

A large, vibrant red splatter shape serves as the background for the word 'Artisan's'. The splatter has several smaller red droplets extending from its edges, giving it a dynamic, paint-splashed appearance.

Artisan's

A rectangular metal plate with a grey, brushed-metal texture. It features four hexagonal bolts at the corners and a series of small black arrows pointing outwards from the edges of the plate. The word 'ASYLUM' is written across the center in a bold, black, blocky font with a white outline.

ASYLUM



Hydraulic Assembly Basics

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Overview



- Setup
 - Fitting Types
 - Hose Sizing
 - Assembly Techniques
-

Setup



- Assume everything will get coated in hydraulic oil. Everything.
 - Drop cloths on all tables and surfaces
 - Absorbent media available at all times
 - Cleaning station to degrease tools
 - Wear gloves at all times, wash hands immediately after working with oil
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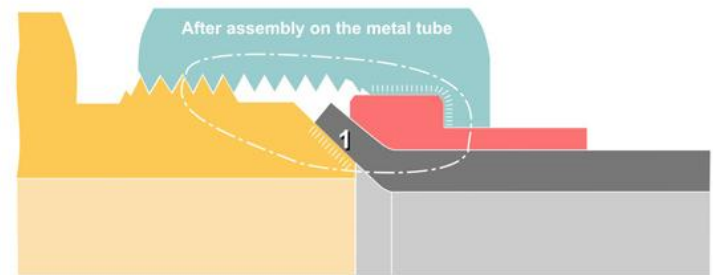
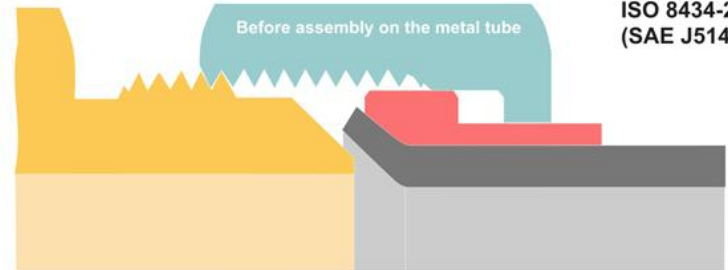
Fitting Types

Fitting Types - JIC



COUPLING SYSTEM

ISO 8434-2
(SAE J514)



----- Field of force after assembly
===== Pressure surfaces after assembly
1 Sealing points

Fitting Types - JIC

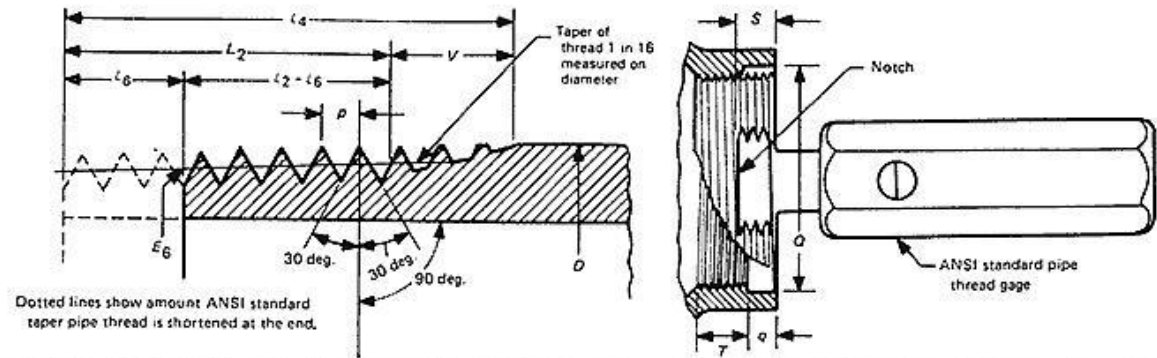


- Sealing surface:
 - 37 degree flare on nose of male fittings
 - Tensioning mechanism:
 - Free-swiveling, floating hex nuts on straight threads
 - Pros:
 - Easy to assemble
 - Widely available
 - New industry standard
 - Cons
 - Easy to not tighten enough
-

Fitting Types - NPT



NPT Thread Definition



| Nom. Pipe Size | O.D. of Pipe (D) | Threads/in. (n) | Height of Thread (h) | Pitch Diameter at End of External Thread (E ₆) | Shortening of Thread (L ₆) | | Length of Effective Thread (L ₂ - L ₆) | | Total Length of External Thread, max. (L ₄ - L ₆) | | Incomplete Threads due to Chamfer of Dia, max. (V) | | Depth of Recess in Fitting (G) | Dia. of Recess in Fitting (Q) | Length (T) | Distance Gage ² Notch comes below Face of Fitting (S) | |
|----------------|------------------|-----------------|----------------------|--|--|---------|---|---------|--|---------|--|---------|--------------------------------|-------------------------------|------------|--|---------|
| | | | | | in. | Threads | in. | Threads | in. | Threads | in. | Threads | | | | in. | Threads |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 3/2 | 0.840 | 14 | 0.0571 | 0.7718 | 0.214 | 3 | 0.320 | 4.47 | 0.499 | 6.98 | 0.179 | 2 1/2 | 0.18 | 0.86 | 0.25 | 0.286 | 4 |
| 5/4 | 1.050 | 14 | 0.0571 | 0.9811 | 0.214 | 3 | 0.332 | 4.64 | 0.510 | 7.15 | 0.179 | 2 1/2 | 0.18 | 1.07 | 0.25 | 0.286 | 4 |
| 1 | 1.315 | 11.5 | 0.0696 | 1.2299 | 0.261 | 3 | 0.422 | 4.85 | 0.639 | 7.35 | 0.217 | 2 1/2 | 0.22 | 1.34 | 0.30 | 0.348 | 4 |
| 1 1/4 | 1.660 | 11.5 | 0.0696 | 1.5734 | 0.261 | 3 | 0.446 | 5.13 | 0.707 | 8.13 | 0.261 | 3 | 0.26 | 1.68 | 0.39 | 0.348 | 4 |
| 1 1/2 | 1.900 | 11.5 | 0.0696 | 1.8124 | 0.261 | 3 | 0.463 | 5.32 | 0.724 | 8.33 | 0.261 | 3 | 0.26 | 1.92 | 0.43 | 0.348 | 4 |
| 2 | 2.375 | 11.5 | 0.0696 | 2.2853 | 0.261 | 3 | 0.496 | 5.70 | 0.757 | 8.70 | 0.261 | 3 | 0.26 | 2.40 | 0.43 | 0.348 | 4 |
| 2 1/2 | 2.875 | 8 | 0.1000 | 2.7508 | 0.500 | 4 | 0.638 | 5.10 | 1.013 | 8.10 | 0.375 | 3 | 0.38 | 2.90 | 0.63 | 0.625 | 5 |
| 3 | 3.500 | 8 | 0.1000 | 3.3719 | 0.500 | 4 | 0.700 | 5.60 | 1.075 | 8.60 | 0.375 | 3 | 0.38 | 3.53 | 0.63 | 0.625 | 5 |
| 3 1/2 | 4.000 | 8 | 0.1000 | 3.8688 | 0.500 | 4 | 0.750 | 6.00 | 1.125 | 9.00 | 0.375 | 3 | 0.38 | 4.04 | 0.63 | 0.625 | 5 |
| 4 | 4.500 | 8 | 0.1000 | 4.3656 | 0.500 | 4 | 0.800 | 6.40 | 1.175 | 9.40 | 0.375 | 3 | 0.38 | 4.54 | 0.63 | 0.625 | 5 |

NOTES:

(1) These dimensions agree with those developed by the Manufacturers Standardization Society of the Valve and Fittings Industry. Thread lengths are specified to three decimal places for convenience.

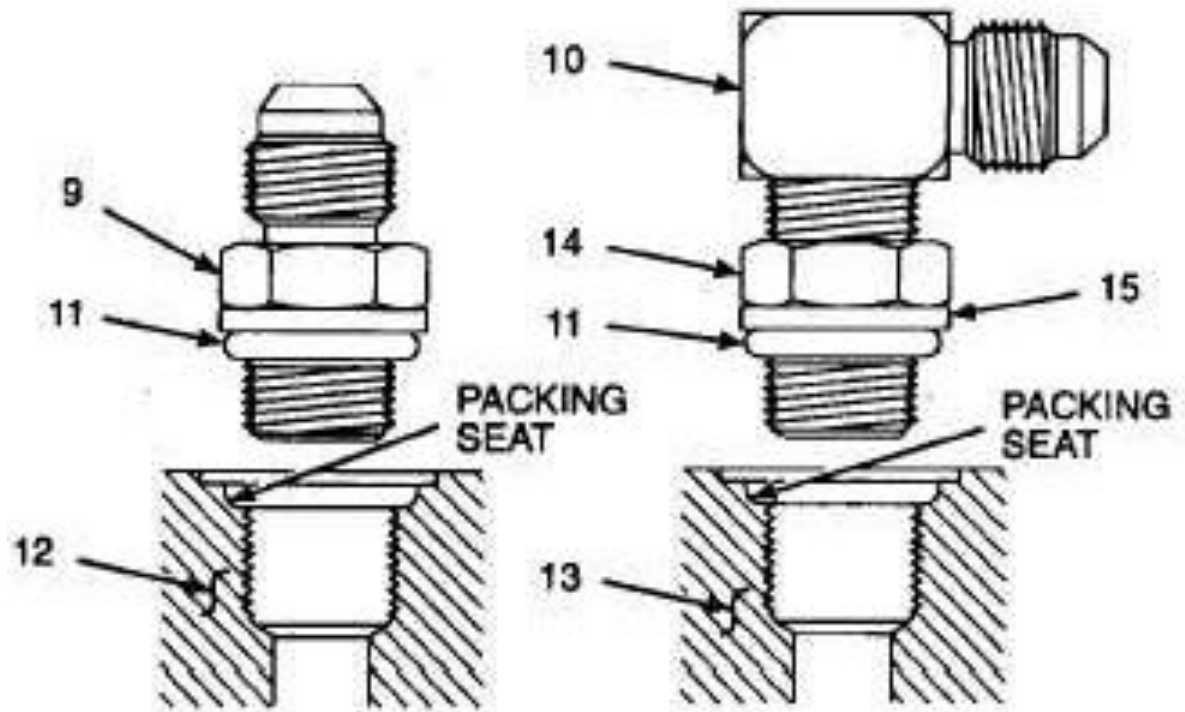
(2) American National Standard Taper Pipe Thread Plug Gage.

Fitting Types - NPT



- Sealing surface:
 - Tapered screw with seal lubricant
 - Tensioning mechanism:
 - Non-swiveling or swiveling tapered screw
 - Pros:
 - ...
 - Cons
 - Almost always leak
 - Difficult to assemble
 - Easy to screw up
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Fitting Types - ORB



Fitting Types - ORB



- Sealing surface:
 - O-Ring touching down on machined surface
 - Tensioning mechanism:
 - Straight non-swiveling thread
 - Pros:
 - Easy to assemble
 - Widely available
 - Very robust
 - Cons
 - O-Ring tearing if mishandled
-

Fitting Types - Flange Mount



Fitting Types - Flange Mount



- Sealing surface:
 - O-Ring touching down on machined surface
 - Tensioning mechanism:
 - Bolt pattern
 - Pros:
 - Easy to assemble
 - Widely available
 - Very robust
 - Cons
 - O-Ring tearing if mishandled
-



Hose Sizing

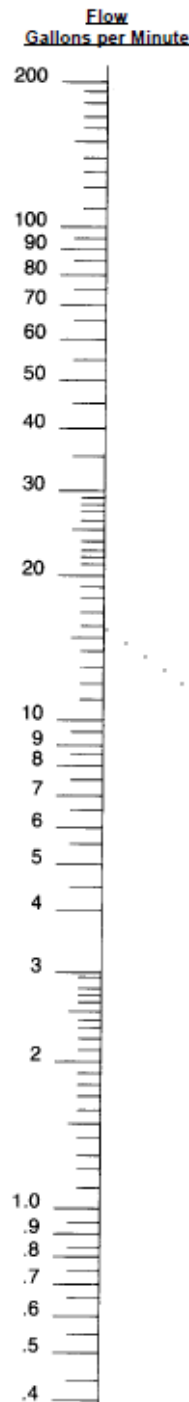
Hose Sizing



- Hoses are sized by “Dash Number”
 - Dash number is hose inner diameter in inches:
 - I.D. = Dash Number / 16
 - “Dash 8” = 0.5” I.D.
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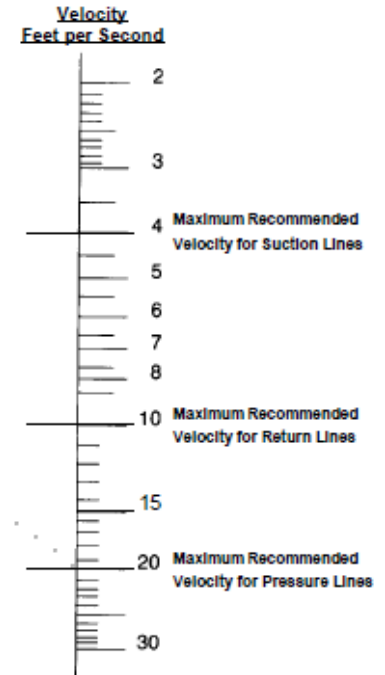
Hose Sizing

- Draw a line between desired flow rate and minimum or maximum flow velocities for your type of hydraulic path



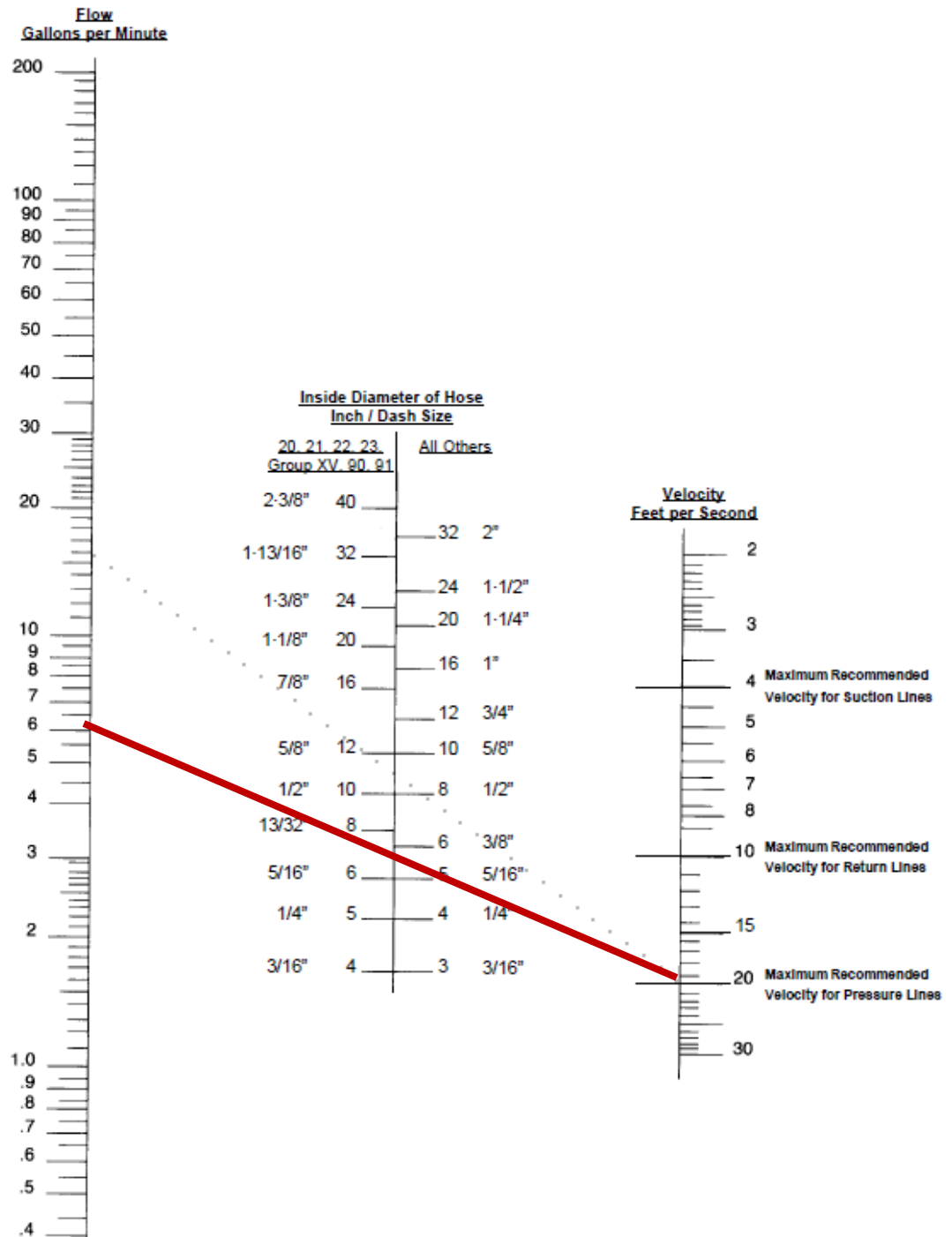
Inside Diameter of Hose
Inch / Dash Size

| 20, 21, 22, 23 Group XV, 90, 91 | | All Others | |
|------------------------------------|----|------------|--------|
| 2-3/8" | 40 | 32 | 2" |
| 1-13/16" | 32 | 24 | 1-1/2" |
| 1-3/8" | 24 | 20 | 1-1/4" |
| 1-1/8" | 20 | 16 | 1" |
| 7/8" | 16 | 12 | 3/4" |
| 5/8" | 12 | 10 | 5/8" |
| 1/2" | 10 | 8 | 1/2" |
| 13/32" | 8 | 6 | 3/8" |
| 5/16" | 6 | 5 | 5/16" |
| 1/4" | 5 | 4 | 1/4" |
| 3/16" | 4 | 3 | 3/16" |



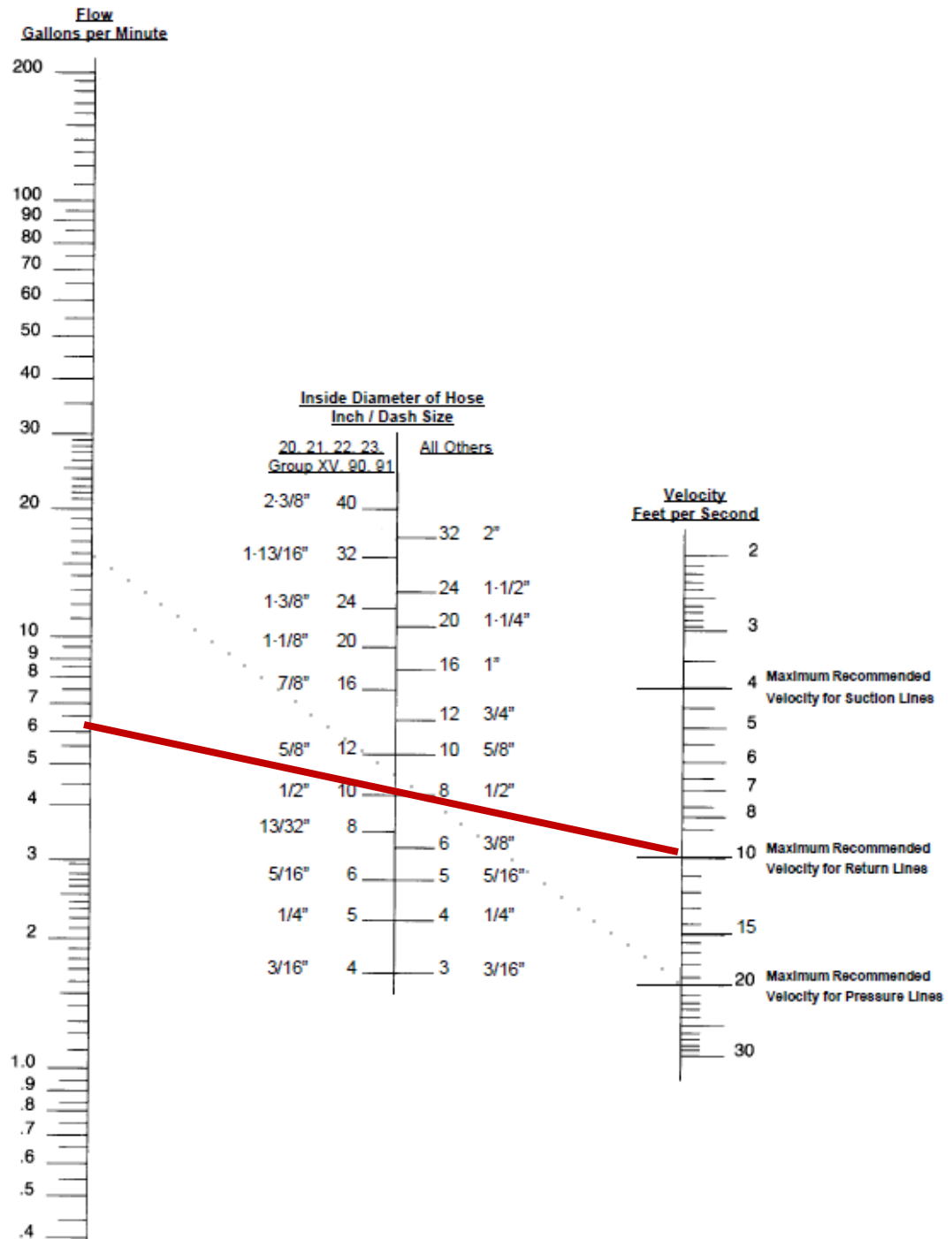
Hose Sizing

- Pressure to individual valve:
 - 6 GPM
 - Pressure line
 - Dash 5-6



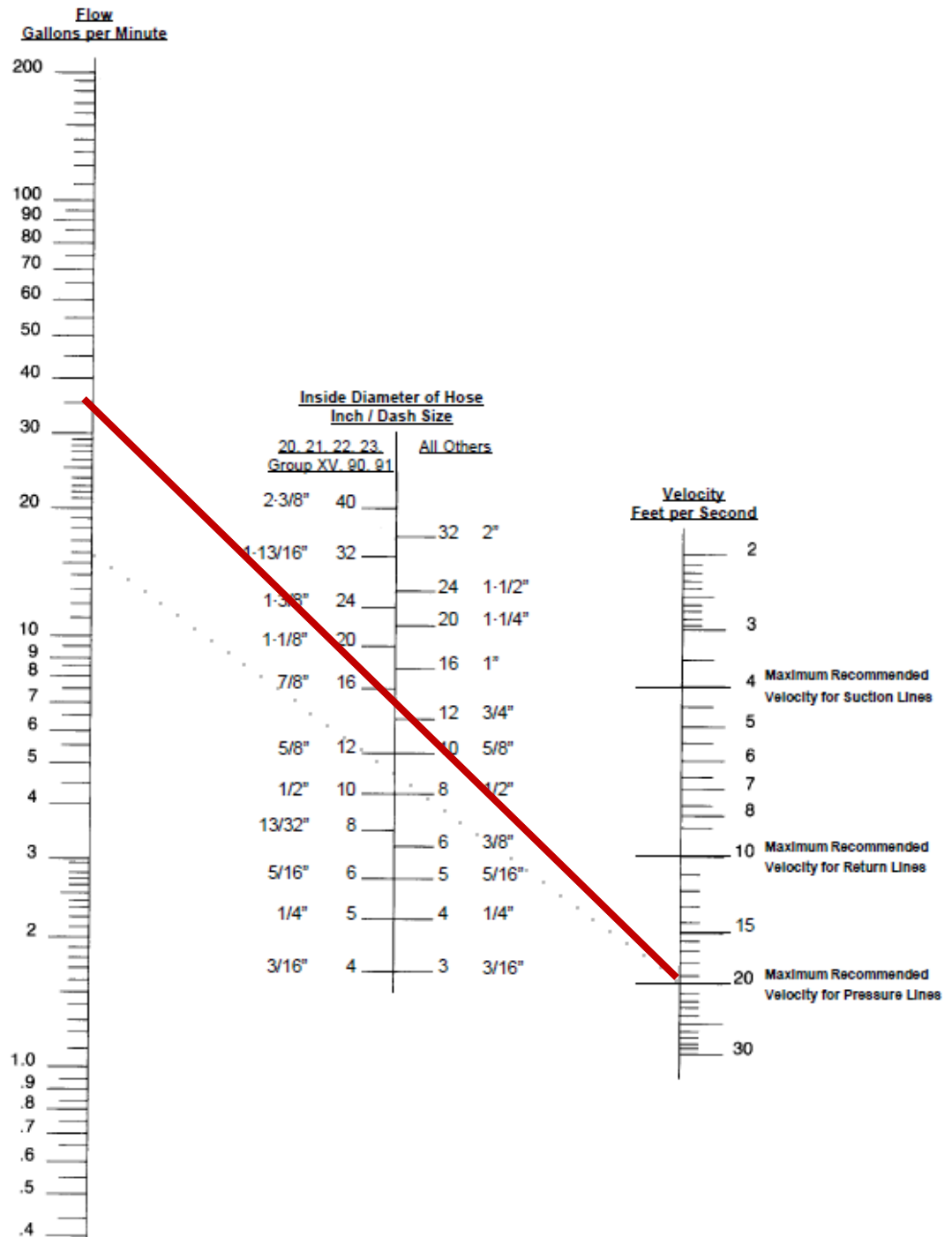
Hose Sizing

- Return from individual valve:
 - 6 GPM
 - Return line
 - Dash 8



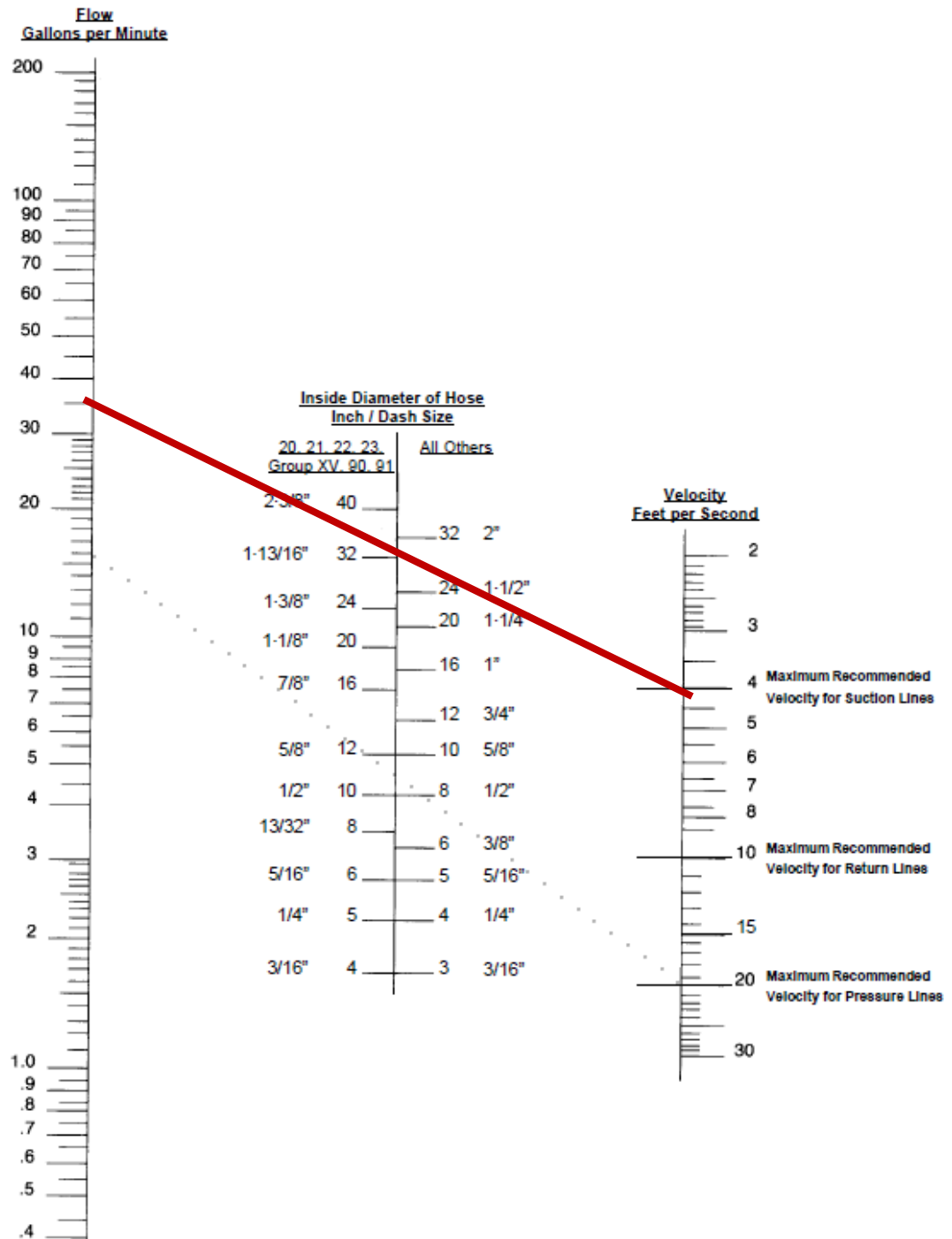
Hose Sizing

- Main pressure line to system:
 - 35 GPM
 - Pressure line
 - Dash 12-16



Hose Sizing

- Low pressure inlet to hydraulic pump:
 - 35 GPM
 - Suction line
 - Dash 24-30





Assembly Techniques

Basics



- Essentials:
 - Hydraulic oil acts like a grit/dust magnet
 - Grit/dust destroys hydraulic systems
 - All surfaces must be cleaned and oiled before assembly
 - Set up in as clean an environment as possible
 - Never leave hydraulic oil or cavities uncovered for any longer than necessary
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Components



- All components must be filled with hydraulic oil before being attached to a system
 - Fill a small squeeze bottle with hydraulic fluid, use it to fill components as much as possible before assembly
 - Consequence if not followed: pumps, cylinders, and valves die or misbehave
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Bleeding



- Traditional hydraulic systems have some way of “bleeding” – removing air from hydraulic lines as much as possible
 - Open circuit systems suffer less than closed circuit systems
 - We have no effective way to do that right now; therefore, caution is called for
 - Fill everything as much as possible
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Fittings



- All fittings must be wetted
 - Threaded surfaces coated in hydraulic oil before assembly to lubricate tightening procedure
 - NPT fittings must be coated in seal lube
 - ABSOLUTELY NO TEFLON TAPE
 - No seal lube for any other type of fitting
 - Fittings should be tightened as much as humanly possible
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