

TC 5.2 (Duct Design) Research Projects

Project	Year	Contractor	Title	Paper
RP-2	1966	Kansas State University	Duct Heat Transfer	<ul style="list-style-type: none"> “Heat Losses from Horizontal Ducts Carrying High Velocity Air” by Kent & Nevins (ASHRAE Transactions 1966, V. 72, Pt.1) No Final Report
RP-79	1975	University of Texas	Oval Duct Loss Coefficients	<ul style="list-style-type: none"> “Pressure Drop in Flat-Oval; Spiral Air Ducts” by Heyt & Diaz (ASHRAE Transactions 1975, V. 81, Pt.2)
RP-81	1978	University of Texas	Duct Design Information: A Critical Assessment of High Velocity	<ul style="list-style-type: none"> “A Critical Assessment of High Velocity Duct Design Information” by Rick Eschman and Dr. Wayne Long, September 1968 (ASHRAE Transactions 1970, V. 76)
RP-176	1978	Tennessee Tech. University	Friction of Air Duct Liners	<ul style="list-style-type: none"> “Flow Losses in Rectangular Ducts Lined with Fiberglass” by Dr. Swim (ASHRAE Transactions 1978, V. 84, Pt.2)
RP-245	1980	Tennessee Tech. University	Plastic Duct Friction	<ul style="list-style-type: none"> “Friction Factor and Roughness for Airflow in Plastic Pipes” by Dr. Swim (ASHRAE Transactions 1982, V. 88, Pt.1)
RP-308	1982	ETL Laboratories	Duct Leakage	<ul style="list-style-type: none"> ETL Report No. 459507: “Investigation of Duct Leakage”, January 1985 No paper.
RP-383	1984	Tennessee Tech. University	Friction Chart	<ul style="list-style-type: none"> “Resistance to Flow of Round Galvanized Ducts” by Dr. Griggs, Dr. Swim & G.H. Henderson. (ASHRAE Transactions 1987, V. 93, Pt.1, pp 3-16.)
RP-447	1985	Tennessee Tech. University	Duct Leakage: Measurement, Analysis and Prediction	<ul style="list-style-type: none"> “Duct Leakage Measurement and Analysis” by Dr. William Swim & Dr. Edwin Griggs (ASHRAE Transactions 1995, V. 101, Pt.1: 274-291)
RP-516	1986	Fluor-Daniel Corp.	T-Method: Optimization and Simulation	<ul style="list-style-type: none"> “Using the T-Method for Duct System Design” by Dr. Robert Tsal (ASHRAE Journal, March 1990) “T-Method Duct Design, Part I: Optimization Theory” by Dr. Tsal (ASHRAE Transactions 1988, V. 94, Pt.2) “T-Method Duct Design, Part II: Calculation Procedure and Economic Analysis” by Dr. Tsal (ASHRAE Transactions 1988, V. 94, Pt.2) “T-Method Duct Design, Part III: Simulation” by Dr. Tsal (ASHRAE Transactions 1990, V. 96, Pt.2)
RP-549	1987	Tennessee Tech. University	Rectangular Duct Friction	<ul style="list-style-type: none"> “Flow Characteristics in Rectangular Ducts” by Dr. E. Griggs (ASHRAE Transactions 1992, V. 98, Pt.1)
RP-551	1988	United McGill Corp.	Select Fitting Loss Coefficients	<ul style="list-style-type: none"> “New ASHRAE Local Loss Coefficients for HVAC Fittings” by P.J. Brooks (ASHRAE Transactions 1993, V. 99, Pt.2)

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RP-574	1989	Oklahoma State University	Computerized Fitting Database & Data Verification	<ul style="list-style-type: none"> “Duct Fitting Data Enhancements and Data Base Development” by Dr. Delahoussaye and Dr. McQuiston (ASHRAE Transactions 1994, V. 100, Pt.1)
RP-641	1989	Netsal & Associates	T-Method: Optimization with Leakage	<ul style="list-style-type: none"> “T-Method Duct Design: Part IV – Duct Leakage Theory” by Dr. Robert Tsal (ASHRAE Transactions 1998, V. 104, Pt.2) “T-Method Duct Design: Part V – Duct Leakage Calculation Technique and Economics” by Dr. Robert Tsal (ASHRAE Transactions 1998, V. 104, Pt.2)
RP-690	1991-94	Tennessee Tech. University	Oval Duct Fitting Resistance	<ul style="list-style-type: none"> “Equivalent Round Diameter of Spiral Flat Oval Ducts” by Brad Townsend, Fariborz Khodabakhsh, and Steve Idem (ASHRAE Transactions 1994, V. 100, Pt.2) “Main Loss Coefficient Measurements for Flat Oval Tees and Laterals” by Dr. Stephen Idem (ASHRAE Transactions 2003, V. 109, Pt.1:456-461) “Loss Coefficient Measurements in Divided-Flow Flat Oval Fittings” by Brad Townsend, F. Khodabakhsh & S. Idem. (ASHRAE Transactions 1996, V. 102, Pt.2:151-158) “Influence of Area Ratio on Flat Oval Divided-Flow Fitting Loss Coefficients” by Dr. Idem & F. Khodabakhsh (HVAC&R Research, Vol. 5, No. 1:19-33. January 1999) “Loss Coefficient Measurements for Flat Oval Elbows and Transitions” by Brad Townsend, F. Khodabakhsh & S. Idem. (ASHRAE Transactions 1996, V. 102, Pt.2:159-169)
RP-732	1994-08	University of Pittsburgh	Modeling and Structural Testing of Flat Oval Ductwork	<ul style="list-style-type: none"> “Experimental Testing and Computational Modeling of Flat Oval Duct Deflection” by Dr. Patrick Smolinski & G.S. Palmer (ASHRAE Transactions 1996, V. 102, Pt.1)
RP-854	1995	Penn State	Determination of Duct Fitting Analysis by Numerical Analysis	<ul style="list-style-type: none"> “Flow Modeling of Flat Oval Ductwork Elbows Using CFD” by Dr Stanley Mumma (ASHRAE Transactions 1997, V. 103, Pt.1)
RP-916	1996-07	Penn State	Impact of Close Coupled Ductwork Fitting Arrangement on System Pressure Drop based upon CFD Analysis and Field Measurement	<ul style="list-style-type: none"> “Close Coupled Ductwork Fitting Pressure Drop” by Dr. Stanley Mumma (HVAC&R Research, Vol. 3, No. 2, April 1997)

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RP-1132	2001	Tennessee Tech. University	Leakage of Ducted Air Terminals	<ul style="list-style-type: none"> “Leakage of Ducted Air Terminal Connections: Part 1 – Experimental Procedure and Data Reduction” by Dr. Stephen Idem (ASHRAE Transactions, 2003, V. 109, Pt.2) “Leakage of Ducted Air Terminal Connections: Part 2 – Experimental Results” (ASHRAE Transactions, 2003, V. 109, Pt.2)
RP-1157	2002	Ruskin Mfg. Co.	Flow Resistance and Modulating Characteristics of Control Dampers	<ul style="list-style-type: none"> “Flow Resistance Characteristics of Airflow Control Dampers” by Robert Van Becelaere & Dr. Sauer (HVAC&R Research, Vol. 11, No. 1, January 2005) Van Becelaere, R. and H.J. Sauer. 2004. Flow resistance and modulation characteristics of control dampers. (Final Report, RP-1157, June 2004)
Private Research Project	2003	Tennessee Tech. University		<ul style="list-style-type: none"> Pressure Loss Coefficient Measurements of Two Close-Coupled HVAC Elbows (HVAC&R Research, Vol. 11, No. 1, January 2005)
RP-1223	2008	Tennessee Tech. University	System Effects of Propeller Fans	<ul style="list-style-type: none"> “Aerodynamic Performance and System Effects of Propeller Fans” by M.N. Young, C. Darvennes & S. Idem (HVAC&R Research, Vol. 15, No. 2, March 2009: 231-254)
RP-1319	2007-08	Tennessee Tech. University	Laboratory Testing of Flat Oval Elbows to Determine Loss Coefficients	<ul style="list-style-type: none"> “Influence of Aspect Ratio and Hydraulic Diameter on Flat Oval Elbow Loss Coefficients” by D. Kulkarni, S. Khaire & S. Idem (ASHRAE Transactions, 2009, V. 115, Pt.1) “Measurements of Flat Oval Elbow Loss Coefficients” by D. Kulkarni, S. Khaire & S. Idem (ASHRAE Transactions, 2009, V. 115, Pt.1) “Pressure Loss of Corrugated Spiral Duct” by D. Kulkarni, S. Khaire & S. Idem (ASHRAE Transactions, 2009, V. 115, Pt.1, pp 28-34.) “Measured and Predicted Pressure Loss in Corrugated Spiral Duct” by D.C. Gibbs and S. Idem (AB 10-002) “Influence of Test Section Entrance Conditions on Straight Flat Oval Duct Apparent Relative Roughness” by S. Khaire and S. Idem (ASHRAE Transactions, 2010, V. 116, Pt.2)
Private Research Project	2010	Tennessee Tech. University		<ul style="list-style-type: none"> “Flat Oval Duct Leakage Class Measurement” by D.C. Gibbs and S. Idem (ASHRAE Transactions, 2010, V. 116, Pt.2) “Measured and Predicted Pressure Loss in Corrugated Spiral Duct” by D.C. Gibbs and S. Idem (Funded by SPIDA) (ASHRAE Transactions, 2010, V. 116, Pt.2)

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RP-1333	2007-08	Texas A&M	HVAC Duct Efficiency Measurements	<ul style="list-style-type: none"> • “Pressure Losses in 12”, 14”, and 16” Non-Metallic Flexible Ducts with Compression and Sag” by C. Culp and D. Cantrill (ASHRAE Transactions, 2009, V. 115, Pt.1, pp 622-628) • “Static Pressure Losses in Nonmetallic Flexible Duct” by C. Culp and K. Weaver (ASHRAE Transactions, 2007, V. 113, Pt.2, pp 400-405) • “Comparative Analysis of CFD ΔP vs. Measured ΔP for Compressed Flexible Ducts” by A. Ugursal and C. Culp (ASHRAE Transactions, 2007, V. 113, Pt.1) • Culp, C. HVAC Flexible Duct Pressure Loss Measurements (Final Report, Texas A&M University, May 2011).
RP-1488	2008	Tennessee Tech. University	Laboratory Testing of Flat Oval Junctions to Determine Loss Coefficients	<ul style="list-style-type: none"> • “Measurements of Flat Oval Diverging Flow Fitting (Tees & Laterals) Loss Coefficients” by D.C. Gibbs and S. Idem. (ASHRAE Transactions, 2012, V. 118, Pt.1) • “Laboratory Testing of Converging Flow Flat Oval Tees and Laterals to Determine Loss Coefficients” by D. Kulkarni, J. Cui, and S. Idem (HVAC&R Research, 2011, 17(5): 710-725)
Private Research Project	2011	Tennessee Tech. University	Laboratory Testing of Saddle Tap Tees to Determine Loss Coefficients	<ul style="list-style-type: none"> • “Laboratory Testing of Saddle-Tap Tees to Determine Loss Coefficients” by A.N Nalla and S. Idem. (ASHRAE Transactions, 2012, V. 118, Pt.1)
RP-1493	2012	University of Colorado Boulder, and University of North Carolina Charlotte	CFD Shootout Contest - Prediction of Duct Fitting Losses	<p>1st Place: “A procedure for predicting pressure loss coefficients of duct fittings using computational fluid dynamics” by Wei Liu, Zhengwei Long, and Qingyan Chen. HVAC&R Research, 18(6): 1168-1181.</p> <p>2nd Place: “CFD analysis of pressure losses in flat-oval duct fittings” by Emir Sirbubalo (Sarajevo, Bosnia), Haris Lulic, and Milovan Gutovic – (DE-13-030).</p> <p>3rd Place: “Prediction of duct fitting losses using computational fluid dynamics” by Andy Manning, John Wilson, Nate Hanlon and Travis Mikjaniec. HVAC&R Research, 19:4, 400-411.</p> <p>“Computational fluid dynamics to predict duct fitting losses: Challenges and opportunities” by Ahmad Sleiti, John Zhai and S. Idem. HVAC&R Research, 19:1, 2-4.</p>
RP-1606	2011/14	University of Illinois	Laboratory Testing of Flat Oval Transitions to Determine Loss Coefficients	<ul style="list-style-type: none"> • “Laboratory Testing of Flat Oval Transitions to Determine Loss Coefficients” by Y. Sun, S.E. Ford and Y. Zhang. (ASHRAE Transactions, 2015, V. 121, Pt.1)

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Private Research Project	2012	Tennessee Tech. University	Laboratory Testing of a Fabric Air Dispersion System	<ul style="list-style-type: none"> “Laboratory Testing of a Fabric Air Dispersion System” by D Kulkarni, A.N. Nalla. S. Idem and K. Gebke. (ASHRAE Transactions, 2012, V. 118, Pt.2)
Private Research Project	2013	Tennessee Tech. University	Loss Coefficients of Bends in Fully Stretched Nonmetallic Flexible Ducts	<ul style="list-style-type: none"> “Pressue Loss in Fully Stretched Nonmetallic Flexible Duct with a Bend” by R.K, Hodges, D. Kulkarni, and S. Idem. (HVAC&R Research, 19:1, 87-100 (2013)
Private Research Project	2014	Tennessee Tech. University and Behls & Associates	Predicted Pressure Loss in Low Pressure Wire-Wound Flexible Ducts	<ul style="list-style-type: none"> “Predicted Pressure Loss in Low Pressure Wire-Wound Flexible Ducts” by S. Idem and H. Behls. (CH-15-09: ASHRAE Transactions, 2015, V. 121, Pt.1)
Private Research Project	2014	Tennessee Tech. University	Pressure and Velocity Variation in a Fabric Air Dispersion System	<ul style="list-style-type: none"> J. Leverette, K. Gebke and S. Item. 2014. Pressure and velocity variation in a fabric air dispersion system. HVAC&R Research, 20:8, 862-874, DOI: 10.1080/10789669.2014.957592. URL: http://dx.doi.org/10.1080/10789669.2014.957592
Private Research Project	2015	Tennessee Tech. University	Flexible Duct Loss Coefficients	<ul style="list-style-type: none"> Kulkarmi, D. and S. Idem. 2015. Loss coefficients of bends in fully stretched nonmetallic flexible ducts. Science and Technology for the Built Environment 21, 413-419. ASHRAE.