Goal 2: Commercial Quality Installation SFDS Working Group
Wednesday October 5, 2016 Meeting Notes

Call to Order

The meeting was called to order at 11:04 am PDT by Pete Jacobs, BuildingMetrics Inc. and Chair. Meetings are normally scheduled for up to 2 hours.

Roll Call

Quorum for voting organizations = 13 of 24. 9 of 23 voting members, 1 non-voting members and 1 guest/staff attended this meeting. A total of 11 members and guests were in attendance.

P = present at meeting
A = absent voting member; if proxy has been assigned it will be noted below.

WHPA Goal 2: CQI SFDS Working Group VOTING Members				Roll Call
ACCA (Air Conditioning Contractors of America)	Donald	Prather	Contractor Association	P
Aire Rite AC & Refrigeration	Larry	Smith	Contractor (Nonresidential)	
BMI (BuildingMetrics Inc.)	Pete	Jacobs	Energy Efficiency Program Consultant	P
Carrier Corporation	Dick	Lord	HVAC Manufacturer	
CDH (CDH Energy Corporation)	Hugh	Henderson	Energy Efficiency Organization	
Clean Energy Horizons, LLC	Norm	Stone	Energy Efficiency Program Consultant	
Cooper Oates AC	Gary	Storck	Contractor (Nonresidential)	
Daiken Applied	Skip	Ernst	HVAC Manufacturer	P
DEG (Davis Energy Group)	Dave	Springer	Energy Efficiency Organization	
DNV-GL (formerly KEMA)	Jarred	Metoyer	Energy Efficiency Program Consultant	P
Energy Analysis Technologies	Chris	Ganimian	Consultant	P
Energy Solutions**	Jim	Hannah+	NR	P
FDSI (Field Diagnostic Services Inc.)	Dale	Rossi	Third Party Quality Assurance Providers	P
Galawish Consulting & Associates	Elsia	Galawish	Energy Efficiency Program Consultant	P
HSGS (Honeywell Smart Grid Solutions)	Shayne	Holderby	Energy Efficiency Program Consultant	
IC Refrigeration	Richard	Imfeld	Contractor (Nonresidential)	
JCI (York Unitary)	Bryan	Rocky	HVAC Manufacturer	
Marina Mechanical	Denny	Mann	Contractor (Nonresidential)	
NCI (National Comfort Institute)	Ben	Lipscomb	Educator, Trainer	P
PG&E (Pacific Gas and Electric)	Adam	Scheer	California IOU	
SCE (Southern California Edison)	Steve	Clinton	California IOU	
University of Nebraska (Lincoln)	David	Yuill	Educator, Trainer	
XCSpec	Jan	Peterson	Controls (Manufacturer or Distributor)	

WHPA Goal 2: CQI SFDS Working Group Non-VOTING Members				Roll Call
ACCA (Air Conditioning Contractors of America)	Wes	Davis	Contractor Association	
ACCA (Air Conditioning Contractors of America)	Glenn	Hourahan	Contractor Association	
Aire Rite AC & Refrigeration	Don	Langston	Contractor (Nonresidential)	
NCI (National Comfort Institute)	Rob	Falke	Educator, Trainer	P
PG&E (Pacific Gas and Electric)	Leif	Magnuson	California IOU	
PG&E (Pacific Gas and Electric)	Robert	Davis	California IOU	
SCE (Southern California Edison)	Lori	Atwater	California IOU	
SCE (Southern California Edison)	Andres	Fergadiotti	California IOU	

Goal 2: Commercial Quality Installation SFDS Working Group
Wednesday October 5, 2016 Meeting Notes

SCE (Southern California Edison)	Sean	Gouw	California IOU	
XCSpec	Jeff	Aalfs	Controls (Manufacturer or Distributor)	
WHPA Goal 2: CQI Committee Invited Guests and Staff				Roll Call
STAFF				
BBI (Better Buildings Inc.)	Dale	Gustavson	WHPA Executive Advisor	
BNB Consulting/WHPA Staff, host, admin. support & scribe	Bob	Sundberg	WHPA Staff	P
Enpowered LLC	Shea	Dibble	WHPA Co-Director	
John Hill **	John	Hill +	(CPUC/ED Ex Ante Consultant)	
Mechanical Systems Design & Consulting	Jeff	Henning	Educator, Trainer	

** *Organization is Not a Member of the WHPA; + Individual is NOT Registered with the WHPA;*
(P) after last name = *Member/Registrant is Pending Approval from the WHPA Executive Committee*

AGENDA

Topic	Discussion Leader	Desired Outcome
Welcome, roll call, approve past meeting minutes, review ACTION items and agenda	Pete Jacobs and Bob Sundberg	Record meeting attendees, finalize past meeting minutes, review status of meeting action items.
Welcome new members & guests	Pete Jacobs	New members and invited guests welcomed.
Review Updates to Commercial Installation Data Specification	Pete Jacobs	Thoroughly understand updates to the spec.
Discussion on current Data Specification	Pete Jacobs	Gather additional input, comments and suggestions.
Discuss suggested changes/revisions to spec.	Pete Jacobs	Reach a decision on all suggested revisions.
Finalize plans on a vote	Pete Jacobs	Decision made about when/how a vote would be taken.
Discuss and plan how to hand off the data spec. to the Commercial Maintenance and Residential Installation Committees	Pete Jacobs	Decide on a process for delivering this draft of a data spec. to other committees.
Determine ACTION items, schedule next meeting & adjourn	Pete Jacobs and Bob Sundberg	Conclude meeting and make arrangements for next meeting.

Goal 2: Commercial Quality Installation SFDS Working Group
Wednesday October 5, 2016 Meeting Notes

Approve Minutes of Previous Meeting

The December 29, 2015 meeting draft notes were distributed January 1, 2016. No suggested revisions were received. Meeting notes were approved as distributed. Final minutes would be posted to the working group's location within the WHPA/CQI Committee website.

Review Status of Action Items from Previous Meeting

Dec. 15, 2015 ACTION: Pete Jacobs would contact chairs and/or key committee members to discuss how best to proceed with cross-cutting efforts toward additional data specifications relevant to residential installation, commercial maintenance and the Energy Savings and DEER Committee. Completed.

Dec. 29 Update: Rob Falke met with Don Langston the previous week. Don said he was very much in favor of what this WG was attempting. Don wanted to meet with Pete, Dale Rossi and Rob early in January to discuss how they could proceed most effectively. Rob had also contacted Chris Ganimian and they'd agreed to also meet in January to align their efforts and discuss how they should proceed regarding residential installation WG work in 2016. Dale Rossi suggested Pete and Don and Rob meet in person at the ASHRAE meetings Friday January 22. Discussions completed.

Dec. 4 ACTION: Rob Falke and Larry Smith would work together over the next couple of weeks to identify recent jobs where full before/after evaluation data was collection for Standard 180 program customer units. Rob offered to pull the data and share the data and analysis with this group to demonstrate the impact of Standard 180 based maintenance and their approach to data collection and analysis. Pending.

November 13 ACTION: Dick Lord, Carrier, offered to provide the group with a copy of the white paper he'd authored related to test parameters and procedures. Pending.

Welcome New Members and Guests

None.

New Business - Pete Jacobs

None.

Standardized Field Measurement Data Specification --- Pete Jacobs

Pete Jacobs, BuildingMetrics Inc. and Chair, provided an overview of the proposed agenda. He intended to begin with a review of updates made to the specification since the last two December 2015 meetings. Next, the floor would be opened for new comments and a discussion on the current specification, version 7. The group would walk through the spec. and gather additional suggestions for revision. Before adjourning, he planned to have the group decide on general timing to complete the specification and vote on its approval to allow time for the full CQI Committee and Executive Committee to consider and, hopefully, approve/adopt it as a WHPA work product. The group also needed to complete plans for how they would address versions to hand off to the Commercial Maintenance and Residential Installation Committees.

Background

Pete provided a background summary. Member comments had been received regarding the previous version 6 of the specification. It was considered:

- too complicated, too much data, some not necessary or unrealistic for field data collection
- its focus was too broad, needed to be narrowed down to commercial installation,

- it needed to be in more of a narrative form providing explanations

Rather than their work product being only in a large spreadsheet format with multiple tabs, recommendations were made that it needed more narrative and to include appropriate parts of the draft spreadsheet information in smaller chunks as each part of the work product was addressed.

Comparison of version 7 to version 6

Pete talked through a slide which provided highlights for changes made for the current version 7. They wanted the specification to address current IOU programs and the data required to build the performance metrics.

- Focus the scope on current Commercial Installation programs
  - Commercial Renovation Pilot (current SCE pilot)
  - Comprehensive Value Chain Heating, Ventilation, and Air Conditioning Program (SCE) which had been designed and was working through the approval process (commercial renovation program)
- Focus on data required to calculate the relevant performance metrics
  - Equipment efficiency and capacity
  - System delivered efficiency and capacity
  - Distribution system efficiency
  - Benchmark Performance Indicators for airside performance

Specification content

By moving this information from a spreadsheet format to a word document, the would be able to provide helpful explanations to help those intending to use the spec. to more easily and quickly understand what was intended. Most of the content remained the same. They added a new section to capture utility information if the building was expected to be participating in a utility program.

- General Job Information
- Utility Information
- General System Information
- In-Field Test Data
- Required Test Instruments and suggested accuracy specifications
- Q and A

General job information changes

- Added unique Identifier
- Added Utility data section
  - Data specific to utility program participation

Pete reminded attendees of the spreadsheet that had been sent out earlier in September which detailed a side-by-side comparison of versions 6 and 7 where key differences were highlighted. He then reviewed a summary of the utility information data points. Utility programs often had unique data requirements in order to allow sites to be properly evaluated. They included data fields for many of the items known to need to be tracked either for deemed or custom programs.

Goal 2: Commercial Quality Installation SFDS Working Group
Wednesday October 5, 2016 Meeting Notes

Utility Data

Data Point Number	Data Point Name	Description	Version 6 to Version 7 Comparison Comment
2.1	Building Type	Specific building types as defined by program	Moved down from Job Information
2.2	Climate Zone	Climate zone where the building is located	Link job to appropriate deemed savings value
2.3	Electric Meter Number	Meter number service the system tested	Moved down from Job Information
2.4	Electric Account Number	Billing account number	Moved down from Job Information
2.5	Gas Meter Number	Meter number service the system tested	Moved down from Job Information
2.6	Gas Meter Account Number	Billing account number	Moved down from Job Information
2.7	Measures installed	Measure names and/or measure codes	
2.8	Incentive application number if known	Contractor incentive application number to Utility or Program Implementer	Links test data by unique ID to incentive application
2.9	Age of building	Approximate age of building	Link job to appropriate deemed savings value
2.10	Data entry date	Data entry date	Used in process evaluation to assess time lag between field work and data entry

Rob Falke, NCI, raised issues related to cyber security and privacy regarding meter number and account number for those who would be collecting an storing that information on software.

Pete agreed that this caution should be foot-noted.

<u>Changes to the general system information section</u>

- Added economizer controller make and model
- Removed unused data elements
  - Cubic feet served
  - Past program sticker numbers
  - Cooling stages
  - Heating stages
  - Design relief airflow – difficult to collect
- Shifted data element to future commercial maintenance specification
  - Filter media type
  - Diagnostic data
    - refrigerant type,
    - factory charge,
    - target subcooling,
    - line length

Dale Rossi, FDSI, suggested they keep unit rated EER but not call for a SEER rating because it included a lot of partial runtime, especially on multiple speed compressors. That partial run information in SEER made it difficult or would be confusing for some to understand how the unit should be running under full load.

Pete Jacobs thought it was a good suggestion and agreed to revise the spec.

Changes to in-field test data

- Removed unused data elements
  - Relief air flow – difficult to capture in the field, not needed for calculations
  - Duct leakage test method
    - CQI program only used flow hood method
    - Data specific to duct blaster tests also removed
  - Supply fan full load Hz – no use seen
  - Economizer minimum airflow position
    - Superseded by actuator signal, thought to be a more reliable indicator of position than visual assessment of % open, minimum position
- Diagnostic info transferred to future maintenance specification
  - Economizer function test
  - Refrigerant charge diagnostic test data
  - Compressor and condenser electrical data
  - Combustion system data
  - Safety checks

Skip Ernst, Daiken Applied, commented on the economizer actuator signal data point. He thought that it should be more specific to avoid field confusion. Possibly, state actuator signal at minimum position.

Rob Falke, NCI, indicated that a key measurement was for airflow and outside air/economizer damper minimum position.

Pete Jacobs invited any additional suggestions which would help address ambiguous data point descriptions.

GENERAL DISCUSSION

Rob Falke, NCI, commented that it had become more clear to him as this spec. moved from a spreadsheet format to a narrative that the specification was really a scoring method for the impact that the system could deliver to the building. The entire system was scored, not just the equipment/unit, following installation. There was a lot more information being collected now than was being called for when compared to the December draft.

Skip Ernst, Daiken Applied, commented on tab 4, In-Field Test Data. He questioned whether field techs could provide all of the listed points of airside pressure. If they did, wouldn't they be introducing a lot of holes in the system which might not be plugged?

Pete Jacobs responded that they had actually removed quite a few airside pressure readings. They'd left in the total external static for the unit. They'd removed most of the intermediate measurements. Something like a filter measurement might be something done as part of a maintenance regimen but was not necessary for this spec.

Skip Ernst then brought up mixed are temperature (MA) measurement. He thought that in commercial units the mixing was not very effective and where to measure accurately varied by the temperature of the airstream.

Pete Jacobs thought that the Achilles heel of the entire calculation was getting a good, accurate measurement of the outside airflow. The preferred method would be a direct measurement of outside air under the intake hood. If not possible, alternatives could be taking an averaged of mixed air temperatures.

The group discussed various locations and combinations of locations for sensors to try and capture an accurate MA reading. The best sensor location was not readily provided by manufacturers from their laboratory testing. Unit airflow characteristics varied greatly.

Rob Falke, NCI, commented that field testing did have many more variables to contend with than laboratory testing. But, if typical units were installed as much as 40% below the equipment rated efficiency, there was a lot to be gained even if measurements were not absolutely accurate. Air balancers had operated for over 50 years testing systems with field measurements and were really the authority. The reality was that there was limited time to take measurements in the field vs. a year or longer in the lab.

Pete Jacobs suggested that they might review some of the data collected during the SCE commercial renovation program at a future meeting. The accuracy of the individual measurements and how error and uncertainty was being dealt with. So far, in the majority of cases he'd reviewed, the movement in the performance metric was bigger than an uncertainty band on the calculated value. To draw any meaningful conclusions, you'd have to examine the uncertainty in any data set.

Standardized Field Measurement Data Specification version 7.0

Pete Jacobs led a review of the content section in the specification which included: 1. General job data; 2. Utility information; 3. General system information; 4. In-field test data; 5. Required test instruments; 6. Questions and answers section.

** In the 3. General system information section page 7, the group thought the Design Criteria section heading should be moved up to capture the earlier "design" information. Decisions:

- Change 3.35 and 3.36 to "current" from "design
- Move 3.37 down and into the design criteria group

4. In-Field Test Data

The group discussed the minimum temperature for which refrigeration charge and other values could be reliably tested and be considered under full load. Ben Lipscomb, NCI, suggested that it was pretty commonly accepted to be 65 degrees F. He thought that manufacturer lower limits often only went down to 85 degrees F.

Dale Rossi, FDSI, mentioned that his firm routinely tested down to 55 degrees F utilizing manufacturer extended performance data and manufacturer data was available up to 115 degrees F. That testing required steady state conditions and the condenser fans needed to be jumpered out.

Skip Ernst added that manufacturers offered performance data at typical design conditions which would typically be 85 to 115 degrees F.

Dale Rossi mentioned the reality for technicians that they tried to work their 40 hours per week, 50 weeks a year. They couldn't always wait for design conditions in order to complete their assigned work. Too strict a standard would eliminate most of the testing time which was available. Dale Rossi stated that 50 degree F wet bulb was a limit to their testing.

Ben Lipscomb summarized that technicians would have to work within those limited conditions unless they were provided with tools, a protocol and manufacturer extended condition data which was not typically published with the equipment.

Bob Sundberg, WHPA staff, asked whether the specification would benefit from a foot-note or asterisked comment providing a caution about ranges of operating conditions within which evaluation of performance should be conducted?

Pete Jacobs responded that he thought there would be follow-on activities after the data specification work was completed which could address instrumentation types and evaluation techniques. That work could include and address cautions and limits on test conditions when it tackled how to take the data.

Donald Prather, ACCA, raised a question about whether the table included economizer strategy options or settings in the space thermostat. After some discussion, the group concluded that all the commercial thermostats they knew simply called for heating or cooling by established temperature setpoints. A separate economizer logic module or the EMS system separately determined, on a call for cooling, whether conditions were suitable for use of outside air as a preliminary stage for cooling prior to mechanical cooling being turned on.

Follow-Up and Planning for Completion of WG Work Product

Pete Jacobs proposed that everyone needed sufficient time to review the current version 7 specification. He asked that all members provide him with their comments by October 19, two weeks out. He said that they had a group of more academic reviewers who'd volunteered to examine the group's specification. He wanted to run a parallel activity and ask those reviewers to also provide him with their comments by October 19 which he would incorporate along with WG member comments.

Pete proposed the group re-convene and discuss the comments and suggested revisions prior to taking a vote. They could meeting Wednesday October 26. Not knowing how many members could attend that meeting, he suggested they plan on an email vote following that meeting in order to reach a quorum of members. Attendees agreed.

This meant that the previously scheduled full CQI Committee meeting for October 28 should probably be re-scheduled later to allow that committee's members the opportunity to review the WG work product. Rob Falke proposed the full committee meeting be postponed to Friday November 4.

Ben Lipscomb suggested that if could be left to Pete's judgement whether they met on October 26 depending on the number of comments he received back and whether Pete thought a meeting was called for. Others agreed and it would be left to Pete to decide about whether to hold the October 26 meeting or not.

Next Steps to Hand Off a Specification to the Commercial Maintenance and Residential Installation Committees

Pete reminded the group that part of their overall 2016 goal was to transform the commercial installation (CI) specification into one more customized for two other related committees to evaluate and revise.

Bob Sundberg, WHPA staff, clarified that there was sufficient staff resource to support four additional hours, or so, of WG meetings to complete customizing the CI spec. for the other two committees.

ACTION: All WG members were to review version 7 of the specification and provide Pete Jacobs with their comments and suggestions. Pete would determine whether there were sufficient revisions to warrant another scheduled meeting or if they could proceed with a WG email vote. He'd inform everyone prior to the 26th.

Closing Comments/Adjournment

Pete Jacobs thanked everyone for attending and their contributions. He looked forward to getting everyone's comments and would let everyone know whether they would be meeting October 26 or not.

The meeting was adjourned at 12:32 pm PDT.

* * * * * *

Summary of Pending and New Action Items and Key Decisions or Understandings

October 5, 2016 ACTION: All WG members were to review version 7 of the specification and provide Pete Jacobs with their comments and suggestions. Pete would determine whether there were sufficient revisions to warrant another scheduled meeting or if they could proceed with a WG email vote. He'd inform everyone prior to the 26th.

Past ACTION Items:
Dec. 4 2015 ACTION: Rob Falke and Larry Smith would work together over the next couple of weeks to identify recent jobs where full before/after evaluation data was collection for Standard 180 program customer units. Rob offered to pull the data and share the data and analysis with this group to demonstrate the impact of Standard 180 based maintenance and their approach to data collection and analysis. Pending.

November 13 2015 ACTION: Dick Lord, Carrier, offered to provide the group with a copy of the white paper he'd authored related to test parameters and procedures. Pending.