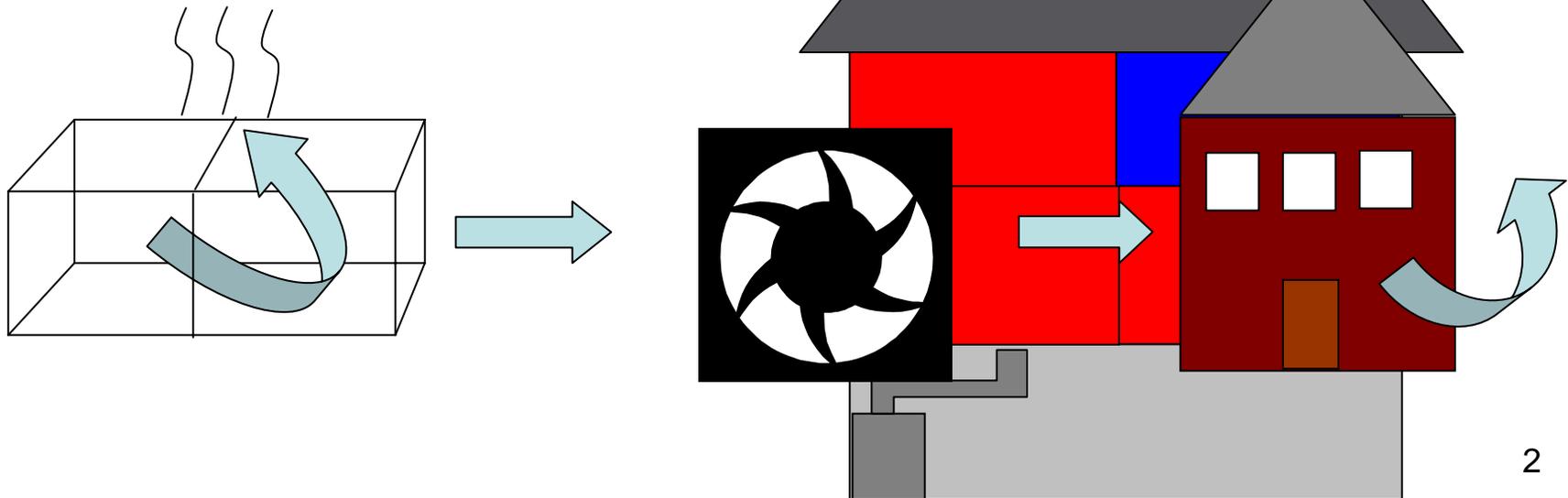


Rough Mechanical

Getting Your Ducts in a Row

Why care about ducts?

- HVAC efficiency
- Dehumidification
- Infiltration
- Comfort



Duct leaks

- **Contribute to Air Leakage in House**
 - Increases air leakage 30-300% while blower is on
- **Reduce Comfort in Home**
 - Increase Drafts
 - Reduce Air Delivery / Unbalanced Airflows
- **Contribute to Moisture Problems!**
- **Contribute to Backdrafting**
 - Leaky Return Depressurizes Lower Floors
 - Especially When Competing With a Smoldering Fireplace (600 Cfm)

The Code on Duct Sealing

IECC 403.2.2 Sealing.

All...

★ ducts, ★

- air handlers,
- filter boxes, and
- building cavities used as ducts

...shall be sealed.



Duct installation

Joists and seams

- Made airtight with tapes, mastics, gaskets, sealants
- Tapes and mastics must comply with UL-181 listings
 - Exact standard depends on type of duct system
 - No cloth DUCT tape
- Mechanical fasteners for flexible non-metallic ducts must comply with UL 181B and be marked UL 181B-C

Duct installation

IRC: M1601.3.1

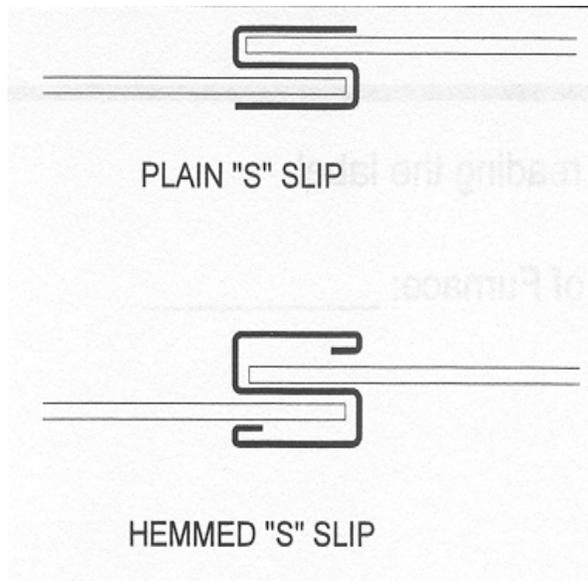
H



Ductmaster™ Duct Straps:

Nylon duct straps are designed for use with flexible air ducts and air connectors allowing for quick and secure installation.

“S” Slip Joints (Plain and Hemmed)

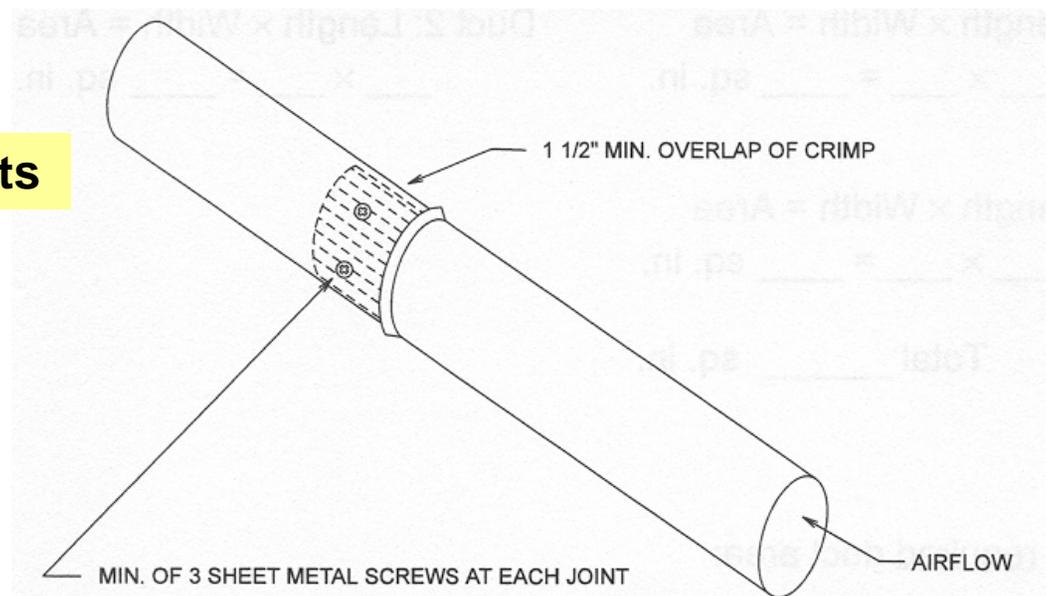


IRC: M1601.3.1

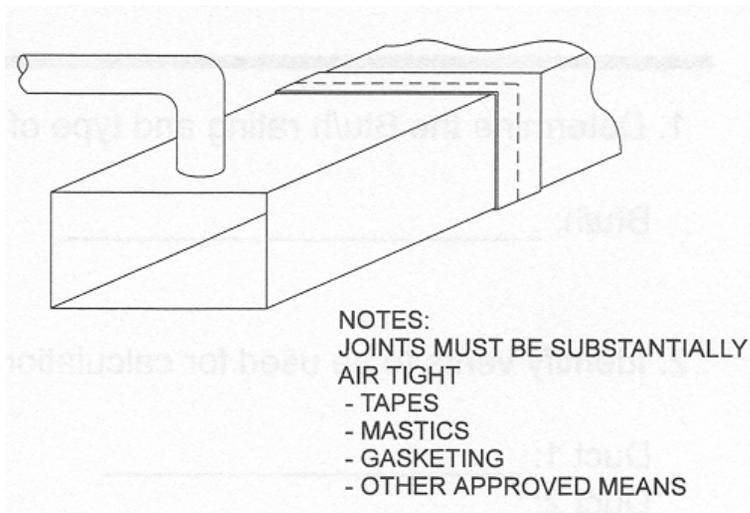


Step 6: Examine joints for air tightness and fastening.

Joints in Round Ducts



Air-tight Joints in Rectangular Ducts



Duct installation



Joins and seams

- Duct connections to flanges of air distribution system equipment or sheet metal fittings must be mechanically fastened
- Crimp joints for round metal ducts must have lap of $\geq 1\frac{1}{2}$ " and must be mechanically fastened with at least 3 sheet metal screws or rivets equally spaced around the joint

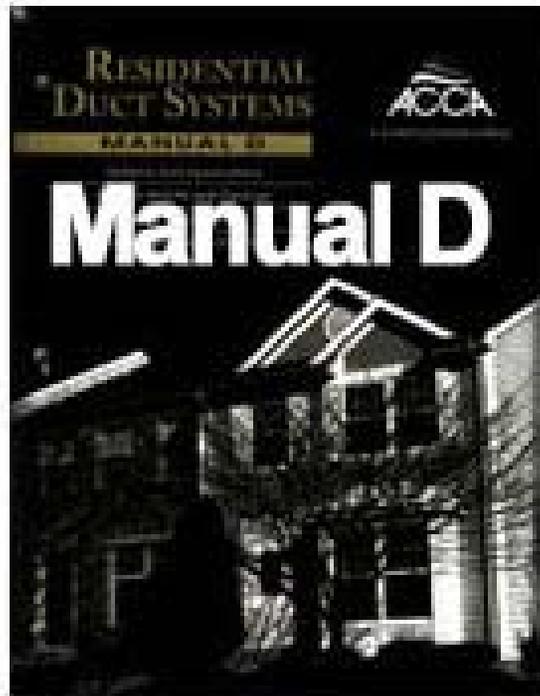
Duct installation



Joists and seams

- UL listings for rigid fibrous glass duct closure systems:
 - 181 A-P for pressure sensitive tape
 - 181 A-M for mastic
 - 181 A-H for heat-sensitive tape
- UL listings for closure systems for flexible air ducts & connectors
 - 181B-X for pressure-sensitive tape
 - 181 B- M for mastic

Sheet metal duct runs and extended plenums: transverse joints must be sealed



Tape



Mastic





The Code on Duct Sealing

IECC 403.2.2 Sealing.

All...

- ducts,
- ★ air handlers, ★
- filter boxes, and
- building cavities used as ducts

...shall be sealed.

Air Handler







The Code on Duct Sealing

IECC 403.2.2 Sealing.

All...

- ducts,
- air handlers,
- ★ filter boxes, ★ and
- building cavities used as ducts

...shall be sealed.

Filter Box



The Code on Duct Sealing

IECC 403.2.2 Sealing.

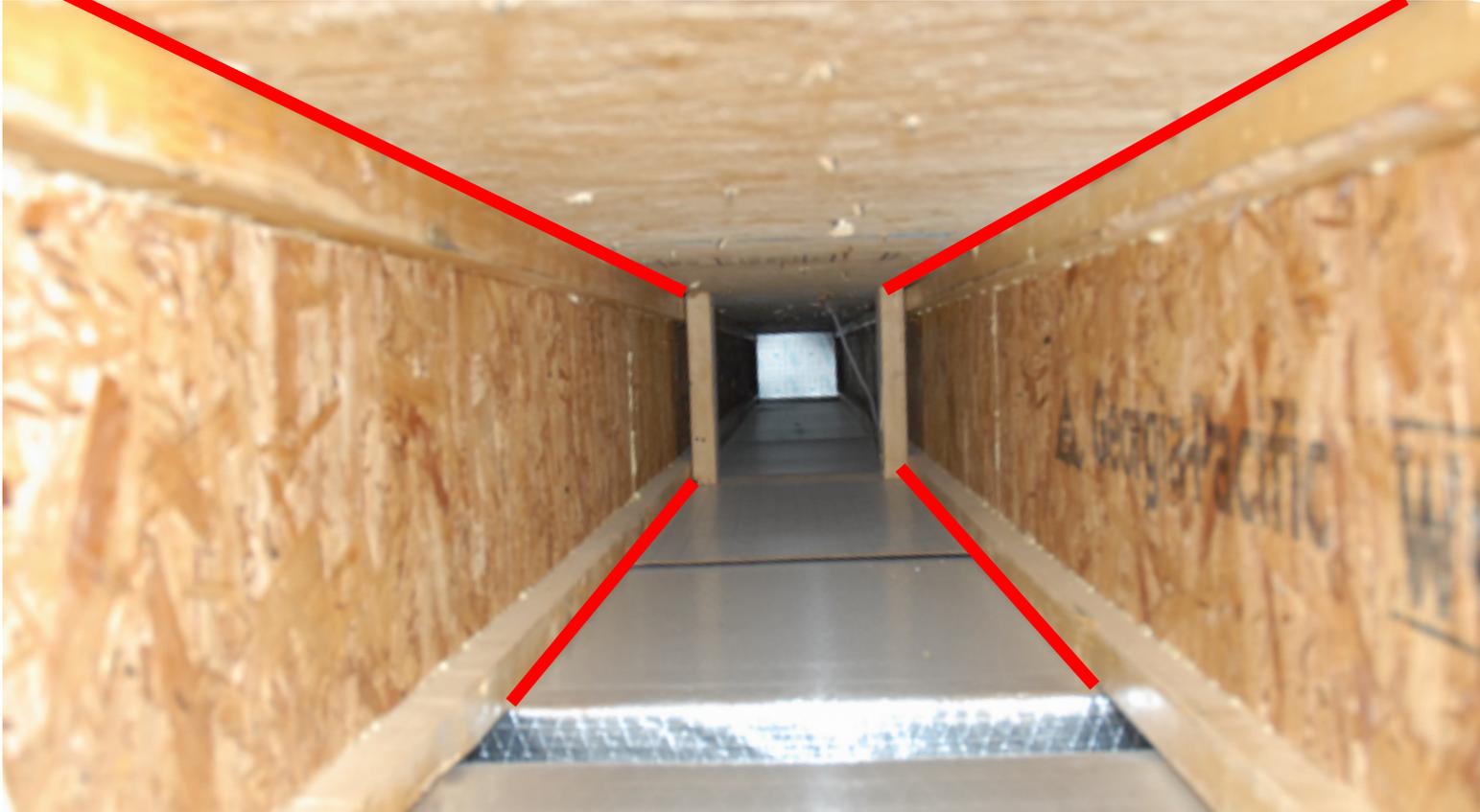
All...

- ducts,
- air handlers,
- filter boxes, and

★ building cavities used as ducts ★
...shall be sealed.



Panned Returns...



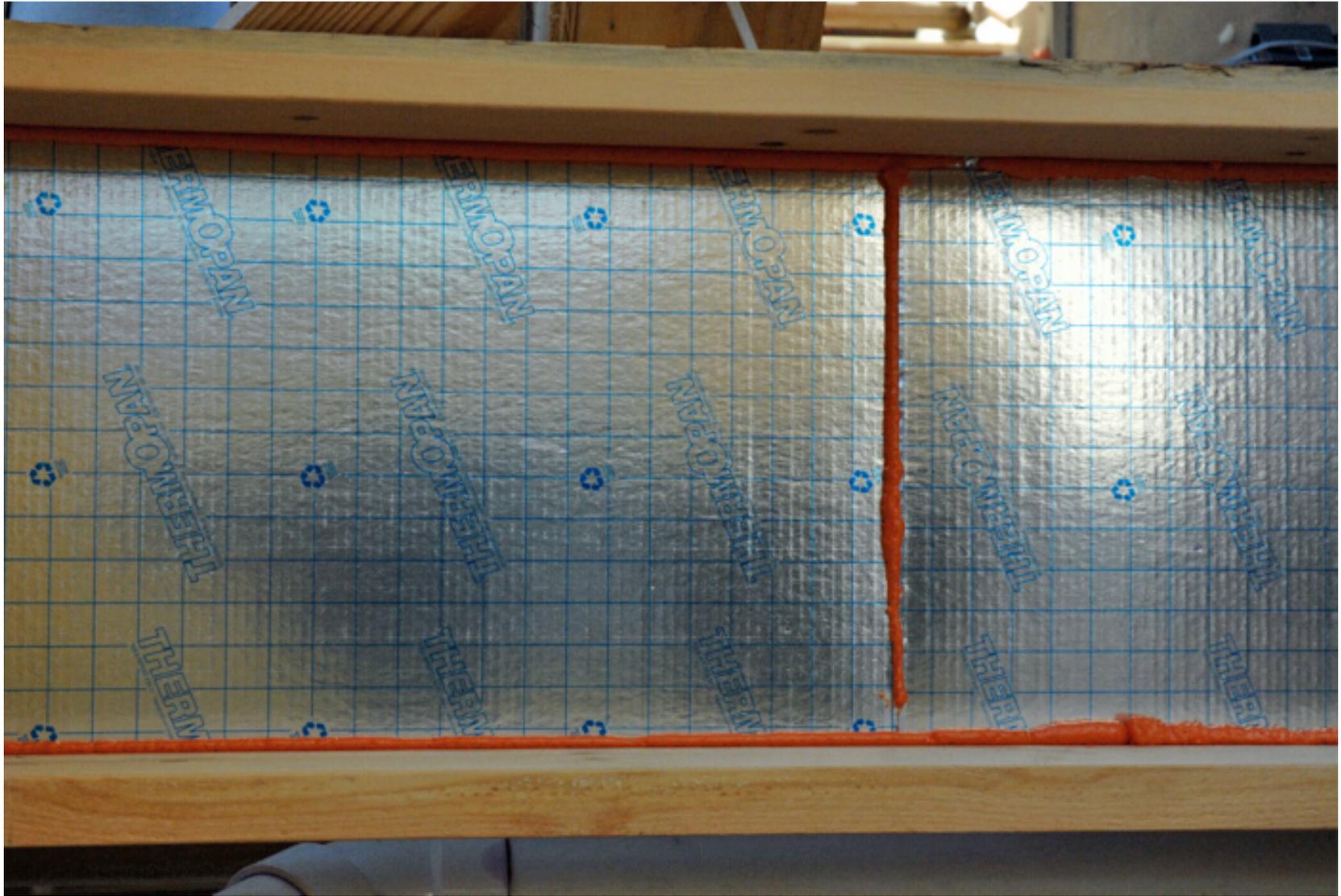


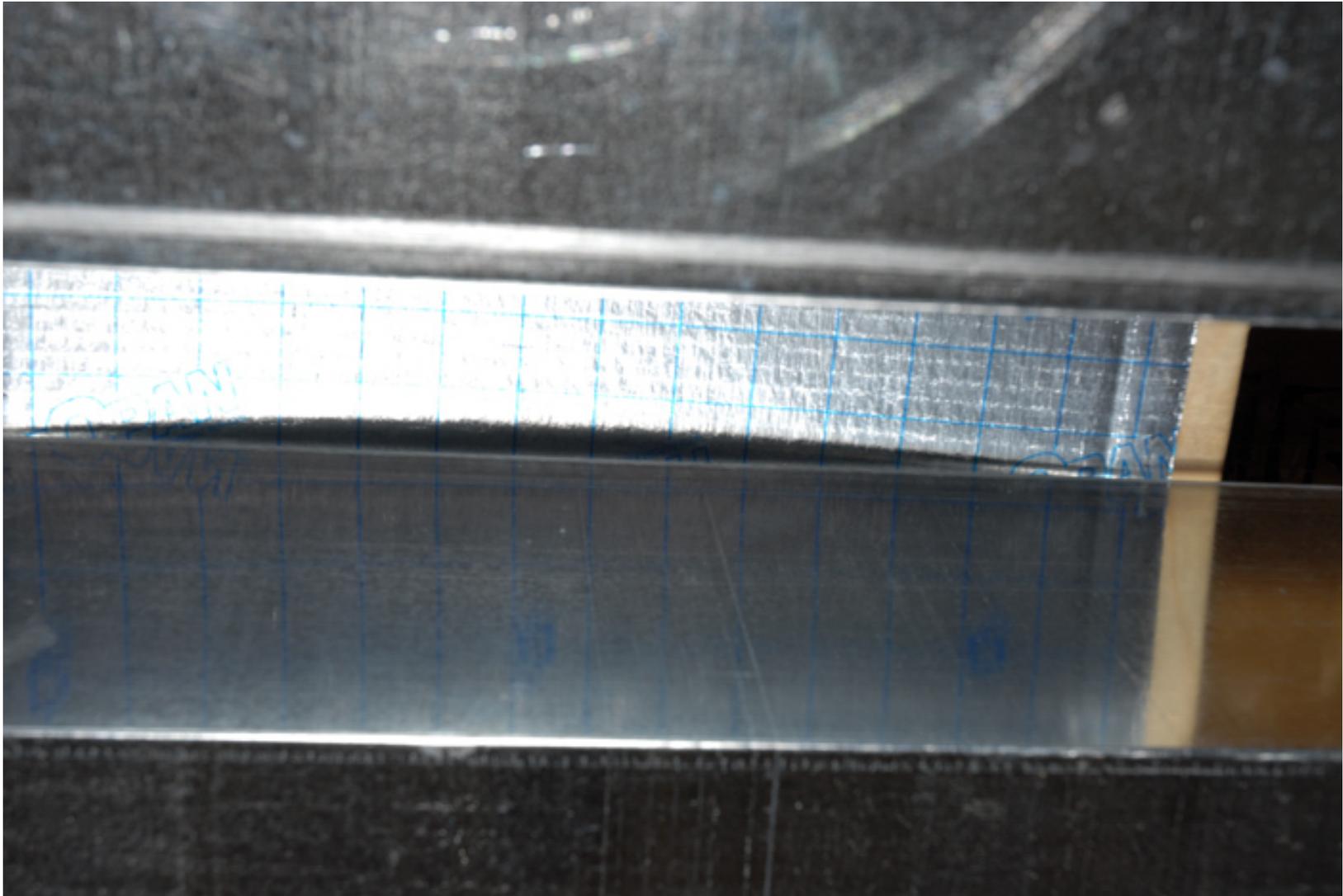


















Duct Sealing

IRC M10601.3.1

Joints of duct systems shall be made **substantially airtight** by means of tapes, mastics, gasketing or other approved closure systems.

Duct connections to flanges of air distribution system equipment or sheet metal fittings shall be **mechanically fastened.**

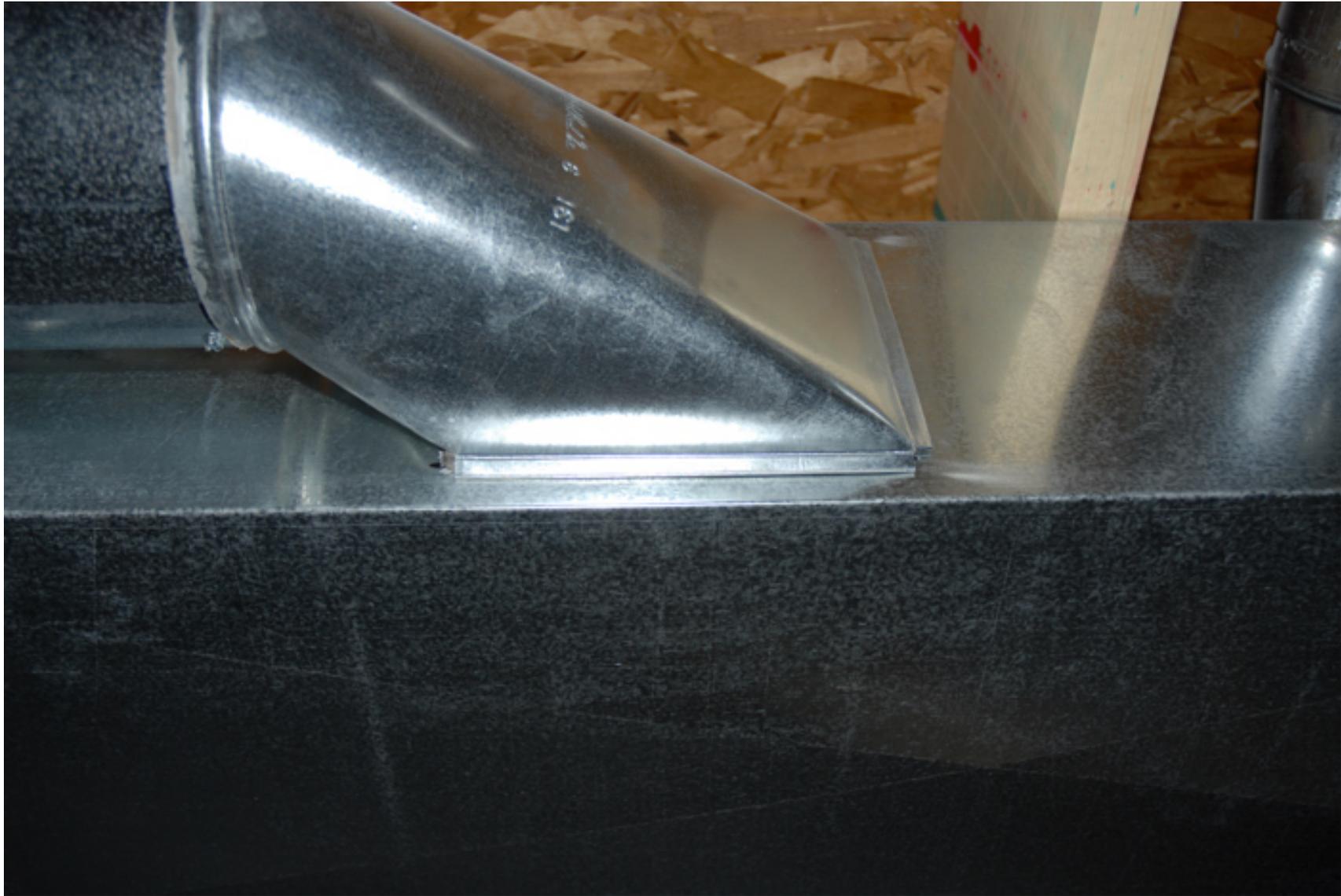
code

Sealing examples





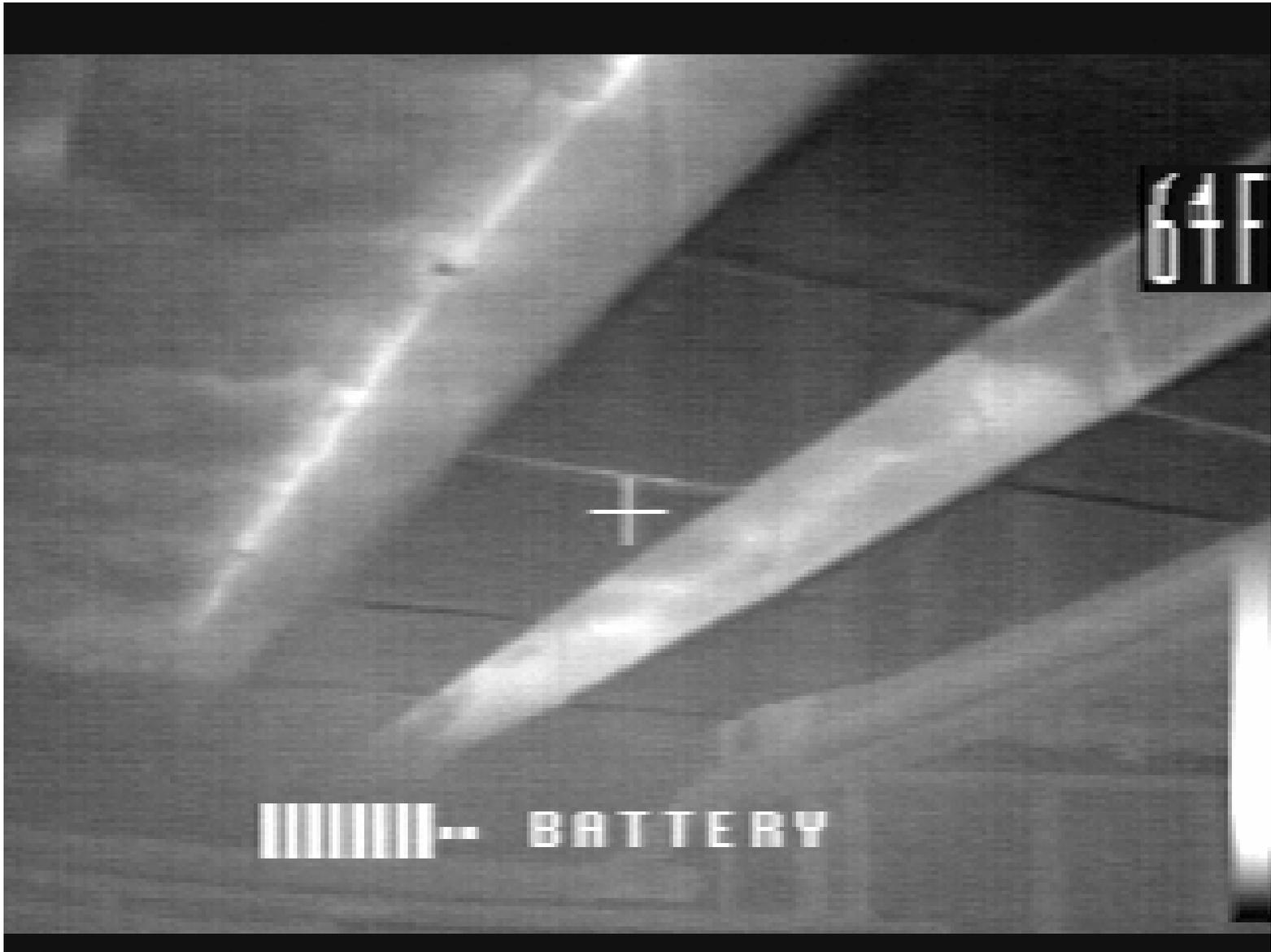














Insulation



R-8 – all supplies and returns

Except:

Ducts located in **conditioned spaces**



2006 IECC & IRC – ducts in floor trusses

PA Alt – ducts in floor trusses and unconditioned basements

Duct Insulation

R-8 - All supply & return ducts within or outside the thermal envelope

N1103.2.1



Exceptions:

- R-6 for ducts in floor trusses
- Ducts or portions of ducts located inside the thermal envelope





Factory made ducts

Duct insulation materials

- R values based on insulation only
- Installed thickness of R-value used to determine R-value:
 - Nominal thickness for duct board, duct liner and factory made rigid ducts
 - 75% of nominal thickness for duct wrap
 - For factory made flexible ducts, divide by 2 the actual outside diameter and nominal inside diameter

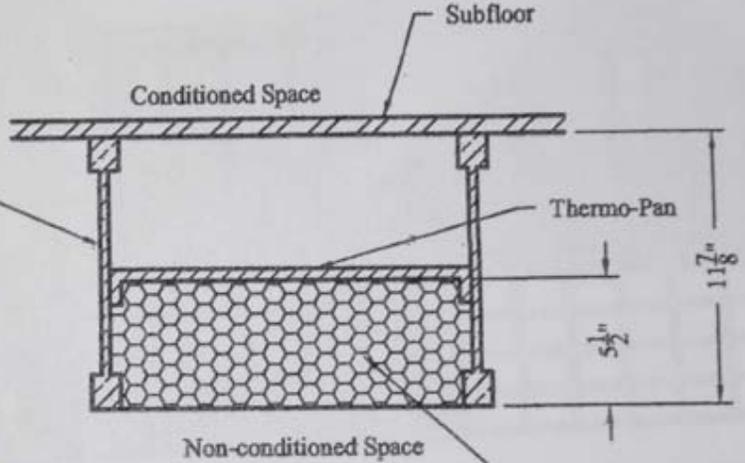
6" Flex Duct, R4.2

11-7/8" I Joist

11-7/8" I Joist Typ.

11-7/8" I Joist Typ.

11-7/8" I Joist Typ.



Owens Corning R-21 Fiber Glass Insulation

Table PA1103.1 requires R-21 for floor over non-conditioned space.

PA110 Requires and from the 3/4" of C with R

PA1104.3 Requires R and the from the c 21

PA1104.3 Duct I Requires R6.4 bel and that porti from the conditio

1" of Owens Co with R4.3 of duct an R vi

HVAC Return Detail 11-7/8" I Joist

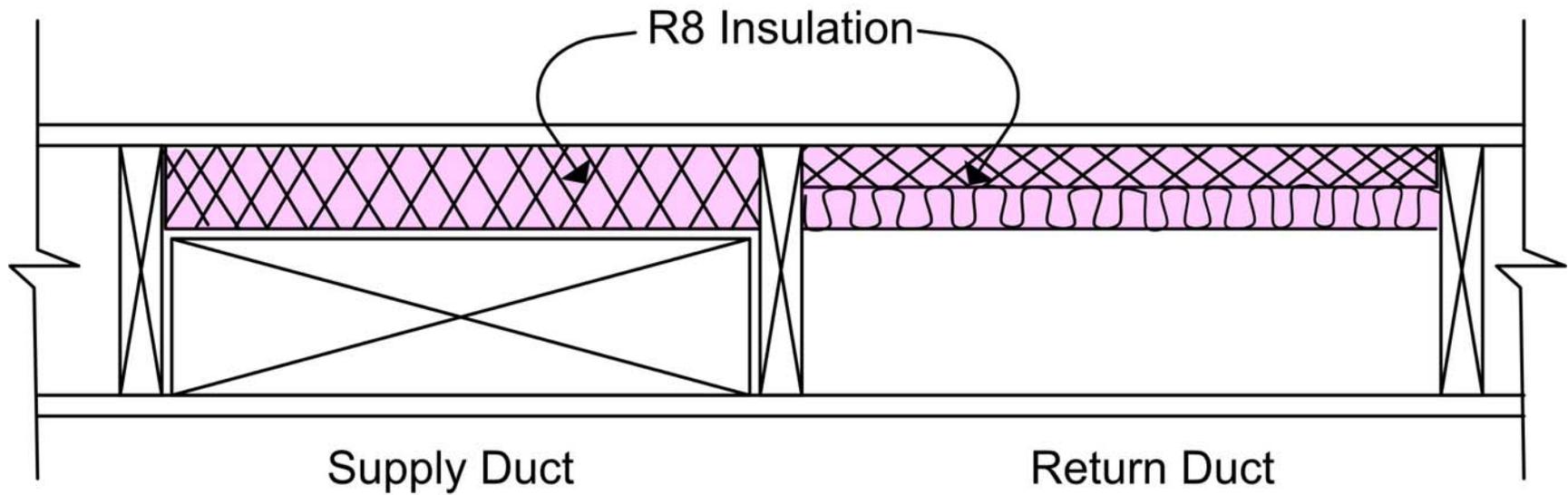
Scale: 1/8" = 1"







Exterior wall duct detail





H

What's Wrong?

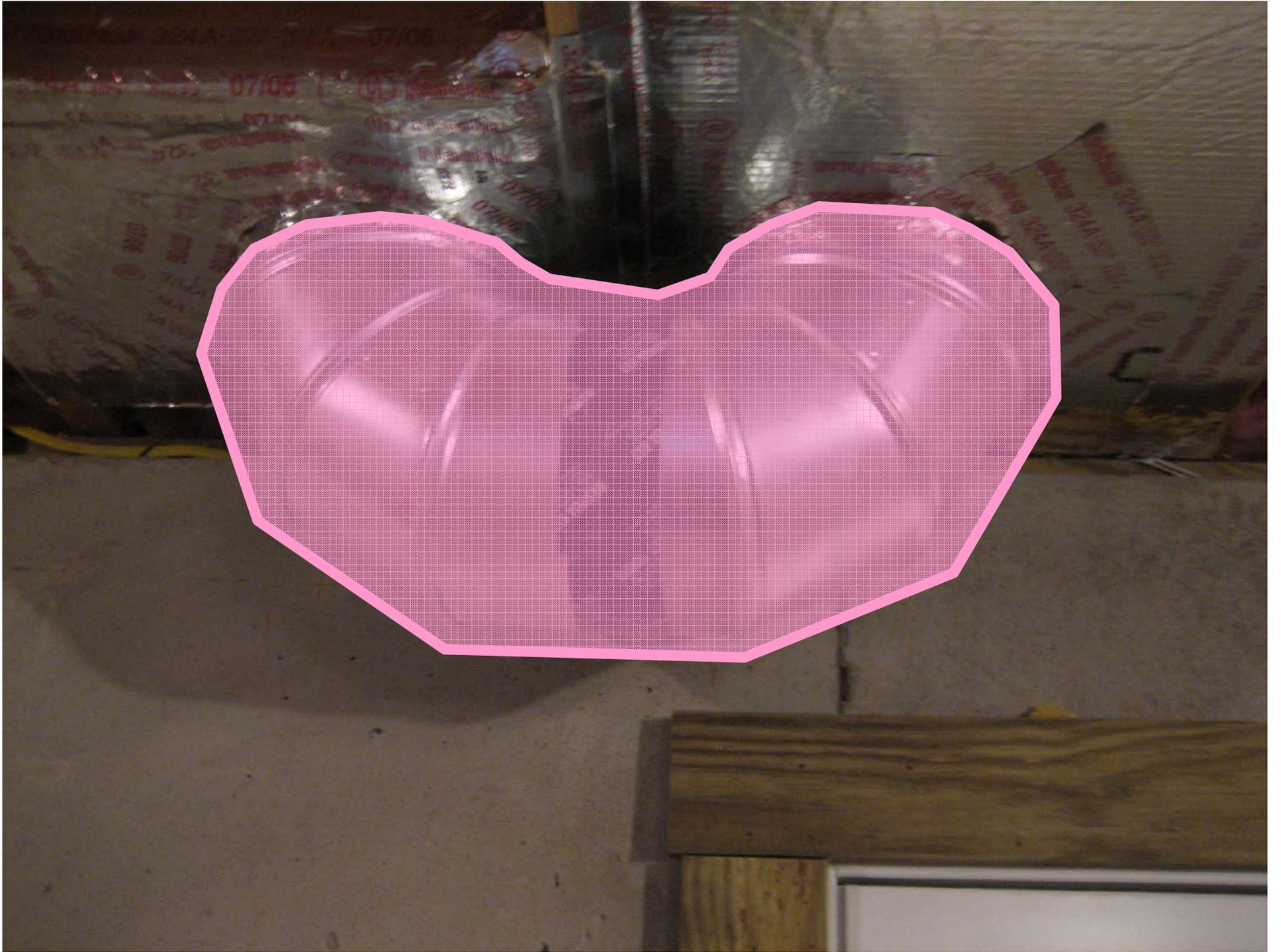
H



Constrictions



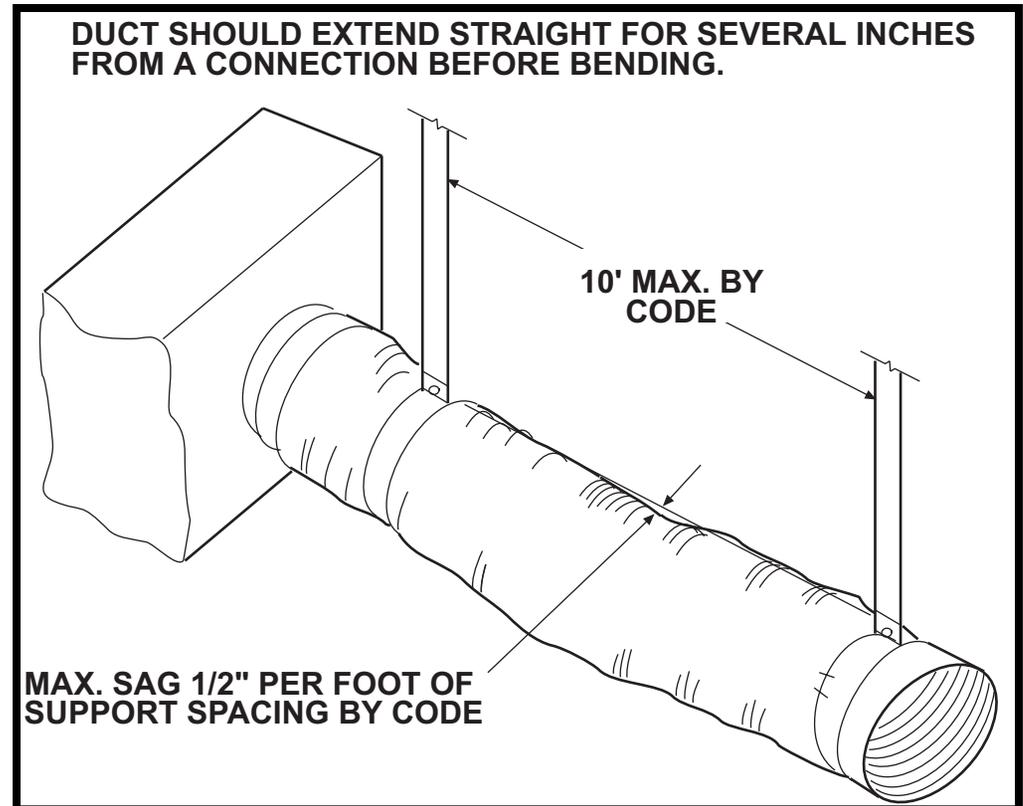


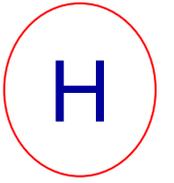




Duct installation

- **Avoid Tight Bends**
- **Minimize Sagging**
- **Size Properly**
- **Place Inside the Envelope**





H

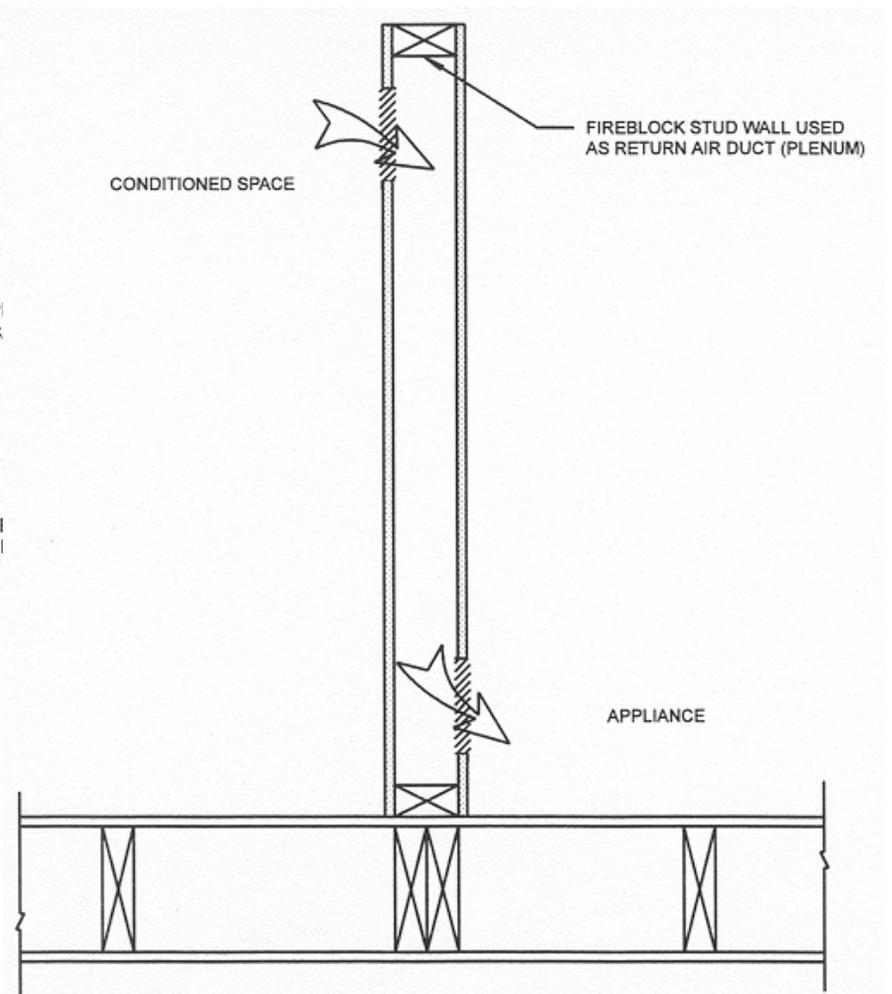
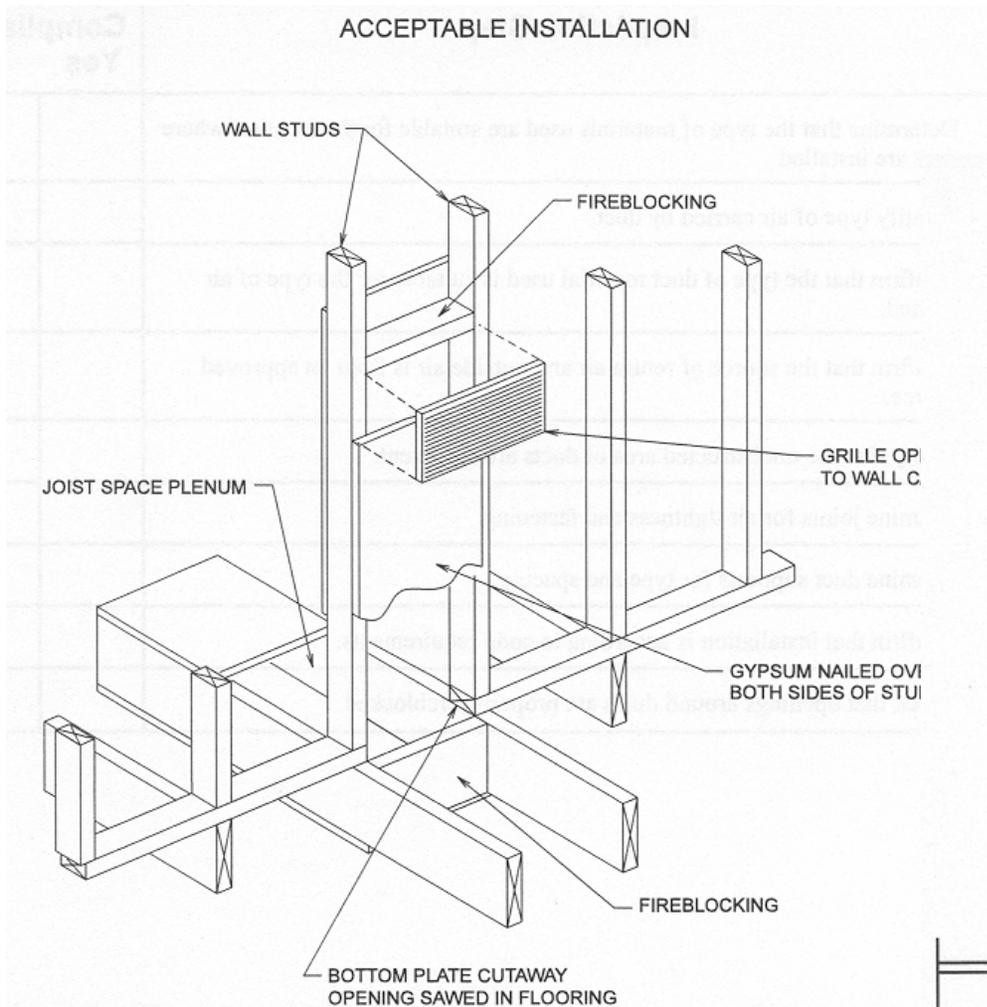


Fireblocking when stud wall is used as return air duct (plenum)

IRC M601.3.3



ACCEPTABLE INSTALLATION





Based on standard U.S. Government tests

ENERGYGUIDE

The AFUE, Annual Fuel Utilization Efficiency, is the measure of energy efficiency for furnaces and boilers. Only furnaces fueled by gas are used in this scale.

Electric furnaces that have higher AFUEs are more energy efficient.

100.0 AFUE

Energy efficiency range of all similar models

Least
Efficient
100.0

Most
Efficient
100.0

The AFUE, Annual Fuel Utilization Efficiency, is the measure of energy efficiency for furnaces and boilers. Only furnaces fueled by gas are used in this scale.



Summary

- Duct sealing (including panned returns)
- Air handler and filter box sealing
- No “inexcusable oversights”
- Mechanically fastened flanges and sheet metal connections
- Taped and/or clamped flex duct connections
- Taped and/or clamped insulation/vapor retarder
- Proper duct support
- R-8 supplies and returns (limited exceptions)