Installation Practices

Refrigerant piping installation practice critical to short and long term system integrity

- General requirements no different from those employed with any built up refrigeration system
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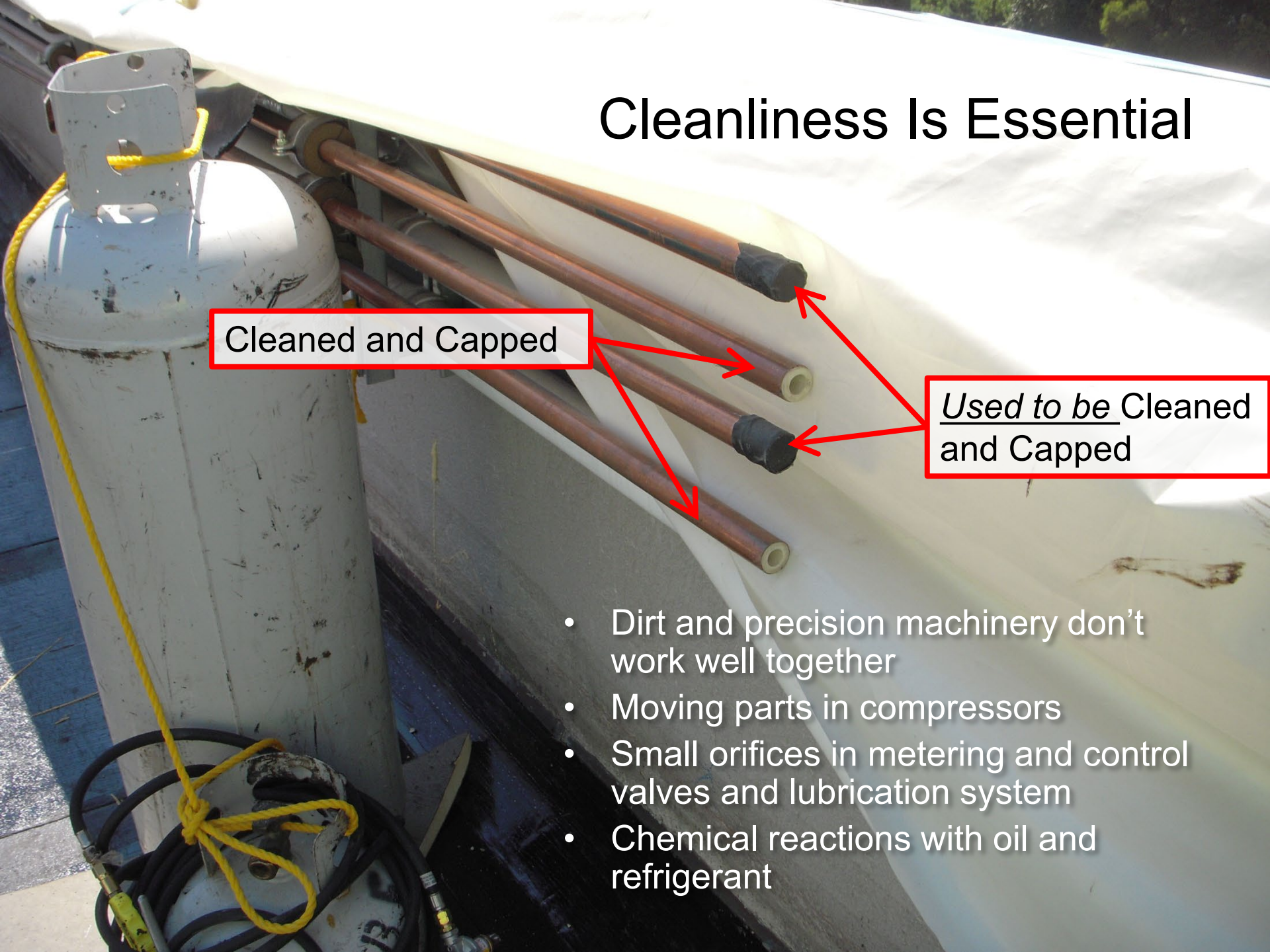
Cleanliness Is Essential

- Cleaned to an ASTM established limit for residue
- Purged with dry nitrogen
- Sealed with rubber plugs with positive nitrogen pressure inside the tuber

Cleanliness Is Essential

- Moisture and refrigerant don't work well together
- Corrosion
- Ice
- Refrigerant oil problems
- Motor problems

Cleanliness Is Essential



- Dirt and precision machinery don't work well together
- Moving parts in compressors
- Small orifices in metering and control valves and lubrication system
- Chemical reactions with oil and refrigerant

Nitrogen Purge is Essential While Brazing

Courtesy http://www.reflok.pl

Courtesy http://www.hvactrainingsolutions.net

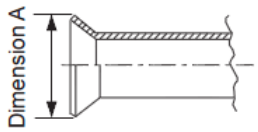
Field Joints

Field joints can be made using a frustum of right circular cone

5. Flare processing (O-material (Annealed) only)

The flare processing dimensions for the pipes that are used in the R410A system are larger than those in the R22 system.

Pipe size (mm[in])		A dimension (mm[in])			
		R410A		R22	
ø6.35	[1/4"]	9.1	[0.358]	9.0	[0.354]
ø9.52	[3/8"]	13.2	[0.520]	13.0	[0.512]
ø12.7	[1/2"]	16.6	[0.654]	16.2	[0.638]
ø15.88	[5/8"]	19.7	[0.776]	19.4	[0.764]
ø19.05	[3/4"]	24.0	[0.945]	23.3	[0.917]



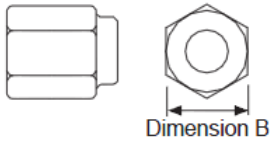
If a clutch-type flare tool is used to flare the pipes in the system using R410A, the length of the pipes must be between 1.0 and 1.5 mm. For margin adjustment, a copper pipe gauge is necessary.

6. **Flare nut**

Type-2 flare nuts instead of type-1 are used to increase the strength. The size of some of the flare nuts have also been changed.

Flare nut dimensions (mm[in])

Pipe size (mm[in])		B dimension (mm[in])			
		R410A		R22	
ø6.35	[1/4"]	17.0	[0.669]	17.0	[0.669]
ø9.52	[3/8"]	22.0	[0.866]	22.0	[0.866]
ø12.7	[1/2"]	26.0	[1.024]	24.0	[0.945]
ø15.88	[5/8"]	29.0	[1.142]	27.0	[1.063]
ø19.05	[3/4"]	36.0	[1.417]	36.0	[1.417]



The figures in the radial thickness column are based on the Japanese standards and provided only as a reference. Use pipes that meet the local standards.

Image courtesy Mitsubishi PRUY Service Instruction; Used with Permission

Field Joints

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Field joints can be made using a 45°SAE Flare joint

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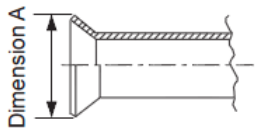

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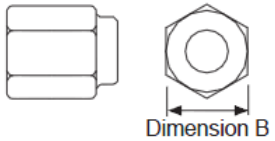

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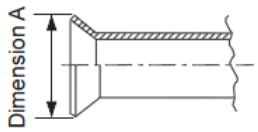

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Operating Pressures

Refrigerant	Low Side	High Side
R22	55-70 psig	180 - 260 psig
R410	95 - 135 psig	305 - 410 psig

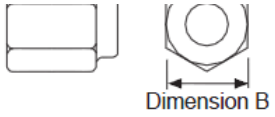

Image courtesy Mitsubishi PRUY Service Instruction; Used with Permission

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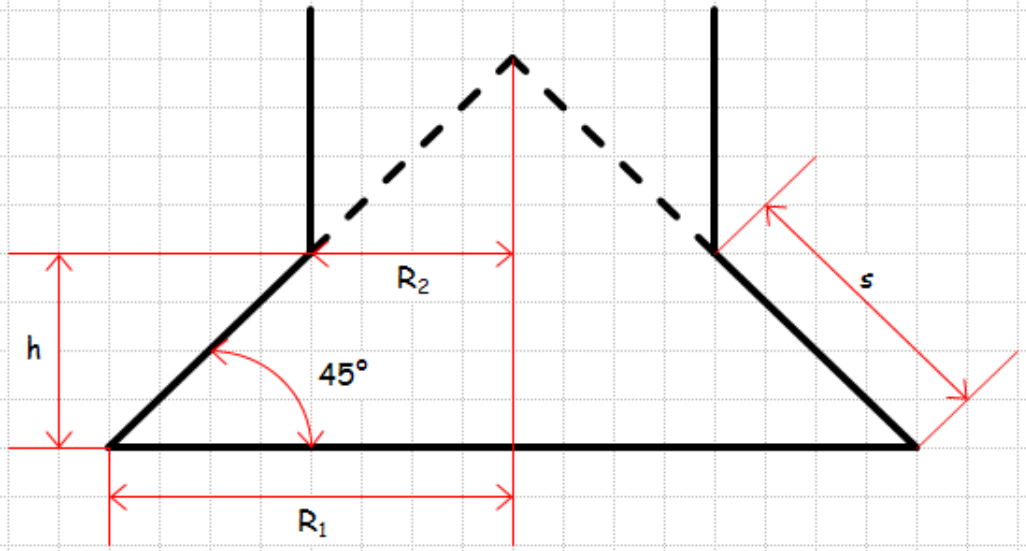
Field Joints

1. Determine the increase in seating surface for different flare dimensions
2. $S = \pi \times (R_1 + R_2) \times s$

   Where, for a Frustrum of a Right Circular Cone:

S =	Lateral surface area
R_1 =	Radius of lower base
R_2 =	Radius of upper base
s =	Slant height

3. $s = ((R_1-R_2)^2 + h_2)^{1/2}$



Field Joints

For nominal 1/2" tube

R410A Application				R22 Application		
Flare dimension -	16.60	mm		Flare dimension -	16.20	mm
Tube dimension -	12.70	mm		Tube dimension -	12.70	mm
Difference -	3.90	mm		Difference -	3.50	mm
Half of difference -	1.95	mm		Half of difference -	1.75	mm
Length of flare (height of frustrum) -	1.95	mm		Length of flare (height of frustrum) -	1.75	mm
Slant height -	2.40	mm		Slant height -	2.19	mm
Area of flare -	221	sq mm		Area of flare -	199	sq mm
Difference -	21.60	sq mm	= 10.8%			

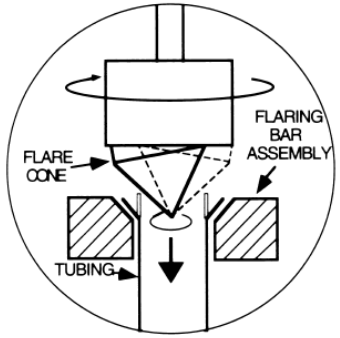
For nominal 1/2" tube

R410A Application				R22 Application		
Flare dimension -	19.70	mm		Flare dimension -	19.40	mm
Tube dimension -	15.88	mm		Tube dimension -	15.88	mm
Difference -	3.82	mm		Difference -	3.52	mm
Half of difference -	1.91	mm		Half of difference -	1.76	mm
Length of flare (height of frustrum) -	1.91	mm		Length of flare (height of frustrum) -	1.76	mm
Slant height -	2.36	mm		Slant height -	2.20	mm
Area of flare -	264	sq mm		Area of flare -	244	sq mm
Difference -	19.24	sq mm	= 7.9%			

For nominal 3/4" tube

R410A Application				R22 Application		
Flare dimension -	24.00	mm		Flare dimension -	23.30	mm
Tube dimension -	19.50	mm		Tube dimension -	19.50	mm
Difference -	4.50	mm		Difference -	3.80	mm
Half of difference -	2.25	mm		Half of difference -	1.90	mm
Length of flare (height of frustrum) -	2.25	mm		Length of flare (height of frustrum) -	1.90	mm
Slant height -	2.70	mm		Slant height -	2.35	mm
Area of flare -	370	sq mm		Area of flare -	316	sq mm
Difference -	53.93	sq mm	= 17.1%			

Flaring Tools; They're Not All Created Equal



centrically Mounted Flare Cone

Conventional flaring tools "press" the flare onto the end of the tube

Recommended flaring tool rolls the flare onto the end of the tube

Either way:

- Metal to metal sealing mechanism
- Lubricate flare before tightening

Images courtesy www.ridgid.com/; Used with Permission

Tightening the Connection

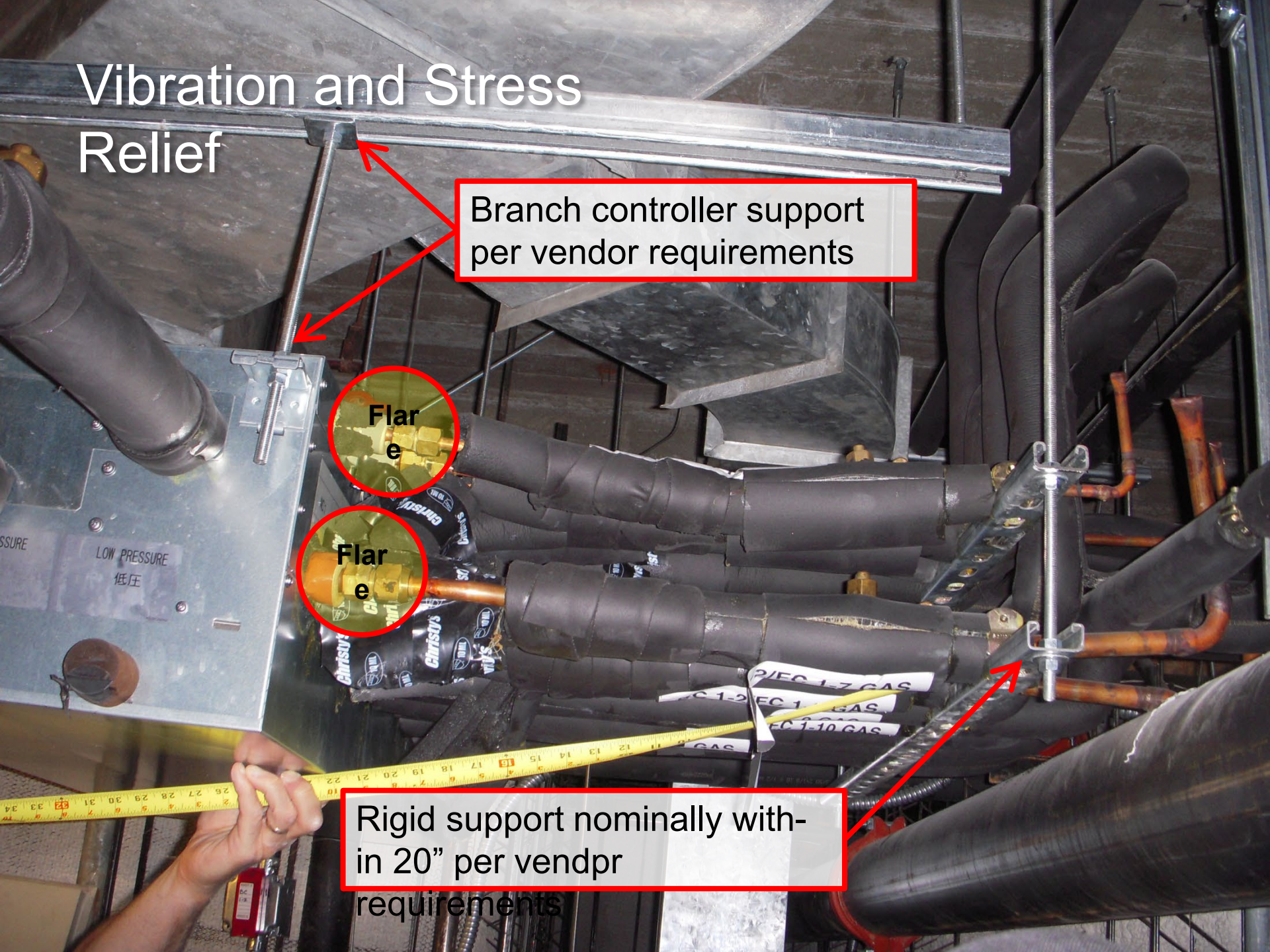
- Lubricate with a refrigerant compatible oil
- Use two wrenches
- Use specified torque values

Torque Wrenches, Flare Nut Wrench and Crow's Foot

Tightening the Connection

- Easier accomplished on the bench than in the air
- Factory line sets minimize field flares

Vibration and Stress Relief



Vibration and Stress Relief