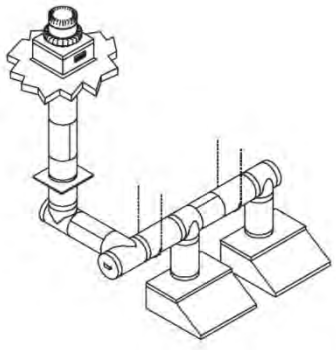
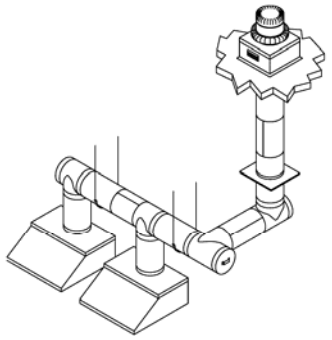
FACTORY- BUILT GREASE DUCTS

A SMARTER CHOICE





Use / Application of Factory-Built Grease Ducts

- Alternative to code prescribed welded, carbon steel systems used to vent commercial cooking appliances
- Single wall, rectangular welded, carbon steel systems have been the “norm”, but are not the best choice anymore
- Factory-built systems – UL listed, stainless steel, modular, cylindrical systems – with *many* advantages
  - Grease exhaust systems require a UL listed Fan & Hood, so why not seriously consider a UL listed exhaust duct in between to maximize safety

Factory-Built Grease Duct features

- Basic construction – welded, stainless steel tubes w/ flanged ends
  - very robust connection
  - similar design and installation as used for decades in mid-efficiency boiler stack flue

AMPCO®

Factory-Built Grease Duct features

- Flanged ends joined with V-shaped profile connecting bands (V-band)
- Variety of versions – single wall to heavily insulated double wall & fire rated zero clearance
- All models are interchangeable on the same job, giving opportunity to value engineer it

Model N

Single wall duct

Model VSI

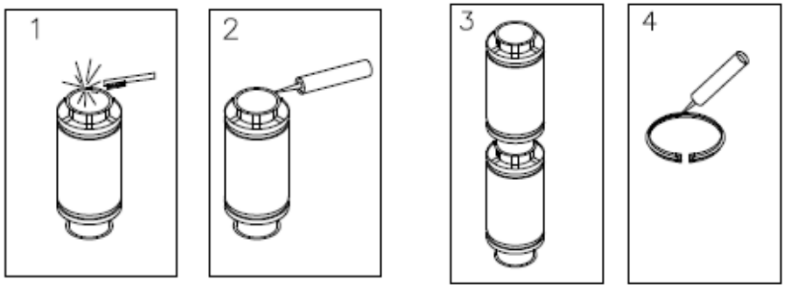
Double wall air insulated duct

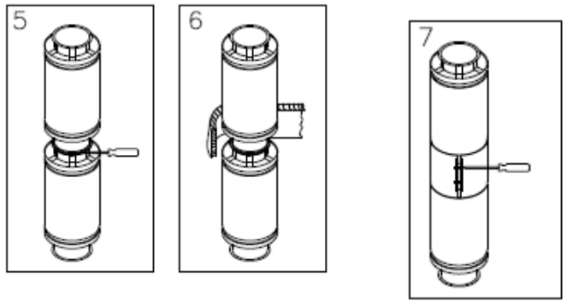
Multiple IVSI Models

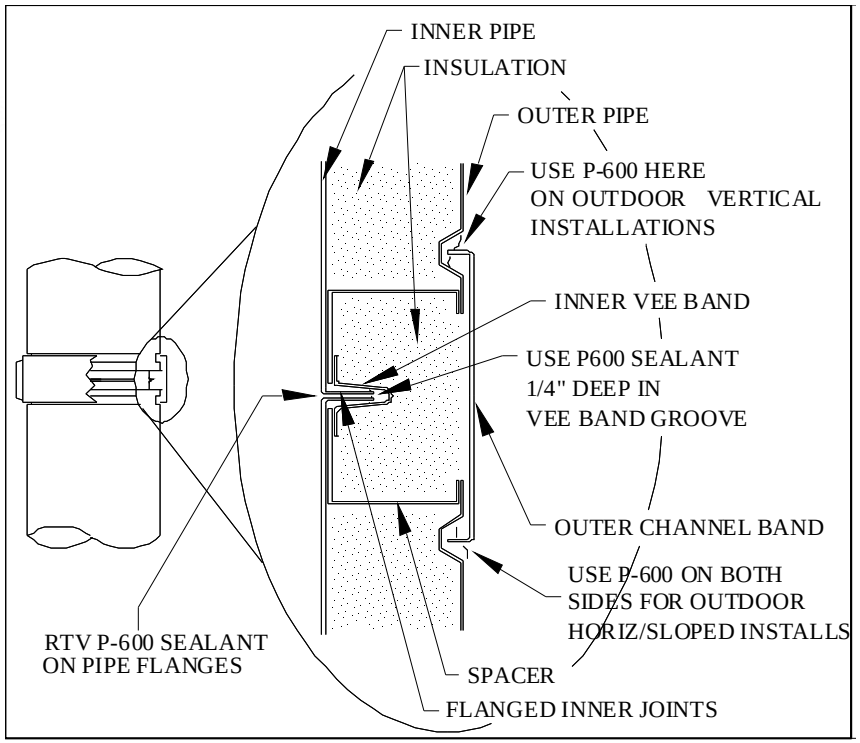
Double wall high temp fiber insulated duct

AMPCO®

Typical Joint Assembly







AMPCO®

Factory-Built Grease Duct features

- Wide variety of system components to complete job from start to finish
  - Tees, Wyes, Elbows, Expansion Joints, Access Doors, Supports, Sq-Rnd Transitions (single and double wall; we can make or contractor can make), Inline Drains, Fan Adapters, etc

AMPCO®

No-Tool Access Door (Use)

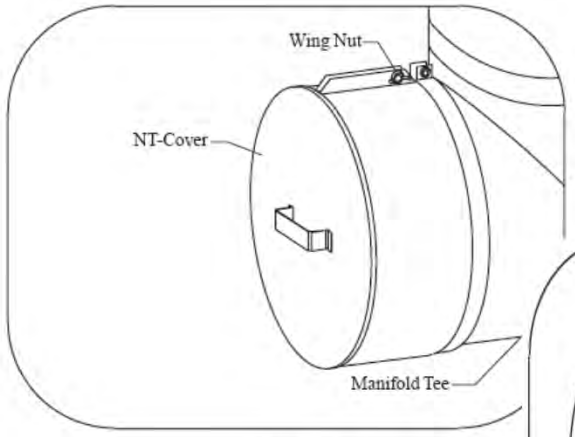


Fig. H-5

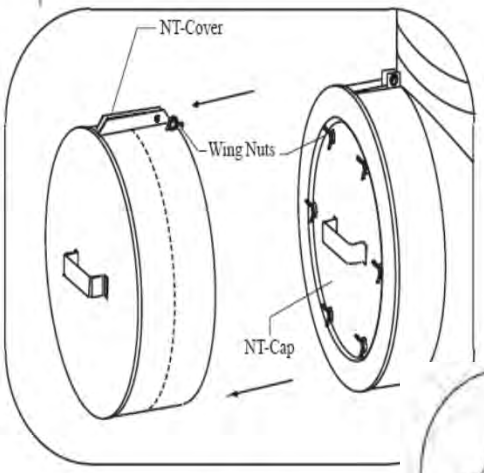


Fig. H-6

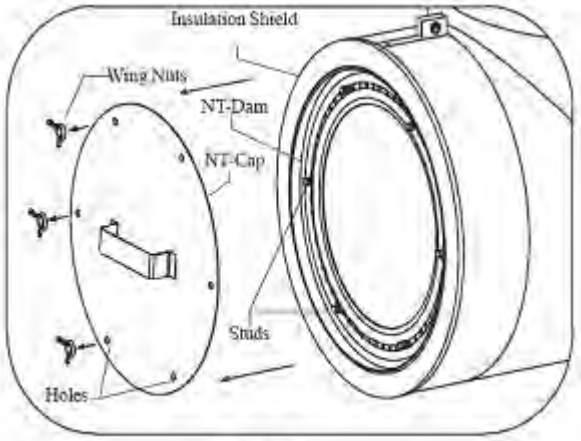
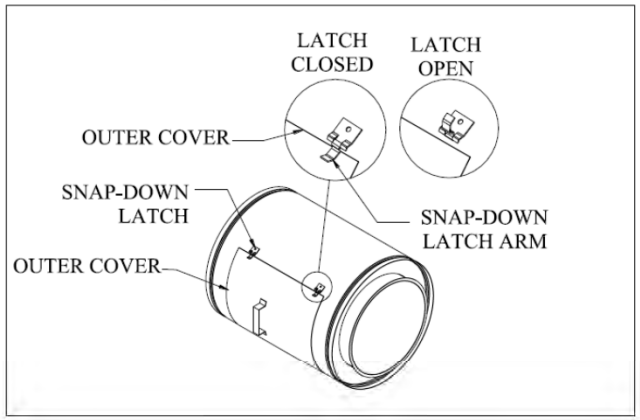


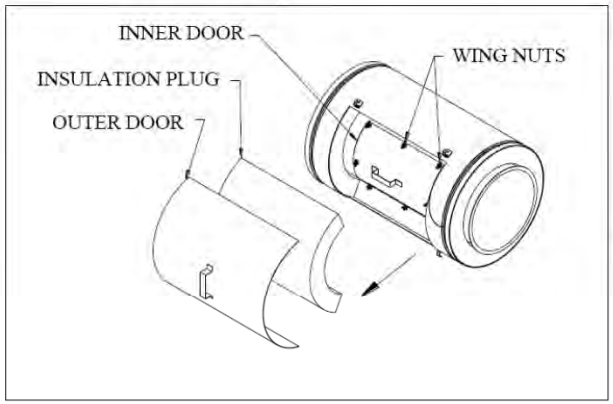
Fig. H-7

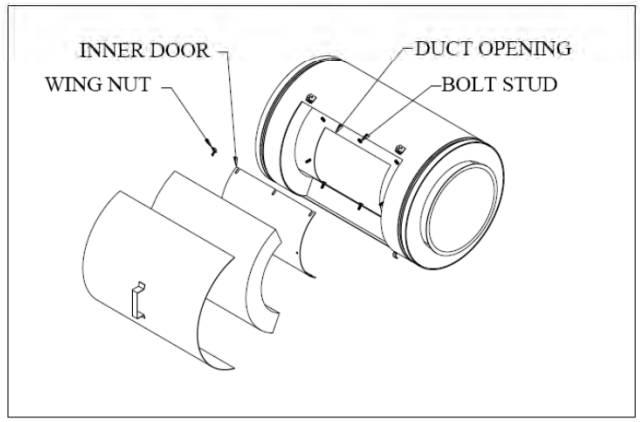
AMPCO®

In-line Access Door

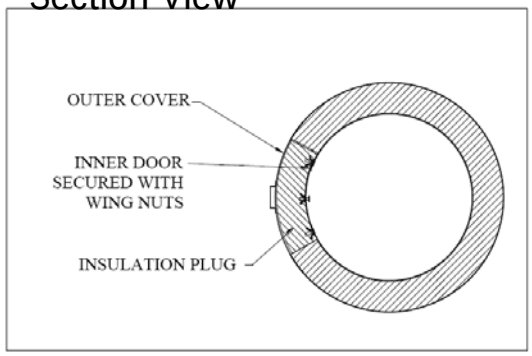


- No Tool
- Less space to install
- Less airflow resistance
  - Elbow turn vs Tee



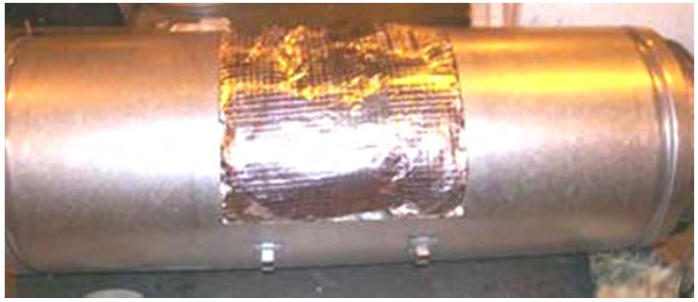


Section View



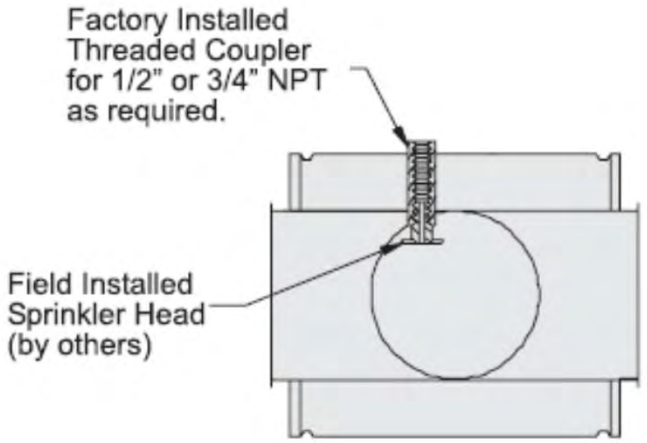
AMPCO®

In-line Access Door



In Duct Fire Suppression

- Most jurisdictions do not require this



Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts

- Modular system; installable in segments
- Minimal to no field welding required
  - Renovation jobs may restrict excessive welding operations for safety reasons (fires, fumes, etc)
  - No fire watch required during multi-story installations
- Reduced clearance to combustibles (see chart)
- Stainless steel inner wall
  - Far superior corrosion resistance / service life
  - Smoother internal duct surfaces - reduced flow resistance
- Lighter weight
  - 20 ga stainless inner wall vs. 16 ga black iron (carbon steel)
- Support spacing is often less

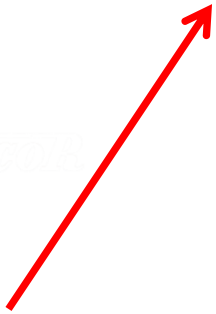
Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts

- **Green**
  - Cylindrical ; reduced flow resistance / higher flow capacity vs. rectangular. Lower fan power
    - General air duct sizing calculators show round having up to 45% lower airflow resistance
  - Recycled and recyclable metal
- Survivability of internal grease fires
- Easier to clean
  - Grease won't stick to round stainless as easy
  - Spin-jet heads will work better in round
  - Cleaning agents can prematurely rust out black iron
  - A TX renovation job reduced cleaning time from 3 days to 1
- Code accepted – IMC, UMC and NFPA96 **all permit** factory-built grease ducts listed per UL1978
  - Canada follows NFPA 96 guidelines in the NBC
- NY MEA / FDNY approved

AMPCO®

Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts

- Less slope required
  - Rectangular – most codes specify ¼” / foot; some require 1” / foot for horizontal runs exceeding 75’
  - UL has approved 1/16” per foot slope for round, listed systems
    - Rounded bottom – less area for grease to pool
    - Since cylindrical - very small buildup will result in tendency to flow; unlike rectangular systems
      - Hydraulic flow calculation methods prove that round duct creates the same amount of flow volume as rectangular, but with a lot less slope. Refer to grease duct white paper
      - Codes permit listed systems to be installed per manufacturer’s instructions
      - Sloped parts (1/4”) available if local code official still won’t acknowledge our UL listing. However realize that even with slope, grease can stick to the sides and top of duct (refer to pictures several slides ahead)



NFPA 96 makes exception for factory-built slope to be installed per its UL instructions

Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts

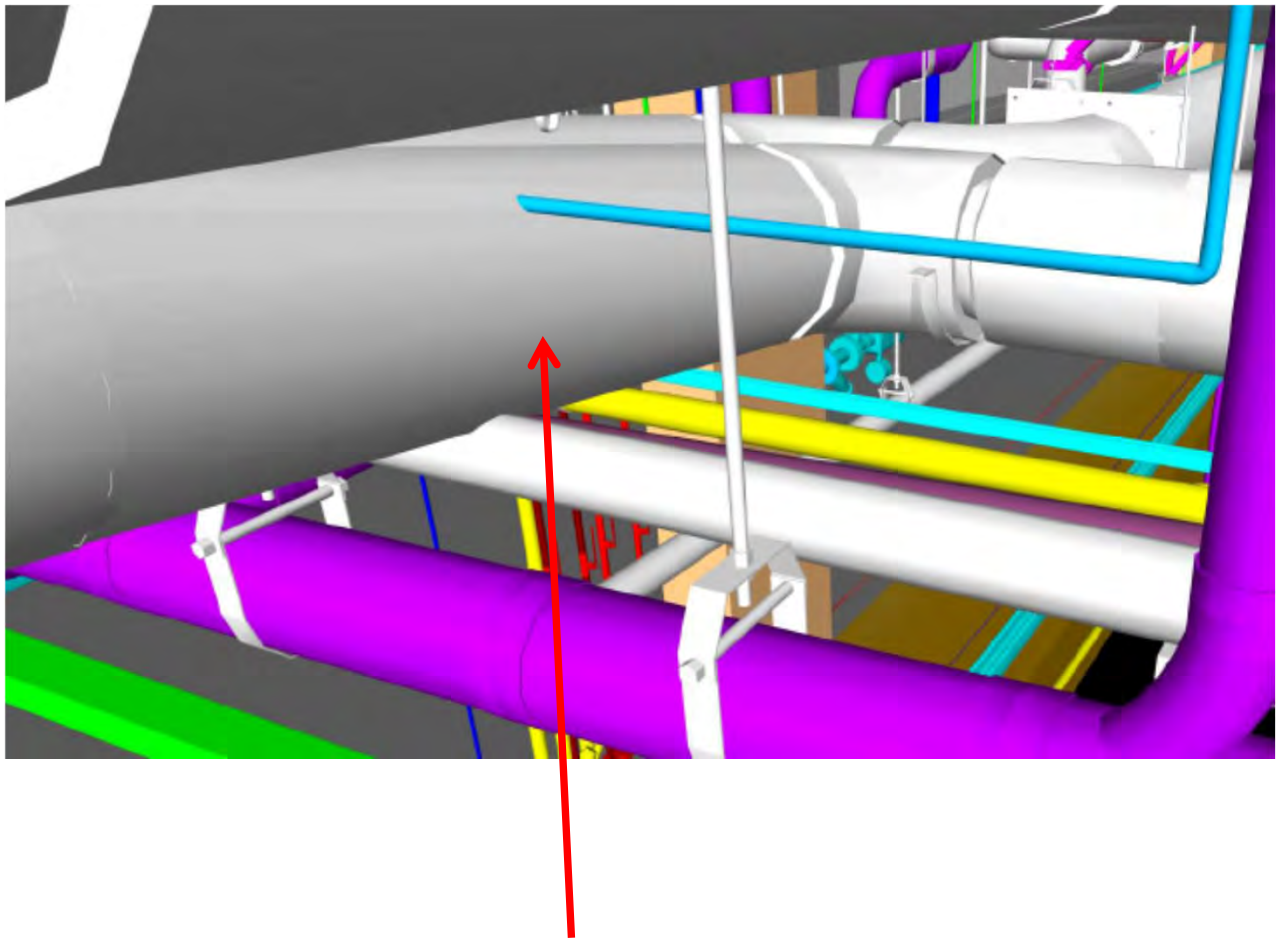
- Combining black iron systems and factory-built on same job
  - UL instructions permit intermixing with generic rectangular, welded, black iron system segments where space limitations dictate
- ACAD layout assistance (3D capabilities)
- Detailed BOM
- Limited Lifetime Warranty

Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts

Started with field-wrapped welded black iron and transitioned to Factory-Built where head room opened up

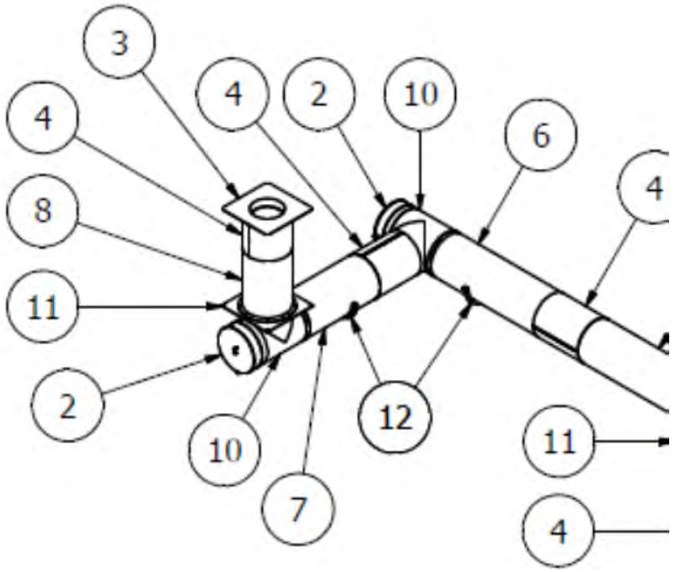
AMPCO®

Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts



Provided 3D model to contractor to check for interference fit

Advantages of Factory-Built Grease Ducts vs. Welded Black Iron Grease Ducts



PDF of 3D and comes with BOM and part tags on same file at final submission

AMPCO®

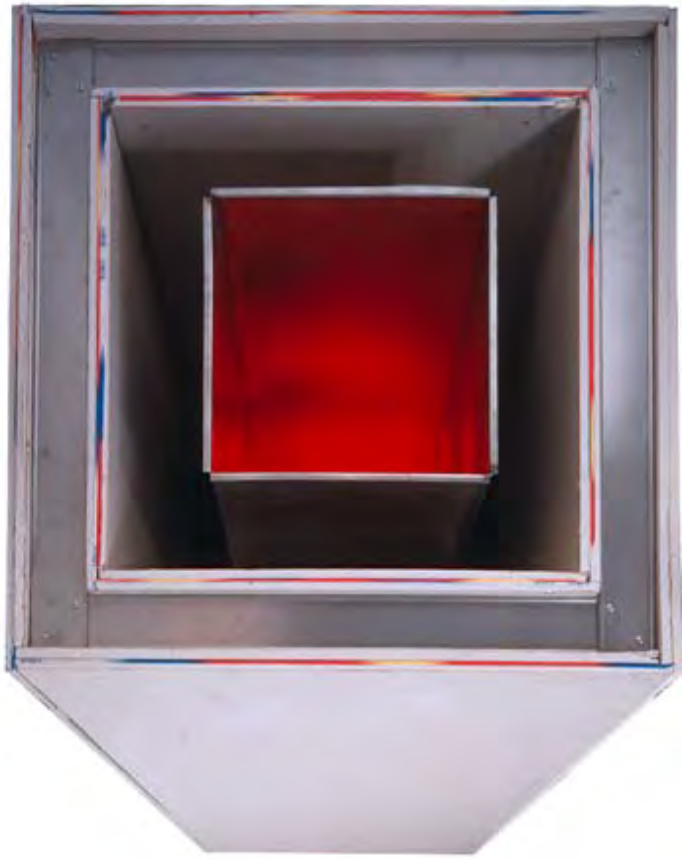
Fire Rated & Zero Clearance
Factory-Built Grease Ducts

- Ampco IVSI-Z3 (3” high density & high temp fiber insulation)
  - Simplified installation. No need for separate fabricator and insulation contractors (if flexible fire wrapping) and no need for separate fire rated enclosure.
  - Simpler inspection process. Easy, 1 step AHJ inspection process vs. 3 steps for welded black iron w/ wrap (initial on continuously welded duct; 1st wrap; 2nd wrap). Multiple inspections cause unaccounted cost delays

Fire Rated & Zero Clearance
Factory-Built Grease Ducts

- Outer wall protects insulation from damage & provides far more aesthetically pleasing appearance vs. flexible foil faced wrap
- Much smaller “footprint” vs. separate fire rated enclosure
- Safety / Performance during any fire exposure
- Survivability of internal grease fire
- Intermixing with other factory-built traditional models and/or black iron is permitted for same job
- 1/16” per foot slope req’d as explained previously

Fire Rated & Zero Clearance
Factory-Built Grease Ducts vs. Black Iron



Gypsum Shaft
18 inch duct (6” clearance inside shaft) consumes about 12.25 square feet of space.

Ampco IVSI-Z3
18” dia duct (24” OD) consumes about 3 square feet of space- 75% less!

Field Wrap Welded Black Iron
(2) 1.5” layers req’d
1.5” x 3 (joint overlap)= 4.5” thick
(5ft²)

Fire Rated & Zero Clearance
Factory-Built Grease Ducts vs. Black Iron

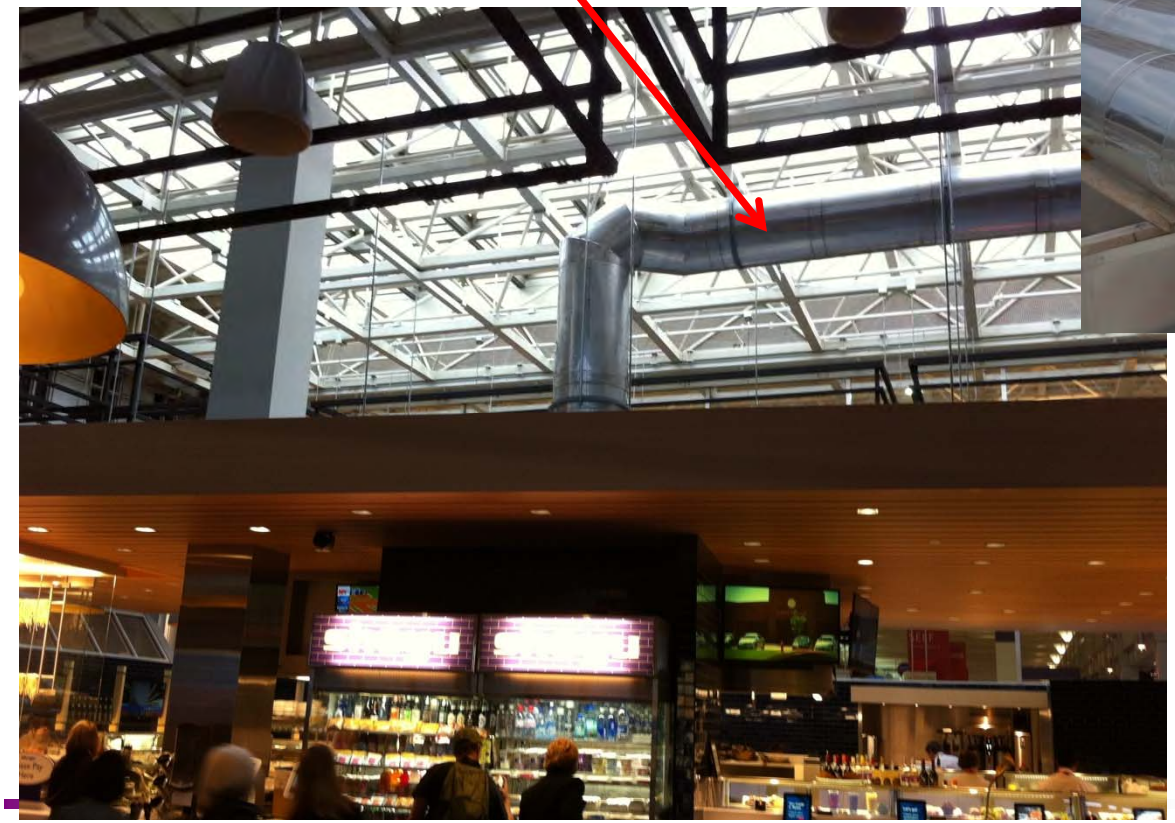
Do You Really Want This Anymore?

AMPCO®

Fire Rated & Zero Clearance
Factory-Built Grease Ducts vs. Black Iron

When You Can Have This Industrial Look

Exposed factory-built
grease duct (stainless outer)
in airport under a skylight



AMPCO®

Airspace Clearances to Combustibles

- Factory-built has multiple clearance options and all possess the benefits of round stainless duct.
- Rectangular welded black iron only has 2: single wall or zero clearance, fire-rated flexible duct wrap
- Value engineer
  - Not all jobs require zero clearance or even a fire rated duct or shaft
  - Notice ≤16” C2 & Z3 clearances = the same overall working window
  - Mix & match our models where needed
  - We provide a layout/schematic to keep things straight

CLEARANCES

Table G-2: Minimum Airspace Clearance to Combustibles for Grease Duct

Pipe ID	Model VSI	Model IVSI-C1	Model IVSI-C2	Model IVSI-C4	Model Z3 & Z4	Model N
5”	5”	2”	1”	1”	0”	18” Or Per Local Code For single Wall construction Per NFPA 96
6”	5”	2”	1”	1”	0”	
8”	5”	3”	1”	1”	0”	
10”	5”	3”	1”	1”	0”	
12”	6”	3”	1”	1”	0”	
14”	7”	3”	1”	1”	0”	
16”	8”	3”	1”	1”	0”	
18”	9”	4”	2”	2”	0”	
20”	10”	4”	2”	2”	0”	
22”	11”	4”	3”	3”	0”	
24”	11”	4”	3”	3”	0”	
26”	12”	5”	4”	4”	0”	
28”	12”	5”	4”	4”	0”	
30”	13”	5”	4”	4”	0”	
32”	13”	5”	4”	4”	0”	
36”	14”	6”	5”	5”	0”	
42”	16”	7”	6”	6”	N/A	
48”	17”	7”	6”	6”	N/A	

AMPCO®

Codes and Standards

- What do the Codes & Standards say about fire rated & zero clearance factory-built grease ducts?
  - UL1978 & UL2221 certified grease ducts are referenced as an option in all Mechanical Codes
    - IMC, UMC, NFPA96 (also guideline for Canada's NBC)
  - 2 hr F&T integrated enclosure (insulation and outer wall) creates the alternative to an otherwise shaft requirement (UL 2221)
    - Use of our Firestop (TPF) may be required per building construction
- What about Fire Rated wraps?
  - Per all latest edition of codes – NFPA96, IMC, UMC – All flexible wraps are now required to comply with ASTM-E2336
    - ICC Evaluation Service "Legacy" reports for Grease Duct "Wraps" were eliminated as of 2009 because they DO NOT comply with ASTM-E2336
    - This eliminates "Lite" / Single layer wraps. *2 layers of 1.5" thick insulation is now the requirement.* (3 inspections)

Codes and Standards

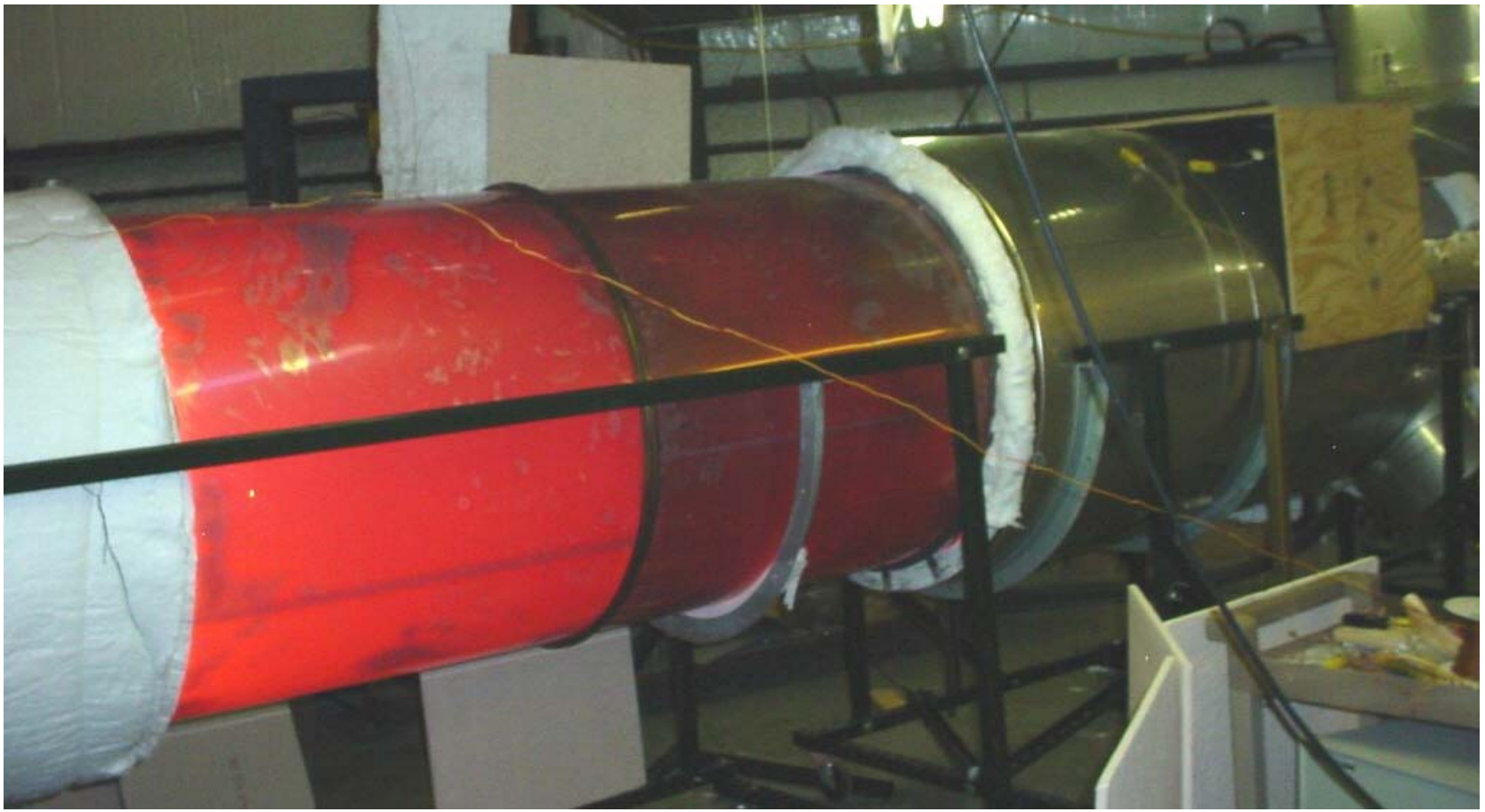
- Overview of UL testing:
  - Internal Fire Test – 2000^{O}F (30 min) after 500°F continuous
    - Per UL1978 & UL2221 – simulates grease fire in system
  - External (Engulfment) Fire Test – 2 Hour (UL 2221)
    - Fire & Hose Stream
  - Partition “Wall” test per ASTM E2336 / E119
    - Not a UL or Mechanical Code requirement for factory-built
    - Fire & Hose Stream

Table G-1 – Grease Duct Certifications			
Model	**Certification Per UL1978**	**Certification/ Fire Rating Per UL2221**	**Certification / Fire Rating per ASTM-E2336**
N, VSI, IVSI-1,2,4	Yes	No	No
Z3	Yes	Yes: 2 Hour	Yes: 1 Hour
Z4	Yes	Yes: 2 Hour	Yes: 2 Hour

AMPCO®

Codes and Standards

2000°F Internal Fire Test (30 min)



Codes and Standards

External Fire Engulfment Test

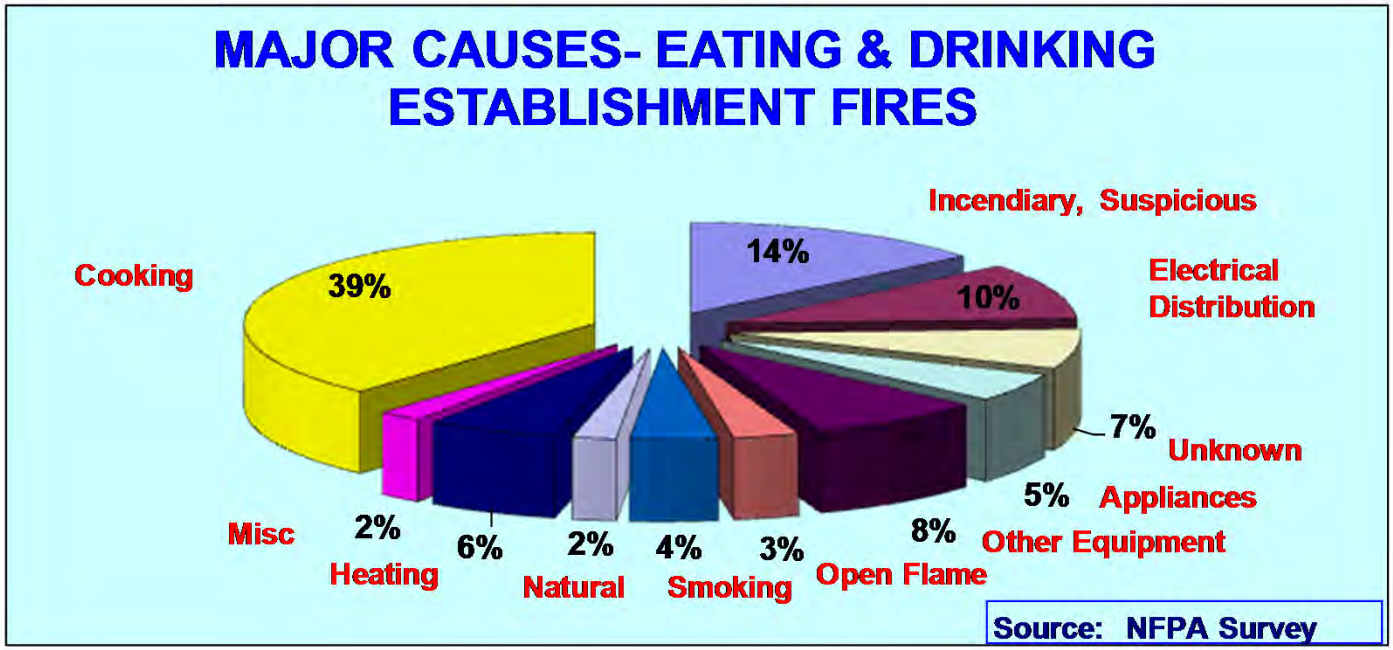
Fire exposed duct:

- exposed to external fire for 2 hours in large furnace getting to 1850°F
- must maintain structural integrity

View into furnace during engulfment test

Unexposed side of fire engulfment test assembly (fire stop):

- must meet temperature requirements on this side
- duct under negative pressure during fire engulfment



A lot of grease sticking to the top and sides of rectangular carbon steel duct, even with a ¼" slope. Also a lot of fuel waiting to ignite. Good thing they *finally* called a credible cleaner

Safety / Performance:

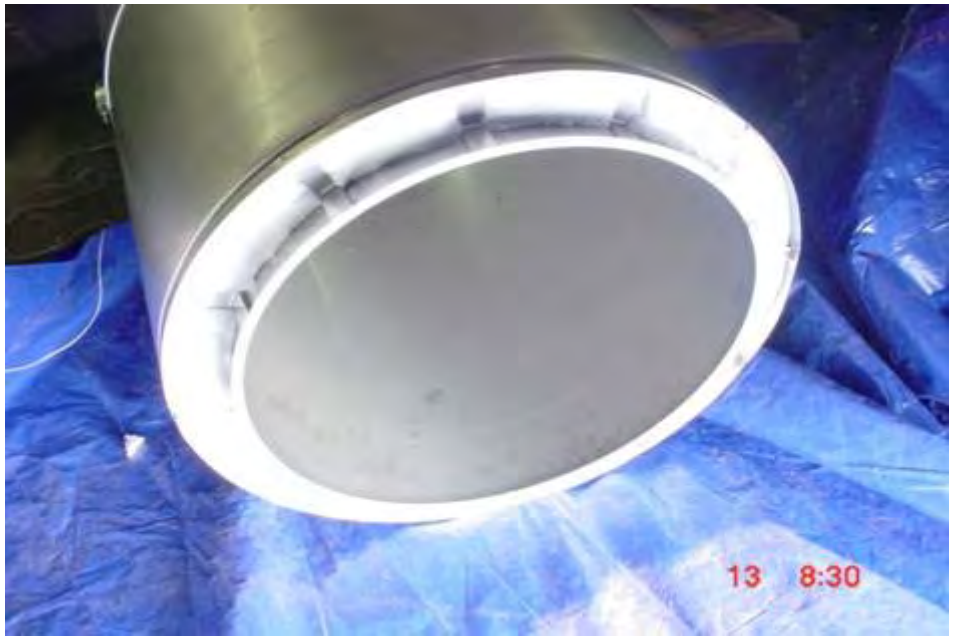
- Listed, cylindrical, stainless steel systems
  - Superior safety & high temperature resistance
  - How so?
    - It is a very well known fact that:
      - Stainless steel maintains strength at much higher temperatures versus carbon steel
      - Cylindrical duct systems are far superior structurally, compared to rectangular ducts

Grease Fire Survivability

- Factory-built systems demonstrated to withstand 2000^{O}F internal fire for 30 minutes w/o structural damage. (UL1978 & UL2221 requirement)
- Wrapped, welded steel systems distort badly and need to be completely torn out and replaced after far less exposure
- How about an example?

Grease Fire Survivability

- **Ampco IVSI-Z3:**
  prior to 2000^{O}F
  exposure for 30 min's.
  - 24" ID sample (3.14 ft^2 cross-sectional area)



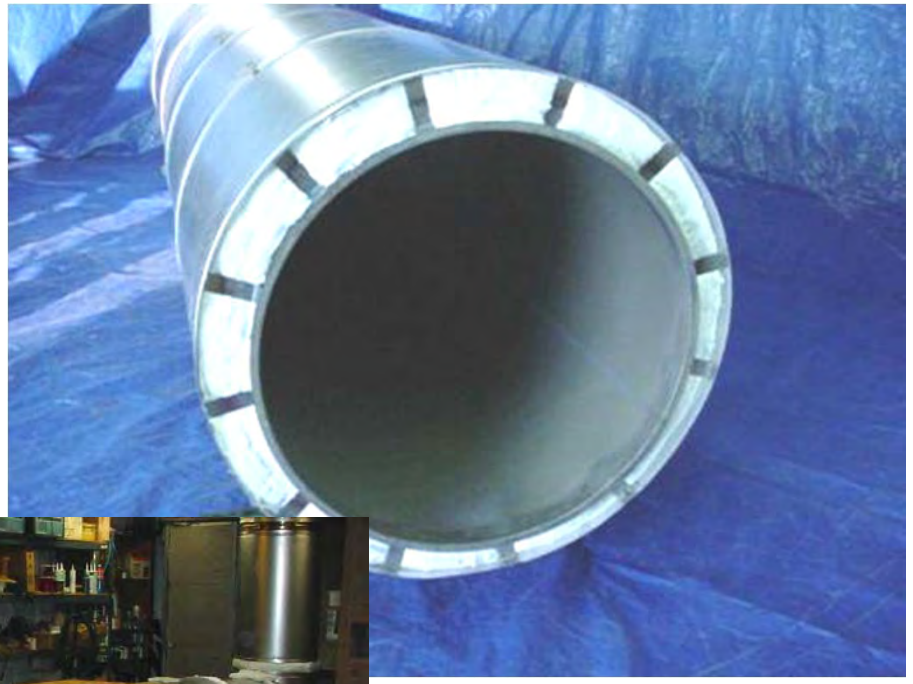
AMPCO®

Grease Fire Survivability

- 12” x 36” rectangular, 16 Ga., welded, carbon steel duct w/ generic “wrap” insulation – prior to 2000^{O}F (simulated grease fire) for 30 min’s.
  - 3.0 ft^2 cross-sectional area

Grease Fire Survivability

- **Ampco IVSI-Z3:**
  during & after 2000^{O}F
  exposure for 30 min's.



AMPCO®

Grease Fire Survivability

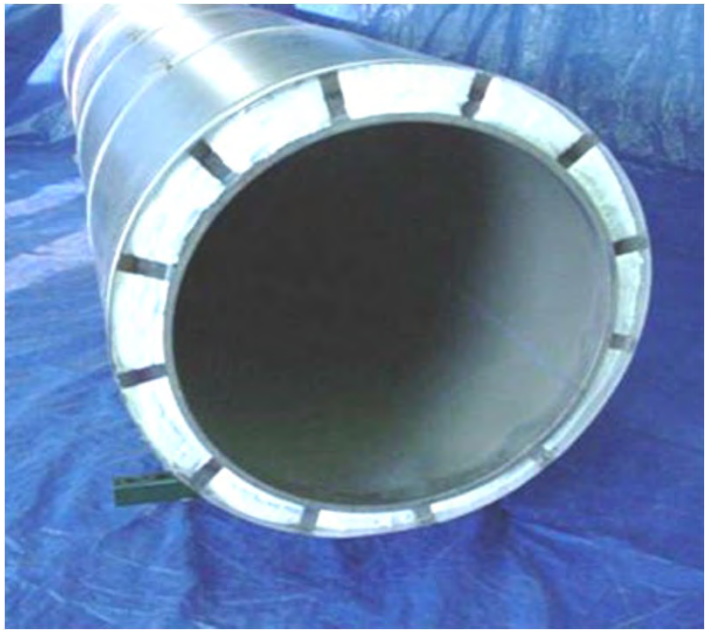
- (same) 12” x 36” rectangular, 16 Ga., welded, carbon steel duct w/ generic “wrap” insulation – *during & after* exposure to 2000^{O}F (simulated grease fire) for 30 min’s.

AMPCO®

Grease Fire Survivability

- Grease fires “happen”……
- Which would you, the business owner, the insurance companies and others prefer?

Ampco IVSI-Z3



The competition

AMPCO®

Grease Fire Survivability

- Comparison of downtime and expense of rehabilitation after internal grease fire
  - Factory-built system
    - Shut down operation
    - Inspect and replace sealant at v-band joints as necessary
    - Ready for use

Grease Fire Survivability

- Comparison of downtime and expense of rehabilitation after internal grease fire
  - Wrapped, rectangular, welded carbon steel system
    - Shut down operation and demolish / remove entire duct system
    - Clean area; fabricate and weld entire new duct system in place
    - Wait for inspection of welded duct
    - Apply insulation wrap – (layer 1) and have inspected
    - Apply second layer of insulation wrap – (layer 2) and have it inspected
    - Begin use of new system

Estimated Cost Comparison

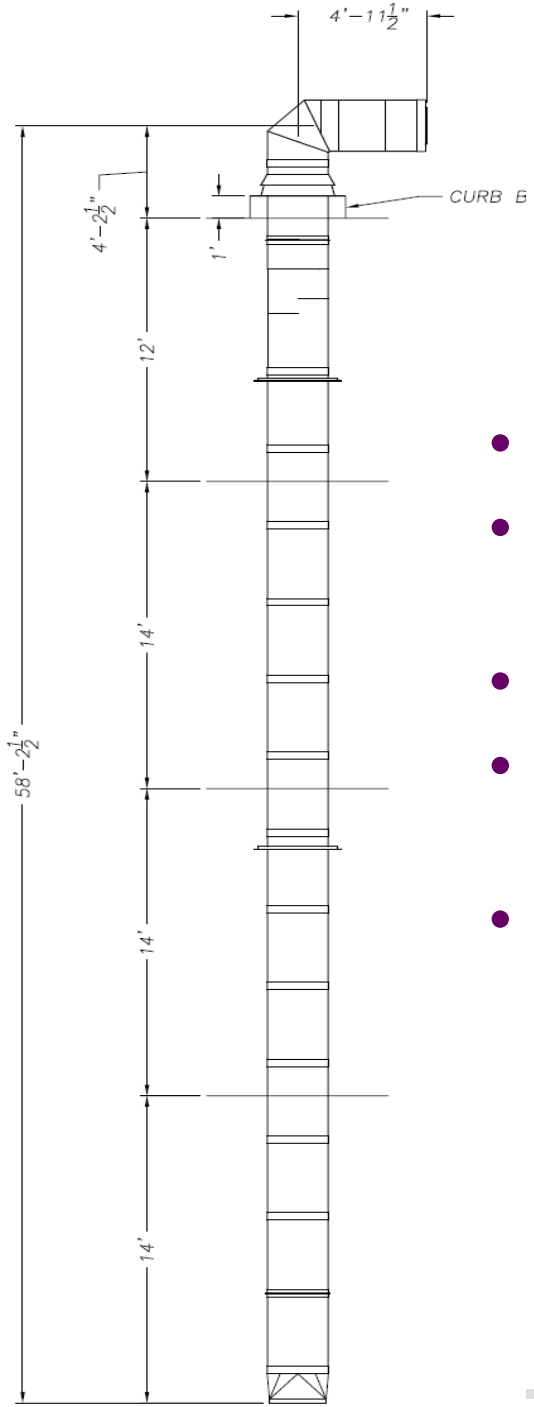
- RSMeans Mechanical Cost Data Book 2014 (37th ed)
  - Z3 fire rated factory-built round (304/Alz)
    - $389 / ft for 24” diameter (using 42”L 2014 pipe pricing)
    - $190 / ft for 12” diameter (using 42”L 2014 pipe pricing)
  - Carbon steel* welded with basic 2 layer duct wrap
    - $380 / ft for 24” x 24” square
    - $190 / ft for 12” x 12” square
  - Consider traditional non-fire rated factory-built grease ducts
    - 1” blanket model: 24” dia = $297 / ft; 12” dia = $146 / ft
    - 2” blanket model: 24” dia = $310 / ft; 12” dia = $153 / ft
  - All costing is a national average relative to contractors installed price including their profit

Limitations of RSMeans Data:

*Used galv for square ducting (no carbon steel avail), but material price appears to have minimal influence compared to the other cost inputs. Insulation costing was un-faced since grease duct wrap is unavailable in costing book

Estimated Cost Comparison

- Factory-built appears to be equal or only slightly more expensive for new construction with all things considered
- But think of the added value!
  - *Far superior performance* under all conditions!
  - UL listed product, ACAD layout (shop drawings), sizing assistance, warranty, survivability, shorter time to completion (especially on multi-story jobs), etc
- Think of the extra advantages if this were a *remodel or rehab* project
  - No welding, modular, far quicker completion (back in business!)



Another Cost Example (southeast US)

- 20” ID (26” OD) Z3 model
- 304 inner & Alz steel protective outer jacket
- 65 vertical feet of grease duct
- Our site delivered cost was $3k less than the black iron version
- Experienced labor is 1.5 days w/ 2 men
  - Minimal to no welding req’d
  - 1 inspection (not 3 separate)

AMPCO®

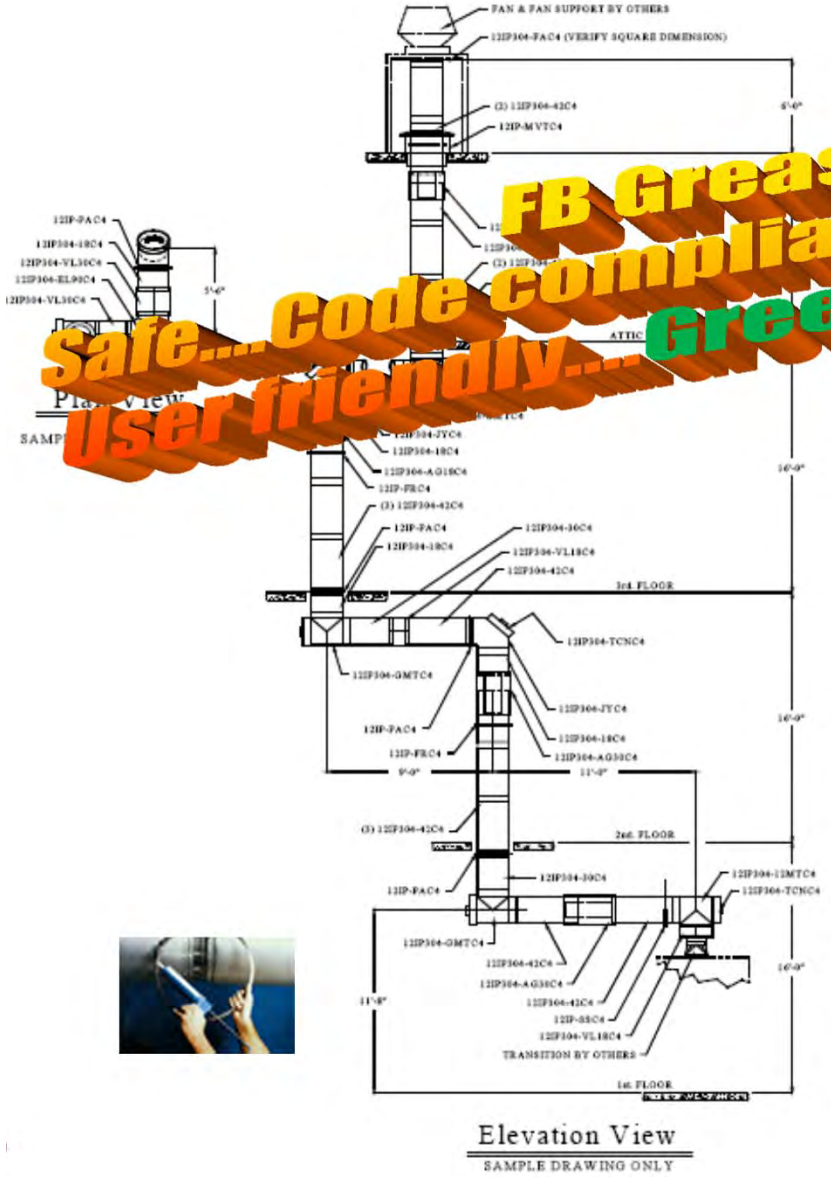
Factory Built Grease Duct Installations
Small - Large & Everything In Between

- Oklahoma State Univ Student Union Bldg
  - 750 linear ft of 12”-22” dia Z3 duct
  - A lot of horizontal with minimal to no slope
  - Had 20 ft of welded/wrapped rectangular in the middle of the run for headroom clearance constraints
- Dallas Convention Center Hotel (Omni)
  - 850 linear ft of 12”-36” dia Z3 duct
- MIT Dormitory
  - 180 linear ft of 22”-30” dia Z3 duct
- Cleveland Horseshoe Casino
  - Half of the horizontal was black iron
- MD Anderson Hospital in Houston
- Texas A&M Student Union
- Variety of Restaurants (fast food chains, bar/grille, etc)
- Walmart
- Military Bases
- Virginia Tech Stadium
- Airports (Seattle, Minneapolis)
- General Electric
- Montana State Dining Hall

All of these drawn, submitted and installed at minimum slope

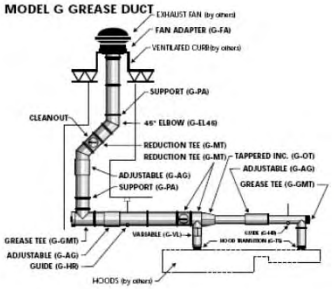
AMPCO®

FACTORY-BUILT GREASE DUCTS
THE SMART CHOICE



Elevation View
SAMPLE DRAWING ONLY

FB Grease Ducts
Safe....Code compliant....Cost effective....
User friendly....Green....the Best Choice"



AMPCO®

Questions?

Thanks for attending

Factory-Built Grease Ducts – the Smart Choice!