

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 Constantine 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 A

RP-1180 Update for Orlando 2020 TC5.2 Meeting

RP-1180 is the Duct Design Guide. Larry Smith, Dr. Steve Item 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 Item'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 B

Duct Fitting Database Update for Orlando 2020 TC5.2 Meeting

The Duct Fitting Database (DFDB) PMS is Larry Smith, Dr. Steve Item 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 follows:

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

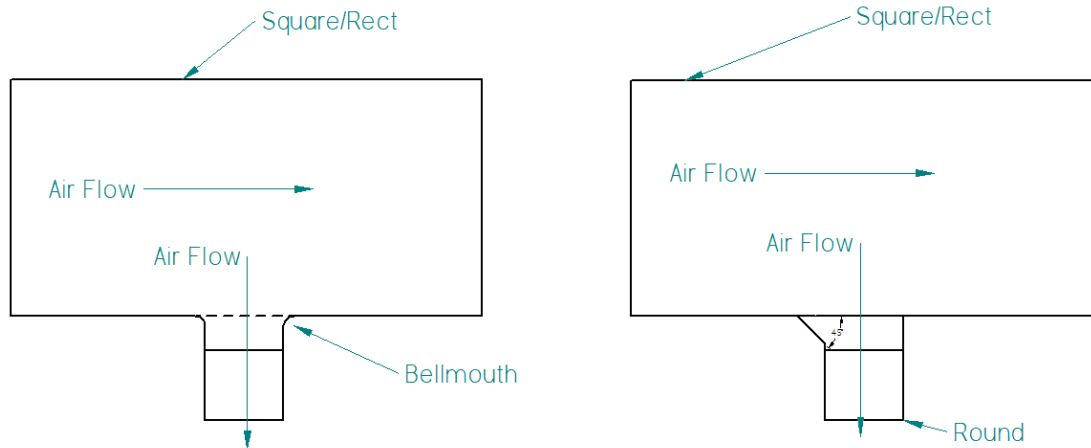
Table – DFDB (Things To Do)—Nov 2015				
Fitting	Description	Source		
ED5-1	Wye	Sepsy 1973		Both branch & main negative coefficients

ED5-2	Wye	Sepsy 1973		Both branch & main negative coefficients
ED5-4	Bullhead Tee	UMC, SRF785E	$Cb1 \neq Cb2$ $Db1 \geq Db2$	FIX 2 Tables
ED5-9	Symmetrical Wye	UMC, SRF785E	$Cb1 \neq Cb2$ $Db1 \geq Db2$	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	$Cb1=Cb2$ $Db1 \neq Db2$	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

				<p>Only 1 Table for branches</p> <p>1 Table for Main</p>
SD5-25	Cross	UMC, SRF386	$Cb1=Cb2$	<p>OK</p> <p>Only 1 Table for branches</p> <p>1 Table for Main</p>
SD5-26	Cross	UMC, SRF386	$Cb1=Cb2$	<p>OK</p> <p>Only 1 Table for branches</p> <p>1 Table for Main</p>
ER5-4	Symmetrical Dovetail	Idelchik Diagram 7-24	$Qb/Qc=0.5$	<p>OK</p> <p>Only 2 Data Points</p>
ER5-5	Bullhead Tee	Idelchik Diagram 7-23		<p>OK</p> <p>Only 1 Table</p>
ER5-6	Symmetrical Wye	Idelchik Diagram 7-30	$Ab1+Ab2=Ac$ $Ab1=Ab2$	<p>OK</p> <p>Only 1 Table</p>
ER5-7	Symmetrical Wye	Idelchik Diagram 7-30	$Ab1+Ab2=Ac$ $Ab1=Ab2$	<p>OK</p> <p>Only 1 Table</p>
ER5-8	Symmetrical Wye	Idelchik Diagram 7-30	$Ab1+Ab2=Ac$ $Ab1=Ab2$	<p>OK</p> <p>Only 1 Table</p>
ER5-9	Double Wye	Idelchik Diagram 7-27	$Ab1=Ab2$ $As=Ac$	<p>OK</p> <p>Only 1 Table for branches</p> <p>1 Table for Main</p>
ER5-10	Cross	Idelchik Diagram 7-29	$Ab1=Ab2$ $As=Ac$	<p>OK</p> <p>Only 1 Table for branches</p>

				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