

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

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TC/TG/TRG MINUTES COVER SHEET

TC/TG/TRG NO: **TC 7.3**

DATE: **June 27, 2017**

LOCATION: **Long Beach, CA**

TC/TG/TRG TITLE: **Operation and Maintenance Management**

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		J. Patrick Carpenter (cm)		Andrew Ecgerd (cm)	
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GUESTS PRESENT		Charles Dorgan (cm)		<i>Forrest Yount (cm)</i>	
Orvil Dillenbeck		Christopher Draper (cm)		<i>Robert Zagar (cm)</i>	
Jason Tate		Frank Ecred (cm)		Syed Subukutheen (pcm)	
Jin Weu		Kevin Fallin (cm)		Danielle Dahan (pcm)	
Bradley Brooks		Jared Higgins (cm)		Michael Fleming (pcm)	
Kevin Brown		Glenn Hourahan (cm)		Nicholas Gayeski (pcm)	
		Tom Javins (cm)		David Handwork (pcm)	
		Manoj Khati (cm)		Liam Lafferty (pcm)	
		Michael Khaw (cm)		Dawen Lu (pcm)	
		Michael King (cm)		Hao Luo (pcm)	
		Mark Lowry (cm)		Steven Meier (pcm)	
		Warren Lupon (cm)		Philip Naughton (pcm)	
		Michael Mamayek (cm)		Terrence Rollins (pcm)	
		Joe Marchese (cm)		Stephen Wren (pcm)	
		Rick Danks		Richard Rooley (cm)	
		Jim Newman (cm)		H. Locke Hutson (cm)	

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Call to Order/Scope/Introductions

Chair John Constantinide called the meeting to order at 1:10 PM. The scope of the committee was read. Attendees in the room introduced themselves. An attendance sheet was circulated. The ASHRAE Code of Ethics was read.

Voting Member Roll Call

Secretary Sonya Pouncy took roll call of the voting members. At the time of roll call, seven (7) of the ten (10) voting members were present. A quorum was established.

Approval of the Agenda

The agenda for the meeting was presented. Motion to accept the agenda was made by Pouncy and seconded by Bobker. Approved by unanimous voice vote 6-0-0-0 (CNV).

Approval of Atlanta Meeting Minutes

The draft meeting minutes from Las Vegas were reviewed. Motion to approve the minutes was made by Ellis and seconded by Bobker. Approved by unanimous voice vote 6-0-0-0 (CNV).

Announcements

1. See Handout from Steve Ferguson regarding ASHRAE's work in helping to develop codes.

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Sub-Committee Reports

Attendance for all Subcommittees

Name	Email	Standards	Program	Research	Handbook	Education
David Norvell	See image of sign-in sheet attached	X				
John Constantinide		X	X		X	
Michael Bobker		X	X	X	X	
Orvil Dillebeck		X	X	X	X	
Jason Tate		X	X			
Mina Agarabi			X	X	X	
Jin Weu		X	X			
Michael Brambley		X	X	X	X	
Bradley Brooks		X	X	X	X	
Marija Todorovic						
Robyn Ellis		X	X	X	X	
Jaya Mukluopadhyay			X	X		
Mike Gallagher			X	X		
Kaih Nguyen (sp?)				X		
Sonya Pouncy			X	X	X	
Rob Kitchcock			X	X		
John Gibbenmeyer				X	X	
Kevin Brown			X	X		

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Research Sub-Committee – Chair: Michael Bobker

The following are minutes submitted from the Research Sub-Committee meeting held in person on Monday, June 26, 2017

1. Introductions. See separate sign-in list for attending.

2. Research Projects Status Report

RP 1609. This is a completed project. Further extension of the work is requested under WS 1801, sponsored by TC 1.5. PI Robert Hitchcock explained the project. The SC voted without dissent to recommend co-sponsorship to the full TC. Based on the SC recommendation, full TC action is required.

RP 1650 Operator Training for High Performance Building Systems

- Project in-progress. The PMS met morning of Tuesday 6/27 with PI Dr. Jaya Mukhopadhyay providing a project report. Project is on-schedule. Draft of milestone first project report was submitted for PMS review.
- PMS: Davidge Warfield, chair, Alex Heckman, John Fugard, Michael Bobker and participation from co-sponsoring TC's: TC 2.8 (Kevin Brown), TC 7.6 (Hoyin Kim) and TC 7.8 (Chuck Dale-Derks)

3. Requests from Other TC

Co-sponsorship for Work Statement 1781 is requested by Dr. Jin Wen of TC 7.5 (Smart Building Systems), sponsoring. This project is about creating a test protocol / test-bed for FDD algorithms for built-up AHU. The WS is available for review. After substantial discussion of the readiness of the WS, the SC voted without dissent to recommend co-sponsorship with the following clarifications and changes in language:

- “strategy” vs “tool” and “product”. It was subsequently agreed with Dr. Wen that the word “strategy” would be eliminated. “Tool” and “product” would be indicated as synonymous.
- Language to be added describing the relationship to and difference(s) from previous work, RP 1312 (2011)
- Review of Tasks to confirm that project is ready for bid and “biddable”
Based on the SC recommendation, full TC action is required.

Co-sponsorship for Conference Session Track is requested from TC 1.13 (Optimization). Full TC action required. This item was turned over to the Program Sub-committee for action – see Program SC minutes.

4. RTAR development and Research Ideas

Updates of RTAR development: no RTAR currently with RAC pending approval, approved, or under development

5. RTAR development to be undertaken:

M.Gallagher with support from K.Brown, J.Mukhopadhyay: laboratory testing of unitary ac equipment for energy performance with various maintenance faults;

B.Brooks with support from M.Bobker: Human Factors in the implementation and performance of O&M and On-going Commissioning

Several old and new research ideas were listed but without time to discuss and are kept for future reference:

- importance of training on design intent and control sequences of operation
- “transforming O&M”: review of electronic tools for maintenance management – applications of CMMS and electronic cloud-based logbooks
- building operations in the future smart grid – what do operators need to know?
- Coordination with new MTG on energy efficiency in existing buildings
- Engineers (in practice and teaching) perspective on O&M

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Chapter 39 REVISED Proposed Outline

1. In brief define O, M and O&M Management
2. Business case for O&M best practices (incl life cycle cost impact, cost of downtime, worker productivity)
3. The turnover
 - a. Check, test & start vs. commissioning
 - i. define each
 - ii. when is each appropriate
 - b. Who should be involved
 - c. Documentation requirements (incl. OPR, CFR)
 - d. Training requirements
4. In detail define operation,
 - a. how is the facility operated and controlled
 - i. what are the setpoints (what is being controlled)
 - ii. are setpoints allowed to vary and if so, on what basis (occupancy, time, outdoor conditions) (setback/setup/reset/load shed/warm-up/cooldown/demand control)
 - iii. who controls setpoints (facility manager, occupants)
 - b. how does the building engineer interface with building
 - i. non-communicating equipment
 - ii. communicating equipment
 - iii. BAS/BEMS
5. In detail define maintenance
 - a. Unplanned (reactive)
 - i. What it is, alternate terms (run to failure, breakdown)
 1. Emergency maintenance
 - ii. Where & where it is appropriate
 - iii. Pros & cons
 - b. Planned (proactive)
 - i. what is it
 - ii. where & when appropriate
 - iii. pros & cons
 - iv. strategies
 1. preventive
 - a. what is it (including alter names)
 - b. how is it implemented/ what are the tools
 - i. checklists
 2. corrective
 - a. what is it (including alter names)
 - b. how is it implemented/ what are the tools
 - i. AFDD
 3. predictive
 - a. what is it (including alter names)
 - b. what are some of the analysis techniques (vibration, thermography, oil analysis, refrigerant analysis, etc.)
 - i. explain 2 of the techniques & when they might be used
 - c. What are some of the implementation methods
 - i. SPC/Six Sigma
 - ii. Reliability centered maintenance
 1. What is it (including alternate names)
 2. how is it implemented

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- c. Selecting the best maintenance strategy for your facility and equipment (consider longevity, resiliency)
 - d. Determining who will operate and maintain the facility
 - i. in-house staff
 - 1. pros & cons
 - ii. out-sourced/ contracted services
 - 1. pros & cons
 - e. Control Techniques and Technologies
 - i. BAS/BEMS/EMS/BEIS
 - ii. CMMS
 - iii. Digital log books
6. Define your operation & maintenance program
- a. Assign authority
 - b. Setting objectives, KPI's and reporting protocols
 - c. Define tasks & tools
 - d. Documentation requirements (reference Guideline 4)
 - i. Document Directory
 - ii. Emergency Info
 - iii. Manuals
 - 1. Operating Manual
 - a. General
 - i. building description
 - ii. Building function
 - iii. SOO with setpoints
 - iv. Logs
 - b. Technical
 - i. design drawings
 - ii. system descriptions
 - iii. start-up procedures
 - iv. operating procedures
 - v. shut-down procedures
 - vi. trouble-shooting info
 - c. Required Testing
 - i. list of systems requiring testing (with frequency)
 - ii. test log (test dates and results)
 - iii. contact info for 3rd party testing
 - iv. Fire Protection
 - v. Boilers & Pressure Vessels
 - 2. Maintenance Manual
 - a. What is it
 - b. Why is it important
 - c. What is in it
 - i. Equipment Inventory
 - 1. Data sheets (submittals)
 - 2. Equipment location
 - 3. Equipment history
 - ii. Supporting Documentation
 - 1. Manufacturer IOM's
 - 2. Spare parts list (may be in the IOM)
 - 3. Maintenance task list (preventive should be in the IOM)

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4. HASPs
 5. Required PPE
 6. Tsk list and instructions
 7. TAB/ commissioning/factory test reports
 8. Repair histories
3. Safety Manual
 - a. Why safety matters
 - b. Communications protocols
 - c. Objectives
 - d. Regulations
 - e. Responsibilities and accountabilities
 - f. Building and building maintenance related hazards
 - g. Required safety measures:
 - i. engineering techniques,
 - ii. safe work practices,
 - iii. PPE
 - iv. administrative controls
 - h. KPI's
 - i. Training (topics, type & frequency)
 4. Emergency Manual
 - 5.
 - e. Technician Training
 - i. KSA Requirements
 - ii. Certifications
7. Implementing the O&M Plan
 - a. CMMS
 - i. what it is
 - ii. pros & cons
 - iii. Considerations in selecting a CMMS
 - iv. Implementing a CMMS
8. Planning for Upgrades
 - a. review maintenance logs
 - b. Conduct audit
 - c. Establish, classify and rank goals
 - i. retro-, re-, & on-going Commissioning
 1. what it is
 2. why it matters
 3. how to implement it
 - ii. Strategic energy management
 1. what it is
 2. why it matters
 3. how to implement it
 - d. Establish KPI metrics and reporting protocol
 - e. Implement
 - f. Measure and report results according to the plan
9. Updating the Plan
 - a. What to consider
 - b. When to consider it
 - c. How to implement it

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Motion to approve the sub-committee report was made, seconded and approved by unanimous voice vote 6-0-0-0 CNV.

Education & Training Sub-Committee – Chair: Mina Agarabi

The following are minutes submitted from the Education and Training Sub-Committee meeting held in person on Mon. June 26, 2017:

1. There was no subcommittee meeting
2. Discussion of Question #56
3. John to Ask Mike Vaughn requested to amend Question #56

Program Sub-Committee – Chair: Robyn Ellis

The following are minutes submitted from the Program Sub-Committee meeting held in person on Monday, Jun 26, 2017:

1. Introductions

2. Approval of the Long Beach Agenda–Approved.

3. Long Beach Program June 2017: TC 7.3

- **Monday, June 26, 8 a.m. Seminar 18**

- **Bridging the Information Gaps to Operation Management**

- *Room: 102AB*

- *Sponsor: 7.3 Operation and Maintenance Management, 7.9*

- *Building Commissioning, 7.8 Owning and Operating Costs*

- *Chair: Robyn Ellis, Associate Member, City of Hamilton – Public Works, Hamilton, ON, Canada*

- **1. Bridging the Information Gap during Commissioning and Project Turnover to Operations**

- *Chuck Dale-Derks, P.E., Member, McClure Engineering, St. Louis, MO*

- **2. Commissioning Documentation for Operations Management**

- *John Gibbemeyer, P.E., Member, George Mason University, Fairfax, VA*

- **3. Building Re-Tuning with Automated Data-Logger Networks**

- *Paul Reale, Building Performance Lab, City University of New York, New York, NY*

- **4. Commissioning in the Cloud**

- *Kris Kinney, Member, Highwoods Properties, Raleigh, NC*

- **Monday, June 26, 8 a.m. Workshop 8**

- **Opaque OPRs Produce Obscure Objectives**

- *Room: 201B*

- *Sponsor: 7.3 Operation and Maintenance Management, 1.7*

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Business, Management & General Legal Education

*Chair: E. Mitchell Swann, P.E., Member, Virtual Construction/
BIM Manager, Paoli, PA*

1. Owner's Perspective of an OPR

Wayne Webster, Member, Princess Towers, Inc., Kingston, ON, Canada

2. Cx Provider's Perspective of an OPR

Mina Agarabi, P.E., CPMP, Member, Agarabi Engineering PLLC, New York, NY

4. Announcements –N/A

5. Upcoming 2018 conferences, tracks and due dates: Chicago (Winter 2018) and Houston, TX (Summer 2018)

[followed by Atlanta (Winter 2019)]

6. Program Planning and Idea Log -See handout. Logs will be updated subsequently based on meeting discussion.

7. New Program ideas (as well as returning program ideas)

Potential for Chicago or Houston:

- a) Potential Topic: District Chilled Water, Potential Speakers: Terrence R. & John C.
Workshop may be best for interactive component
(Chicago in HE Track 8, or Houston in DE Track 3)
ACTION: follow-up with Terrence
ACTION: follow-up with Jason regarding potential healthcare speaker
- b) Potential Topic: design & operation in extreme conditions
Earth, wind & fire Track 4 Chicago
Orvil, extreme weather, John C., earthquakes, hurricanes, resilient systems, UFC criteria, NFPA, critical facilities
ACTION: follow-up with Orvil
ACTION: follow-up with John C.
ACTION: follow-up with Jason regarding potential healthcare speaker
- c) Potential Topic: Education on Hospital Systems & Equipment (Track 1 Chicago & Houston)
Jason has a speaker on hospital building systems apprenticeship who is president of ACCA
ACTION: follow-up with Jason regarding potential healthcare speaker
- d) Potential Topic: Awareness of Standard 180 (Track 3 Chicago on Standards, Guidelines & Codes)
Rick Danks, Tom as potential speakers
John C., Nate Boyd, Mike G.
ACTION: follow-up with Rick Danks & John C.
- e) Potential Topic: Lifecycle Costs & Energy modelling (Track 7 Chicago)
David Norvell as potential speaker
ACTION: follow-up with David
- f) Potential Topic: Controls freak-out, living with rigid parameters and common trouble-shooting issues
Track 8 Houston
Michael Bobker as potential speaker (or his contacts)
Mike Gallagher a related thought about what make a useful controls sequence of operations, touching on Guideline GPC 36
ACTION: follow-up with Michael Bobker & Mike Gallagher
- g) Potential Topic: O&M on building integrate solar pv
Marija Todorovic

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ACTION: follow-up with Marija Todorovic

- h) BAS Conference Paper by Orvil on schedule to be presented in Chicago
Possible Track 1?

TC doesn't sponsor conference papers

TC members will assist with the review

Possible topic for programs subsequent to Chicago when the paper will be presented

8. Opportunities for Program through partnerships with other TC's

TC1.13, New Track in 2019 on Optimization from Zheng O'Neill

Motion: Recommend New Track in 2019 on Optimization to full TC—Carried.

Concern was raised regarding silos when doing Optimization and the impact of Optimization on Operations & Maintenance

9. New Business

10. Adjourn

Other ideas:

John Constantinide and Terrence Rollins to speak on hospital systems

Motion was made, seconded and approved to recommend a new track with TC 1.6 to support optimization of HVACR by unanimous voice vote, 6-0-0-0 CNV.

Standards Sub-Committee –Chair: David Norvell

The following are minutes submitted from the Standards Sub-Committee meeting held in person on Monday, Jun 26, 2017:

1. Call to order
2. Introductions
3. Status update of on-going standards activities
 - a. Guideline 4: Preparation of Operating and Maintenance Documentation for HVAC&R Systems, Liaison: Davidge Warfield. Mr. Warfield was not able to attend the meeting, Jerry Kepler substituted for him. Michael Bebker briefed our sub-committee and stated that the guideline 4 committee was making progress. Guideline 4 revision has been approved. It should be going for public review prior to the Chicago winter meeting. There was a discussion as to whether guideline 4 and guideline 1.4 should be combined, since an O&M manual is simply a subset of a systems manual
 - b. Guideline 32: Sustainable, High Performance Operations & Maintenance, Liaison: Michael Bebker. Michael reported that the guideline committee did not meet. But that they have updated of original document and that it was ready for public review. There was an electronic committee meeting and that the document was approved for public review prior to the summer meeting in Chicago.

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- c. Standard 180 – SPC: Standard Practice for Inspection & Maintenance of Commercial-Building HVAC Systems, Liaison: Richard Danks. Mr. Danks was not in attendance but had sent a written report prior, which is attached to these minutes.
 - d. APPA Standard 1000: Total Cost of Ownership for Facilities Asset Management, Liaison: David Handwork. Mr. Handcock was not in attendance and there was not an update available.
 - e. GPC 1.3P – Proposed Guideline: Building Operation and Maintenance Training for the HVAC&R Commissioning Process (Co-cognizant with TC 7.9 lead), Liaison: Michael Bebker. Mr. Bebker reported that the editing was completed and that it was approved by electronic vote to go for public review prior to the winter meeting in Chicago.
 - f. GPC41P Design, Installation, and Commissioning of Variable Refrigerant Flow Systems. Liaison: Mina Agarabi. Ms. Agarabi was not in attendance and there was no update available.
 - g. SPC221 Test Method to Measure and Score the Operating Performance of an Installed Constant Volume Unitary HVAC System, Liaison: Rob Falke. Mr Falke was not present at the sub-committee meeting but did provide a written report prior, which is attached to these minutes.
 - h. MTGO&MEE Operations and Maintenance Activities the impact Energy Efficiency, Liaison: David Norvell. Mr. Norvell reported that he did not attend the meeting. Sonya Pouncy was at the committee meeting and may have a report.
4. Other business – no other business was discussed.
 5. Meeting adjournment

Motion to approve the sub-committee report was made, seconded and approved by unanimous voice vote 6-0-0-0 CNV.

Old Business

1. Publication and Education Council Functional Planning Subcommittee MBO Response #2 (See Addendum A for copy). It was decided that one answer needs to be changed.

New Business

1. Subcommittee Needs & Requests
 - a. Education & Training-None
 - b. Handbook-None
 - c. Program-None
 - d. Standards-None
 - e. Research- Need to brainstorm and generate ideas that subcommittee members can develop
2. Closed Session Items & Votes
 - a. None

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Action Items

1. John Constantinide and Keith Reihl, Chair of TC 7.8 to discuss development of an app for O&M costs
2. Keith Reihl to consult ALI course info.

Next Meeting

The Chicago, IL meeting will be Jan 20, 2018 – Jan 24, 2018. The Committee meeting will be Tuesday, Jan 23rd from 1:00 PM -3:30PM. Sub-committee meetings will be held on Monday afternoon Jan 22nd. (All rooms to be announced).

Adjournment

A Motion to adjourn the meeting was made, seconded and approved by unanimous voice vote, 6-0-0-0 CNV. The chair adjourned the meeting at 3:28 PM