

ATSM-2350: DUCT DESIGN AND TESTING

Cuyahoga Community College

Viewing: ATSM-2350 : Duct Design and Testing

Academic Term:

Spring 2019

Subject Code

ATSM - Applied Ind Tech- Sheetmetal

Course Number:

2350

Title:

Duct Design and Testing

Catalog Description:

Covers duct configuration and design concepts including plenum requirements and aspect ratios covering air loss due to friction. Also included is a section on performing a system leak test.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to Sheet Metal Worker's apprenticeship program.

Outcomes

Course Outcome(s):

I. Determine the required sizes of ductwork and explain the concepts of duct configuration based on unit size and friction loss.

Objective(s):

1. A. Define the terms used in duct design and explain the application of each.
2. B. Determine the required size of the ductwork using applied math and friction loss charts.
3. C. Explain how air flow velocity is lost due to friction.
4. D. Compile a list of duct sizes that are required for any air handling unit given the size of the unit, room dimensions and load calculations.

Course Outcome(s):

II. Determine how aspect ratio and friction loss affects air flow.

Objective(s):

1. D. Compute the required cubic feet per minute of air for duct runs that are branches of the plenum.
2. A. Explain how field installation conditions and restrictions affect duct sizes and friction loss and air flow.
3. B. Define air flow and explain the factors that constitute and determine good air flow in a duct system.
4. C. Compute air flow requirements using velocity and area formulas.

Course Outcome(s):

III. Describe the different types of plenum systems and their respective functions and discuss how design factors affect air loss in each.

Objective(s):

1. A. Identify the various types of plenums and explain the application of each.
2. B. Explain how design factors are contingent upon the building design, layout and purpose of the facility.
3. C. Calculate the air loss within a system bases on different plenum configurations

Course Outcome(s):

IV. Discuss the concepts of air leakage in heating and cooling system, explain how air leakage tests are performed and demonstrate the ability to correct problems of air loss within a system.

Objective(s):

1. A. Explain how air loss affects a heating and cooling system.
 2. B. List various tests that are used to determine air leakage within ductwork.
 3. C. Interpret industry tables and charts that are used to determine allowable air loss in a heating and cooling system.
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Methods of Evaluation:

Quizzes, tests and class participation

Course Content Outline:

1. Ductwork: Concepts
 - a. Terminology
 - i. Design
 1. Aspect ratio
 2. Plenum
 3. Friction loss
 - ii. Application
 1. Cross sectional areas
 2. Surface areas
 3. Extended reducing
 4. Perimeter loop
 5. Down flow
 6. Eddy currents
 7. Static pressure
 - b. Sizing
 - i. Applied math
 1. Basic concepts
 2. Square roots
 3. Areas: total and surface
 - ii. Friction loss
 1. Air quantity
 2. Equal friction
 3. Charts
 - c. Air flow loss
 - i. Friction
 - ii. Duct design
 - iii. Eddy currents
 - d. Duct size lists
 - i. Air handling units
 - ii. Unit size
 - iii. Room dimensions
 - iv. Load calculations
2. Aspect ratio and friction loss
 - a. Duct sizing
 - i. Field installation considerations
 - ii. Restrictions
 - b. Aspect ratio specifications
 - i. Four-to-one rule
 - ii. Surface area
 - iii. Cost efficiency
3. Plenum systems and functions
 - a. Terms
 - i. Air handlers
 - ii. Plenums
 - b. Systems

- i. Extended
 - ii. Extended reducing
 - iii. Perimeter
- c. Applications
 - i. Residential
 - ii. Open air
 - iii. Industrial
 - iv. Down flow
 - 1. In ground
 - 2. Perimeter loop
- d. Building layout factors
 - i. Multiple office
 - ii. Industrial
 - iii. Residential
 - iv. E. Air loss calculations
 - 1. Plenum configurations
 - 2. length of plenum and duct runs
 - 3. Static pressure
- 4. Air leakage tests and troubleshooting
 - a. Affects of air loss
 - i. Costs
 - ii. Efficiency
 - b. Tests
 - i. Types
 - 1. Percent of system design
 - 2. Cubic feet per minute/square footage
 - ii. Set up and procedures
 - c. Tables and charts
 - i. Allowances
 - ii. Classifications
 - d. Troubleshooting
 - i. Results analysis
 - ii. Sealing methods
 - iii. Corrective measures

Resources

Whitman, William. *Refrigeration and Air conditioning Technology*. 7th ed. Delmar, Clifton Park, NY, 2012.

CP Arora. *Refrigeration and Air Conditioning*. 3rd ed. McGraw Hill, Columbus Ohio, 2000.

Smith, Russel. *Electricity for Refrigeration*. 8th. Delmar Publishers, Albany, NY, 2010.

Resources Other

1. www.refrigerationbasics.com/ (<http://cs.webcrawler.com/ClickHandler.ashx?du=http%3a%2f%2fwww.refrigerationbasics.com%2f&ru=http%3a%2f%2fwww.refrigerationbasics.com%2f&ld=20121029&ap=6&app=1&c=info.wbcrwl.300.46&s=webcrawler302&coi=239137&cop=main-title&eui=141.110.189.29&npp=6&p=0&pp=0&pvoid=2a691be2ddcf43be9ef5d295c70382bc&sid=733632038.2003334094027.1351513140>)
2. www.refrigerationbasics.com/ (<http://cs.webcrawler.com/ClickHandler.ashx?du=http%3a%2f%2fwww.refrigerationbasics.com%2f&ru=http%3a%2f%2fwww.refrigerationbasics.com%2f&ld=20121029&ap=4&app=1&c=info.wbcrwl.300.46&s=webcrawler302&coi=239138&cop=main-bottom&fpid=2&ep=3&mid=9&hash=6ABAC467B7F52BA538780FE82293E916>)
3. www.grainger.com/ (<http://www.grainger.com/Refrigeration/>) **Refrigeration**
4. archive.org/details/refrigerationan00andegoog (<http://cs.webcrawler.com/ClickHandler.ashx?du=http%3a%2f%2farchive.org%2f&ru=http%3a%2f%2farchive.org%2f&ld=20121029&ap=4&app=1&c=info.wbcrwl.300.46&s=webcrawler302&coi=239138&cop=main-bottom&fpid=2&ep=3&mid=9&hash=6ABAC467B7F52BA538780FE82293E916>)

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title&eui=141.110.189.29&npp=1&p=0&pp=0&pvoid=34a6a97cc7db4e4692010693623283b0&sid=733632038.2003334094027.135151314

5. [www. \(http://cs.webcrawler.com/ClickHandler.ashx?du=http%3a%2f%2fwww.refrigeration-engineer.com%2fforums%2fforumdisplay.php%3f24-Refrigeration-Books&ru=http%3a%2f%2fwww.refrigeration-engineer.com%2fforums%2fforumdisplay.php%3f24-Refrigeration-Books&ld=20121029&ap=4&app=1&c=info.wbcrwl.300.46&s=webcrawler302&coi=239138&cop=main-title&eui=141.110.189.29&npp=4&p=0&pp=0&pvoid=34a6a97cc7db4e4692010693623283b0&sid=733632038.2003334094027.135151314](http://cs.webcrawler.com/ClickHandler.ashx?du=http%3a%2f%2fwww.refrigeration-engineer.com%2fforums%2fforumdisplay.php%3f24-Refrigeration-Books&ru=http%3a%2f%2fwww.refrigeration-engineer.com%2fforums%2fforumdisplay.php%3f24-Refrigeration-Books&ld=20121029&ap=4&app=1&c=info.wbcrwl.300.46&s=webcrawler302&coi=239138&cop=main-title&eui=141.110.189.29&npp=4&p=0&pp=0&pvoid=34a6a97cc7db4e4692010693623283b0&sid=733632038.2003334094027.135151314)
engineer.com/...ay.php?24-**Refrigeration**-Books

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