AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, N.E.
Atlanta, GA 30329
404-636-8400

TC MINUTES COVER SHEET

TC/TG/TRG NO TC 5.2 DATE February 4, 2020

TC/TG/TRG TITLE Duct Design

DATE OF MEETING February 4, 2020 LOCATION Orlando, FL

MEMBERS PRESENT	TERM TO	MEMBERS ABSENT	YEA	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Chris Van Rite, Chair	6/30/21			
John Constantinide, Vice Chair	6/30/21		X	
Cindy Bittel, Secretary	6/30/20			
Dr. Stephen Idem	6/30/23			
Pat Brooks, ALI Coord	6/30/20			
Randy Young, Membership	6/30/23			
Kevin Gebke	6/30/23			
Bill Smith	6/30/20			
Robert Reid	6/30/23			
Wes Davis	6/30/21			
	6/30/21	John Gierzak		
Ralph Koerber	6/30/21			
	6/30/22	Scott Hobbs		
Vikram Murthy *	6/30/23			
Akshay Bhargava	6/30/23		X	
				Jeffrey Martin, G
				Robert Hassler, CM
				Tim Orris, G
				David Krupa, G
				Dane Carey, G
				Jeff Boldt, CM
				Walter Robison, PCM
				Madess Seyednezhad, G
				Brian Poe, G
				Mark Smith, CM
				Eli Howard, G
				Chris Ruch, PCM
				Duane Smith, CM
				Brandon Bates, G

				Gus Faris, CM
				David Dias, CM
			X	Jon Kamies, PCM
				Byron Hagen, G
				Kevin Herreman, PCM
				Allison Bailes, CM
				Marty Gissel, G
				Ed Janowiak, G
				John Hamilton, CM
			X	Kezhen Shen, G
			X	Micah Dawson, CM
				Zahra Sardoveinasab, G
				Chase Payne, G
				Dana Smith, CM
			X	Aaron Gunzner, PCM
				Bruce Meyer, CM
				Mark Terzigni, CM
				Tim Eorgan, CM
				Shawn OHara, G
				Bass Abushakra, CM
				Larry Smith, CM
				Craig Wray, CM
				Matt Moder, G

*** Member Non-Quorum**
CM = Corresponding Member
PCM = Provisional Corresponding Member
G = Guest

DISTRIBUTION

All Members of TC plus the following:	
TAC Section Head	Larry Smith
TAC Chair	Mr Jay A Kohler
2021 Handbook Liaison (Fundamentals)	Dr. Bass Abushakra
2020 Handbook Liaison (Systems & Equipment)	Florentino Rodriguez
Research Liaison	Dennis L Loveday
Standards Liaison	Kwang Woo Kim
Chapter Tech Transfer	Somasundaram Natarajan
Staff Liaison	Steven J Hammerling

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONIONG ENGINEERS

1791 Tullie Circle, N.E.

Atlanta, GA 30329

ASHRAE Winter Conference, Orlando, FL

TC 5.2 Duct Design

Tuesday, February 4, 2020

Time: 3:30-6:00 PM

Hilton Orlando, L, Lake Down B

1) **Call to Order**

2) **ASHRAE Code of Ethics Commitment** – Chris Van Rite

   "In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interest. (See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)"

3) **Introductions and Attendance**
   - **a)** Introduction of people present
   - **b)** Acknowledge and welcome remote participants
   - **c)** Quorum was reached with _13__ voting members
   - **d)** Quorum requires _8__ voting members present
   - **e)** Corrections/additions and approve agenda

4) **Base Camp Basics** – John Constantinide
   - **a)** Decision made to eliminate Basecamp tutorial during TC meeting moving forward

5) **Kansas City June 25, 2019 Meeting Minutes**
   The KC minutes were approved 12-0-0-3 CV on Thursday January 16th.
   The approved minutes were uploaded to the TC Web Page and to Basecamp.

6) **Special Announcements**
   - **a)** ASHRAE Mission – To serve humanity by advancing the arts and science of heating, ventilation, air conditioning, refrigeration and their allied fields.
   - **b)** ASHRAE Vision - A healthy and sustainable built environmental for all.
   - **c)** TC 5.2 Scope - TC 5.2 is concerned with the design, characteristics and construction of all types of ductwork for the handling of air and other gases but does not include chimneys.

7) **Herman and Dorothy Behls Endowment** – Dr. Stephen Idem **(SEE ATTACHMENT 5)**
   - **a)** Funding update
   - **b)** "Herman and Dorothy Behls HVAC Designer Certification Award" Sub-committee report

8) **TC 5.2 Items** – Chris Van Rite, John Constantinide
   - **a)** Strategic Plan (draft posted on Basecamp, and also post its approval on TC website (https://public.3.basecamp.com/p/GPWMyDsgyKuFC2MiugwvtRo9)
     - i) Covers 4 areas: Membership/recruitment, Addressing Duct System Leakage, Update DFD and add User Guide, Education Program for DDG
     - ii) Request to vote on approval of the Strategic Plan
       1. Comment by Eli Howard– we need more Design professionals involved in the TCs to remain relevant and beneficial to the industry
          a. This objective is directly addressed within the membership outreach section with Actionable Objective Initiative 1.A (PAGE 5), which states to recruit 2 TC members from 5 industry segments
       2. Motion to approve the Strategic Plan and implement – John Constantinide, 2nd by Bob Reid. APPROVED 13-0-0 CV
   - **b)** Remote access for meetings initiative
     - i) Subcommittee meeting took place Wed January 29, 2020 11am-1pm EST
       1. Meeting notes attached **(SEE ATTACHMENT 1)**

9) **Handbook Liaison-** Bass Abushakra
   - **a)** June 7, 2020 deadline for TC 5.2
     - i) If feel that we will not meet the deadline, request extension by July 31st to Bass Ab. If no request, ASHRAE will assume there are no revisions.
     - ii) Even if no revisions, there is a form to submit
   - **b)** Deadlines for all of the chapters run from June 1 to July 2020.

10) **Section 5 and TAC Report** – Larry Smith **(SEE ATTACHMENT 3)**
   - **a)** TCs were requested to submit a form/draft of Strategic Plan defining Mission, Goals, and responsibilities for the TC moving forward.
   - **b)** Also, a list of recommendations to TAC to help TAC be more useful

11) **Subcommittee Reports** **(SEE ATTACHMENT 1)**
   - **a)** **Research** – Kevin Gebke, Larry Smith **SEE ATTACHMENT 1 Section 6**)
     - i) Duct Sealant Initiative
       1. Overview, background and scope
       2. Appoint sub-committee, 2 RTARs

b) 2021 Handbook of Fundamentals – Micah Dawson (**SEE ATTACHMENT 1 Section 8**)

i) Chapter 21 is in Basecamp and the location will be revised.
ii) All changes email to Micah Dawson before May 1st, 2020
iii) June 7, 2020 is deadline, but recommendation to TC by Micah for vote during June meeting and apply for extension.
iv) Decision to give til March 31, 2020 to review, and then schedule a WebEx conference for voting members to vote electronically.

c) Membership - Randy Young

i) 16 new Provisional Corresponding Members (PCMs) since January 2019.
- ✓ Mr. Christopher Ruch, National Energy Management Institute, Fairfax, VA
- ✓ Mr. George Games, Port Authority of NYNJ
- ✓ Mr. Mohammad Daoud, Eng, LG Electronics, UAE, **YEA**
- ✓ Mr. Vinod Venugopal, MSCEB, Manama, Bahrain, **YEA**
- ✓ Mr. Joseph Chin, PE, Western Allied Mechanical Inc Menlo Park, CA
- ✓ Dr Rajesh Choudhary, Lovely Professional University, School of Mechanical Engineering, INDIA, **YEA**
- ✓ Mr Aaron Kent Gunzner, AMCA International, Denver, CO, **YEA**
- ✓ Mr Armin Hauer, ebm-papst, Farmington, CT, Chair TC 5.1, Fans
- ✓ Mr Henry P Hoffman, Ballinger, Philadelphia, PA
- ✓ Mr Jon M Kamies, Springfield, MO, **YEA**
- ✓ Mr Mohammed Murtaza, Eng, Cubic Engineering Conslutancy, UAE, **YEA**
- ✓ Mr Kartik A Patel, Armacell, Mebane, NC
- ✓ Mr Rodrigo Pellegrin, São Paulo, Brazil
- ✓ Mr Walter A Robison, Atco Rubber Products, Fort Worth, TX, **YEA**
- ✓ Mr Matthew T Wende, Bernhard TME, Little Rock, AR, **YEA**
- ✓ Mr Jay A Kohler, Engineering Consultant, York, PA

d) Programs – Dr. Steve Idem **(SEE ATTACHMENT 4)**

i) Mon Feb 10th is deadline for Austin to submit programs
1. Will resubmit program that was previously rejected
2. Reason that we had 2 submissions that were rejected – was told that they received more than 40 applications and were limited to how many were able to approve
3. Interaction with Track Chair previous to submittal – John Constanitide volunteering to assist Dr Idem with communication before submittal

e) Duct Design Guide (DDG) - Pat Brooks (**SEE ATTACHMENT 1 Section 9** and **ATTACHMENT 1A**)

f) Duct Fitting Database (DFDB) - Pat Brooks (**SEE ATTACHMENT 1 Section 9** and **ATTACHMENT 1B**)

i) We have some issues with DFDB, one of which is missing
ii) Feel very strongly that we might want to contract work out to TTU or other contractors to maintain and update the DFDB for future
iii) We should not need to refer back to Research Liaison, because the DFDB is under Publications

iv) We feel that the DFDB needs to be up to date for the DDG to refer to it
v) Bob Reid – Make a work statement as to what do we want to happen with the DFDB going forward, including modernization, adding/revising fittings and making it more user friendly
vi) Bob Reid – need to promote the DFDB and encourage people to use it. But it is not user friendly as-is. Part of having someone takeover would need to include modernizing the DFDB and making it more user-friendly.
vii) This is identified in the Strategic Plan as an initiative.

g) Duct Leakage Subcommittee – Larry Smith **(SEE ATTACHMENT 2)**
i) met on Sunday 2/2/20 between 4:30 - 5:00 pm

h) Codes & Standards Interaction - Ralph Koerber
i) Connor Barbary – only one with ASHRAE that can officially make recommendations to code commissions. He is the player that we need to involve with any recommendations that TC 5.2 may have toward codes/standards
ii) John Hamilton – how can we better report from and make recommendations to codes and standards relevant to TC 5.2
iii) Put together a list of Codes and Standards to keep an eye on

i) ASHRAE Learning Institute (ALI) - Pat Brooks
i) Professional Development Committee (PDC) would like to have the self-directed learning (SDL) course titled, "Air System Design," (Summary available at https://www.ashrae.org/professional-development/self-directed-learning-group-learning-texts/fundamentals-of-air-system-design) reviewed to see if it needs updating. TCs 5.2 and 5.3 have been asked to do this.
1. One person is asked to review course from each TC.
2. Maybe we can incorporate DDG into this course? **AI**: DDG Subcommittee will review to see if this is possible.
3. Recommend TC 5.1, Section 9 TCs, SSPCs 90.1 & 189.1, and other relevant functional groups to include? **AI**: Chris and Kevin will review and include in response to Charlie Henck with PDC.

j) Webmaster - Akshay Bhargava
TC 5.2 Website: https://TC0502.ashraetcs.org/

k) Liaison Reports- Mark Smith and Jeff Boldt 90.1 – (nothing new to report)

12) Historian - Bob Reid Herman Behls library and papers

i) Discussion about the possibility of turning the collection into an electronic library. Concern over copywright issues, but possibility to “check out” and “return”

ii) Posted list of documents on Basecamp: https://3.basecamp.com/3106353/buckets/4139680/uploads/2388984157

13) Deadlines
a) Handbook 2021 deadline is June 7, 2020.
i) TC 5.2 to review draft on Basecamp and submit any changes to Micah Dawson by March 31, 2020

ii) TC 5.2 voting members to schedule and complete a WebEx meeting to vote on Handbook Chapter submittal in April 2020.

b) Strategic Plan Deadlines: ONGOING refer to document on Basecamp and TC Website https://public.3.basecamp.com/p/GPWMyDsgyKuFC2MiugwvtRo9

14) Notifications

SMACNA presentations scheduled for AHR 2020:

a) Feb 3, 9 – 10 am, Duct Construction Standards, W311E, Terzigni
b) Feb 4, 9-10 am, High Performance Duct Design, W311B, Brooks
c) Feb 4, 11 – 12 pm, Duct Leakage, W311E, Terzigni
d) Feb 4, 2:30 – 3:30 pm, F/O reinforcement, W311E, Terzigni

15) Action Items

TC 5.2 Duct Design Action Items			
Number	Description	Assigned to	Status
1	TC 5.2 Strategic Pan	John Constantinide	Vote passed to approve in Orlando
2	Write content for the Duct Design chapter of the Fundamentals Handbook related to gypsum board.	Larry Smith, Ralph Koerber, and John Hamilton	Completed
3	Write a paragraph of content that can be published in the Duct Design chapter of the Fundamentals Handbook, to be reviewed by the former PMS of 1764-RP.	Dr. Steve Idem	Completed
4	Investigate PTAR process with intent to publish textile air dispersion publication	Kevin Gebke	Assigned in KC
5	Post and publicize Handbook proof submitted	Bob Reid	Assigned in KC
6	Review possibility of including DDG in self-directed learning course titled “Air Design Systems,” that is under review by PDC	Pat Brooks, Bob Reid, Larry Smith	Assigned in KC
7	DFDB: Work Statement to address the future of DFDB and search for a contractor to take over the maintance.	Dr Steve Idem with Pat Brooks and Larry Smith	Assigned in Orlando
8	Review Handbook Chapter 21 for 2021 submission by March 31, 2020 and schedule WebEx meeting for Voting members to approve in April 2020. Chapter submission due June 7, 2020	Micah Dawson	Assigned in Orlando
9	Codes & Standards Subcommittee: Put together a list of relevant codes/standards to TC 5.2 to be able to assign liaisons that can report updates	John Hamilton with assistance from Ralph Koerber	Assigned at Orlando
10	Consider using our Monday meeting time as possibility to present education sessions. Consider holding a webinar instead of a physical presentations in order to free up members time during the conference.	Chris Van Rite, Bob Reid, Steve Idem	Assigned at Orlando

16) Adjournment

a) 6:05pm Motion to adjourn: John Constantinide, 2nd: Randy Young

Upcoming Meetings:

2020 ASHRAE Annual/Technical Conference---Austin, TX----Jun 27–Jul 1, 2020

2021 ASHRAE Winter Conference --- Chicago, IL --- January 23-27, 2021

2021 ASHRAE Annual/Technical Conference---Phoenix, AZ----Jun 27–Jul 1, 2021

2022 ASHRAE Winter Conference --- Las Vegas --- January 29-Febuary 2, 2022

ATTACHMENT 1

TC 5.2 Duct Design, Sub-Committee Teleconference Notes
Wednesday, January 29, 2020
11:00 AM – 1:00 PM EST

Meeting Agenda

Attendance: Chris Van Rite, John Constantinide, Aaron Guzner, Bob Reid, Cindy Bittel, Craig Wray, Dane Carey, Henry Hoffman, Kevin Gebke, Larry Smith, Mark Hooks, Mark Modera, Micah Dawson, Patrick Brooks, Perry Philp, Ralph Koerber, Tim Eorgan, Walter Robinson, Wes Davis, Akshay Bhargava, Dr. Stephen Idem

1. **11:00 to 11:05** Opening remarks

Chris Van Rite, TC 5.2 Chair

   a. ASHRAE Code of Ethics opening statement read.

2. **11:05 to 11:10** –Teleconference Protocols,

John Constantinide, Teleconference Moderator, TC 5.2 Vice Chair

3. **12:10 to 12:25 – TC 5.2 Strategic Plan Document**
   https://public.3.basecamp.com/p/GPWMyDsgyKuFC2MiugwvtRo9

John Constantinide – Vice Chair TC 5.2

   a. This document has been compiled from assessing TC current and future needs and obtaining feedback from the TC leadership.
   b. Please download the document using the aforementioned link and e-mail comments to John Constantinide at jmc@mail.ashrae.org.
   c. **AI**: John Constantinide will ask Akshay Bhargava to post the draft Strategic Plan to the TC website.

4. **11:10 to 11:25** – Herman and Dorothy Behls Endowment update, appointment of "Annual Award Sub-Committee"

Dr. Stephen Idem

   a. Endowment is fully funded with current balance of over $33,000.
   b. Certification and travel awards may start at the Winter Conference in Chicago.
   c. A group of interested parties will meet prior to the full committee meeting and will make recommendations regarding:
      i. Recommendations for sub-committee to administrate awards;
      ii. When the first award(s) should be presented; and
      iii. Consideration will be given to presenting in Chicago 2021, so that the ASHRAE Illinois Chapter and the Behls Family can participate.

5. **11:25 to 11:35** – Programs Sub-Committee report, Orlando and Austin presentations

Dr. Stephen Idem, Chair Programs SC

   a. Four programs were submitted for presentation in Orlando, but only two were accepted.
   b. Craig Wray suggested that we inquire into the reason why the other two programs were not accepted.
   c. Dr. Stephen Idem will submit the rejected programs again for the Austin Annual Conference.

6. **11:35 to 12:00** – Research Sub-Committee report, discuss "Duct Sealants" RTAR and scope of related initiatives

Kevin Gebke, Chair Research SC
Larry Smith

a. At fall meeting, Larry Smith requested to head up writing and proposing two RTARs related to duct sealants and duct leakage. Potential subcommittee members will be solicited from volunteers.
b. The new Chair of the Duct Sealant & Leakage Subcommittee is Larry Smith, as appointed by Chris Van Rite as of this teleconference. **AI**: John Constantinide will update the draft Strategic Plan accordingly.
c. PTAR process for textile air dispersion publication is not progressing. **AI**: Kevin will find out more about the process and report at full committee meeting.

7. **12:25 to 12:30** – 2020 HVAC Systems and Equipment Handbook (complete)

Bob Reid – Chair Handbook SC

a. Chapter submitted on June 27 after Annual Conference. Acknowledged by July 9 for editing. Proofs will be sent in February.
b. Submitted proof available on Basecamp. **AI**: Post notification to TC that draft is on Basecamp.

8. **12:30 to 12:35** – 2021 Handbook of Fundamentals update, 2020 deadlines

Micah Dawson – Chair, Fundamentals SC

a. We have one chapter (Ch. 21).
b. 2021 Handbook: Fundamentals, Duct Design – Vikram Murthy, Wes Davis, Jeff Boldt — Chair: Micah Dawson
    i. Chapter will be placed on Basecamp for member distribution. E-mail changes back to Micah Dawson (mdawson@mii.com).
        1. Micah Dawson has received verbiage from RP-1764 (Phenolic Duct Roughness).
    ii. Vote can be made by letter ballot. Additional content changes may be made, with TC vote for approval, until May 2020.
    iii. Timeline:
        1. February 2020 – Lead reviser completes edits and chapter approval checklist
        2. March-June 2020 – TC Votes on revisions
        3. May 1, 2020 – Any additional content changes as approved by TC submitted to Micah.
c. June 8, 2020 – Final revised chapter, as approved by TC and completed chapter approval checklist sent to HB Liaison and ASHRAE staff

9. **12:35 to 12:45** – Duct Design Guide, RP-1180 and Duct Fitting Database

Pat Brooks – SMACNA

a. Reports are attached to these notes. (**ATTACHMENTS A & B**)
b. DDG/RP-1180 Summary: Additional edits are requested by ASHRAE Staff (Cindy Michaels), which is being done by the DDG Subcommittee. DDG will not be published by the Winter Conference. Publication can be done before or by Annual Conference in Austin but dependent on ASHRAE staff.
c. Professional Development Committee (PDC) would like to have the self-directed learning (SDL) course titled, "Air System Design," (Summary available at https://www.ashrae.org/professional-development/self-directed-learning-group-learning-texts/fundamentals-of-air-system-design) reviewed to see if it needs updating. TCs 5.2 and 5.3 have been asked to do this.
    i. One person is asked to review course from each TC.
    ii. Maybe we can incorporate DDG into this course? **AI**: DDG Subcommittee will review to see if this is possible.
    iii. Recommend TC 5.1, Section 9 TCs, SSPCs 90.1 & 189.1, and other relevant functional groups to include? **AI**: Chris and Kevin will review and include in response to Charlie Henck with PDC.

10. **12:45 to 12:50** – Airflow Research and Tour update– Florida Solar Energy Center
https://www.ashrae.org/conferences/2020-winter-conference-orlando/2020-ashrae-winter-conference-tours
Chris Van Rite – Air Distribution Institute (ADI)

a. More information about the tour is on the ASHRAE Winter Conference website through the link above.
b. Research at FSEC is scheduled to run until May 31, 2020 but may extend to include July and August 2020.
c. High performance metal and flex systems were installed with the metal operating at .25" TESP and the flex system operating at .34 TESP.
d. Flex system was then reconfigured to operate at .82" TESP which is the average TESP for USA as reported by National Comfort Institute.
e. Data will continue to be collected with the new configuration for duration of the project.
f. Peak summer energy use delta between the two systems is significant, but when annualized it will be less.
g. ASHRAE has tours available, but visitors will not be allowed in attics due to time and safety issues.

11. **12:50 to 1:00** - New and Old Business, Comments and Questions from participants

a. Participants generally agreed that the teleconference format worked well
b. Craig Wray suggested that we might find additional ways to make people aware of these type meetings and encourage more participation.
c. Larry Smith gave his endorsement of our initiative to make meetings available to members and guests who cannot attend in person.
d. Larry Smith will mention the TC 5.2 "Digital Initiative" in his Section 5 address and will lobby ASHRAE to make GoToMeeting access available for reasons other than to meet quorum.

12. **1:00** – Adjourn: Meeting adjourned at 12:40 pm.

ATTACHMENT 1A

RP-1180 Update for Orlando 2020 TC5.2 Meeting

RP-1180 is the Duct Design Guide. Larry Smith, Dr. Steve Idem and Pat Brooks have worked closely with Cindy Michaels to edit the version that was submitted and voted on at the last TC5.2 meeting into a publishable version.

Cindy's title is Editor, Special Publications. She has made some significant changes such that the table of content now looks like this.

- A page listing the contributors and project monitoring committee.
- A cover page with Herman Behls listed (indicating he is the primary author)
- A disclaimer page saying ASHRAE is a registered trademark, etc. and listing the ASHRAE staff.
- Table of Contents
- Preface
- Introduction (this is no longer the first chapter). Includes Overview, Scope and References
    1. DUCT DESIGN FUNDAMENTALS
    2. DUCT DESIGN CONSIDERATIONS
    3. DUCT DESIGN – EQUAL FRICTION
    4. DUCT DESIGN - STATIC REGAIN
    5. DUCT DEIGN – LOCAL EXHAUST SYSTEMS (CONSTAND VELOCITY)
    6. FAN-DUCT SYSTEM INTERACTION
    7. DUCT SYSTEM MATERIALS
    8. DUCT SYSTEM ACOUSTICS

Each of the chapters and the Preface and Introduction have been submitted and edited by Cindy. She then sent the edited versions to Pat Brooks for review and acceptance. After Pat's review the chapter was sent to Larry Smith for review, then to Dr. Steve Idem. After Dr Idem's review it was returned to Pat for final review and acceptance, then returned to Cindy for additional review and incorporation of the edits. After Cindy incorporates the agreed about edits, it will be returned to Pat, then Larry then Dr. Idem and back to Pat for final review, then back to Cindy.

The goal was to have the Guide published by the Orlando show. However, Cindy's edits were extensive and required us to prove acceptance to use Figures or other from other manuals. Cindy also had limited time the past two months as she was working on other publications as well and had not been able to get to the revisions for the past month. That manual has been published so she will now return to the Design Guide and her other publications. It is likely the Duct Design Guide will take another couple of months before it can be published.

Unfortunately, we are waiting on the availability of Cindy to return edited chapters and will work as quickly as her times allows to finish the Guide

Pat Brooks, Chair RP-1180 PMS

ATTACHMENT 1B

Duct Fitting Database Update for Orlando 2020 TC5.2 Meeting

The Duct Fitting Database (DFDB) PMS is Larry Smith, Dr. Steve Idem and Pat Brooks. Here is what was accomplished since the last meeting.
The calculation of the Friction Factor for CD11-4 was fixed by John Downey who has been handling the update of the DFDB. Dr Idem needs to approve it.
Also Dr. Idem recently sent an email to John Downey who has been handling the update of the DFDB which read:
John – I wanted to follow up on this issue with you. Last month we determined that the DFDB was not correctly calculating the pressure loss for straight flat oval ducts, i.e., fitting CF11-1. The fundamental cause is that for I-P units is that the DFDB is currently calculating the Reynolds number incorrectly; please remove the unit's conversion of 12.0 in in line 5 of the I-P code (below); I'm unable to do that. For SI units the Reynolds numbers is also calculated incorrectly; please remove both units conversion factors 12 and 1000.0 from line 5 of the SI code. I believe the friction factor subroutine used by the I-P and SI versions is correct, but please make sure it uses the hydraulic diameter 'D' in each case. As of today, the I-P units for 'D' are 'ft', and for SI the units are 'm'. It might be helpful if the program printed those values out for the user. If you make those changes to the program, please verify that the DFDB duplicates the hand calculations provided in the attachments. This is the same case but with different units. I should be available next week Monday afternoon if you have any questions.
John Downey's response on January 6, 2020 was:
Stephen,
I am waiting for ASHRAE to send me a copy of the database. Mine is not current and I do not have access to download a copy. Therefore, I cannot test out the calculations on my system. I added Mark Owen to this email. I did change the equation per your instructions. The equations are the same for both IP and SI.
Do you have ADMIN privileges? You can make these changes on your end. Let me know if steps or training is needed. However, I do not mind doing this function for you.
I changed Line 5 from:
*Re=RHO*V*(D/12)/(RC*MU)*
to:
*Re=RHO*V*D/MU*
*RC is a constant which is different values for IP and IS: The list of constants are as follow*s:

In addition, Pat had correspondence with John Constantinide on how the DFDB fits with Strategic Plan. Pat wrote:

Here is what we are trying to do:

1. The DFDB (Duct Fitting Database) was developed mostly by Herman and John Downey under Herman's specification. Herman developed the fitting codes that were used and the tree structure (under Supply, Exhaust and Common Fitting).
2. Most people find it cumbersome to use (not user friendly). Even I find it cumbersome
3. It is the only place that all of ASHRAEs loss coefficients reside.
4. There are help screens
5. Administrators like Larry, Steve and I can see most of the equations but there are subroutines, and interpolation and some extrapolation that we don't actually see what equations are used. We need access to all of the programming code so we can see what is going on.
6. We know many of the duct friction loss equations are wrong and need fixed.
7. Also, there needs to be checks added so the results don't go out of bounds.

8. We have suggested that another contractor besides John Downey handle the programming and maintenance of the program. **We have suggested TTU and are waiting on their proposal.** John Downey is not responsive enough to our requests.
9. I think we will develop a user's manual that is easy to use and explains all functions of the DFDB

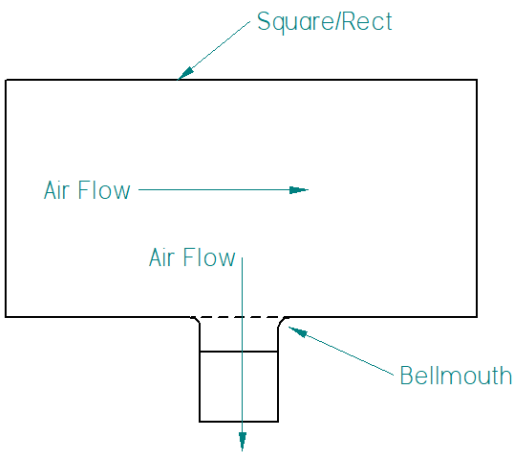
We haven't developed the full specifications for a rewrite of the DFDB. Larry, Steve and I need to do that, but I don't want to take that on while we are working on the Duct Design Guide. It is almost finished though and at that point I can concentrate on the DFDB
We are also trying to create a list of fittings or combination of fittings that need tested to determine the loss coefficients. If anyone has some fittings that should be tested, which should add them to a listed. Close coupled elbows are on the list. Also, John Hamilton brought up mitered elbows with turning vanes. Should the vanes be flush at the heal, throat or in between.

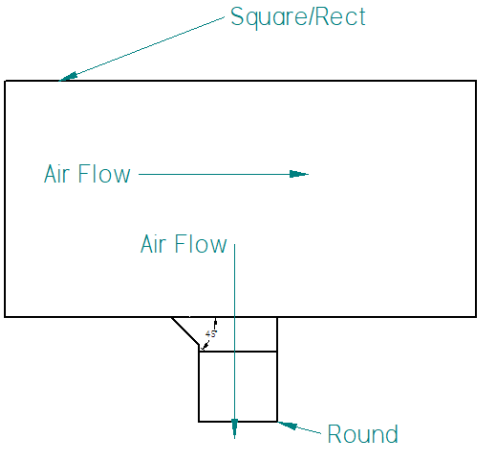
Here is the current list

Table – DFDB (Things to Do)—Nov 2015				
Fitting	**Description**	**Source**		
ED5-1	Wye	Sepsy 1973		**Both branch & main negative coefficients**
ED5-2	Wye	Sepsy 1973		**Both branch & main negative coefficients**
ED5-4	Bullhead Tee	UMC, SRF785E	Cb1≠Cb2 Db1≠Db2	**FIX** **2 Tables**
ED5-9	Symmetrical Wye	UMC, SRF785E	Cb1≠Cb2 Db1≠Db2	**FIX** **2 Tables**
ED5-10	Double Wye	Idelchik Diagram 7-27	Cb1=Cb2 Ab1=Ab2 As=Ac	**OK** **Only 1 Table for branch** **1 Table for Main**
ED5-11	Cross	Idelchik Diagram 7-29	Cb1=Cb2	**OK** **Only 1 Table for branches** **1 Table for Main**
SD5-18	Bullhead Tee	Sepsy 1969	Cb1=Cb2 Db1≠Db2	**OK** **Only 1 Table**
SD5-19	Bullhead Tee	Sepsy 1969	Cb1=Cb2	**OK** **Only 1 Table**
SD5-20	Cross, Capped	Sepsy 1969	Cb1=Cb2	**OK** **Only 1 Table**
SD5-22	Symmetrical Wye	Sepsy 1969	Cb1=Cb2	**OK** **Only 1 Table**
SD5-23	Double Wye	UMC, SRF386	Cb1=Cb2	**OK** **Only 1 Table for branches** **1 Table for Main**
SD5-24	Cross	UMC, SRF386	Cb1=Cb2	**OK** **Only 1 Table for branches** **1 Table for Main**
SD5-25	Cross	UMC, SRF386	Cb1=Cb2	**OK** **Only 1 Table for branches** **1 Table for Main**
SD5-26	Cross	UMC, SRF386	Cb1=Cb2	**OK** **Only 1 Table for branches** **1 Table for Main**

ER5-4	Symmetrical Dovetail	Idelchik Diagram 7-24	Qb/Qc=0.5	**OK** **Only 2 Data Points**
ER5-5	Bullhead Tee	Idelchik Diagram 7-23		**OK** **Only 1 Table**
ER5-6	Symmetrical Wye	Idelchik Diagram 7-30	Ab1+Ab2=Ac Ab1=Ab2	**OK** **Only 1 Table**
ER5-7	Symmetrical Wye	Idelchik Diagram 7-30	Ab1+Ab2=Ac Ab1=Ab2	**OK** **Only 1 Table**
ER5-8	Symmetrical Wye	Idelchik Diagram 7-30	Ab1+Ab2=Ac Ab1=Ab2	**OK** **Only 1 Table**
ER5-9	Double Wye	Idelchik Diagram 7-27	Ab1=Ab2 As=Ac	**OK** **Only 1 Table for branches** **1 Table for Main**
ER5-10	Cross	Idelchik Diagram 7-29	Ab1=Ab2 As=Ac	**OK** **Only 1 Table for branches** **1 Table for Main**
SR5-4	Symmetrical Wye, Dovetail	Idelchik Diagram 7-24		**OK** **Only 2 Data Points**
SR5-15	Bullhead Tee	Idelchik Diagrams 7-16 & 7-27		**OK** **Only 1 Table**
SR5-20	Double Wye	Idelchik Diagrams 7-15, 7-17 & 7-27	As=Ac	**OK** **Only 1 Table for branches** **1 Table for Main**
SR5-21	Cross	Idelchik Diagrams 7-15, 7-17 & 7-27	As=Ac	**OK** **Only 1 Table for branches** **1 Table for Main**

Requested Per Mark Terzigni





Pat Brooks, Chair DFDB

ATTACHMENT 2

TC 5.2 Duct Leakage Subcommittee Notes

The duct leakage sub-committee met on Sunday 2/2/20 between 4:30 - 5:00 pm.

The following were in attendance: Larry Smith (sub-committee chair), Kevin Gebke, Dr. Steve Idem, Randy Young, Bob Reid, Chris Van Rite, Craig Wray, Chris Ruch and Pat Brooks.

The following is to be reported by the research chair of TC5.2 that the sub-committee will commence work on two (2) work statements. This research is needed to update this committee's knowledge on duct design which is based upon research that is over 30 years old with current best practice and materials.

1. **Duct sealant longevity testing** - this research will be based upon various research work done by Walker and Sherman at LBNL (2000 - 2005) and ASTM E-2342-10 (2015) (https://www.astm.org/Standards/E2342.htm), however, modified to reflect current commercial duct construction standards, practices, and sealants (tapes, mastics, aerosel, gaskets, and others).

2. **Duct air leakage** - revisit both ASHRAE RP-308 (1985) Investigation of Duct Leakage and ASHRAE RP-447 (1989) Duct Leakage - Measurement, Analysis and Prediction Model for their relevance in current practice for manufacturing and assembly of metal duct using currently available materials for sealing the ductwork to minimize air leakage.
ASHRAE RP-308 The objectives of this research are (1) to evaluate the test chamber and instrumentation for use as a standard method of measuring duct leakage in the laboratory, and (2) to measure the leakage of typical duct construction. The scope of tests includes fibrous glass ducts, and sealed and unsealed rectangular, round and flexible ducts fabricated per SMACNA standards.
Sponsor: TC 5.2, Duct Design
Conducted: November 1981 - March 1985

ASHRAE RP-447 The prediction of leakage rates for commercial sheet metal duct systems is most difficult. The leakage rates of specific components are largely unknown and only crude models have been advanced to estimate the leakage. ASHRAE Technical Committee 5.2, Duct Design and Construction, recognized the need for reliable methods of leakage prediction for sheet metal ducts and commissioned several studies aimed at resolving this design problem. The work reported herein is a part of TC5.2's effort.
Sponsor: TC 5.2, Duct Design
Conducted: May 1985 - June 1988

Larry Smith, Duct Leakage Subcommittee Chair

ATTACHMENT 3

Section 5 and TAC Report

To: Jay Kohler, TAC Chair

From: Larry Smith, Section 5 Head

Date: February 5, 2020

Ref: Status of Section 5 Air Distribution

I joined TAC in June 2017 and was first introduced to the pending ASHRAE reorganization during the 2019 (Atlanta) winter meeting. The following deficiencies were reported:

1. Non-Disciplinary; working in silos; too specific; need wider perspective
2. Management of stagnant TCs and membership
3. Takes too long to change things; get discouraged
4. Maintain industry leadership
5. Do better job of sharing best practices

The reorganization committee believed that by undertaking reorganization the following would be accomplished:

1. Increase opportunity for collaboration for programs & research
2. Increase opportunity for Handbook workshops
3. Increase meeting efficiency
4. Increase effectiveness of members' volunteer time

I would like to comment on several steps that have recently occurred:

1. In June 2019 (Kansas City) we initiated a joint breakfast meeting. This was a positive step, however, it left little time for each individual Section to have any meaningful conversation. Hopefully this will be addressed with the changes in Orlando in addition to dedicating 40 minutes for individual Section conversation.
2. As reported by the reorganization sub-committee chair December 2019 (Orlando 2020):
    a. There are many TC's looking into restructuring **(that may be true, however, it is not true for Section 5)**
    b. TAC is here to assist, but not dictate (restructuring)
    c. And to paraphrase…if there is unwillingness to consider change then TAC may need to take a more proactive approach

In the fall of 2019 Section 5 took a close look at our ASHRAE meeting footprint. Prior to our evaluation Section 5 occupied 66.5 hours of meeting space. Our Orlando space allocation should be about 52 hours resulting in a 20% reduction, or 45 hours (32% reduction) without meetings for RP's and PMS's currently underway.

Also, in the fall of 2019, Section 5 undertook an initiative I called the "Tip of the Spear" which:

1. Stated the ASHRAE Mission, Vison, and BOD's Strategic Plan (2019-2024)
2. Stated that ASHRAE recognizes the TC as the experts in their respective field
3. Stated the responsibility of the Section head, as spelled out in the TC MOP, to review and evaluate the progress of the technical committee and make recommendations to TAC for any actions required by the TC MOP
4. Requested a five (5) year plan of actionable items with deadlines and with the names of people willing to champion the actionable items

The five (5) year plan results were a mixed ranging from very detailed with much deliberation within the TC to nothing. To me the importance of the planning was not necessary the results, however, the journey. This initiative gave me the opportunity to have several great conversations with the TC chairs talking about the impact of reorganization, how reorganization would or would not work, and the challenges the TC faces.

I will share some written responses from the TC's, but the conclusions are all the same. In my opinion, taking a TC in Section 5 and merging it with another TC in Section 5, or elsewhere, does not accomplish any of the goals or objectives we have stated above. This is when 1 + 1 will equal less than 2!

> ***A push to merge with another TC would dilute our efforts, and likely remove key talent from our memberships. Fewer TC groups would also mean fewer people attending if there are fewer committees; larger companies won't send as many – especially if they are sitting on the same TC/other group meetings. Larger, merged TC meeting will not make more happen – it is generally a smaller work group that can work together.***

> ***ASHRAE is not respecting the work and expertise we are bringing to ASHRAE. WE represent the knowledge base for a unique set of applications. Without TC xxx, that knowledge base will not have a strong voice.***

> ***A more serious problem is that 5xx, 5xx and 5xx are not natural allies. For example, 5xx has already in the past few years opposed TC 5xx in the 90.1 arena. This is one reason I opined yesterday that your proposal would encounter significant resistance in TC 5xx, as is reflected in the past votes of TC 5xx expressing no interest in merging with other Sections.***

In conclusion, while I appreciate what you are trying to do for the organization and for the TCs, I don't think that your idea with regards to TC 5xx is a good one and I recommend you not propose it to the TC.

A huge success story from TC 5.2 demonstrates what our 21st century digital future may look like. The TC received an on-line membership request from an assistant professor in the School of Engineering in Phagwara, India. The TC Chair personally responded with an email welcoming the person to the committee and the availability of a GoToMeeting for the upcoming Orlando meeting. TC5.2 had previously taken the initiative to acquire dedicated audio-visual equipment so that they would not be dependent on ASHRAE or other individuals to provide their personal equipment. The new member responded:

Thank you very much for accepting me as a member of the ASHRAE TC 5.2 Duct Design. I will try my best to contribute to the ASHRAE. I will attend the teleconference meeting surely.

TC 5.2 has made remote access a priority to attract membership and member participation as noted in the below statement from the TC 5.2 Chair:

ASHRAE TC 5.2 is going digital.

Orlando 2020 and all future full committee meetings will be open to conference attendees and available via remote access @ GoToMeeting.

We are reaching out to members and guests who would like to contribute, but are unable to attend, or simply prefer participating from their home or office.

We are also reaching out to new members and encouraging their participation in person or online.

The response so far has been positive.

The below is the official ASHRAE response for TC 5.2 request for arranging a GoToMeeting; **NOT** a request for the equipment which will be furnished by the TC due to the gracious donation from the Chair's company.

Unfortunately, the purpose of the RPM (remote participation meetings) is to ensure quorum for TC main committee meetings.

In addition, the RPM rules have the following requirements:

> ***Concurrent Face-to-Face & Remote Participation Meetings (RPM) Meetings at Society Conferences. A formal request must be made by the Committee Chair in writing to ASHRAE Staff at least 30 days prior to the scheduled Conference. This request must contain a list of the expected voting members participating remotely and bona fide substantiation of the reason(s) for the request. The request must also include the expected number of members and guests participating remotely. Final approval for concurrent remote participation meetings shall be by ASHRAE Staff.***

We cannot accommodate a non-quorum issue request at this late time for use on one of the ASHRAE RPM GoToMeeting lines. However, TC 5.2 is welcome to use their own meeting software to do a remote meeting in conjunction with the equipment that they have acquired for all full committee meetings moving forward

After having a discussion with Lilas Pratt (ASHRAE Manager of Special Projects) there are several issues that need to be addressed by TAC:

1. ASHRAE at this time has equipment for nine (9) RPM sessions to be conducted at one time
2. Even if the FG's were to supply their own equipment, ASHRAE can only conduct nine (9) concurrent GoToMeetings
3. ASHRAE currently has in place the ability to create a LISTSERVE which could be used by the FG's to advertise remote meetings
4. ASHRAE would need to include advertising to the ASHRAE membership to make them aware that a LISTSERVE is available as they will need to "sign-in" if they want notifications. This also needs to be included in the TC MOP.
5. FG's could use "no cost" TEAM or Skype to conduct remote meetings at no cost
6. Wi-Fi bandwidth at the conferences may be an issue as more FG's go digital
7. It will be a challenge for the FG's to acquire, or ASHRAE to provide, the necessary equipment to conduct a remote login during the 2 annual meetings. TC5.2 was lucky enough to have donated professional quality equipment for $600 (less computer) for a high-quality microphone and projector to conduct a remote meeting with the Chair using their companies GoToMeeting account.
8. Lilas also mentioned the large amount of staff time that is required to set up and host RPM's. We will have to be smart and figure a method that does not burden staff. Maybe a web portal to make it happen.

This is what I believe we need to do:

1. TAC must exert their authority over the FG's as required by the ASHRAE MOP and the BOD
2. The Section heads must be more proactively involved with the interactions of the FG's, in particular, the FG leadership

3. Chair and vice chair must be vetted, have the prior approval of the Section head, and trained as required by the TC MOP
4. Written annual effectiveness evaluations of the FG's with actionable items
5. TAC needs to figure out what FG effectiveness means and update the activity form
6. Leadership and Change Management training must be provided to the incoming chairs and vice-chairs. We should promote this as a privilege of ASHRAE membership for leadership positions and carry recognition as completing the formal training.
7. The cognizant FG must be included on all matters ASHRAE that involve the TC (journal articles, papers, seminars, symposiums, transactions, etc.)
8. We must have a vehicle to advertise conference calls held off-line to the entire ASHRAE audience like ASHRAE Standards (LISTSERVE mentioned above)
9. TAC must continue to push for FG collaboration between the meetings
10. TAC must continue to push FG's to make effective use of their meeting footprint
11. TAC should embrace a marketing approach for increasing membership and participation

ATTACHMENT 4

TC 5.2 Programs – Orlando Winter Conference

The Duct Design Committee, TC 5.2, is presenting the following two programs at the 2020 Winter Conference in Orlando:

Reducing Duct Leakage: An Overview of Materials, Methods and Expectations
ASHRAE Seminar 68
Wednesday, February 5
9:45 a.m. – 10:45 a.m.
Hilton Orlando, LL, Orange Ballroom E
Sponsored by TC5.2
ABSTRACT:
Duct system leakage is widely considered to be the most preventable of building energy wastes. Yet, there are few quantitative measures currently applied to reducing the problem. Until such measures are developed and implemented, simple admonitions to "just do a better job" are hollow without an understanding of current methods and expectations, and how specifications and design may be used to produce better outcomes. This presentation will start with an item that is currently specifiable: the duct sealant. It follows with an overview of training programs designed to educate HVAC installers in proper methods to apply sealants for best results. Finally, there will be an overview from the test & balance/commissioning perspective on the effectiveness of duct sealing strategies and the areas where continuing problems with leakage occur.

Solving Duct System Performance Problems:
Acoustics Effects, Air Leakage, and Capture Hood Flow Measurements
ASHRAE Seminar 75
Wednesday, February 5
11:00 a.m. – 12:30 p.m.
Hilton Orlando, LL, Orange Ballroom C
Sponsored by TC 5.2 Duct Design
Co-Sponsored by TC 1.2 Instruments and Measurements
ABSTRACT:
This seminar will discuss three different performance metrics for duct systems, including the influence of acoustics on duct design, simplified low-cost identification of duct leakage, and accurate diffuser flow measurement with capture hoods. Affordable ways to comply with ASHRAE's background noise recommendations will be presented, as will a low-cost duct leakage measurement based on temperature and humidity. Field test results and comparisons with fan-pressurization testing will be presented. The lack of a universally accepted calibration standard for flow capture hoods will be discussed, and guidance for measurement practices when using capture hoods for residential or commercial systems will be presented.

There is another session that might be of interest to TC 5.2 members:

Paper Session 21: Airflow Measurement in Ducts and Fans
Wednesday, February 5
8:00 AM–9:30 AM
Location: Hilton Orlando, LL, Orange A
Days: Wednesday, 5 February
Program Track: Ventilation, IAQ and Air Distribution Systems
Session Type: Paper Session
Location: Hilton Orlando, Orange A

Summary:
This session focuses on airflow and energy consumption in ducts and fans and includes ASHRAE sponsored research. The first paper presents data for pressure losses in light-commercial duct systems comprised of wire-wound flexible duct and rigid sheet metal duct. The second paper uses data from four manufacturers to develop simplified performance models of fan coil units that could be used in building simulation programs to estimate the annual energy performance of fan coil units. In the third paper, airflow and power of twelve fan coil units from three manufacturers were measured over an external static pressure range from 0 to 125 Pa (0 to 0.5 in. w.g.). In the final paper, measurements of pressure losses attributed to internal reinforcements installed in a 22 in. (559 mm), 10-ft-long phenolic duct system connected with four-bolt flanges and cleats are presented.
Chair:
Ratnesh Tiwari, Ph.D.
Presentations

- Part of Paper Session 21: Airflow Measurement in Ducts and Fans

Paper Session 21: Presentation 1: Pressure Loss Measurements in Typical Flexible and Sheet Metal Light-Commercial Duct Systems (OR-20-016)
8:00AM–8:20AM, Hilton Orlando, LL, Orange A

- Part of Paper Session 21: Airflow Measurement in Ducts and Fans

Paper Session 21: Presentation 2: A Simple Airflow and Power Model of Fan Coil Units with Permanent Split Capacitor Motors (OR-20-017)
8:20AM–8:40AM, Hilton Orlando, LL, Orange A

- Part of Paper Session 21: Airflow Measurement in Ducts and Fans

Paper Session 21: Presentation 3: Laboratory Performance Measurement of Blowers with Electronically Commutated Motors in Horizontal Low-Profile Fan Coil Units (RP-1741) (OR-20-018)
8:40AM–9:00AM, Hilton Orlando, LL, Orange A

- Part of Paper Session 21: Airflow Measurement in Ducts and Fans

Paper Session 21: Presentation 4: Loss Coefficients for Internal Reinforcements Installed in a Phenolic Duct System (RP-1764) (OR-20-019)
9:00AM–9:20AM, Hilton Orlando, LL, Orange A

ATTACHMENT 5

TC 5.2 Herman and Dorothy Behls Travel Award and Herman and Dorothy Behls HVAC Design Certification Award

A total of $33,000 has been raised as of 2-4-2020 for the two awards (see below). This is sufficient to fund both awards, but fundraising efforts will continue unabated in future years. A sub-committee consisting of TC 5.2 members will prepare an application form for each award, and decide on a procedure to select awardees. It is proposed to coordinate these efforts with the local Chicago ASHRAE Chapter, of which Herman was an active member. The sub-committee will work closely with Ms. Margaret Smith, Manager of Development – ASHRAE Foundation, to initiate these award process. To honor Herman's family, who made major donations to the fund, it is proposed that the award will first be presented in the Chicago 2021 Winter Conference, so that the families of Herman and Dorothy Behls can be in attendance.