

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 January 12, 2021

TC/TG/TRG TITLE Duct Design

DATE OF MEETING January 12, 2021 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 (CM)				
Dr. Stephen Idem, Programs	6/30/23			
Randy Young, Membership	6/30/23			
Kevin Gebke	6/30/23			
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	
				Larry Smith CM
				Perry Philip CM
				Aaron Guzner YEA PCM
				Tim Eorgan CM
				Eddie Musso CM
				Pat Brooks CM (ALI coordinator)
				Chris Ruch PCM
				Craig Wray CM
				Walter Robison YEA PCM
				Brian Rok Guest

			Dave Dias CM
			Mark Smith CM
			Prateek Shrestha YEA PCM
			Vinod Vinogupal YEA PCM
			John Reints CM
			Dave Cary Guest
			Jeff Boldt CM
			Jonathan Henkel YEA PCM
			Eli Howard Guest
			Jamie Fine PCM
			John Hamilton CM

*** Member Non-Quorum**

CM = Corresponding Member

PCM = Provisional Corresponding Member

G = Guest

DISTRIBUTION

All Members of TC plus the following:	
TAC Section Head	Kevin Marple
TAC Chair	Dustin Meridith
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 Winter Conference – Virtual Meeting

TC 5.2 Duct Design

**Tuesday January 12, 2021
Time: 3:30-6:00 PM EDT
Virtual Meeting – Zoom**

<https://ashrae-org.zoom.us/j/97552812491?pwd=VnR3cjFIRUICZmlxK3NiaTZTUTc4dz09>

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) Recognize attendees
- b) Quorum was reached with **10** voting members (*out of 12*)
- c) Quorum requires **7** voting members present
- d) Corrections/additions and approve agenda

4) Virtual Annual Meeting Minutes June 16, 2020

- a) The DRAFT minutes were posted to Basecamp in the Files>Minutes folder for Voting Members to review.
- b) Vote to approve 2020 Annual Meeting minutes: 10 / 0 / 0 (approve/reject/abstain).
- c) Approved FINAL minutes will be 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.
- d) Virtual Meeting Protocols – John Constantinide

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

- a) Strategic Plan references **

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

- a) Who was Herman Behls
- b) Purpose of Endowment
 - i) To fund supplemental travel grants for travel to ASHRAE conferences
- c) Who is eligible
 - i) YEA members selected from applications submitted
- d) Report on status of awards
- e) Follow-up on action item from June Virtual meeting:
 - i) 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.
 - 1. Can include additional fundraising through endowment

8) Section 5 and TAC Report – Larry Smith presenting for Kevin Marple

- a) Request/reminder for timely submission of TC 5.2 Activity Report
- b) Also request for submission of newly required document related to efficiency/efficacy of TC – virtual meeting to review and submit set for Fri January 22nd.

9) Subcommittee Reports

- a) **Ducted Return Recommendation to ASHRAE Covid-19 Task Force** - Chris Rusch
 - i) Submitted a recommendation to the COVID task force basically to recommend the use of ducted returns. Paper goes over current code requirements. Final version submitted to task force.
 - ii) Nov 25, 2020 received response from task force – consensus was that while ducted returns make sense for particular buildings, they are not comfortable with a blanket statement. Did recommend doing a research project?
 - iii) Jan 15th, 2021 the task force will be reconvening.
- b) **Membership ****- Randy Young, Chair
 - i) Recognize new Provisional Corresponding Members (PCMs) since June 2020.
 - 1. Mohammed Haleemeh 8/30/20
 - 2. Jonathan Henkel 10/23/20
 - 3. Khaled Gamal 12/9/20
 - 4. Prateek Shrestha 10/27/20
 - 5. Jamie Fine 1/12/2021
 - 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.

- ii) Jeff Boldt recommended a drafted outreach statement to distribute to various industry groups. He offered to distribute a document to engineers at his firm.
 - iii) Ernest Conrad – contact to get BOMA stakeholders to get involved in TC 5.2
 - iv) Full list of attendees in [Addendum C](#)
- b) **2021 Handbook of Fundamentals** – Chris Van Rite
- i) Handbook responsibilities were passed Chris Van Rite from Micah, therefore behind on submittal for 2021 publication, but hoping to get in for either hard copy 2021 or a special publication process.
- c) **Programs **** - Steve Idem
- i) **Planning **** - Organize at least one (1) ASHRAE Chapter seminar every six (6) months addressing a topic within the scope of TC 5.2.
 - ii) Dr Idem has a lot on his plate currently and requests volunteers to assist with the committee. If interested please contact Chair or Dr Idem.
 - iii) No programs for this Winter Annual conference except program during our TC meeting.
- d) **ANSI ASHRAE Standard 215-2018 Presentation** – Larry Smith and Craig Wray
 “Overview and Rationale for ANSI/ASHRAE Standard 215-2018, Method of Test to Determine Leakage of Operating HVAC Air Distribution Systems”
- i) 1st part of presentation (by Larry Smith)
<https://tc0502.ashraetcs.org/documents/presentations/Standard%20215%20Presentation%20Part%201%2012Jan21.pptx>
 - ii) 2nd part of presentation (by Craig Wray)
<https://tc0502.ashraetcs.org/documents/presentations/Standard%20215%20Presentation%20Part%202%2012Jan2021.pptx>
 - iii) Suggestion was made by Craig Wray to work toward a research project in combination with the Department of Energy and other participants to get a data set using the test method of Standard 215
 - iv) Jeff Boldt requested sealant costs for 90.1 committee; Randy Young said his group may have some relevant data relating to work done in California.
 - v) Recommendation from Craig Wray to develop a standard procedure for proper flow hood measurements
- e) **Duct Design Guide **** (DDG) - Pat Brooks
- i) Updates:
 - a) Duct Design Committee reviewed the complete Duct Design Guide
 - b) Corrections and updates were sent to Cindy Michaels of ASHRAE in November 2020.
 - c) Cindy has been very busy and has not had a chance to review the updated Guide. She hopes to get to it within the next couple of weeks
 - d) 50/50 chance of having it published before next meeting, more likely to be done for the Vegas meeting in 2022
 - ii) 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.
- f) **Duct Fitting Database**** (DFDB) - Pat Brooks
 - i) Please refer to **Addendum A** for update to DFDB
 - ii) Game Plan for completion in two years while team members are still active
 - iii) 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.
- g) **Research** – Kevin Gebke
 - i) Bob Reid – RTAR Proposal “Duct Take-offs, Taps”
 - a) Request for some co-authors to create a research project
 - a. Exposed duct projects with grilles/registers mounted on duct
 - 10. Have good data with Standard 70 for grilles, but when it comes from going from trunk, perpendicularly to grille, we don’t have data on what would be most efficient
 - 11. What types of grille diffusers are efficient – no testing found on how taps perform
 - 12. Meant to give some guidance as to what works/doesn’t work when it comes to different types/designs of registers/grilles.
 - 13. Would want co-sponsorship with 5.3 and Test & Balance folks. Perhaps something SPIDA would be interesting in financially supporting
 - b. Dates –
 - c. Volunteers? Please contact Bob Reid – (Kevin Gebke and Jeff Boldt)
- h) **Codes & Standards Interaction** - Ralph Koerber
 - i) ASHRAE Standard 90.1 Mark Smith, Jeff Boldt
 - a) Meetings coming up in the next week+
 - b) Request for costs for duct sealing to relay to 90.1 committee
 - c) Also doing work on Energy Recovery, multi-wheel, etc. during the 90.1 meeting
 - d) Request from chair: please send agenda from 90.1 meeting and notes from meetings after they occur
 - e) Please see Addendum
- i) **Webmaster** - Akshay Bhargava
 - i) TC 5.2 Website: <https://TC0502.ashraetcs.org/>
- j) **Historian** - Bob Reid
 - i) Herman Behls library and papers
 - a) List of publications is available on Basecamp

- b) There are several standards, many research publications, and many sources for past Bibliographies available for TC members to “borrow”
- c) Opportunity for new members: can anyone work on paying attention to source references for research, publications, etc and let the committee know when a reference needs to be updated?

10) ADI Research Report (Time Permitting) Chris Van Rite

- a) Report will be available upcoming with a lot of valuable information

11) Deadlines

12) Notifications

13) Action Items

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 Hamilton	Under review
2	Documents/Information/Publications to share with students, contractors and engineers are valuable to the industry.	Unassigned	
3	Webinars/seminars related to Duct Design guide, Duct Fitting Database are in very high need	unassigned	

14) New Business

- a) Discussion related to the need for webinars & seminars from the TC to present to the industry at large. Possibilities include subjects related to the Duct Design Guide, Duct Fitting Database, and any research projects the TC has completed.

15) Adjournment

- a) Motion by 5:59pm (Motion by Randy Young and Second by John Constantinide)

Upcoming Meetings:

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

Duct Fitting Database Update for 12 January 2021 TC5.2 Virtual Meeting

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.

Old Business

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 had developed this strategic plan prior to recent events on updating or rewriting the entire DFDB.

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. We need to add data on saddle taps from TTU research.
3. Most people find it cumbersome to use (not user friendly). Even I find it cumbersome.
4. It is the only place that all ASHRAE's loss coefficients reside.
5. There are help screens.
6. Administrators like Larry, Steve, Vikram 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.
7. We know many of the duct friction loss equations are wrong and need to be fixed.
8. Also, there needs to be checks added so the results do not go out of bounds.
9. We have suggested that other contractors besides John Downey be able to handle the programming and maintenance of the program.
10. I think we will develop a user's manual that is easy to use and explains all functions of the DFDB.

We have drafted specifications update the DFDB which should include the above. A meeting to discuss the specifications was held on 11 January 2021. Here is the DRAFT of the Project Scope John Downey submitted for the update.

New Business - Project Scope

This project will focus on key areas that will enhance the user ability of the program.

1. **Add column and row headers including title and version information when a table is displayed by the program or exported.**
2. **Display the coefficient data for the fitting from the "Show Table Data" icon.**

3. Add an 'Export to Excel' for the coefficient data from the page in #2 .
4. Add an 'Export to PDF' for the coefficient data from the page in #2
5. Improve 'Drawing View' with additional filters for each column.
6. Increase the Drawing graphic size for drawing view. Make sure drawings are dark enough.
7. Add features to the 'Project Management' system (including copying, editing and keep delete).
8. Add 'User Type' to User Management (i.e. administrator, user or other)
9. Correct any erroneous friction factor calculations.
10. Add User input error validation or display "Out of Range". Determine which ratios the DFDB should be allowed to be used (down to 0.1 or 0.01)
11. Add ED5-3 to database. [This doesn't need added, it needs some coefficients corrected]
12. The DFDB output data can still be accessed by duct design programs.
13. Non-standard conditions of temperature, elevation, barometric pressure, and relative humidity can be entered on the fly. Air properties can be displayed or hidden. Default values should stay as they are.
14. Units of either I-P or SI can easily be selected.
15. Curve fitting of equations and tables utilized in the program can be edited by a High-Level Administrator only, as designated by the DFDB Subcommittee. Identify them under User Management.
16. A new test web site should be set up to update and test loss or loss coefficients data and new fitting editions.
17. The following duct/fitting corrections/additions should be included in the project:
 - a. Add the correct algorithms for CD-11-4-1 I-P and SI; delete the version CD-11-4 (I-P and SI) since they don't converge
 - b. Correct the algorithm for CF11-1 (SI and I-P); it is not working because it is using the equivalent round cross-section instead of the actual cross-section, and there is apparently a units conversion mistake in the friction factor calculation.
 - c. Carefully check whether CD-11-3 is giving the proper answers (SI and I-P). It may have the same problems as CD11-4.
 - d. Add loss coefficients for saddle tap tees (diverging and converging flows)
 - e. Add schematic diagrams for fittings CD8-9 through CD8-14 (terminal units SI and I-P)
 - f. Correct loss coefficient data for ED5-1, ED5-2, and ED5-3 based on the research "An Experimental Study of the Pressure Losses in Converging Flow Fittings Used in Exhaust Systems - Final Report Part I and II from The Ohio State University College of Engineering. Jamie Fine to supply any data corrections.
18. A help key feature (designated by the symbol "?") shall be added to strategic locations of the program to quickly identify the definition of that item.

Someone or some group will be designated to store and maintain the research data. The information at the ASHRAE Headquarters will be shipped to them and cataloged. Not part of the scope but needs to be done.

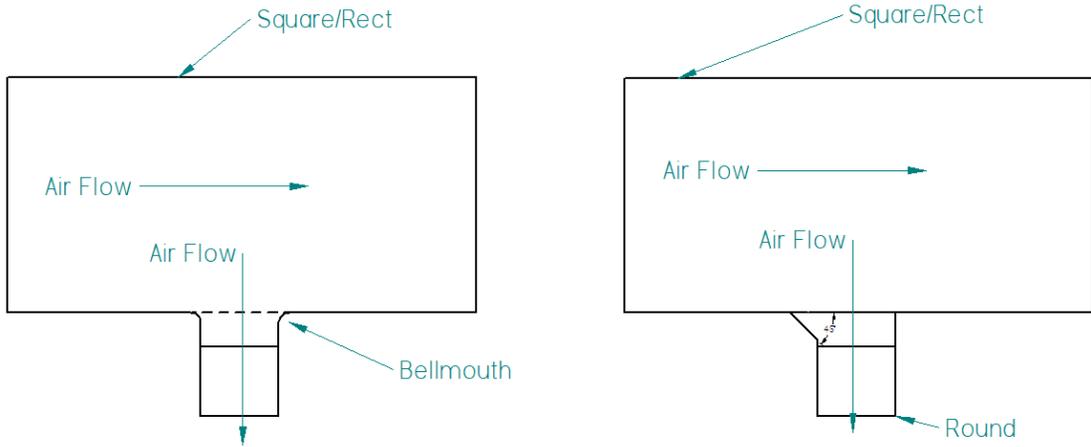
In discussions with Mark Owen of ASHRAE, they are very interested in funding this project. John Downey estimates a cost of less than \$10,000 for 60 days but his proposal needs updated.

- Dr. Jamie Fine – University of Toronto. Dr Fine has become very well versed in the existing DFDB. He has been added to the DFDB committee.
- Tennessee Tech University - Dr. Steve Idem, Larry Smith and Vikrum Murthy are also on the committee. Along with myself, those people will review the program as it is enhance.
- John Downey – John is the main administrator of the program

Here is a list of fittings that need to be tested or retested 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	30 Deg Wye	Sepsy 1973		Both branch & main negative coefficients
ED5-2	45 Deg Wye	Sepsy 1973		Both branch & main negative coefficients
ED5-3	90 Deg Wye	Sepsy 1973		Typos and extrapolation need fixed.
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

- 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

Other notes, get TC1.5 involved.

Addendum B

Codes & Standards Discussion (TC-5.2 on 1/12/21 by Ralph Koerber)

1. Underwriters Laboratories
 - a. UL2518 Air Dispersion Systems Standard
 - i. UL has initiated a Call for Proposals to UL181 STP members -
Are there requirements in the UL 2518 Ed. 1 Standard for Air Dispersion Systems that should be updated or emerging technologies or applications that need addressed through changes to the standard?
Proposals requested through UL's On-Line Collaborative Standards Development System (CSDS) by December 4, 2020.
2. NFPA 90A & 90B Standards
 - a. NFPA's 2021 Editions are printed and are available in print or downloadable online.
 - i. The First Draft public input for the 2024 cycle is now open with a closing deadline for proposals of June 01, 2021.
 - ii. The 90A & 90B TC will meet sometime in late 2021 to review proposals.
 - iii. The First Draft Report posting will be on March 22, 2022.
3. International Code Council - 2021 Editions
 - a. Group B Cycle -
 - i. IECC, 2021 Edition
 1. Final action results posted on 4/8/20.
 2. Appeals deadline was 5/8/20.
 3. Council met in September to finalize all appeals.

Addendum C

1/12/21 5.2 TC Meeting Attendance

1. Chris Van Rite VM
2. John Consantinide YEA VM
3. Bob Reid VM
4. Cindy Bittel NV/CM
5. Dr. Stephen Idem VM
6. Randy Young VM
7. Kevin Gebke VM
8. Wes Davis VM
9. Ralph Koerber VM
10. Vikram Murthy VM
11. Akshay Bhargava YEA VM
12. Larry Smith CM
13. Perry Philp CM
14. Aaron Guzner YEA PCM
15. Tim Eorgan CM
16. Eddie Musso CM
17. Pat Brooks CM (ALI coordinator)
18. Chris Ruch PCM
19. Craig Wray CM
20. Walter Robison YEA PCM
21. Brian Rok Guest
22. Dave Dias CM
23. Mark Smith CM
24. Prateek Shrestha YEA PCM
25. Vinod Vinogupal YEA PCM
26. John Reints CM
27. Dave Cary Guest
28. Jeff Boldt CM
29. Jonathan Henkel YEA PCM
30. Eli Howard Guest
31. Jamie Fine PCM
32. John Hamilton CM