

ASHRAE TC1.5 Computer Applications
Meeting Minutes
Dallas Winter Meeting
Jan 29, 2007

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

ASHRAE TC1.5 ACTIVITIES SHEET

TC NO. TC 1.5TC TITLE: Computer ApplicationsCHAIR: Rob HitchcockVICE CHAIR/SECRETARY: Krishnan GowriDATE: Jan 29, 2007TC Web Site: <http://tc15.ashraetcs.org/index.html>

TC MEETING SCHEDULE

| Location, past 12 mo. | Date | Location, next 12 mo. | Date |
|-----------------------|----------|-----------------------|----------|
| Chicago | Jan 2006 | Long Beach | Jun 2007 |
| Quebec City | Jun 2006 | New York | Jan 2007 |

TC SUBCOMMITTEES

| Subcommittee | Chair |
|--------------------------------|-------------------|
| Emerging Computer Applications | Nick Rajkovich |
| Handbook | Mike Galler |
| Program | Pornsak Songkakul |
| Research | Mike Pouchak |
| Standards | Alison Kwok |

TC 1.5 MEETING ATTENDANCE

| | Number Present | Total Number on Committee |
|-----------------------|----------------|---------------------------|
| Voting Members | 7 | 9 |
| International Members | 1 | 1 |
| Corresponding Members | 10 | 27 |
| Visitors and Guests | 5 | |

| Name | Affiliation | TC | Res | Prog | Emer Apps | Hand book |
|------------------|---------------------------------------|----|-----|------|-----------|-----------|
| Vikrant Aute | CEEE, University of Maryland | X | X | X | X | X |
| Bruce Billedeaux | | X | X | X | X | X |
| David Branson | Compliance Services Group, Inc. | X | X | X | X | |
| Tim Dwyer | London South Bank University | X | X | X | X | X |
| Mike Galler | NIST | X | X | X | X | X |
| Krishnan Gowri | PNNL | X | X | X | X | X |
| Walter Grondzik | Florida A&M University | X | X | X | X | X |
| Rob Hitchcock | Lawrence Berkeley National Laboratory | X | X | X | X | X |
| Mark Hydeman | Taylor Engineering | X | | X | | |
| John Kennedy | Green Building Services | X | X | X | X | |
| Alison Kwok | University of Oregon | | X | X | X | |
| Ron Nelson | Iowa State University | X | X | X | X | X |

| Name | Affiliation | TC | Res | Prog | Emer Apps | Hand book |
|-------------------|-------------------------------|----|-----|------|-----------|-----------|
| Bob Old | Siemens Building Technologies | X | X | X | X | X |
| Vernon Peppers | Peppers Engineering | X | | | | |
| Michael Pouchak | Honeywell, Inc. | X | X | X | X | X |
| Steve Rosen | Autodesk, Inc. | X | | | | |
| Stephen Roth | Carmel Software | X | X | X | X | X |
| Nick Rajkovich | Cornell | X | X | X | X | |
| Pornsak Songkakul | Siemens Building Technologies | X | X | X | X | X |
| Kris Subbarao | Texas A&M | | X | X | X | |
| Noel Susskind | Aron Engineers | X | X | X | X | |

RESEARCH PROJECTS

| Project Title | Contractor | Monitoring Committee Chair | Report Made at Meeting? |
|---|---|-----------------------------------|--------------------------------|
| RP-1354 Generic Common Interoperable Data for the HVAC & R industry | GARD Analytics Principal Investigator: Jason Glazer | Krishnan Gowri | Yes |

LONG RANGE RESEARCH PLAN

| Priority | Project | Champion | Status: Chicago Jan 2006 |
|-----------------|--|--|---|
| 1 | Development of reference building information model (BIM) for thermal model compliance testing. | John Kennedy, Dave Branson, Nick Rajkovich | RTAR to be revised by John Kennedy with input from Dave and Nick. |
| 2 | Retooling the HVAC&R Design process to Better use Computer aided design and simulation software | Dave Branson, Ron Nelson | Dave & Ron to review for Dallas. |
| 3 | Human computer interactions - Combined effect of thermal and visual environment on human computer interaction. | Nick Rajkovich, Allison Kwok | Working on RTAR – possible co-sponsor with TC 2.1 |

HANDBOOK RESPONSIBILITIES

| Year & Volume | Chapter Title | No. | Deadline | Approval | Handbook Committee Liaison |
|--------------------------|-----------------------|------------|-----------------|-----------------|-----------------------------------|
| 2007 HVAC Applications | Computer Applications | 39 | 07/31/06 | Approved | David Meredith dxm15@psu.edu |

TECHNICAL PAPERS FROM SPONSORED RESEARCH (PAST 3 YRS, PRESENT, PLANNED)

| Title | When Presented |
|---|-----------------------|
| 1017 RP (Akleman and Haberl) – Jim Watts | Chicago (1/03) |
| 1032 TRP - Interoperable Computer Applications – Dave Branson | Chicago (1/03) |

TC SPONSORED SYMPOSIA (PAST 3 YRS, PRESENT, PLANNED)

| Title | When Presented |
|--|-----------------------|
| Symposium: Interoperable Computer Applications – Branson | Chicago (1/03) |

TC SPONSORED SEMINARS (PAST 3 YRS, PRESENT, PLANNED)

| Title | When Presented |
|--------------------------------------|-----------------------|
| Bringing Fresh Air to HVAC Classroom | Long Beach '07 |

| | |
|--|--------------------|
| On-line code compliance | Long Beach '07 |
| Web-Based Simulation – Give me a minute and it's done | Quebec' 06 |
| ASHRAE HQ: Extreme Makeover | Chicago'06 |
| Designing Building Automation Systems with IT Security in Mind | Chicago'06 |
| Miss the plane, make the meeting and cut the cost – Dwyer | Denver (6/05) |
| HVAC Unplugged - the Wireless Approach - Branson | Orlando (2/05) |
| A Vision of eASHRAE: or How to Give a Seminar in your Pajamas - Hydeman | Nashville (6/04) |
| XML Guidelines for the HVAC Industry - Gowri | Nashville (6/04) |
| Computer Tools for Sustainable Design – Dwyer | Anaheim (1/04) |
| Emerging Web Applications for HVAC and Energy Industries - Hitchcock | Anaheim (1/04) |
| Establishing Cost Effective Energy Baseline for Measurement and Verification – Songkakul | Kansas City (6/03) |
| Computer Security - Pouchak | Chicago (1/03) |
| Experiences in Distance Learning: Leveraging Curriculum through Media - Pouchak | Chicago (1/03) |

TC SPONSORED FORUMS (PAST 3 YRS, PRESENT, PLANNED)

| Title | When Presented |
|---|-----------------------|
| How can proposed Guideline 20 Help the ASHRAE Membership? - Barnaby | Nashville (6/04) |
| How Secure is Your Wireless Office Place - Culp | Kansas City (6/03) |

SUBMITTED BY: Krishnan Gowri -- TC 1.5 Vice-Chairman/Secretary

TC 1.5 Computer Applications

TC Web Site: <http://tc15.ashraetcs.org/index.html>

Main Committee Meeting Dallas, Jan 29, 2007

Committee Meeting Schedule

- Main TC 1.5: 6:30-9:00p.m. Monday 6:30-9:00p San Antonio A
- Internet/Emerging Applications Sunday 5:00-6:30p City View 8
- Program/Research Sunday 6:30-8:30p San Antonio B
- Handbook Monday 6:00-6:30p San Antonio A

Main Committee Meeting Minutes

General

• *Call to order*

Meeting called to order at 6:40 p.m.

• *Introductions/Sign up sheet/Welcome*

This is our fifth paperless meeting. Kudos to Vikram Aute, Bruce Billedeaux.

Bruce updated the membership that the ECC has made presentations to several other TC's regarding paperless meetings. Software has been packaged within an installation program with a manual that will allow other committees to set up paperless meetings easily.

Web-based sign-up sheet was made accessible through wireless connection to local server. In order to record the attendance of those without the laptop computer, the sign-up sheet was circulated.

• *Agenda Review*

• **Roll Call: Quorum: 8** voting members present.

| MEMBER | PRESENT? |
|---------------------------|----------|
| Vikrant Aute | X |
| Bruce Billedeaux | X |
| Wayne Dunn | |
| Tim Dwyer (International) | X |
| Rob Hitchcock | X |
| Alison Kwok | |
| Vernon Peppers | X |

| | |
|----------------|---|
| Mike Pouchak | X |
| Nick Rajkovich | X |
| Steven Rosen | X |

· ***Quebec City Meeting Minutes Approval***

Motion to approve Quebec City Meeting Minutes: Moved by **Dwyer**, Seconded by **Pouchak**.

Discussion: **None**

Motion **Passed 8-0-0**

Chair's Report

· ***Dinner Plans:*** 12 (Yo Steak restaurant, Steve Rosen made reservations)

· ***Step Up to the Plate Awards***

- Mike Pouchack, Mich Schwidler, Tim Dwyer, Mike Pouchak (MMTM Award) for suggesting Objectives for MBO (management by objective) process.

. Program Selection Process

- For each ASHRAE meeting, there is a theme and programs targeting the theme are given priority
 - Seminar and Forum chairs and speakers no longer receive full registration, this is being debated by a number of other TC's

Motion – Chair to write a letter to Section Head objecting to the new ASHRAE policy on meeting registration for Seminar and Forum chairs and speakers: Moved by **Peppers**, Seconded by **Rajkovich**.

Discussion: We need the background on this decision and it might affect the number of volunteers who would be speakers and session chairs. We are concerned that we will see a reduction in speakers and volunteer participation.

Motion **Passed 7-0-1 (Chair abstaining)**

• **Committee Membership**

Rolling off July 2007 – Bruce Billedaux, Wayne Dunn, Rob Hitchcock, Alison Kwok

Rolling on July 2007 – Branson, Galler, Gowri, Grondzik, Nelson, Roth

Officers July 1, 2007: Chair: Gowri, Vice-Chair/Secretary: Pouchak

Need a Research Subcommittee chair after the Long Beach meeting. Now that we have a new RTAR in the development stage, we need a volunteer quickly to transition into the role.

All other subcommittee chairs will continue their role.

Ron Nelson as web master has been doing a fabulous job and it is up to date with minutes. His role was recognized (applause...)

ALI – Tim Dwyer: The society is seeking short courses (3 hrs duration), and Tim has volunteered to help with any members interested in submitting proposals for short courses. No specific deadlines for submission, so members are invited to submit proposals.

Action Items

Note yellow highlight indicates that action item is more than 1 meeting old

- Action item: **All**: Email Hitchcock one new Objective for TC1.5 Management By Objective (MBO) exercise. Choose objective accomplishment by next meeting, one year, or long term.

This TC has been focused on many different topics. More definite MBO's with an objective and time line are needed by next meeting.

- Action item: **All**: Review RTAR-1468 and provide feedback.

The RTAR and comments were posted on the meeting web site for those present to review. They had been previously emailed to the extended TC listserv.

See Research Subcommittee meeting minutes below for more detail on next steps.

TC members are requested to keep an eye out for upcoming version to be voted on for resubmission to RAC.

- Action item: **Galler**: Send email to listserv with instructions on where to find latest version of our Handbook Chapter contribution, and the near term deadlines for updating and reviewing it.
- Action item: **Long Beach Program Session Chairs**: submit programs by Feb. 9, 2007 using the ASHRAE web forms.
- Action item: **Hitchcock**: Chair to write a letter to Meetings and Arrangements strongly urging that they consider free high speed Internet access in all meeting rooms as a prerequisite for selecting future meeting locations.

Subcommittee Reports

Research – Mike Pouchak

Motion to accept the proposal of prioritized list of research plan as proposed in the attached minutes of the Research subcommittee: Moved by **Hitchcock**, Seconded by **Peppers**.

Discussion: **None**

Motion **Passed 8-0-0**

Mike Pouchak reviewed the research RTAR development process.

The program subcommittee has invited more proposals as there is more money is available and Martha Brook from CEC to

A document 'How to write a successful RTAR' was circulated.

See attached Research Subcommittee Meeting Minutes for more details.

Cosponsorship of the TC 7.5 in the Development of Metrics of Benefits of Sensor Networks in Buildings

Vernon From TC 4.2 gave descriptions of an RTAR Computational Fluid Dynamics for Testing Duct fittings using duct loss coefficients. TC 4.2 is seeking sponsorship of a competition to model 'round elbow'.

Motion to support TC 5.2 on the RTAR to host a competition for duct-loss testing using Computational Fluid Dynamics: Moved by **Billedaux**, Seconded by **Rosen**.

Discussion: Comparison will be done to real world data that already available.

Motion **Passed 8-0-0**

Emerging Applications – Nick Rajkovich

- Program proposals and discussions were forwarded to the program subcommittee.

Handbook - Mike Galler

- An update to the handbook chapter is solicited for CD Plus
- Chair requested that Mike send an e-mail to the membership a copy of the current version of the handbook.

Standard Subcommittee

- Requests funding for getting the Standards work started.

Program - Pornsak Songkakul, Chair

Ranked programs listed below under Program Subcommittee Meeting Results.

Long Beach program is due on Feb 9, 2007. New York meeting program submission deadline Aug. 3., 2007.

No programs made it to the Dallas meeting and it may be due to the proposals not meeting the theme of the Dallas meeting.

Motion to accept the program as prioritized and proposed by the program subcommittee for Long Beach meeting: Moved by **Pouchak**, Seconded by **Peppers**.

Discussion: **None**

Motion **Passed 8-0-0**

Web Page - Ron Nelson

Web page is up to date.

T&P – Dave Branson

See T&P Subcommittee Meeting Minutes not included below.

Meeting Times for Long Beach

No changes discussed.

Liaisons

PDC Liaison – Tim Dwyer requested members to propose new PDC courses.

· GPC-20 – Rob Hitchcock – Discussed the RP-1354 outcome being folded into the GPC-20 guideline document. The draft of the document is being fully reviewed and the committee is hopeful of producing more solid progress by the Long Beach meeting.

Old Business

MMTM Award – Chair reviewed the Management By Objective suggestions.

- Handbook Update Review Team (HURT) (Galler)
- Update TC 1.5 “New member” document (Schwedler)
- TC 1.5 shall propose at least 1 programme item per year that has particular relevance to the application of IT to HVAC&R in countries outside North America (Dwyer)
- Publish and distribute paperless-meeting best practices to other TC or article (Pouchak)

New Business

Motion - Chair to write a letter to Meetings and Arrangements strongly urging that they consider free high speed Internet access in all meeting rooms as a prerequisite for selecting future meeting locations.

Moved by **Rajkovich**, Seconded by **Peppers**.

Discussion: **Rousing support**

Motion **Passed 7-0-1 (BNV – Bruce Not Voting)**

Adjournment

Time: 9:00 p.m.

Motion: Adjourn: Moved by **Gowri**, Seconded by **Billedaux**.

Discussion: **None**

Motion **Passed** Unanimous (Chair Voting).

Research Subcommittee Meeting Minutes TC 1.5, Computer Applications

Sunday, January 27, 2007

Dallas, TX

TC 1.5 Research Sunday 6:30-7:30 p.m.

San Antonio B room, Adam's Mark Hotel (CC3)

1. Call to Order/Introductions

Attendance: Pornak Songkakul (Siemens), Krishnan Gowri (PNNL), Rob Hitchcock (LBNL), John Kennedy (Green Bldg Studio), Stephen Roth (Carmel SW), Ron Nelson (Iowa State), Kris Subbarao (Texas A&M), Walter Grondzik (Tallahassee FL), Bob Old (Siemens), Noel Susskind (Aron Engineers), Alison Kwok (Univ of Oregon), Nick Ravkovich (RSK Architects), Tim Dwyer (London South Bank Univ), Dave Branson (Compliance Services Group), Mike Galler (Nist), Mike Pouchak Honeywell, Research Subcommittee Chair).

2. Review of ASHRAE Research procedures.

- Research themes 1) Energy and Resources, 2) Indoor Environmental Quality 3) Tools and Applications , and 4) Equipment, Components, and Materials.
- weighted criteria: 1) supports strategic plan 45% 2) co-funding support 10% 3) anticipated application 10% 4) TC vote 10% 5) RAC vote 20% 6) Tech Council Preview Feedback 5%.
- RAC will review RTARS at all meetings (3 / yr) – need 45 days advance – May 15, Dec 15, Aug 15. This will start after Denver.
- Ashrae Research has asked for more research projects. There is more funding available and fewer projects than in the past history. The backlog of projects waiting for funding is clear.

Jim Braun , research liaison for section 1 was introduced..

RTAR #1468, "Development of Reference Building Information Model (BIM) for Thermal Model Compliance Testing" status update. John F. Kennedy; Dave Branson; Nick Rajkovich

- current version of the RTAR review

- Jim Braun (RL1) email comments from December 15, 2006 were reviewed.

- RTAR was returned from RAC with comments to address for revision. Comments include that work is important however RTAR is not clear how the work will contribute. Request to clearly describe how BIMs may generate thermal models. Need to modify justification statement.

- Discussion included comments for clarification of BIM and proposals for re-submittal.

-RTAR process must include TC 1.5 committee approval for all submission/changes.

Actions: 1) RTAR Authors to edit and improve RTAR per RAC comments 2)Walter Grondzik and Stephen Roth to review output of Draft. 3) RTAR authors to circulate to full TC for review. Include Jim Braun in review. Get Main TC 1.5 email ballot to endorse and then Submit to RAC (Mike Vaughn) with copy to Jim Braun (RL1).

3. 2007 TC 1.5 Research Project Prioritized:

| Priority | Project | Champion | Status: Dallas Jan 2007 |
|-------------------|---|---|---|
| Funded 1354-RP | Generic Common Interoperable Data for the HVAC & R industry | Chip Barnaby, Krishnan Gowri (PMS chair), Ken Gillespie | PMS mtg 1/29/07 PMS mtg 6/26/06 PES selection 1/23/06 |

| | | | |
|-------------------------|--|---|---|
| | | | WS submitted 5/12/5 WS approved RTAR approved 7/27/4. |
| 1 | Development of reference building information model (BIM) for thermal model compliance testing. 9 votes –voting ID “F” | John Kennedy, Dave Branson, Nick Rajkovich | RTAR returned from RAC for revision RTAR completed. Voted Priority 1 on 6/25/06. Potential co-sponsor with TC 4.7 energy calc and TC 4.1 load calc |
| 2 | Retooling the HVAC&R Design process to Better use Computer aided design and simulation software- 7 votes –voting ID “B” | Dave Branson, Ron Nelson | RTAR 1355 rejected by RAC 11/4/4. Returned to Author 11/11/4. Action: Jeff to review with Steve Rosen for Quebec mtg. Jeff no longer available. Action: Dave & Ron to review for Dallas. |
| 3 | Human computer interactions - Combined effect of thermal and visual environment on human computer interaction.- 6 votes – voting id “C”. 2 nd vote 8 votes. | Nick Rajkovich, Allison Kwok | Working on RTAR – possible co-sponsor with tc 2.1 |
| 4 | Study of personal preference control behavior. 6 votes – voting id “E”. 2 nd vote 6 votes. | Bruce Billedeaux | New Topic. Needs RTAR |
| 5 | Develop a expert system front end to 90.1 Std. Benefit to ASHRAE – 3 votes – voting ID “A” | Ron Nelson, Krishnan Gowri, (formerly 90.1 rep. David Weitz) | David Weitz is no longer available to work on this RTAR. Per vote of subcommittee, this Research is to be placed in lower priority. Need work statement. |
| Not prioritized- (ID 6) | Requirements for diagnostics and optimization for deployment in a large scale – removed from voting for support. – ID “D” | Kris Subbarao | New Topic Needs RTAR – Jeff to work on RTAR by next meeting. |
| Not prioritized- (ID 7) | Methods to validate and ensure quality of data from the Controls systems | | New Topic. Needs RTAR |
| Not prioritized- (ID 8) | Methods to collaborate the controls decision of the set point | | New Topic. Needs RTAR |
| Not prioritized- (ID 9) | Handbook filter – for advanced filtering - if you view the handbook from an architecture perspective, from a chiller manufacture perspective-make xml data in handbook- tabled – former priority 5 | Jeff Haberl | |
| Not | Demonstration of Development of | Jeff Haberl | |

| | | | |
|--------------------------|---|-------------|---------------------------------------|
| prioritized- (ID 10) | advanced visualization method for viewing results from computer simulation- tabled. Former priority 6 | | |
| Not prioritized- (ID 11) | Methods for the development of drive by simulations- Generate 3D model from drive by video- tabled. Former priority 7 | Jeff Haberl | Jeff to work on RTAR by next meeting. |

4. It was agreed that the project prioritization is to be left as-is. No further Research Topic Advancement Requests (RTARs) were advanced from emerging applications.
5. PMS #1354 update – Project Monitoring Subcommittee (PMS) will meet Monday 8-10 a.m. to review progress with Jason Glazer, GARD Analytics
 A. Project Number and Title: *1354-RP Common Data Definitions for HVAC&R Industry Applications*
 B. Research Institution: *GARD Analytics*
 C. Period Covered by Report: *June 11, 2006 to September 30, 2006*
 Total expenditures to date: \$ 5,248.00 Balance of appropriated funds: \$ 122,252.00

1354-RP, “Common Data Definitions for HVAC&R Industry Applications;” Responsible TC/TG: TC 1.5 (Computer Applications); Co-Sponsor (s): GPC-20; Contractor: GARD Analytics; Duration: 18 months; Cost to ASHRAE: \$127,500; Supports Strategic Goals: A.7, C.4 (Energy & Resources Goal #7, and Tools & Applications Goal #4).

Krishnan update on RP-1354. Krishnan is the chair of the Project Monitoring Committee (PMS). Rob is expected to take over the chair of this PMS after Dallas.

They have IFC GBXML based on 4 use cases to be compared. Bldg Sim/ Op. & Maint.

PMS mtg did not meet in Quebec due to unavailability of Contractor. Review of 3 data models. Contractor regain work end of summer. 1st task complete of 95 data groups. They will be refined. 1st task report will be complete in 4 weeks from today. Current progress is at 15% of completion. Contact Rob Hitchcock or Krishnan Gowri for more information. Schedule completion is end of September. California Energy commission has offered to assist with cofunding. There is a 4 month lead time. Evaluation of GARD analytics works needs to be analysis.

ASHRAE Overview of Research Project

1354-RP

COMMON DATA DEFINITIONS FOR HVAC&R INDUSTRY APPLICATIONS

April 2006 – September 2007
 GARD Analytics, Inc
 Principal Investigator, Jason Glazer
 TC 1.5, Computer Applications

As is clear from the discussion above, there is much activity across the industry devoted to development of data exchange methods. It is natural to question why ASHRAE should become involved rather than simply waiting for the results of the work of others. ASHRAE has a unique and broad role in the HVAC&R industry. If ASHRAE is not involved in the definition of data

exchange methods, the interests of its members may be overlooked with the result that important processes remain isolated from the emerging automated business world. The initiatives described above are championed by groups whose interests are not necessarily aligned with those of the ASHRAE membership. On the other hand, the related initiatives should not be ignored – there is no reason to re-invent methods that are suitable for ASHRAE. In addition, these methods are being applied and will be encountered in practice. The approach of this project is to examine existing data models in light of ASHRAE's needs as represented by the GPC-20P use cases. This will yield a map of the overlaps, inter-relationships, and omissions in the range of models pertinent to the ASHRAE domain. The availability of such a map will accelerate development of guidelines, standards, and software that addresses the entire life-cycle of HVAC&R projects.

Program Subcommittee Meeting Results TC 1.5, Computer Applications

Long Beach Program Proposals:

| Rank | Venue | Type | Title | Chair |
|------|------------|-------------|---|------------------|
| 1 | Long Beach | Seminar | Bringing Fresh Air to HVAC Classroom | Grondzik, Walter |
| 2 | Long Beach | Forum | What can ASHRAE do to electronically convey information to students and faculty | Charlie Culp |
| 3 | Long Beach | Seminar | On-line code compliance | Norm Borassa |
| 4 | Long Beach | Forum | Emerging from the trenches: What should the mature E-HVAC/R industry look like | Dave Branson |
| | Long Beach | Transaction | Emerging Applications for the HVAC Industry | Branson |

Future Program Proposals:

| Venue | Type | Title | Chair | |
|----------|--------------|--|------------------|----|
| Future | Forum | RFID tags for HVAC/R industry | Bruce Billedeaux | |
| Future | Forum | AHSRAE 20/20 - Is the HVAC Engineer Endangered from the Research done in 2000-2005 ? | Schwedler | Ye |
| New York | Seminar | Using the Internet Classroom for Lifelong Learning" | Tim Dwyer | 3 |
| Future | Seminar | X-Tech: Extreme technologies for HVAC and R industry | Dave Branson | 3 |
| Future | Seminar | Impact of Nanotechnology on HVAC industry | Peng Xu | 3 |
| Future | Forum | Software quality assurance | Krishnan | |
| Future | Seminar | Tooling up today's youth to be an engineer | Dave Branson | |
| Future | Seminar | Big Brother is Watching | Billedeaux | ye |
| Future | Seminar | Can the Spam Guaranteed | Billedeaux | |
| Future | Short Course | Electronic Information Exchange - (how to) | Hydeman | |
| New York | Transaction | Emerging Applications for the HVAC Industry Part 2 | Branson | Ye |
| New York | Seminar | BIM There Done That | Hitchcock | |
| New York | Seminar | Unboxing the solutions: Temperature Controls Solutions from Outside the Box | Branson | |

TC 1.5: Program Subcommittee - Past Programs (Updated 01/28/2007)

| Past Programs | | | | |
|---------------|---------|------------|--|----------------|
| (06/06) | Quebec | Seminar 7 | Web-Based Simulations for Design: Yata Yata Yata | Nick Rajkovich |
| (06/06) | Quebec | Seminar 13 | Greening the ASHRAE HQ Building | Tim Dwyer |
| (01/06) | Chicago | Seminar | Designing Building Automation Systems with IT security in mind | Mike Pouchak |
| (01/06) | Chicago | Seminar | ASHRAE HQ: Extreme makeover | Tim Dwyer |

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|---------------|---------------|--------------|--|-----------|
| (6/04) | Nashville | Seminar | A Vision of eASHRAE: or How to Give a Seminar in your Pajamas | Hydeman |
| (6/04) | Nashville | Seminar | XML Guidelines for the HVAC Industry | Gowri |
| (6/04) | Nashville | Forum | How can proposed Guideline 20 Help the ASHRAE Membership? | Barnaby |
| (1/04) | Anaheim | Seminar | Computer Tools for Sustainable Design | Dwyer |
| (1/04) | Anaheim | Seminar | Emerging Web Applications for HVAC and Energy Industries | Hitchcock |
| (6/03) | Kansas City | Seminar | Establishing Cost Effective Energy Baseline for Measurement and Verification | Pornsak |
| (6/03) | Kansas City | Forum | How Secure is Your Wireless Office Place | Culp |
| (1/03) | Chicago | Poster Paper | 1017 RP | Haberl |
| (1/03) | Chicago | Symposium | Interoperable Computer Applications | Branson |
| (1/03) | Chicago | Seminar | Computer Security | Pouchak |
| (1/03) | Chicago | Seminar | Experiences in Distance Learning: Leveraging Curriculum through Media | Pouchak |
| (6/02) | Honolulu | Seminar | Internet Technology for HVAC/R Business: Use It or Lose It | Dwyer |
| (6/02) | Honolulu | Seminar | Terms that Your Engineer Knows, but You Don't | Schwedler |
| (6/02) | Honolulu | Seminar | Self-Configuring Controls: Needs, Technology and Potential Benefits | Brambley |
| (1/02) | Atlantic City | Seminar | Uses and Benefits of Electronic Collaboration, Newsrooms and Groupware | Pouchak |
| (1/02) | Atlantic City | Symposium | Tools and Techniques for Calibration of Component Models | Reddy |
| (6/01) | Cincinnati | Seminar | Internet for Global Working | Dwyer |
| (6/01) | Cincinnati | Seminar | Future NET Gains for the AE Office | Kammers |
| (6/01) | Cincinnati | Seminar | Pattern-Recognition-Based Fault Detection and Diagnostics for Building Operation | Brambley |
| (6/01) | Cincinnati | Seminar | Future NET Gains for the AE Office | Kammers |
| (1/01) | Atlanta | Seminar | Interoperable Computer Applications for the Computer Industry | Hydeman |
| (1/01) | Atlanta | Forum | What Does the ASHRAE Membership Need from the Computer Applications Handbook | Pouchak |