WHPA Goal 2: CQM Standard 180 User Guide Working Group
Thursday February 23, 2017 Meeting Notes

Call to Order

The meeting was called to order at 9:03 am PST by Dale Rossi, Chair of this working group and a representative of Field Diagnostic Services Inc. (FDSI).

Roll Call

The Chair considered one member of each organization to be a voting member for this working group. 9 of 16 voting members in attendance would constitute a quorum. 7 voting members, 1 non-voting members, 1 guests and 1 staff were present for a total of 10 attendees.

P = Present at meeting
A = Absent from meeting; if proxy has been assigned it will be noted below.
Although Voting Members have been designated by Staff, this group acts primarily by consensus.

CQM User Guide Working Group Voting Members				
ACCA (Air Conditioning Contractors of America)	Donald	Prather	Contractor Association	P
Air Management Industries	April	Yungen	Contractor (Nonresidential)	
Aire Rite AC & Refrigeration	Don	Langston	Contractor (Nonresidential)	
AMS (American Mechanical Services)	Marc	Pickett	Contractor (Nonresidential)	
Charles Segerstrom, Energy Efficiency Consulting	Charles	Segerstrom	Energy Efficiency Program Consultant	P
CLEAResult (formerly PECI)	Todd	Van Osdol	California IOU	P
FDSI (Field Diagnostic Services Inc.)	Dale	Rossi	Third Party Quality Assurance Providers	P
GWP (Goodheart-Willcox Publisher)	Sandy	Clark	Educator, Trainer	P
Honeywell E&ES, Commercial Buildings, Trade	Michael	Lawing	Controls (Manufacturer or Distributor)	
HSGS (Honeywell Smart Grid Solutions)	Shayne	Holderby	Energy Efficiency Program Consultant	
National Comfort Institute	Jeff	Sturgeon	Educator, Trainer	
Richard Danks Consulting - FacilityPro	Rick	Danks	Other Stakeholder	P
SCE (Southern California Edison)	Scott	Higa	California IOU	P
Tre' Laine Associates	Pepper	Hunziker	Energy Efficiency Program Consultant	
Western Allied Corporation	Mike	Gallagher	Contractor (Nonresidential)	
Warren Lupson and Associates	Warren	Lupson	Other Stakeholder	
CQM User Guide Working Group Non-Voting Members				
BELIMO	Darryl	DeAngelis	Controls (Manufacturer or Distributor)	
BMI (BuildingMetrics, Inc.)	Pete	Jacobs	Energy Efficiency Program Consultant	
CLEAResult (formerly PECI)	Michael	Blazey	Energy Efficiency Program Consultant	P
HSGS (Honeywell Smart Grid Solutions)	Steve	Varnum	Energy Efficiency Program Consultant	
SCE (Southern California Edison)	Steve	Clinton	California IOU	
UC Davis EEC (Energy Efficiency Center)	Kristin	Heinemeier	Research Organization	
CQM User Guide Working Group Guests (Non-Voting)				
Adrienne Thomle, Consulting**	Adrienne	Thomle+		
Fresno Unified School District	Frank	DiLiddo		
Little Caesar's **	Wendy	Gallo+		P
WHPA Staff (Non-Voting)				
BBI (Better Buildings Inc.)	Mark	Lowry	WHPA Executive Advisor/BBI COO	
BNB Consulting/WHPA Staff	Bob	Sundberg	Energy Efficiency Program Consultant	P (scribe)
Enpowered Solutions/WHPA Staff (WHPA Co-Director)	Shea	Dibble	Energy Efficiency Organization	

*** 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*

To avoid repetition, the name of the member organization will not be repeated in the body of the minutes past the first identification with the name of the representative participant.

WESTERN HVAC PERFORMANCE ALLIANCE

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Welcoming and Member Introductions

Attendees were welcomed.

Approve Previous Meeting Draft Notes

The February 16 meeting draft notes were distributed February 24. Finalized meeting notes would be posted to the WHPA website by Bob Sundberg.

ACTION Items

None.

New Business – Dale Rossi and Bob Sundberg

None.

AGENDA

Topic	Discussion Leader	Desired Outcome
Welcome, Roll Call, Member Introduction, Approve Past Meeting Notes, Review Action Items, New Business, Meeting Agenda	Chair, WHPA Staff	Record attendees, welcome any new members, approve previous meeting minutes, review status of any open Action items, planned agenda and bring up any new business items for the WG to consider addressing.
WG Topic Outline	Dale Rossi	Agree on 2016 topics the WG will address.
Develop Tasks for each Topic	Dale Rossi	Tasks listed for next topics discussed.
Discuss Measurement, Data Gathering, Reporting, Validation Topic	Dale Rossi	Agree on how they would approach this topic in development of the user guide.
Detailed Plan for Meetings Through June 2017	Dale Rossi	Agree on topics to be worked at all remaining meetings through June 2017.
Confirm last meeting date/time, assign actions and proposed agenda and adjourn.	Dale Rossi, WHPA Staff	Clear understanding of member responsibilities for the next meeting. Next meeting date/time established.

NOTE: **The discussions at this meeting jumped back and forth between topics of reporting and measurement quite a lot and as additional members were able to join the discussions. Staff tried to collect discussions on the same topic and place them together rather than record the discussion in strict chronological order.**

Review of Feb. 16 meeting draft report – Dale Rossi

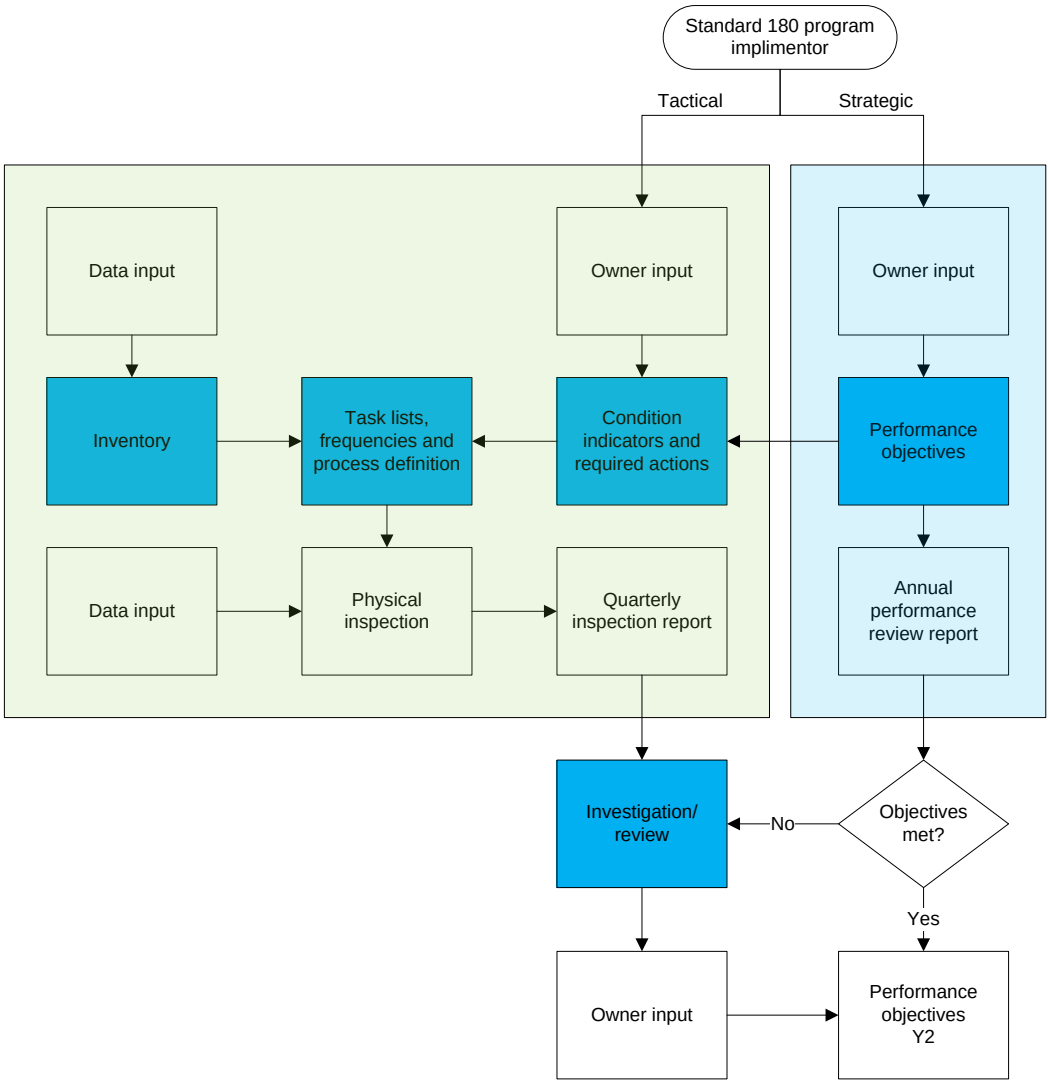
Dale Rossi – started to put WG decisions and past discussion content into the "report" format. At the previous meeting, he sensed that some additional understanding of Standard 180 was needed. He had produced two flow charts to help him understand and visualize how he thought the standard was intended to work at a high level. In the first chart, the Standard 180 implementer was the party responsible for implementing maintenance on the HVAC systems, typically the contractor, and who would deliver reports to the responsible party/owner. He thought that this implementer/contractor had two ways or levels at which they approached the standard – tactically and strategically. See flow chart 1. The second flow chart had been developed previously to help differentiate between the roles of the responsible party/owner, contractor manager, technician and available technology.

- The strategic way involved that development of performance objectives and reporting on the entire program. That also involved taking action when investigations were necessary, resolving issues and changing task frequency or resources as needed to revise and attempted to continuously improve the program and results.
- The tactical approach involved development of system condition indicators, maintenance task lists, physical inspections, data inputs, quarterly reports and investigations.

Flow Chart 1: Introduction to and Overview of Standard 180

How does Standard 180 work?

- *The plan*
- *The program*



Dale developed this overview in response to a request at the previous meeting about how to turn quarterly reports into performance objectives. He couldn't figure out how to do that – the jump from when investigations for when condition indicators and/or performance were unacceptable to the level of maintenance program performance objectives not being met. This chart helped him express how, in his thinking, they were not in the same chain of reasoning, were at

different process levels within the same overall program. The performance objectives were an evaluation about how well the program was working while the quarterly inspection reports based on condition indicators were focused on how well the actual HVAC system was operating. System operation was, certainly, related to meeting performance objectives but loosely or indirectly connected.

Measuring Pressure Drops as a Condition Indicator & Airflow Validation

Dale Rossi – this subject was discussed at the last meeting and he was confused because it seemed to be used in two ways. At one point Dale had indicated that measuring airflow was not listed as a maintenance task in the standard. He recalled that Rick Danks had then indicated that although it was not specifically spelled out and listed in the standard, it was one of those inspections which could be used as a condition indicator. The point which Dale wanted to make was that there was nothing he was aware of in the maintenance task tables which referred to taking any airflow related measurements, either quantifying it or validating it. He didn't want to bring it up to see if one of them was right or wrong but, rather, because the needed to consider whether airflow related measurements should be included in the standard. Theoretically, he thought it should. Practically thinking and from his limited experience, he wasn't sure the time and effort it would require should be considered as a required task in a minimum standard. He wondered whether they should be looking at all the Section 5 tables and consider suggesting airflow validation be added where appropriate? He asked Rick Danks for his opinion.

Rick Danks, Richard Danks Consulting – airflow was directly related to both thermal comfort as well as indoor air quality as well as system energy efficiency. He thought knowing proper airflow was critical to meeting the scope of the standard. He hadn't looked at those tables in a long time but thought it should be considered, maybe later in their work.

Donald Prather, ACCA – it wasn't called out in the rooftop unit table. If it would be anywhere, you should find it in Table 5-1 Air Distribution. He'd checked and it wasn't there either.

Dale Rossi – the NCI air side approach had value but he didn't think it was part of the current concept of maintenance. The group needed to decide whether they should consider changing the concept of maintenance to include the NCI approach or whether it was a part of other services, but not a part of maintenance. That question didn't need to be answered right then but he thought it was interesting.

ACTION: the working group needed to decide whether they should change their concept of maintenance to include airside measurements or not. Also, whether they believed that airflow related measurement needed to be added to Standard 180 or not.

Dale Rossi – Jeff Sturgeon had talked about airflow measurements at previous meetings. But, Dale thought his statements were from an NCI perspective in an effort for airside measurement and analysis to become an industry standard. While Dale thought there was merit to that approach, taking and tracking airside measurements was not, in his opinion, a common practice in the industry and there were counterpoints which some could make. Airflow measurement, in his opinion, was outside the parameters of current maintenance practices.

Air filtration and service, like many equipment design features and maintenance practices, was a balance between competing goals. From a pure airflow perspective, having no filter would be the ideal since the pressure drop would be zero. But, filters were used to keep the coils clean, to avoid the high expense for cleaning and to avoid the big impact of degraded heat transfer and decreased system capacity. There was a significant efficiency penalty when coils got dirty. Use of more restrictive pleated filters would results in somewhat greater fan energy use and improve indoor air quality. To pay a little more for fan energy to avoid expensive evaporator coil cleaning was a reasonable business decision. He asked if the group agreed.

Charles Segerstrom – he countered that there were code requirements for airflow in CFM/ton that should be maintained and fan watt draw standards which were beyond one proprietary approach, like NCI's. He thought that NCI's

approach should be explored now that you could measure airflow related factors more simply and inexpensively. He'd like the group to take advantage of new analysis capabilities which were emerging that were fairly inexpensive and which could move quality maintenance beyond just a prescriptive checklist like simply a visual filter inspection. New practices and measurement had the potential to provide valuable data and help create greater value.

Dale Rossi – agreed with the goals Charles suggested but not with his analogy. Dale thought that the types of airflow measurements Jeff and NCI advocated where more generally done during equipment initial installation and commissioning or at other similar events and not during routine maintenance as it was currently conceived in the industry. He considered it pretty invasive. He thought of it as being more like putting a guy on a treadmill to run a stress test rather than checking his heart with a stethoscope. The NCI approach looked at the airside only and not at the refrigeration cycle at all.

Charles Segerstrom – responded that contractors commonly replaced the manufacturer recommended filters with those having higher MERV ratings in an attempt to improve indoor air quality and, maybe, to further protect those coils. That change, thought to be an improvement, could have consequences with hindering proper airflow, causing coil icing and the like.

Dale Rossi – manufacturers commonly recommend 40% air filters but without having any idea what sort of duct system was going to be designed for the building. Commercial common practices usually resulted in undersized returns that greatly restricted airflow.

Charles Segerstrom – those issues should have been addressed in the design and commissioning process, but often weren't.

Dale Rossi – he repeated his understanding of comments Charles had made at the previous meeting about his interest to, somehow, make use of the output of those quarterly inspection reports in the annual performance evaluation reporting. For Dale, the quarterly reporting and annual reporting seemed to be very separate functions. He'd added a link at the bottom of the chart where performance objectives were not met. He believed this link would lead a contractor to need to drill down into those quarterly reports and investigations that had to be conducted in order to find explanations for why goals were not met and to revise the maintenance plan and probably performance objectives for the next year. Dale was still struggling with how they would describe how to cross-over between the tactical practices and reporting to the annual more strategic planning and reporting.

Rick Danks – suggested they consider looking through the lens of "continuous improvement" which he thought was really the foundation of why you would want to measure anything in the first place. You measured to manage a process and improve whatever you were doing. He thought Dale had captured this Deming quality principle quite well. The quarterly inspections, analysis and reporting could identify equipment related improvements which could be made. The ideal would be to not need inspections because the equipment was bullet-proof, which, of course, it never is. You could improve the performance of the program by achieving the same end result as desired but with less effort and resource. You'd roll the quarterly inspection reports and conclusions up into that annual evaluation reporting and be in a position to recommend making adjustments and improvements to the overall program. Put more attention and resources where it needed to be placed.

Dale Rossi – he agreed. The goal was to meet those performance objectives but over time to do so more efficiently and at lower overall cost. He still struggled with how quarterly reporting could be done in a way to link it more directly with those more strategic performance objectives.

Charles Segerstrom – he looked forward to the user guide including a baseline of minimum standards but that it would also be embellished by suggesting additional methods and measurements like short-term and wireless monitoring. These additional suggestions would allow them to measure more key factors at lower cost to provide greater value.

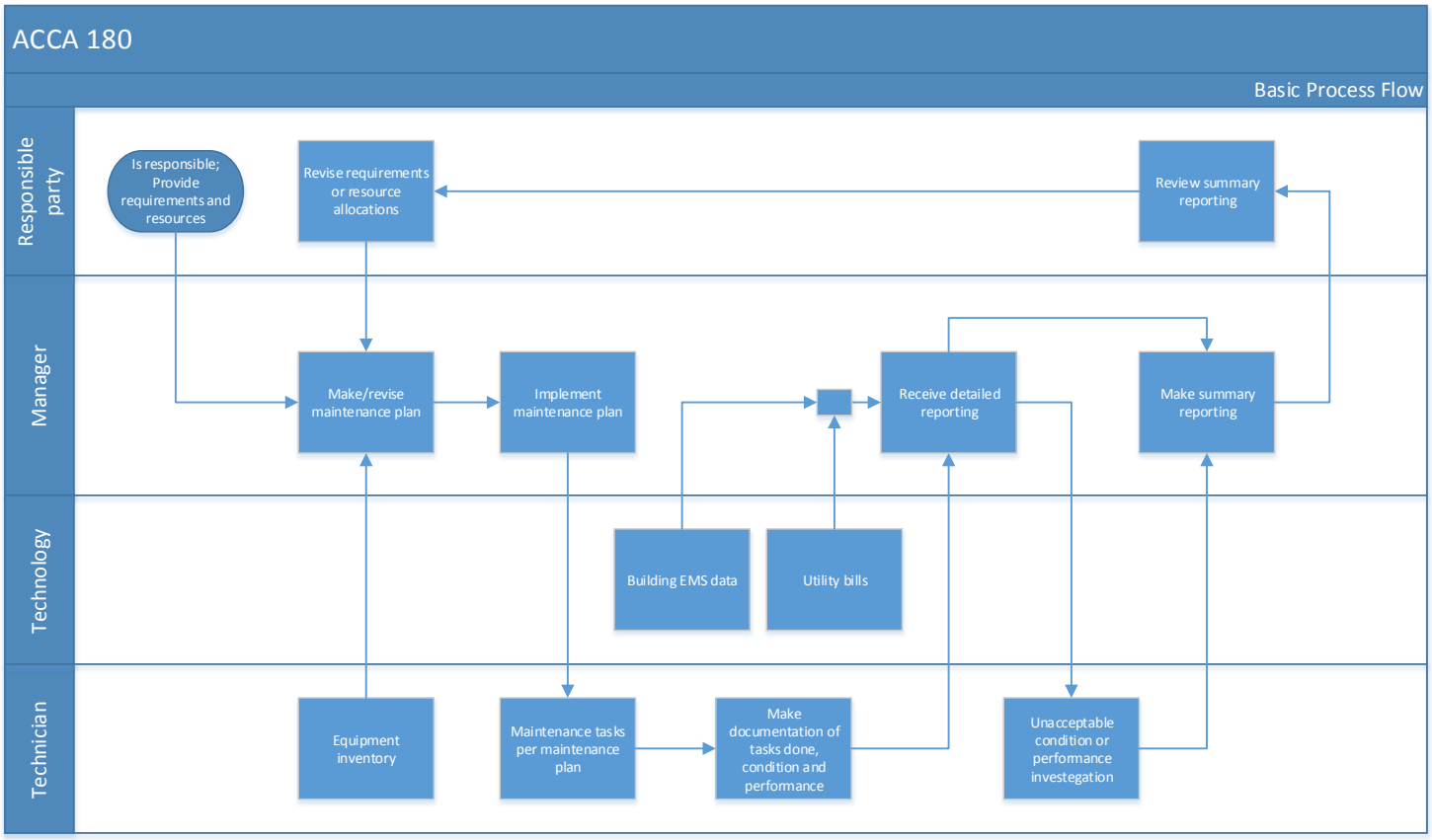
Dale Rossi – commented that the FDD Committee, of which he was a member, was thinking along those same lines. They were struggling with determining how those kinds of practices could have an impact on CQM practices.

Charles Segerstrom – use of those kinds of advanced technologies and practices was precisely what the utility emerging technologies groups were working on to promote technologies beyond the prescriptive code minimum standards. For example, instead of only conducting visual filter inspections a contractor could take repeated pressure drop measurements or even remotely monitor measurement data to track performance and catch and correct degraded performance.

Flow Chart 2: Standard 180 Basic Roles and Process Flow

This second flow chart was intended to show what each player was responsible for and how responsibility in the maintenance process moved from party to party.

- The manager set the agenda and tasks and then reviewed the results and was, basically, responsible for meeting the performance objectives established by the responsible party/owner.



Review of Feb. 16 meeting draft report - continued – Dale Rossi

Dale Rossi – at the previous meeting they'd defined what they thought making a maintenance plan involved, a format, step by step instructions, a template and spreadsheet which outline the key information needed in columns.
For each task:

1. One row per condition indicator
2. Columns

a. Condition indicator
b. Task frequency
c. Responsible party
d. How condition data is collected
e. How condition data is to be recorded
f. Example of acceptable condition (as makes sense for the case)
g. Example of unacceptable condition (as makes sense for the case)
h. Example of additional unacceptable condition (as makes sense for the case)
i. Which of the performance objective(s) does this unacceptable condition impact?
j. How does an unacceptable condition impact the performance objective?
k. What is the expected action when the current condition is unacceptable?

Dale Rossi – next, they'd discussed implementation of a maintenance program, that it was an overarching document at the facility level. It would include performance objectives with a template/example with one objective per row and columns to capture the following information.

Performance objectives

1. Performance objective
2. How Performance data is collected?
3. What is current performance?
4. What is the desired performance?

Equipment inventory

They would provide a template for equipment inventory. One row per unit and columns to call out a unique identifier and enough additional information to select the correct maintenance task list. The term "inventory" still needed to be defined.

Authorization to implement

Review of results

Measurement, data collection and report making

They'd spent most of the previous meeting working on this topic. The primary decision that needed to be made at this meeting was whether they were going to provide examples of report making or just descriptions of what was important and they would recommend be included in measurements, data collection and reports. At this meeting, he thought they needed to decide

1. *Categorize data types*
2. *Categorize data collection methods*
3. *Categorize useful calculations*
4. *Categorize useful outputs and descriptions*
5. *Categorize useful comparisons and conclusions*

Donald Prather, ACCA – it was important for the group to have decided who was the primary audience for the reports.

Dale Rossi - there were two different kinds of reports. The quarterly inspection reports on HVAC system operations (conditions) and the annual outcomes report (program performance). He was most interested in their focusing on the annual report for the owner/responsible party rather than the quarterly report. This was because there were really well defined maintenance tables available to drive those quarterly and periodic inspection reports and quarterly system inspections were an accepted industry standard procedure. The annual performance report was, in his opinion, the one for which guidance was so sorely needed and being asked for. Annual contract reviews were also an industry standard. If you weren't meeting those annual objectives, the quarterly reports would be used to drill down and try and determine

why they weren't being accomplished. He thought that developing examples and descriptions for an annual report needed a creative process since it was really being started from scratch.

Todd Van Osdol, CLEAResult – he agreed that contractors had quarterly inspection information in the form of work orders and inspection tickets. Producing an annual report for a program review didn't seem to be a common industry practice. He thought that the group could provide the greatest value trying to provide guidance on how to product that annual performance evaluation report. Also, that an annual report would help drive the value being delivered by standards based maintenance.

Decision: the WG decided to concentrate first on how to develop and produce annual reports and attempt work on recommendations for quarterly/periodic reports as time permitted.

Dale Rossi – Rick Danks had proposed at the previous meeting that direct data measurements or statistics tracked from managing the maintenance program could be used to validate maintenance improvements such as:

- *Work order backlog/ avg. days to complete a work order*
- *Changes in rates of unplanned maintenance*
- *Changes in equipment uptime*

Dale Rossi – proposed that the sorts of data collection and reporting the user guide would suggest should be activities which most, 80% of contractors were capable of doing. It shouldn't suppose or assume the sort which would depend on the most sophisticated software systems available.

Todd Van Osdol – gearing this user guide towards the average contractor or lowest common denominator was probably a good idea but they should also be challenging contractors to use more sophisticated tools, technologies and methods. Things like encouraging the use of monitoring, data collection and analysis from EMS systems for faults and trending and the like.

Dale Rossi – he understood Todd to be recommending they create a minimum standard that was believed to be achievable by the vast majority of contractors. The guide should also articulate "reach goals" as ideas for how they might offer more value if they were so inclined.

User Guide Working Group Planning – Dale Rossi

Dale Rossi, Chair – proposed that by the end of this meeting the schedule at the end of his Feb. 22 draft report should be filled in and completed with which parts of their work they expected to cover at each meeting. What did they intend to deliver within the time that they had been allocated? He understood that they would hold a total fourteen meetings through June. Four were dedicated to planning. He wanted them to have a plan for all the other ten meetings. The roadmap he'd originally laid out needed to be reduced to ten remaining meetings.

Roadmap/calendar – Originally considered

Feb 23 – Finalize work plan and roadmap
1 - Mar 2 –
2 - Mar 9 –
3 - Mar 16 –
4 - Mar 23 –
5 - Mar 30 –
6 - Apr 6 –
7 - Apr 13 –
8 - Apr 20 –
9 - Apr 27 – Write introduction
10 - May 4 – Write conclusion

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11 - May 11 – Final document review and debate
12 - May 25 – Final document review and vote

The Working Group discussed the topics they'd selected and decided to try to accomplish those listed in the following roadmap.

Roadmap/calendar – Decided at Feb. 23 meeting

Feb 23 – Finalize work plan and roadmap – stay at higher level and concentrate on "what" rather than "how"
1 - Mar 2 – defining performance objectives for customer facing reporting
2 - Mar 9 – categorize data types
3 - Mar 16 – categorize data collection methods
4 - Mar 23 – categorize useful calculations
5 - Mar 30 – categorize useful outputs and descriptions
6 - Apr 6 – categorize useful comparisons and conclusions
7 - Apr 13 – Write introduction
8 - Apr 20 – Write conclusion
9 - Apr 27 – Final document review and debate
10 - May 4 – Final document review and vote

Bob Sundberg, WHPA staff, asked whether they were going to into more detail that simply list the three overriding goals of Standard 180 which were very general in nature.

Dale Rossi – they'd certainly want to start with those three main objectives and ask what data needed to be collected to address those objectives. Members could suggest additional performance objectives the group would recommend that are commonly used or the group thought would be particularly useful to consider. The group would need to decide about any aspirational performance objectives to include.

Closing Comments/Adjournment

The next meeting was scheduled for Thursday March 2 at 10:00 am PST.

The March 2 meeting topic would be: defining performance objectives for customer facing reporting.

The meeting was adjourned at 10:07 am PST.

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Action Items and Key Decisions

Feb. 23 **Decision:** the WG decided to concentrate first on how to develop and produce annual reports and attempt work on recommendations for quarterly/periodic reports as time permitted.

Feb. 23 **ACTION**: the working group needed to decide whether they should change their concept of maintenance to include airside measurements or not. Also, whether they believed that airflow related measurement needed to be added to Standard 180 or not.