

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 June 16, 2020

TC/TG/TRG TITLE Duct Design _____

DATE OF MEETING June 16, 2020 3:30pm EST LOCATION Virtual _____

| MEMBERS PRESENT | TERM TO | MEMBERS ABSENT | Y E A | 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, Programs | 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 | |
| | | | | Chris Ruch |
| | | | | David Dias |
| | | | | Joe Chin |
| | | | | Jon Kaimes |
| | | | X | Walter Robinson |
| | | | | Vinod Venugopal |
| | | | X | Scott Herrington |
| | | | | Tim Gordon |
| | | | | Matt Archey |

| | | | |
|--|--|--|--------------------|
| | | | Rodrigo Pelligrini |
| | | | Larry Smith |
| | | | Craig Wray |
| | | | Mark Smith |
| | | | Robert Hassler |
| | | | Aaron Gunzner |
| | | | Kevin Herreman |
| | | | Matthew Atkins |
| | | | John Hamilton |
| | | | Tim Eorgan |
| | | | Eli Howard |
| | | | Mark Modera |
| | | | Bruce Meyer |
| | | | Dane Carey |
| | | | John Reints |
| | | | Brian Rock |
| | | | Jeff Boldt |
| | | | Perry Philp |
| | | | |
| | | | |

*** 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-CONDITIONING
ENGINEERS**

**1791 Tullie Circle, N.E.
Atlanta, GA 30329**

ASHRAE Annual Conference – Virtual Meeting

TC 5.2 Duct Design

**Tuesday June 16, 2020
Time: 3:30-6:00 PM EDT
Virtual Meeting - Webex**

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) Quorum was reached with **13** voting members
- c) Quorum requires **8** voting members present
- d) Corrections/additions and approve agenda

4) Orlando, FL February 4, 2020 Meeting Minutes

The Orlando minutes were approved 10-0-0-0 CV on Mon June 8, 2020.
The approved minutes were uploaded to the TC Web Page and to Basecamp.

5) 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.

6) TC 5.2 Items – Chris Van Rite, John Constantinide

- a) Strategic Plan references **

7) Herman and Dorothy Behls Endowment ** – Dr. Stephen Idem

- a) Funding update
- b) Both awards are fully funded and prepared to be awarded for Chicago meeting, which is especially meaningful as Herman was member of the Chicago chapter

and his family can be included. Applications submitted, and first award should be set up for Chicago.

- c) "Herman and Dorothy Behls HVAC Designer Certification Award" Sub-committee report
- d) Follow-up **: Create at least one (1), with the goal of six (6), additional endowed Travel Grants through the ASHRAE Foundation for Young Engineers in ASHRAE (YEAs) in critical positions or with critical knowledge to travel to ASHRAE Annual and Winter Conferences.
 - i) Can include additional fundraising through endowment

8) Section 5 and TAC Report – Larry Smith

- a) Last meeting as Section 5 Head, moving to Vice Chair at TAC and Chair of reorganization committee
- b) Please see **ADDENDUM A** attached.
- c) Any questions/comments on reorganization send to Larry Smith at: ReOrg@ASHRAE.net

9) Subcommittee Reports

a) Research – Keven Gebke, Chair - Larry Smith

- i) Duct Sealant Initiative **
 - 1. Overview, background and scope
 - a. The following action items to complete **:
 - i. A transition of materials from past work addressing duct sealants and duct system leakage;
 - ii. Recruitment of engineers and owner's representatives who have completed projects addressing duct system leakages;
 - iii. Conduct a critical literature review on past work with duct design in relation to duct system leakage, leading to identifying gaps in understanding how to best address duct system leakage through design, construction, operation, and maintenance of HVAC&R systems;
 - iv. Bridging duct system leakage with other aspects of duct design, including duct system construction, operation, and maintenance, to engage in a wholistic approach and result of the work done by the subcommittee;
 - v. Update the Duct Design and Duct Construction Handbook chapters to incorporate the final product of the subcommittee; and
 - vi. A timeline of documents (e.g. Technical Bulletins, conference papers) to be published to address best practices in design, construction, operation, and maintenance of HVAC&R systems to minimize duct system leakage.
 - b. Sub-committee report, RTAR(s)

a) Membership **- Randy Young, Chair

- i) 6 new Provisional Corresponding Members (PCMs) since January 2020.

- a) Miss Jessica Mariye Katoka, **YEA** 2-5-20
 - b) Mr. Walter Robinson, **YEA** 1-15-20
 - c) Mr. Kok Zhen, **YEA** 5-27-20
 - d) Mr. Scott Herrington, **YEA** 2-5-20
 - e) Mr. Zak Dobson, **YEA** 2-5-20
 - f) Mr. Kevin Herreman, 2-6-20
 - ii) TC 5.2 will reach out to the following market segments for additional engagement and representation:
 - a) Duct Design Engineers;
 - b) Academics and Researchers Focused on Duct Design;
 - c) Code Authorities/Authorities Having Jurisdiction;
 - d) Building Owners/Managers and Owner Authorized Representatives; and
 - e) General Contractors, Mechanical/Sheet Metal (including SMACNA) Contractors, and Associated Technicians.
- b) **2021 Handbook of Fundamentals** – Micah Dawson
 Deadline June 7, 2020
 Micah couldn't attend today, but has some clerical updates for the Handbook
 One submission about phenolic duct that might need moved ???
 In touch with Bass Ashukra? To keep up with submission
- c) **Programs **** - Dr. Stephen Idem
- i) **Duct Design Fundamentals** – Dr. Stephen Idem, Larry Smith
 - a) Re-Scheduled for later in June
 - a. Seminar 59 “Designing Energy Efficient Duct Systems” – Virtual presentation Monday June 22, 2020 8:00-9:00 AM EST
 - b. Live Q&A session related to seminar (above) Monday June 29, 2020 9:00AM – 9:20AM EST
 - b) Presented in meeting and Posted to Basecamp under “Docs & Files/DDG Seminar June 2020”:
 - a. Duct Design Presentation was given – narrated by Larry Smith
 - b. Duct Design Fundamentals Equal Friction Method, ASHRAE 5.2 YEA Seminar – by Dr. Stephen Idem,
 - ii) **Planning **** - Organize at least one (1) ASHRAE Chapter seminar every six (6) months addressing a topic within the scope of TC 5.2.
 - a) Deadline to submit program package for Chicago Winter Conference 2021 is Monday Aug 3, 2020.
 - a. Currently we have no plans to submit for Winter Conference
 - iii) **Coordinate with Duct Sealant Initiative **** -
 - a) Organize at least one (1) program session or a TC-sponsored training session for each upcoming ASHRAE Annual and Winter Conference addressing duct system leakage. OR Create a duct design and construction track at an upcoming ASHRAE Annual and Winter Conference.

- b) Nominate at least one (1) TC 5.2 member to become an ASHRAE Distinguished Lecturer (DL) to address one or more topics on duct system leakage.
 - a. Can tie into planning for at least one (1) ASHRAE Chapter seminar every six (6) months addressing a topic within the scope of TC 5.2
- d) **Duct Design Guide ** (DDG) - Pat Brooks**
 - i) Follow-up after publication**:
 - a) Create an education program utilizing content from the Duct Design Guide.
 - b) Create a plan to publicize the Duct Design Guide education program to ASHRAE and non-ASHRAE members.
 - ii) Jeff Boldt needs to get some info to Pat Brooks regarding Duct Design Guide
 - iii) Please see updated report **ADDENDUM B**
- e) **Duct Fitting Database** (DFDB) - Pat Brooks**
 - i) Follow-up after publication**:
 - a) Create a user guide assisting practitioners with utilizing the Duct Fitting Database, with a timeline for publication of the user guide.
 - b) Organize at least one (1) conference workshop or a TC-sponsored session that trains professionals on the Duct Fitting Database and accompanying user guide.
 - ii) Please see updated report **ADDENDUM C**
- f) **Codes & Standards Interaction - Ralph Koerber**
 - i) **ICC 2021 – IMC, IRC, IECC Code Revision Cycle – Group B**
 - a) 6 appeals posted April 8, 2020
 - ii) **IAPMO 2021 UMC Code Revision Cycle**
 - a) UMC TC initial meeting by conference on April 9, 2020
 - b) Call for proposals July 6, 2020
 - c) Deadline to submit proposals January 4, 2021
 - d) TC Meetings May 3 to 7, 2021
 - iii) **NFPA 90A & 90B Standards 2021 Revision Cycle**
 - a) Final date to appeal was May 22, 2020
 - b) Consent document not presented due to postponement of Technical Session in June 2020.
 - iv) **UL 181 Standards (UL 181, UL 181A, UL 181B)**
 - a) UL181C Outline of Investigation for Non-Metal Accessories for Use with Flexible Ducts
 - b) UL Duct Fabricators program- mainly for fabrication shops that assemble duct from rigid fiberglass or phenolic materials
 - v) **ASHRAE Standard 90.1 - Mark Smith, Jeff Boldt**
 - a) Present seminars and publish papers in response to publication and research based off of SPC 215 Method of Test to Determine Leakage of Operating HVAC Air-Distribution Systems.
- g) **Webmaster - Akshay Bhargava**
 - i) TC 5.2 Website: <https://TC0502.ashraetcs.org/>
 - ii) Trying to update the background, but no reply from ASHRAE yet.

- h) **Historian** - Bob Reid
 - i) Herman Behls library and papers
 - ii) Still have another box to go through
 - iii) Some projects touch on research projects, which we hope to put together into an index to provide a resource for TC members to use.

10) Deadlines

- a) Handbook – on borrowed time for 2020 submission
 - i) Will be sent out for comments before submitted

11) Notifications

- a) Craig Wray - DFDB issue: Someone looked at the equations and found a small discrepancy regarding Friction Factor

12) Action Items

13)

| TC 5.2 Duct Design Action Items | | | |
|---------------------------------|---|--------------------------------------|--------------|
| Number | Description | Assigned to | Status |
| 1 | Write content for the Duct Design chapter of the Fundamentals Handbook related to gypsum board. | Larry Smith, Ralph Koerber, and John | Under review |
| | | | |

14) New Business

- a) Chris Ruch – Do we want to look into making a recommendation for requirement for return ducts (potentially for retrofits and for potential emergency cases where existing buildings were abruptly revised to become medical facilities)
 - i) John C. – believe there is ducted return called for Renovations and New Construction in the ICC, while IECC (Energy Conservation Code)
 - ii) Jeff Boldt – don't believe ducted return is required in other building categories that are NOT health care spaces
 - iii) Propose a subcommittee to address this issue, chair by Chris Ruch
 - 1. Volunteers: Randy Young, Bob Reid, Walter Robison, John Constantinide, John Hamilton
- b) 5.3 is looking to create a committee addressing COVID-19 related concerns, Craig Wray suggests we should have 5.2 also on that committee (Kevin Gebke agrees) and get information to ASHRAE's
 - i) Focusing on distribution of air within a room
 - ii) How does air react going to the return, and then from return on
 - iii) John Hamilton – white paper was published (by Chris Ruch) on assessment on buildings to verify proper distribution and ventilation
 - iv) Discussion about dynamics of the virus and its ability to survive on surfaces and be transmitted back to central air handler. Questions on how long the virus lasts, how easily it transmits, and what materials it survives on. Keeping focus on the room air movement and quality helps to sidestep those questions for the time being. (Craig Wray)

- v) FOCUS: what can 5.3 and 5.2 recommend regarding transmission of viruses like COVID-19 (aerosols) through the duct system
- vi) Worthy of a research project?
- c) Presentation regarding COVID-19, from Stephanie Taylor

15) Adjournment – Closed at 6:00pm Bob Reid (motion), several seconds to pass.

Upcoming Meetings:

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

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

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

2022 ASHRAE Annual Conference --- Toronto, ON --- June 25 - 29, 2022

Addendum A

Section Head Report

1) This is my last meeting as section head, however, I will be continuing as the incoming vice-chair at TAC. I have also been tagged the incoming chair for the ASHRAE reorganization. There is now a direct line for anyone to make suggestions, offer constructive criticism, or ask any questions by using ReOrg@ASHRAE.net.

2) Please have your Honors Chairman scout your membership and committee for nominating a person for the Hightower Award. This award is bestowed to a person that has exhibited technical leadership and contribution to the society during the last 4-years of service. The application deadline is 9/1/20.

3) During a virtual meeting, or even during a regular meeting, it is very beneficial to announce your companies affiliation along with what you may be actively involved to establish any bias you may unintentionally have prior to weighing in on a particular subject. This is more important when you have people in attendance that may not be familiar with your particular background. This removes all potential ethical issues up front!

4) For a sustainable membership please reach out to the YEA membership. This is one of the most important functions for your committee. Your efforts to date have been stellar!

5) My thanks and appreciation for the privilege of serving you as your section head.

6) In addition, my sincere personal thanks for your volunteerism maintain this technical committees leadership in the art and science of duct design.

Addendum B

Duct Design Guide Report

RP-1180 Update for Virtual 16 June 2020 TC5.2 Meeting

RP-1180 is the Duct Design Guide. Larry Smith, Dr. Steve Idem and Pat Brooks continue to work closely with Cindy Michaels on the updated edited versions of all chapters to make them suitable for publication.

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. Updated

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 (Updated)

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 DESIGN – LOCAL EXHAUST SYSTEMS (CONSTAN VELOCITY)
- 6 FAN-DUCT SYSTEM INTERACTION (Edited and Returned 5-18-20)
- 7 DUCT SYSTEM MATERIALS (Edited and Returned 5-20-20)
- 8 DUCT SYSTEM ACOUSTICS (Edited, sent to Jeff Boldt to Proof by EOD 4 June)

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

Addendum C

Duct Fitting Database (DFDB) Report

The Duct Fitting Database (DFDB) PMS is Larry Smith, Dr. Steve Idem, Vikram Murthy, and Pat Brooks. Here is what was accomplished since the last meeting.

A correction of calculation procedure of the friction factor for CD11-4 (friction rate calculation) was attempted by John Downey, who has been handling the update of the DFDB. Dr. Idem checked and it still not working properly because of unit conversions. Dr. Idem will need to get back with John Downey.

CF11-1 is not working because it is using the equivalent round cross-section instead of the actual cross-section. Dr. Idem will need to get with John Downey on this as well.

We have added below to the strategic plan. Here is what we are trying to do:

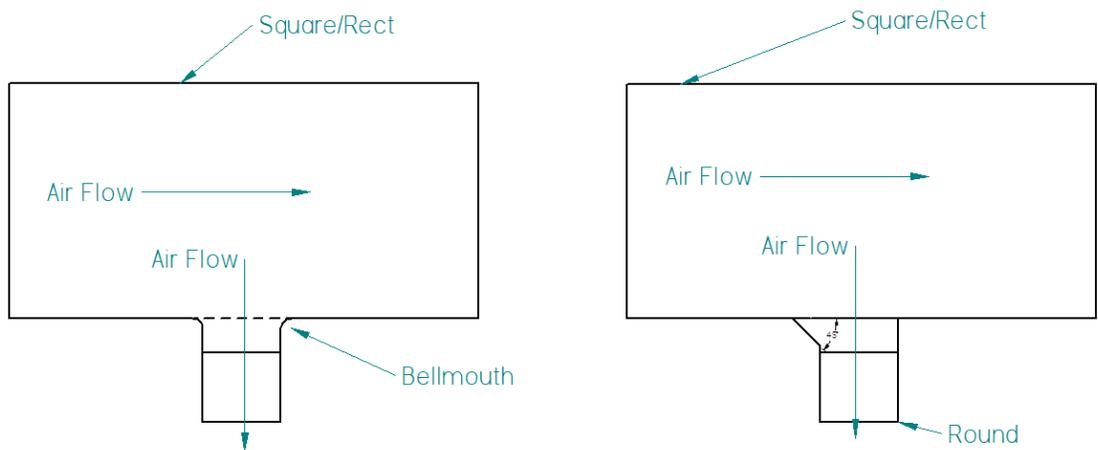
1. The DFDB (Duct Fitting Database) was developed mostly by Herman and John Downey using Herman's specifications. Herman developed the fitting codes that were used and the tree structure (under Supply, Exhaust and Common Fitting).
2. Most people find it cumbersome to use (not user friendly). Even I find it cumbersome.
3. It is the only place that all ASHRAE's loss coefficients reside.
4. There are help screens.
5. Administrators like Larry, Steve, Vikrum and I can see most of the equations but there are subroutines, and interpolation and some extrapolation calculations that we do not actually see what equations are used. We need access to all 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 to be fixed.
7. Also, there needs to be checks added so the results do not go out of bounds.
8. We have suggested that another contractor besides John Downey to handle the programming and maintenance of the program. 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 have not developed the full specifications for a rewrite of the DFDB. Larry, Steve, Vikram, and I need to do that, but I do not 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. Vikram should be learning to use the program and help update the Program Instructions in the database. Would like Vikram to review the program instructions and update them. Need a list of fittings with their code and other useful instructions updated.

Here is a list of fittings that need to be tested to determine the loss coefficients. If anyone has some fittings that should be tested, they should add them to the list. Close-coupled elbows are on the 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 | $C_{b1} \neq C_{b2}$ $D_{b1} \geq D_{b2}$ | FIX 2 Tables |
| ED5-9 | Symmetrical Wye | UMC, SRF785E | $C_{b1} \neq C_{b2}$ $D_{b1} \geq D_{b2}$ | FIX 2 Tables |
| | | | | |

- Requested Per Mark Terzigni



- Mitered elbows with turning vanes. Should the vanes be flush at the heel, throat or in between.
Requested by John Hamilton
- Close-coupled fittings like taps
- Combination fittings
- Close-coupled elbows

Pat Brooks, Chair DFDB