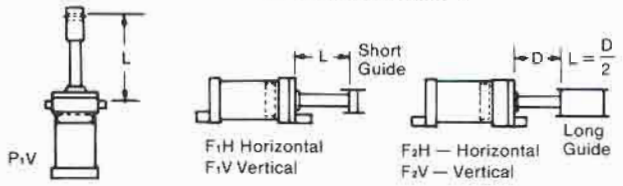
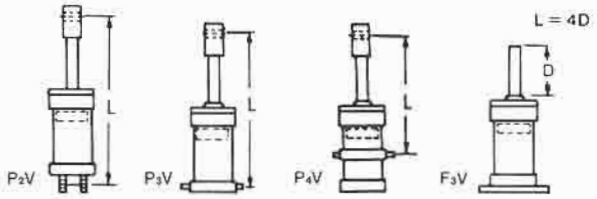
ENGINEERING DATA

INFORMATION TO PREVENT EXCESSIVE BEARING WEAR AND PISTON ROD COLUMN FAILURES

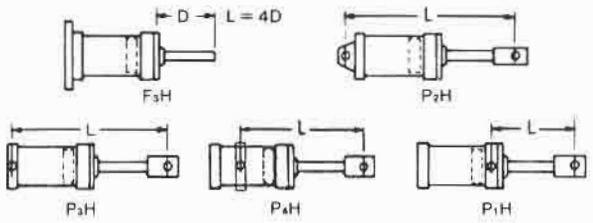
GROUP A — With piston rods extended.



GROUP B — To be checked for buckling or jack-knifing with piston rods extended and vertically mounted.



GROUP C — To be checked for load on bearing with piston rods extended and horizontally mounted.



STEP 1 – Find drawing in one of three groups above that fits your cylinder application, and follow instructions listed for that group.

Instructions: Stop tubes are used on log push stroke cylinders to prevent jack-knifing or buckling. They are placed between the piston and cylinder head to restrict the extended position of the piston rod so that the lengthened space between piston and bushing provides additional piston rod guide support.
The best choice for a cylinder with an exceptionally long stop tube requirement is the DOUBLE PISTON WITH SPACER. Note that the piston effective bearing area is doubled in addition to gaining the normal increased minimum distance between bearing points.

To determine whether a stop tube is required on a push stroke cylinder, proceed as follows:

a. Using above drawings, determine value of "L" from stroke length, rod and cylinder dimensions.
b. Refer to Table 1 for stop tube recommendation. A cylinder having an "L" value 45 requires a minimum of 1" stop tube and a maximum of 5" stop tube. Specifications for more than the maximum stop tube will usually adversely increase the cylinder weight.

Example: In a P_2V type application requiring 32" of stroke, "L" = 32" + 32" + approximately 10" for head and cap thickness = 74". A stop tube 4" long is required. (when a fraction of an inch of stop tube is calculated, use the next full inch.) Adjusted value of "L" is 74" + 4" or 78". Use of up to 8" of stop tube will further reduce bearing loads.

Instructions: Stop tubing is recommended for reducing piston and bushing/bearing loads on long stroke cylinders of the types shown. To determine length of stop tube required for this type of application, resolve the turning moments and loads between the piston and rod bushing. Include the weight of the fluid especially on large bore cylinders. It is ideal to keep projected bearing area loads lower than 200 PSI.

Caution: Do not use oversize rods to lessen bearing loads. Stop tubes are more economical and effective; oversize rods are heavier, cost more than stop tubing and if misalignment occurs, bearing loads are considerably increased due to stiffness of the oversize rod.

If your drawing is F_3H, P_2H, P_3H, or P_4H, in Group C, check for stop tube requirements from instructions in Group B.

Use whichever stop tube is longer. Determine value of "L" and proceed to Step 2.

STEP 2 – Find Rod Diameter for Column Strength.

Standard diameter piston rods are recommended on all installations except where column strength, piston rod sag, or return rate of hydraulic cylinders requires larger diameter rods.

Bushing/bearing loads caused by unavoidable misalignment are minimized when piston rods of correct diameter instead of unnecessarily large diameter piston rods are used. Correct (usually standard) piston rod diameters decrease and absorb shock loads to a greater extend than unnecessarily large oversize rods.

To determine the minimum piston rod diameter on push stroke cylinders:

a. Determine your push stroke thrust from table on page 35.
b. Find your push stroke thrust "T" in Table 2. If exact thrust isn't shown, use next larger shown.
c. In the horizontal column in line with your thrust, find value of "L" determined in Step 1.
d. Find minimum piston rod diameter required by following the same vertical line where your value of "L" is located, toward the top of the table.