcija Joe Ferdleman Stephen Kavanaugh Ken-Ichi Kimura Brian Rock Branislav Todorovic Gary Wingfield Gabrielle Powell Ahmad Sleiti Kevin Wood		Visitors Elyse Malherek Harris Sheinman - Liaison Bill Mohs Jimmy Kim Laura Southard Trevor Holbrook Dustin Wales Bryan Beyers Rob Hitchcock

DISTRIBUTION:

All Members of TC/TG/TRG

ADDITIONAL DISTRIBUTION:

TAC Chairman: William F. McQuade
 TAC Section Head: Michael R. Bilderbeck
 Chapter Tech Transfer: Harris M. Sheinman
 Research Liaison: Dr. Srinivas Garimella
 ALI/PDC: Donald L. Brandt
 Special Publications: Francis A. Mills
 2013 HB Fundamentals: Peter Simmonds, PhD
 Standard Liaison: Cecily M. Grzywacz
 Manager of Standards: Stephanie C. Reinche
 Staff Liaison: Michael R. Vaughn

"These draft minutes have not been approved and are not the official, approved record until approved by this committee."

January 28, 2013
Committee Meeting Minutes
TC 4.1 Load Calculations Data and Procedures
Dallas, TX

1. Meeting called to order by Rolando Legarreta at 2:20 p.m.
2. Roll Call
 - a. 8 of 8 voting members present – quorum present.
3. Introductions
4. Liaison Reports
 - a. Harris Sheinman – Chapter Technology Transfer
 - b. Request TC's speak at local chapter meetings and promote and encourage participation in TC's.
 - c. TAC has a prepared presentation to be presented at Chapter level.
5. Corrections to San Antonio Minutes
 - a. Item 6e – Future Research, page 2 of 5, “Steve Bilderbeck” should be “Mike Bilderbeck”.
 - b. Motion to approve minutes as corrected: Doug Hittle
 - Second: Glenn Friedman
 - Vote: 8-0-0
6. Research Subcommittee Report – Chris Wilkins
 - a. Research Breakfast:
 - 7 slots for Work Statements with available funding and zero Work Statements submitted.
 - 62 projects totaling \$12 million.
 - RTAR and Work Statements format changing.
 - b. RTAR-1681, “Energy Efficient Lighting” work accepted.
 - c. Research Subcommittee Meeting:
 - 1681 RTAR - Start development of Work Statement with Dan Fisher/Glenn Friedman.
 - Co-sponsoring Work Statement with 5.10, Rolando – attended meeting on un-hooded kitchen equipment.
 - Future Research RTAR – Experimental validation of the empirical approach for radiant or non-uniform temperature spaces. Fred Bauman and assistant.
 - Future Research - Follow-up with various committees on large space load calculations.
 - Jim Pegues reported on RP-1616 Load Calculation Update of 2008 Version. Jeff Spittler of Oklahoma State is the Contractor. They are 9 months into the project with draft due March 2013, SI Version to follow.

- A no cost extension was requested by the Contractor from April 1, 2013 to December 31, 2013.
 - Motion to approve extension: Doug Hittle
 - Second: Suzanne LeViseur.
 - Vote: 7-0-0. 1 abstention
- d. Request to Co-Sponsor Work Statement, “Update Climatic Design Data” in Chapter 14 of the 2017 Handbook with TC 4.2 the sponsoring TC.
- Steve Bruning recommended co-sponsoring the Work Statement.
 - So Moved: Suzanne LeViseur
 - Second: Chip Barnaby
 - Vote: 8-0-0
7. Program/Standard Subcommittee Report – Glenn Friedman
- a. Glenn thanked participants in the Sponsored Dallas Seminar “When is the Load Not What You Think”. “The Radiant Effect of Non-Uniform Surface”.
- Speakers: Chip Barnaby, Fred Bauman and Dan Fisher
- b. Seminar for Denver
- “Mobile Applications”
 - Need two or three speakers, Steve Roth, Chip Barnaby, possibly a manufacturer.
 - TC 1.5 to co-sponsor.
 - Motion to present “Mobile Applications” in Denver: Glenn Friedman
 - Second: Chip Barnaby
 - Vote: 8-0-0
- c. See Continuation of Program Chair Friedman’s Report in attached “Meeting Program/Standards Minutes”.
- d. Standard SPC 203 “Method of Test for Office Equipment Used in Buildings”
- Still looking for a manufacturer to be represented on Committee.
 - Without a balanced committee we cannot move on as a Standard.
 - An Advisory Public Review will be issued shortly.
8. Handbook Subcommittee Report – Steve Bruning
- a. Steve Bruning passed out final draft of Chapter.
- b. A Revit Model of the ASHRAE building will be available online.
- c. Require to have final vote on Revised Handbook Chapter 18 example.
- So Moved: Doug Hittle
 - Second: Suzanne LeViseur
 - Vote: 8-0-0
- d. Chip Barnaby will distribute revised Chapter 17, Residential Loads for email ballot.
- e. Insert to introduce UFAD Systems into Chapter 18 HOF.
- Fred Bauman conducted a discussion.
 - Vote to insert UFAD into Chapter 18.
 - So Moved: Glenn Friedman
 - Second: Doug Hittle

- Vote: 8-0-0
 - See attached document with revisions prepared by Fred Bauman.
 - f. See attached Handbook Subcommittee Meeting Minutes prepared by Steve Bruning.
9. Website – Jim Pegues indicated the TC 4.1 website page is active and will be updated shortly.
10. Old Business
- a. Passing of longtime ASHRAE and TC 4.1 members: Dr. Curtis Pedersen passed July 10, 2012 and Thomas Romine, Jr. passed July 17, 2012.
 - Doug Hittle former student of Curtis' spoke on his behalf and his contribution to teaching, ASHRAE, and our Committee.
 - Steve Bruning spoke on behalf of Tom and his dedication and contribution to our Committee and the profession.
 - Curtis' and Tom's obituaries are attached.
11. New Business
- a. Glenn Friedman was congratulated on becoming an ASHRAE Fellow.
 - b. Rolando said ASHRAE requested we review the new Code of Ethics modified last in 2007.
 - c. The ASHRAE Bio's have been expanded to reflect member disciplines. All are ask to update their file by the Denver meeting.
 - d. Jeff Spitler was nominated for the ASHRAE E.K. Campbell Award.
 - e. SGPC-20 Committee, Guideline 20 "Documenting HVAC&R Process and Data Exchange Requirements".
 - Steven Roth discussed the Guideline – a process for engineers to explain to software developers their needs to aid in useful software development.
 - Steve requested TC 4.1 aid in developing a use case. Chip Barnaby and Chris Wilkins will participate in the development.
 - f. SPC 205 "Standard Representation of Equipment Performance Data".
 - Chip Barnaby explained the SPC is working on standardizing data formats for exchange of equipment data in the software environment. Chip invited TC 4.1 members to participate.
12. Motion to Adjourn: Doug Hittle
- Second: Glenn Friedman
 - Vote: 8-0-0

Attachments:

Sign-In Sheet
Dallas Agenda
Program Subcommittee Report
Handbook Subcommittee Report
Handbook UFAD Insertion to Chapter 18
Dr. Curtis Pedersen Obituary
Thomas Romine, Jr. Obituary

TC 4.1 Sign-In Sheet - Dallas January 2013

2013 January	Name	Status	Affiliation	E-mail
1	Raouf BEGAVETA	VM ✓	AECOM ENGINEERING	rbegaveta@alegro-engineering.com
2	Glenn Friedman	VM ✓	Taylor Engineering	
3	LARRY SON	CM	TK ISC	lson@tkisc.com
4	JIM FEGUES	CM	CARRIER CORPORATION	James.F.Fegues@carrierjlc.com
5	SUZANNE LEVISOUE	VM ✓	HADDAD ENGINEERING, INC	sleviseur@haddadeng.com
6	Chris Wilkins	CM	Hallam-ICS	cwilkins@hallam-ics.com
7	Jimmy Kim	SM	Oklahoma State University	jimmy.kim@okstate.edu
8	Laura Southard	SM	Oklahoma State University	laura.southard@okstate.edu
9	Dan Fisher	VM ✓	Oklahoma State Univ	d.fisher@okstate.edu
10	Chip Barandy	VM ✓	Wrightsoft	chbarandy@wrightsoft.com
11	HITZE	VM ✓	CSU	hitze@okstate.edu
12	Jeff Spitzer	CM	OSU	spitzer@okstate.edu
13	Bill Mohs	Guest	Ingersoll Rand / Thermo King	bill-mohs@irco.com
14	Steve Bruning	CM	Newcomb + Boyd	sburning@newcomb-boyd.com
15	Bob Doeffinger	VM ✓	ZMM	red@zmm, Inc
16	Harris Sheinman	liaison	CTT	hsheinma@heety.com
17	Trevor Holbrook	SM	CSU, Fresno	tholbrook@mail.fresnostate.edu
18	DUSTIN WALKER	SM-YEA	CSU, FRESNO	dwalker@mail.fresnostate.edu
19	Bryan Beyers	SM	CSU, Fresno	foxrider1227@mail.fresnostate.edu
20	Elyse Malweck	CM? YEA	The Weidt Group	elyseme@twg.com
21	Rob Hitchcock	—	Hitchcock Consulting	RTHitchcock@gmail.com
22	Fred Bauman	CM	UC Berkeley	Fbauman@berkeley.edu
23	Som Shrestha	VM ✓	ORN	shrestha.s@ornl.gov
24	Stephen Roth	CM	Carmel Software	sroth@carmelsoft.com



ASHRAE Technical Committee 4.1

Agenda for - TC4.1 Load Calculation Data & Procedures

Dallas
January 28, 2013

TC4.1 Load Calculation Data and Procedures
Monday, 2:15 PM to 4:15 PM
Majestic 3 (H37), Sheraton Hotel

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|---|--------------------|
| 1. Call to Order | Rolando Legarreta |
| 2. Roll Call | Robert Doeffinger |
| 3. Introduction of Visitors | Rolando Legarreta |
| 4. Approval and/or Corrections to San Antonio Meeting Minutes | Rolando Legarreta |
| 5. Liaison Comments | |
| TAC Chair | William McQuade |
| Section Head | Michael Bilderbeck |
| Chapter Technology Transfer | Harris Sheinman |
| Research | Srinivas Garimella |
| Handbook | Peter Simmonds |
| ALI/PDC | Donald Brandt |
| Standards Liaison | Cecily Grzywacz |
| Staff Liaison | Michael R. Vaughn |
| Special Pubs | Francis Mills |
| 6. Research Subcommittee Report | Chris Wilkins |
| 7. Programs Subcommittee Report | Glenn Friedman |
| 8. Standards Subcommittee Report | Glenn Friedman |
| 9. Handbook Subcommittee Report | |
| Residential Chap 17 | Chip Barnaby |
| Non-Residential Chap 18 | Steve Bruning |
| 10. ASHRAE Website for TC 4.1 | Jim Pegues |
| 11. Old Business | Rolando Legarreta |
| 12. New Business | Rolando Legarreta |
| 13. Adjournment | Rolando Legarreta |



ASHRAE Technical Committee 4.1

Meetings

TC 4.1 Load Calculation Data and Procedures

Monday 2:15-4:15p (Majestic (H37), Sheraton Hotel)

Sponsoring:

Seminar 25: When is the load not what you think? The Radiant Effect of Non-Uniform Surface Temperature

Monday, January 28, 8:00-9:30am (Lone Star A4)

TC 4.1 Handbook

Sunday 3:00-4:00p (Dallas Ballroom A2 (CC1) Sheraton Conference Center)

TC 4.1 Research

Sunday 4:00-5:00p (Dallas Ballroom A2 (CC1) Sheraton Conference Center)

TC 4.1 Programs & Standards

Sunday 5:00-7:00p (Dallas Ballroom A2 (CC1) Sheraton Conference Center)

TC 4.1 RP-1616 PMS

Day, Time (Room) TBD

SPC 203

Saturday 1:00-3:00p (City Room 5 (H4) Sheraton Hotel)

Introduction of officers and voting members for 2013:

Rolando Legarreta	Chair	Voting
James Pegues	Vice Chair	Non-Voting
Robert Doeffinger	Secretary	Voting
Steven Bruning	Handbook Subc Chair	Non-Voting
Chris Wilkins	Research Subc Chair	Non-Voting
Glenn Friedman	Stds/Prog Subc.Chair	Voting
Chip Barnaby		Voting
Dan Fisher		Voting
Doug Hittle		Voting
Suzanne LeViseur		Voting
Som Shrestha		Voting

TC 4.1 Meeting, Programs/Standards Minutes
Dallas, Monday, January 28, 2013

Glenn Friedman, Program Chair

1. Current Programs

- a. Dallas Seminar: When Is the Load Not What You Think? The Radiant Effect of Non-uniform Surface, *Monday, January 28, at 8:00 am*
 - i. SEMINAR
 - Speaker #1: Chip Barnaby
 - Speaker #2: Fred Bauman
 - Speaker #3: Dan Fisher

2. Future Programs

- b. Denver, June 22-26, 2013
 - i. Mobile applications seminar, *Roth, Manufacturer (Carrier), Chip*, TC1.5 would like to co-chair. Approved unanimously.
- c. New York, January 18-22, 2014
 - i. Back to Basics: "Loads: Where Judgment Comes In; Zoning, Loads to Selection, Things You Don't Control" for next trades show in New York; *Wilkins* could connect this to Load calculations for envelop loads, wall and roof U-values, problems with the way folks fiddle and fudge wall factors for things like metal studs. Is it too small to matter? Similar question regarding fenestration. *Jim P.*
 - ii. BIM and Load Calculations Seminar Update for Denver or New York, *Roth, Bruning, Wilkins*
 - iii. Seminar on changes in research in load calculations, last several years' worth of data, this would be good to do with new manual update publication in New York (or possibly a Tech Paper further after that) *Spitler and Barnaby*
- d. Seattle, June 28-July 2, 2014
- e. Chicago, January 24-28, 2015
- f. Atlanta, June 27-July 1, 2015

3. Future Program Ideas

- a. Seminar Session Proposals
 - i. Ventilation and infiltration
 - ii. How Load Calculations Interact with Other ASHRAE Chapters
 - Weather
 - Infiltration
 - Building skin color
 - Ventilation
 - Fenestration, dynamic windows
 - iii. Business Practices Risks of Loads Calc Codes Being so Hidden, *TC1.7 Legal*
 - iv. Forum on what is the Standard of Care for load calculations. Mitchell Swan.
 - v. Radiant System Research Results seminar *Dove, Phase Change (Hittle)*

4. Standard SPC-203 Method of Test for Determining Heat Gain of Office Equipment Used In Buildings

- a. Still short of Producer members so the committee lacks balance
- b. Plan to go for Advisory Public Review in the next ASHRAE cycle and hoping this will develop interest by Producers so we can get Producer member(s)



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TC4.1 Load Calculation Data & Procedures

Dallas, TX

January 28, 2013

Handbook Subcommittee Report

Sunday, January 27, 3:00 PM to 4:00 PM

Dallas Ballroom A2 (CC1)

1. Chapter 18 Non-Residential Loads:

- Steve Bruning reported the main text of the Chapter approved by the TC in San Antonio was submitted to HQ on schedule in July.
- Steve Bruning distributed a revised Master Example mark-up with attachments for inserts and replacement of selected text and tables. The Handbook Subcommittee voted to recommend approval to the full TC.
- Fred Bauman distributed a proposed insert to address UFAD cooling load calculation information consistent with the upcoming update of the UFAD Design Manual. Discussion concluded references to Energy Plus and the on-line design tool should be accomplished by reference to the research papers, and not included directly in the Handbook text. Fred will bring a revised insert to the full TC meeting for review.

2. Chapter 17 Residential Loads:

- Chip Barnaby has compiled reviews and user comments received.
- Chip has concluded the changes in TC4.2 weather data would have very minor impact on the chapter 17 tabulated data and example and that it would not be worthwhile to rework those for this update.
- Other changes in response to user questions are fairly minor and mostly explanatory and editorial.
- Chapter mark-up will be distributed in the next week or so with a letter ballot requesting fast response from the TC for submittal to HQ.

Underfloor Air Distribution Systems

Room cooling loads determined by methods in this chapter are not able to model two distinguishing aspects of the thermal performance of underfloor air distribution (UFAD) systems under cooling operation:

- Room air stratification: UFAD systems supply cool air at the floor and extract warmer air at the ceiling, thus creating vertical thermal stratification. Cooling load models assume a well-mixed uniform space temperature.
- Underfloor air supply plenums: cool supply air flowing through the underfloor plenum is exposed to heat gain from both the concrete slab (conducted from the warm return air on the adjacent floor below in a multistory building) and the raised floor panels (conducted from the warmer room above).

Extensive simulation and experimental research led to the development of a whole-building energy simulation program capable of modeling energy performance and load calculations for UFAD systems [Bauman et al. 2007, Webster et al. 2008]. Previously, it was thought that cooling loads for UFAD and overhead (OH) mixing systems were nearly identical. However, energy modeling studies have demonstrated that the UFAD cooling load is generally higher than the cooling load calculated in the same building for a well-mixed system [Schiavon et al. 2010a]. The difference is primarily due to the thermal storage effect of the lighter-weight raised floor panels compared to the heavier mass of a structural floor slab. Schiavon et al. (2010b) showed that the mere presence of the raised floor reduces the ability of the slab to store heat, thereby producing for the system with a raised floor higher peak cooling loads compared to the system without a raised floor. A second contributing factor is due to the raised floor surface above the underfloor plenum tending to be cooler (except when illuminated by the sun) than most other room surfaces, producing a room surface temperature distribution resembling a chilled radiant floor system. Recent research has found differences in peak cooling loads between radiant cooling and all-air systems [Feng et al. 2012]. The precise magnitude of the difference in design cooling loads between OH and UFAD systems is still under further investigation, but mainly depends on zone orientation and floor level, and possibly the effects of furniture. Methods for determining UFAD cooling loads will be updated as additional research results become available. For more information about simplified approaches to UFAD cooling load calculations, see Schiavon et al. (2010c), Bauman et al. (2010), and the updated ASHRAE UFAD Design Guide.

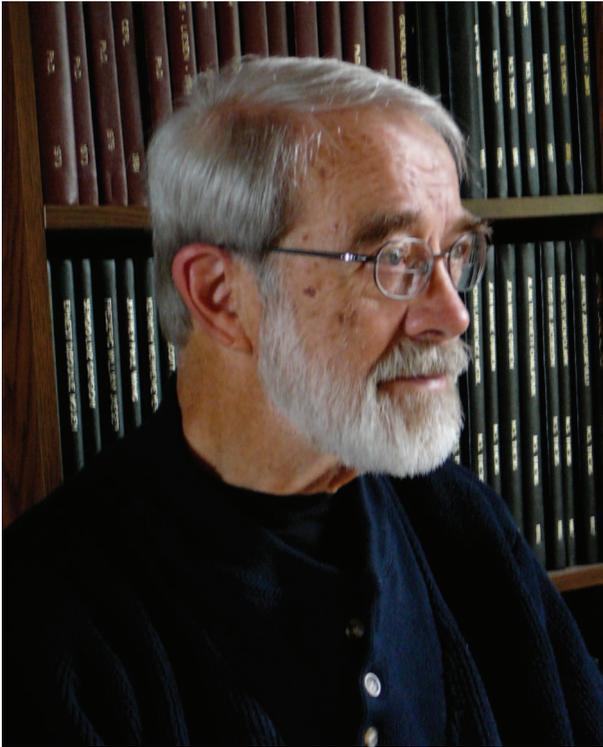
References

- Bauman, F., et al. 2007. "Energy Performance of UFAD Systems," Final Report to CEC PIER Buildings Program. Center for the Built Environment, University of California, Berkeley, California, US. <http://www.energy.ca.gov/2007publications/CEC-500-2007-050/index.html>
- Bauman, F., S. Schiavon, T. Webster, and K.H. Lee. 2010. "Cooling Load Design Tool for UFAD Systems." ASHRAE Journal, September, pp. 62-71. www.cbe.berkeley.edu/research/ufad_designtooldownload.htm
- Feng, J., S. Schiavon, and F. Bauman. 2012. Comparison of zone cooling load for radiant and air conditioning systems. Proceedings of the International Conference on Building Energy and Environment. Boulder, CO. <http://escholarship.org/uc/item/9g24f38j>.
- Schiavon, S., F. Bauman, K.H. Lee, and T. Webster. 2010a. "Simplified calculation method for design cooling loads in underfloor air distribution (UFAD) systems." Energy and Buildings, Vol. 43 (1-2), pp. 517-528. doi:10.1016/j.enbuild.2010.10.017 <http://escholarship.org/uc/item/5w53c7kr>

- Schiavon, S., K.H. Lee, F. Bauman, and T. Webster. 2010b. "Influence of raised floor on zone design cooling load in commercial buildings." *Energy and Buildings*, Vol. 42, Part 5, pp. 1182-1191. doi:10.1016/j.enbuild.2010.02.009. <http://escholarship.org/uc/item/2bv611dt>.
- Schiavon, S., F. Bauman, K.H. Lee, and T. Webster. 2010c. "Development of a simplified cooling load design tool for underfloor air distribution systems." *Final Report to CEC PIER Program*, July. <http://escholarship.org/uc/item/70f4n03z>.
- Webster, T., F. Bauman, F. Buhl, and A. Daly. 2008. "Modeling of Underfloor Air Distribution (UFAD) Systems." *SimBuild 2008*, University of California, Berkeley, CA, July 30 – August 1.

OBITUARY

Dr. Curtis Oneal Pedersen



Dr. Curtis Oneal Pedersen, Professor Emeritus of Mechanical Engineering, passed away on July 10, 2012 at his home in Hastings, Minnesota. He is survived by his wife, Carolyn, his son Mark, daughter and son-in-law, Krista and Larry Betcher, and two grandsons, CJ and Kyle Betcher.

Dr. Pedersen was born on November 2, 1934 and grew up on the family farm near Tyler, Minnesota. After receiving his Bachelor's degree from South Dakota State University and Master's degree from University of Minnesota, he went to work for General Electric, then PPG Industries. After earning a Ph.D. in mechanical engineering from Carnegie-Mellon University in 1968, he served as a professor at the University of Illinois at Urbana-Champaign until retiring in 1993. After his official retirement, he remained very active in the field, developing EnergyPlus and working on other projects. At the time of his death he was working on an ASHRAE research project on simulation of radiant systems.

He was an active researcher in building simulation and related fields. His research encompassed simulation methodology, development of new models, use of system identification and parameter estimation techniques, room heat transfer and building cooling and heating load calculations, among other topics. He was active in both development of simulations and experimental research aimed at validating simulations.

Dr. Pedersen's contributions to building simulation began in the late 70's with his involvement in the development of the Building Loads Analysis and System Thermodynamics (BLAST) program. BLAST was developed by a team at the US Army Construction Engineering Research Laboratory (CERL) led by one of his Ph.D. students, Doug Hittle. In 1983, Dr. Pedersen founded the BLAST Support Office, and over the next twelve years directed development of new models and features by a team of graduate students, research engineers and research programmers.

In 1995, the Department of Energy selected a research version of BLAST, developed by Russ Taylor, one of his Ph.D. students, as the basis for the next generation EnergyPlus program. Dr. Pedersen and his students were active in EnergyPlus development for another ten years. His contributions ranged from HVAC system component models, such as stratified thermal storage tanks, to fundamental heat transfer algorithms for building walls and slabs. His work in integrating quasi-steady state simulations with different characteristic time scales formed the basis of the EnergyPlus split-time step solution methodology.

Dr. Pedersen was a tireless proponent of the heat balance method that formed the basis of both BLAST and EnergyPlus and was instrumental in developing the heat balance based load calculation procedures currently used by ASHRAE. His contributions in this area include numerous archival journal and conference papers on the topic as well as the book, *Load Calculation Principles*, and the ASHRAE Loads Toolkit, a simulation workbench for both developers and students.

He served the American Society of Heating, Refrigerating and Air-Conditioning Engineers and the International Building Performance Simulation Association in many different roles, including serving

as president of the latter organization's US affiliate. He was also honored as a fellow of both societies.

During his time at the University of Illinois, Dr. Pedersen was a well-liked and well-respected teacher, a leading researcher internationally recognized in the fields of building simulation and building heating/cooling systems, and an adviser and mentor to more than

50 graduate students. He introduced many graduate students to the field of building simulation. He was remarkably successful at passing the torch to his graduate students, many of whom are now leaders in industry or professors at universities throughout the U.S.

Jeffrey D. Spitler and Daniel E. Fisher



Thomas B. Romine Jr.

1925 - 2012 | Obituary

Thomas B. Romine Jr., 86, went to be with the Lord on Tuesday, July 17, 2012. Funeral: Eucharist of Christian Burial, 2 p.m. Saturday at St. John's Episcopal Church. Interment: Greenwood Memorial Park. Visitation: 5 to 7 p.m. Friday at Thompson's Harveson & Cole Funeral Home. Memorials: His memory may be

honored with a gift to a favorite . Mr. Romine was born Nov. 16, 1925, in Billings, Mont., to Elizabeth Marjorie Tschudy Romine and Thomas Beeson Romine Sr. The family moved and settled in Fort Worth in 1936 where Tom attended Arlington Heights High School. He was an officer in the ROTC and an Eagle Scout. Tom enlisted in the Navy V-12 program in 1943. He was finishing his pilot training when [World War II](#) ended in 1945 and was honorably discharged. Tom enrolled at the [University of Texas](#) in November 1945, where he graduated Pi Tau Sigma in mechanical engineering, and where he joined Delta Tau Delta Fraternity. He was a UT Foundation Member and avid supporter of the Texas Exes Alumni Association. While at UT, Tom met on a blind date fellow student Rosemary Melancon, from San Antonio. This soon blossomed into a love affair, and they married in 1948 after graduation. In 1956, Tom went into business for himself as a consulting mechanical engineer, expanding through the years to the present Romine, Romine & Burgess, Inc. Consulting MEP firm. Rosemary and Tom joined the Episcopal Church while still in college, remaining active parishioners thereafter. Tom had been a vestryman, choir member, Sunday school teacher, and was currently a lay reader and usher at St. John's Episcopal.

He was active in civic affairs as chairman of the Fort Worth City Planning Commission, Fort Worth Mechanical & Plumbing Boards, Fort Worth Symphony Orchestra Association, Fort Worth Guitar Society, [Rotary Club](#) of Fort Worth, regional vice chairman of Delta Tau Delta Fraternity, and many others. Tom was a founding member and president of the Fort Worth chapter of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, and was a Fellow Member of ASHRAE, the American Consulting Engineers Council, and Automated Procedures for Engineering Consultants, of which he was also International president and world recognized computer programmer. He served many years in the national ASHRAE organization, helping to create its Energy Conservation Standard, long term member and chairman of its Cooling Load Calculation Committee, and editor of the Cooling Load chapter of four editions of its "Handbook of Fundamentals." He presented papers on Computerized Heating and Cooling Load Calculations at International Conferences in Washington, D.C., Paris, France, and Sarajevo, Yugoslavia. He was a registered professional engineer in Texas, Oklahoma, Louisiana, and Georgia. In addition to his professional and civic activities, Tom loved sailing, skiing, and spending time at his cabin in Ruidoso, N.M. Known with his wife as "Froggie and Organizer," and a.k.a. "Gumdaddy," he was devoted to Rosemary, who preceded him in death in 2008, and to his family, children and grandchildren, and in the last two years to his very special friend, Marjorie Griffin. Survivors: Tom is survived by his sister, Nancy Romine Gillis; brother, Joe T. Romine and wife, Jane; sons, Thomas B. III and wife, Janice, Richard A., and Robert H. Romine and wife, Pamela; and grandchildren, Joseph E. Romine, Caroline Rose Romine, Brian H. Romine and Jackson A. Romine.