

**AMERICAN SOCIETY OF HEATING REFRIGERATING AND
AIR-CONDITIONING ENGINEERS, INC.**

TC/TG/TRG NO: **TC 9.9** Date: **June 25, 2012** Location: **San Antonio, Texas, USA**

**TC/TG/TRG TITLE: Mission Critical Facilities, Technology Spaces and
Electronic Equipment**

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General Meeting on June 25th, 2012 - Call to order

Chairman, Jack Glass called the meeting to order at 2:15 p.m.

A quorum (11 of 16) voting members were present.

VOTING MEMBERS	YEAR APPTD	PRESENT ABSENT	VOTING MEMBERS	YEAR APPTD	PRESENT ABSENT
John Bean	10	P	David Moss	11	P
Don Beaty , Publications Subcommittee Chair	10	A	David Quirk , Vice Chair	09	P
Chris Kurkjian	11	P	Terry Rodgers	09	A
Ecton English, Webmaster	10	P	Roger Schmidt , IT subcommittee-Chair	09	P
Joseph Gangemi , Programs Sub Chair	11	P	Robin Steinbrecher	10	P
Jack Glass , Chair	09	P	Herb Villa	10	P
Rhonda Johnson	10	P			
Mukesh Khattar	10	A			
Francis Mills	09	Int'l -A			
Corresponding Members and all attendees-see below		See Below			

DISTRIBUTION

<i>All Members of TC/TG/MTG/TRG plus the following:</i>	
TAC Section Head:	Tom Lawrence
TAC Chair:	Charles Culp
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters:	
Manager Of Standards	Stephanie Reiniche
Manager Of Research & Technical Services	Mike Vaughn

<i>All Attendees</i>			
	First	Last	(V)oting member (C)orresponding member (P)rovisional Corresponding member (G)uest
1	Andrew	Baxter	C
2	John	Bean	V
3	Eric	Carter	P
4	Herman	Chu	G
5	David	Copeland	C
6	Craig	Crader	C
7	Charlie	Culp	G-ASHRAE TAC Chair
8	Tom	Davidson	C
9	Nick	DesChamps	G
10	Ecton	English	V
11	Bert	Etherege	G- ASHRAE
12	Paul	Finch	G
13	Jon	Fitch	G
14	Nick	Gangemi	V
15	Tift	Gannon	G
16	Art	Giesler	C
17	Ken	Gill	G
18	Jack	Glass	V
19	Kevin	Huges	P

20	Greg	Jeffers	C
21	Mike	Kaler	P
22	Raj	Kapoor	C
23	Daniel	Kennedy	P
24	Geoff	Lawler	C
25	Stuart	Lawrence	C
26	Sang	Lee	C
27	Carol	Marriot	G
28	Caroline	Mason	G
29	Bob	McFarlane	C
30	Doug	McLellan	C
31	Jacque	McIlrath	G
32	Michael	McKenna	G
33	Bill	McQuade	G- TAC V Chair ASHRAE
34	David	Moss	V
35	David	Meadows	V
36	Chris	Muller	C
37	Mike	Ohadi	G
38	Mike	Patterson	C
39	Rick	Pavlak	V
40	David	Quirk	V
41	Stephanie	Reniche	G- ASHRAE Staff
42	Eddie	Rodrigues	G
43	Jeff	Rutt	V
44	Mike	Scofield	C
45	Roger	Schmidt	V
46	Ian	Seaton	C
47	Mark	Seymor	C
48	PJ	Singh	C
49	David	Schowalter	G
50	Vali	Sorell	V
51	Robin	Steinbrecher	V
52	Jeff	Trower	V
53	Bill	Tschudi	C
54	Herb	Villa	V
55	Marlin	Vogel	G

Introduction

Everyone in the room announced their names and affiliation.

David Quirk, incoming TC 9.9 chairman, provided a *Certificate of Appreciation* to Jack Glass, outgoing chairman.

David gives a general discussion on TC9.9, including membership and voting members represent a good mix in the industry, including, IT manufacturers, end-users and operators, contractors, other vendors as well as engineers.

Website

Webmaster gave a summary of the web site and its current capabilities

Site was launched 2.5 yrs ago launched and now includes search engine optimization, Top of major search engines, as well as a free service website measurement software.

Some statistics included-

- Tracking views since Sept 28, 2011
- 18,000 page views
- 15,000 are unique visits.
- Index and documents have about 85% hits
- 8465 Download events, 692 in one day- Wed , Oct12, 2011
- 2011 Thermal Guidelines WP most popular download at 23222, second is 2011 Liquid Cooling WP
- Track countries as well.

Seminar on TIA/ASHRAE Harmonization and Updates

Presented by Rhonda Johnson -Sr. Research engineer

- Tia 942-2005- data center standard for structural cabling; managed by TR42.1 Generic Telecom. Just voted draft for 942-A, available in august.
- Original included envelope operating environments for computer rooms.
- 942A moved standards to TIA-569 for generic requirements
- 3 classes of standards, Common (incl. 569-generic), Primary standards (applicable- industrial, data centers, various types incl. residential)
- Components standards for cabling
- History going back to 2004 Thermal Guidelines in 2005
- TIA revised standards in 2008; 942-2-2010 for update (harmonization's)
- Oct 2011 TIA 569-c-1 for revision; June 21, out for vote and comments due Aug 20, 2011. Generally has been accepted.
- Recommend changes for higher cable temps, (60-65C current limit). They are still looking for comments.
- Outstanding questions -Are classes A3 and A4 relevant to TIA? Will they use structured cabling?
- Environmental classes A3& A4 in containers are not normally used.

ASHRAE STD 90.1 discussion and updates

Discussion started by Jack Glass

- TC9.9 to create our own energy standard, tentatively call SPC 90.4.
- Work has already been started on it and there has been a working group with Mechanical subcommittee for 90.1 that has been working on related issues for the last several months
- The Title Purpose and Scope (TPS) was reviewed for unique aspects of data Centers
- He also stated that the prescriptive paths unmanageable to prove a minimum standard as reported by many on TC 9.9.
- 90.1 addendum AQ added summer 2009 for including data centers, yet discussion between committees have not achieved consensus to date.
- It was still subsequently approved in 2010 addition to the objections of TC 9.9.
- 2013 comes out next year
- Scope similar to 90.1 with DataCom Facilities to determine minimum as well as above minimum for higher efficiency and compliance criteria.
- Process must allow but has problem with the speed of innovation.
- Of the recommendations recently made to 90.1, only one made it out for review, none have been approved. Contention exists (no consensus). We only have 12 months to make the changes happen
- The plan for today is to call to a vote Title, Purpose and Scope, and submit to standards committee tomorrow. Formally published, 90.1 then makes direct reference.

Discussions from group-

- TPS can be changed during the process
- Carol Marion chair on standards (3 days left) spoke . Committee voted on recommendations for Chair, but standards committee makes the rule PPIS next body (policy procedures interpretation standards).The proposed standards committee has a good mix of users, engineers, contractors and engineers. Some voiced concerns, pursuing a parallel path.
- Data centers captured by computer rooms in 90.1; new definition follows Tier 1 for 90.1. Everyone else falls into the data center/ new 90.4 standards. New standard must consider risks and the cost justification payback changes that were not considered when they decided to incorporate data centers in standard 90.1. There will be hiccups, but we have a path.
- Discussion on proposed chair and recommended members; Don Beaty was recommended because he understands process with experience, well known in committee and ASHRAE, founder of TC9.9, served as Vice Chair of 90.1.

Call for votes by Jack Glass:

- Approval of title, purpose , scope was unanimous by voting members
- Approval of Don Beaty as the recommended chair was unanimous by voting members

IT Subcommittee Report

IT Subcommittee Report Power Trends by Roger Schmidt. This was interlaced and discussed with other topics; see below for seminars and publications.

Standard 189 Report

Jeff Rutt, Standard 189 liaison, reported that they are working on 6 addendums, lighting, efficiencies to food and beverage DX, but nothing covers data centers.

Publications

Roger Schmidt spoke on behalf of Don and explained contamination operation needs further whitepaper/information on contamination for Data center operators.

- 3 Books being revised.
- Contamination book includes 18-24 months survey.
- Update to structural book (weight of racks, etc.) and the book liquid cooling book, incorporates updates from white paper.
- DT across IT equipment needs more information.
- Seminar possibly first, then white paper. 2 other items, user manual on envelopes, temp maximized for reliability.
- Other questions discussed on publications. How this is drawing into categories A2, A3, A4. X factor for temperature have been discussed. Items such as what are the X factors for moisture in the data center need research?
- Revised Thermal trends book due out in the summer, which will have system and rack level trends including tabular information
- Power guidelines second editions is due.

Some voiced that the local rep is disconnected from some of the manufacturer when discussing requirements for servers and allowable limits. Roger agreed and indicated why it was so important that TC9.9 continue the publications and awareness campaigns to close those gaps; such is the problem with any large organizations.

Current Seminars at Meeting

Robin Steinbrecher quick overview of seminar with aspects of updates to first to book, including how you use load trends.

- Thermal guidelines 3rd editions. Appendix C – How to approach high ambient temperature, new or existing, detail specific info with complex flowchart. Put into words and pictures on how to approach Thermal Guidelines.

Then turned over to Dave Moss-

- In yesterday's seminar, unconventional looking at cold aisle and run negative containment to let servers pull in the air.
- Included bench test of several servers which appeared to respond well to the test.
- Indicates Mike Paterson's look at cold aisle containments.
- Concluded pressure is the better way overall to control containment. Split pressure and temp control in CRAC may also be the best solution.

Mark Seymore talked about reality vs. what is planned.

- Evolution, planning can still be missed. 60-70 folks attended Sunday's meeting. Recommend a few

hundreds of an inch pressure settings, but only up to a few tenths of inch, high for rack, but really higher for room containment. See presentation. People looking at tightly coupled systems and they need to provide for real world conditions.

Corrosion Update and Seminar

PJ Singh of IT Sub-committee gave presentations on gaseous and contamination in Data Centers, part of his continuing IT series presentation during the TC9.9 meetings.

- They recently gave 3 related presentations on research including in Beijing China; review corrosion on circuit boards and third contamination book updates.
- Research found in beginning- 2 modes of failure- creep corrosion with copper, and corrosion of silver metallization in miniature-silver sulfide needles, extruding out of resistors. Copper creep corrosion- attack by sulfur, copper sulfide precipitates on corrosion. Surface-mount technology resistor corrosion mechanism causing open circuit corrosion. Silver corrosion is the worst.
- Copper creep corrosion occurs because industry primarily has gone away from lead tin to lead free solder.(RoHS) Lead-tin solder wets copper well metallization and very corrosion resistant. Lead free solders don't wet copper well, higher melting-more difficult to use. Creep corrosion on PCB's in IT equipment is relatively new. First reported 2006, 2007. One company looking at mechanics of creep corrosion, moisture is playing a role. Silver sulfide migrates first, followed by copper corrosion.
- Big increase creep corrosion 2007/8. 2006 industry converted to lead free solder (RoHS). Industry benchmark of growing corrosion problem by number of papers published keep on increasing, trends is up, so corrosion problem is up (exponential increase). PCB densities rising, air quality decreasing. Downward trend in feature sizes, everything is smaller and denser. H2s attracts corrosion; SO2 is easily tracked with satellites. NO2 summer months found to be lower
- Studies included 57 data centers, took 79 readings in China. Corrosion is higher in winter months. Poughkeepsie, NY is the same, seems to be universal. Summer less, winter highest.
- Low levels of corrosives have lower failures (200 angstroms/month silver corrosion rate is threshold, recent data as of Sept 2011, proposition still stands. Copper corrosion is not as good a predictor as silver corrosion.
- Testing various corrosion test methods. Mix flow gas test, Chavant clay test, Flowers of Sulfur test. Role of PCB surface finish and soldering Flux since lead free solder is not very wet. HASL with rosin flux is good choice
- Creep corrosion Mitigation with various coatings, including silicone, epoxy coatings. Above 60% RH corrosion rate really increases.
- Deliquescent Relative Humidity- When RH is greater, the films get wet. Salt at 75% get wet and causes corrosion. Magnesium chloride threshold is only 40% DRH

Second Paper

- CWWDI meeting 24 April 3012Change GB50174-2008. Need to change Chinese codes.
- 200 angstroms copper, 300 angstroms silver corrosion limits for benchmark if data center has problems
- One company disagrees on some of this and states, has no emphasis of RoHS requirements on creep corrosion. No companies have a good test to qualify hardware. Creep corrosion has also seen lead-tin solder. INEMI position center on DC gaseous contamination, including several IT subcommittee companies.

Another area of research

- More cooperation for primary data with trends, see in the US in 2-4 years
- Standard 7104- Basis of ASHRAE white paper, will be an international standard, for leverage to explain to data centers.

- Air filter manufacturer representative spoke on the subject. No predictive model yet for air pollution rates, but they may be able to use data they have
- Don McFarlane comments- High power generation in summer year highest corrosion rates in winter. China burns more coal in the winter, which is why that is but is the same in Poughkeepsie and Guadalajara. U.S is still the cleanest and we can make some judgments for data center design.

Third area

- Data center design guide book update-
- Changes- Upfront summary defines limits and means of measuring contaminations. Companies have different ways to obtain results and examine data.
- New section on Gas phase filtration and include case studies.- include 3 diff modes of filters, air entering, re-recirculation and CRAC units. Easiest to replace CRAC filters with Gas phase filters.
- An improved section on particle contamination- Mechanisms, limits and levels on particles, how to measure particle contamination. PJ indicates this needs more changes. He is not comfortable with limit and white paper
- ISO 14644-1 Class * Cleanliness. Doesn't deal with particles larger than 5 micrometers. Most concern is with larger particles as well, needs more work. Differentiate between metallic and non-metallic particles. Contamination often occurs during the construction process and the hardware is contaminated. Need a specification for contamination limit, what particle sizes are acceptable.
- Two types of particle contaminations-1. What has settled on the board? 2. What is the limit of airborne particles also needed? A lot of work needs to be done. Class C is the highest class of cleanliness PC Type b. % micron particles are not a concern. PJ is looking for particle contamination limits.

Government

Bill Tschudi discussed work being provided by the govt.-

- More can be done-TROPEC transformative reductions in operational energy consumption Military ASTEC <http://TROPEC.net>
- Logistics of fuel delivery and logistics for relief efforts during relief efforts \$46/gallon to deliver the fuel.
- How do they reduce energy to reduce this cost?
- Directed primarily to manufacturers of equipment. Bill is soliciting member companies.
- Need to evaluate appropriate for hot and humid Climates. Improving Infrastructure systems, including human factors.
- LBNI- DCpro tools refresh. DCEP program development, there is no IT equipment component. They are working with advisory team including green grid, to develop material. Computing metric, computation per watt and power use. Federal consolidation guidelines, wireless assessment kit to monitor and controls, heat re-use paper, compressless cooling equipment.. Espc contract development. Visualization tool. Demonstration project with in-row cooler with no chiller.
- FEMP- Federal partnership for Green Data Centers.
- Energy efficient high performance working group- Many members, including vendors and helped with input to liquid guidelines
- Emerge Alliance DC power initiative- appliances, lighting, promotes 380 volt dc for data centers
- Developed a standard procedure for reporting energy use and metrics.
- Worked with Silicon Valley Energy Group-
- DOE has the 2012 Data Center Energy Eff. Summit-, October 24th, 2012
- Government has not gone silent, but they wanted to report on what they have done. Any more reports from EPA to congress, has energy use curve been updated? Plan on doing updated, but never received funding. There is a report on their website.

Mike Patterson-research subcommittee chair-

- ASHRAE research Updates
- TRP 1499- ESD and Low humidity PMS up and running
- Issues RH and DP, surface selections discussions, consistent clothing, lower RH levels-
- They must meet lowest corners of ASHRAE recommended range and then 2 points in their chamber limits.
- Vendors- Desiccant vendors could help with some donations.
- 19 new projects, 62 active projects. Only 5 RTARS and 4 WS's submitted in Chicago.
- Last year 64 grants in aid high % of funding.
- Innovative research grants only 5 submitted, all were rejected not innovative

- TC 4.10. Indoor environmental Modeling.
- Jim VanGilder TC 4.10 Experimental Benchmark Data For Data Center Numerical Modeling RTAR. No comments from RAC.
- 4.10 Request for co-sponsorships
- CFD analysis validation for racks required. Comparison with experiment in literature are generally poor. Lack of control in experiments. Reasons for comparison. Project goals- provide benchmark data Model 1 code over another. Provide benchmark.
- Provide sanitized model for low detail, actual sizes. Anticipate a 2nd study with more practical data center details. Write up future drafts of the RTAR. Volunteers would sit on the project monitoring sub-committee. 18 month and 125 K.
- Justification of ASHRAE- Develop tools, to support development of energy standards, support development for tools, procedures and methods suitable for low designing low energy buildings.
- Next deadline for RAC is in September. It has to pass muster with TC 4.10.
- Transactions for CFD models this morning. Jim session, summary of last research project
- CFD validation has been done. Most are proprietary codes for cost effective validations.
- Academic groups like CEETHERM can be used for the facilities. Research is getting harder and harder.
- What distinguishes data center PIV measurements for academics. Simple room vs. experiments, data vs. model. Which university compare to commercial codes.
- Interested in participating, contact Mike Patterson for volunteers.

Dave Quirk talked on other two research projects which paralleled earlier discussion on the standard 90.4 initiative-

- Data center Energy Efficiency- Gap on (1)Baseline energy models and gap on (2)cost justification models
- (1)Set requirements and gaps in current modeling systems. Modeling criteria needs to be defined, Tiers, building sizes, HCAC system, load profiles, recommend range thermal guidelines.
- (2) Develop data center specific costs, require publically available cost information, baseline model
- Capital costs for ECM, maintenance costs, energy savings, useful life, IT systems cost tradeoffs,
- Model base cases system and air delivery. Doesn't have all of the variations for liquid cooling
- 90.1 Cost justification Model 7.0- IE. Scalar Ratio target vs. the target number. The SR has to be lower to pass analysis.
- Unknowns- Equipment life data, first cost data, energy data, maintenance data, SR calculation Comparisons-
- We can skip RTAR phase and proceed directly to work statements per ASHRAE staff. Drafts produced but need more work. Need to complete and vote out to RAC for review and detail. Get results back into the detail. Needs to happen before September
- These research projects will form some of the final foundations for 90.4 in the future
- Drop Dave an email if interested or Mike Patterson. Most teams work only for 4 folks and get back to the TC for review.

Mike Patterson back on-

- Denver program.(summer 2013) Special track to support ASHRAE research
- A seminar on two modeling procedures are recommended. Seminar on other TC 9.9

Programs

Nick Gangemi

- A summary for San Antonios-4 seminars, 1 transaction, 1 conference and 1 forum.. Seminar 60 and conf session 12 at 11:00 am on Wednesday.
- Reviewed paper and various meeting requirements; Transaction paper, 32 pages, double blind review, heavy duty research. Conference paper- 8 pages, single blind review, 400 word abstract. Seminars are the less, no review to make sure it is accurate.
- Forum is freewheeling ideas.

Dates for Denver

- Future projects- Have a lot of ideas.
- Publication updates, 90.1 issues, Controls, Commissioning, More IT for Engineers. Like to see 2-3 people.
- Request not to bypass Nick, it can't be protected, gets stuck in different TC
- Other topics
- Small Legacy data centers
- IT equipment delta T's
- Failure rate
- Case Studies on research
- Maintaining innovation and at what cost, what does that mean Risk vs. financial assessment.
- Codes inhibiting or enhancing
- Failure trends, what do they look like in US. What should message be?

Dallas

- Aug 13, Seminar proposals must be in to Nick. Nothing else is available (Past dates). No forums.

Denver everything wide open

- Sept 24th conference paper abstracts and full research papers due.
- Feb 11, 2013 Date for seminars ins
- April 1st, 2013

Additional Publications (see other discussions on Publications above0

Jack Glass in for Publications subcommittee Chair, Don Beaty.

- Power trends book in book store today. When it book 4 years old, they contact TC groups for update. Structural and Vibration books, liquid cooling books require updated, and then case studies. Not a front burner to revise case studies.
- Publications now has international subcommittee. Tom Watson, incoming ASHRAE president, has emphasis on international members/new focus. International membership is growing. Domestic membership is considered flat. Update on membership. New takes update on July 1. 15-20 Provisional corresponding members rolled on to corresponding, still 45 provisional members.

Meeting Adjourned

The Meeting was adjourned at 7:30 p.m.

Greg Jeffers – TC 9.9 Secretary, July 18, 2012