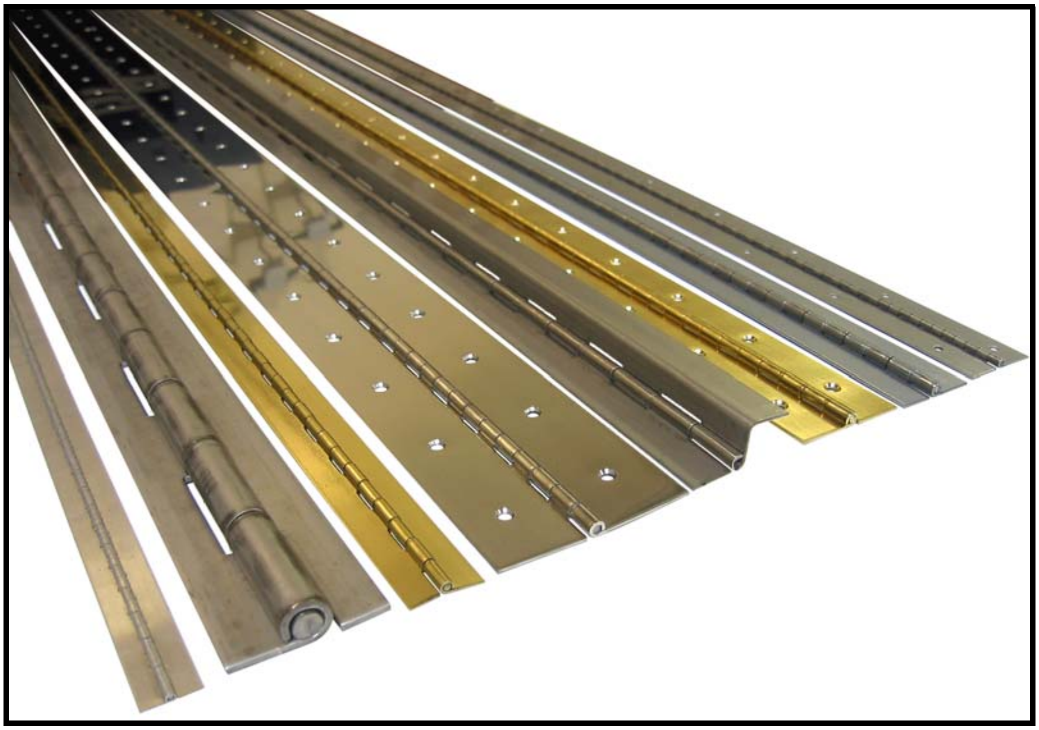
SIERRA PACIFIC
ENGINEERING AND PRODUCTS

QUALITY - VALUE - SERVICE - INNOVATION

GUIDE FOR SELECTING
CONTINUOUS HINGES



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FOREWORD

In 1970 continuous hinge manufacturing members of the Builders Hardware Manufacturers Association, Inc. (BHMA) initiated an extensive testing program. It started with in-house testing at two member companies' facilities and culminated with two phases of testing conducted for the BHMA by the Illinois Institute of Technology (IIT).

The findings of IIT were analyzed by an independent mechanical engineer whose recommendations formed the basis for this guide.

The objectives of the testing program are to provide the basis upon which recommendations can be made to interested parties as to selection of continuous hinges for specific purposes when load conditions and type of applications are known. It is also felt that the information presented in this guide will enable users of continuous hinges to make selections of standard products and avoid, in many cases, the necessity of using special designs.

Before selecting a continuous hinge therefore, the user should establish the maximum force the hinge should withstand prior to reaching the yield load point in accordance with the application selected. This procedure will avoid the selection of too strong or too weak a product and will make the most cost effective selection possible. Although the data given to make this determination is based on what BHMA members believe to be empirical evidence, variables may exist and BHMA disclaims all liability for the suitability of the product selected.

2. General

2.1 The criteria in this guide is based upon yield load and not upon ultimate load (failure). The ratio of ultimate load to yield load is at least 1.5 for all hinges and is a natural safety factor. Impact or shock loads are not included.

2.2 Additional safety factors should be considered based on the material requirement. Generally harder materials, or metals, result in stronger hinges.

2.3 Values given are based upon the selection of hinges made of cold rolled steel. To calculate graph values for aluminum, multiply by 0.74, and for stainless steel, multiply by 1.54. These comparative values are based on the premise of similar hardness of metals used among continuous hinge producers. Unique materials should be identified by individual manufacturers.

3. Strength Factors

3.1 Hinges are strongest in horizontal stress when the forces are applied perpendicular to the hinge pin. Hinges are weakest in vertical stress when the forces are applied parallel to the pin.

3.2 In horizontal load, the strength per unit of length is constant. The longer the hinge, the stronger it will be.

3.3 In vertical load, the strength increases with the square of the length.

3.4 As the hinge leaf thickness increases, hinge strength increases.

3.5 As the diameter of the hinge pin is reduced, hinge strength increases provided the pin diameter is not reduced below twice the thickness of the leaf.

3.6 Under vertical stress, shorter hinge knuckles provide greater strength.

4. Recommended Selection Criteria

4.1 When applicable, use a hinge thickness approximately the same as the material to which the hinge is to be attached.

4.2 Select hinges with the smallest possible knuckle length and having at least 10 knuckles.

4.3 Choose a hinge having the smallest pin diameter (see 3.5) available for the hinge thickness selected.

4.4 Apply a hinge with the knuckles always out if the hinge is to be used under horizontal stress only. Using this application, the strength will not vary with the angle opening.

4.5 Lubricating hinges weakens them by a factor of about 25%. Allow a safety factor of 25% if hinges are to be lubricated.

5. Vertical Hinge Loads

5.1 Hinge strength for vertical loads is not measured in pound force (lbf) but in pound force feet (lbf-ft). This requires knowledge of the forces the hinge must withstand, including the weight of the object to be hung plus any weight the object may support. For example, a 4 ft high by 6 ft wide door weighing 200 lbs has a moment of 600 lbf-ft (3 x 200). This is based on the assumption the door is of uniform density and the entire weight can be considered to be concentrated at a point halfway along the top. However if a 250 lb man hung on the end of the door, he would add his weight at the end of a 6 ft lever thus adding and additional 1500 lbf-ft (6 x 250). The total forces to withstand would then be 2100 lbf-ft (600 + 1500). Referring to the following graphs, the designer notes that a 1 inch knuckle hinge a minimum of 0.075 inch thick cold rolled steel by 4 ft long is required to withstand 2100 lbf-ft or a 2 inch knuckle hinge 4 ft long of 0.125 inch minimum thickness. If aluminum or stainless steel materials were preferred, he would multiply the graph values by 0.74 or 1.54 (see 2.2) and recalculate.

6. Horizontal Hinge Loads

6.1 Determine the total load in pounds the hinge must carry.

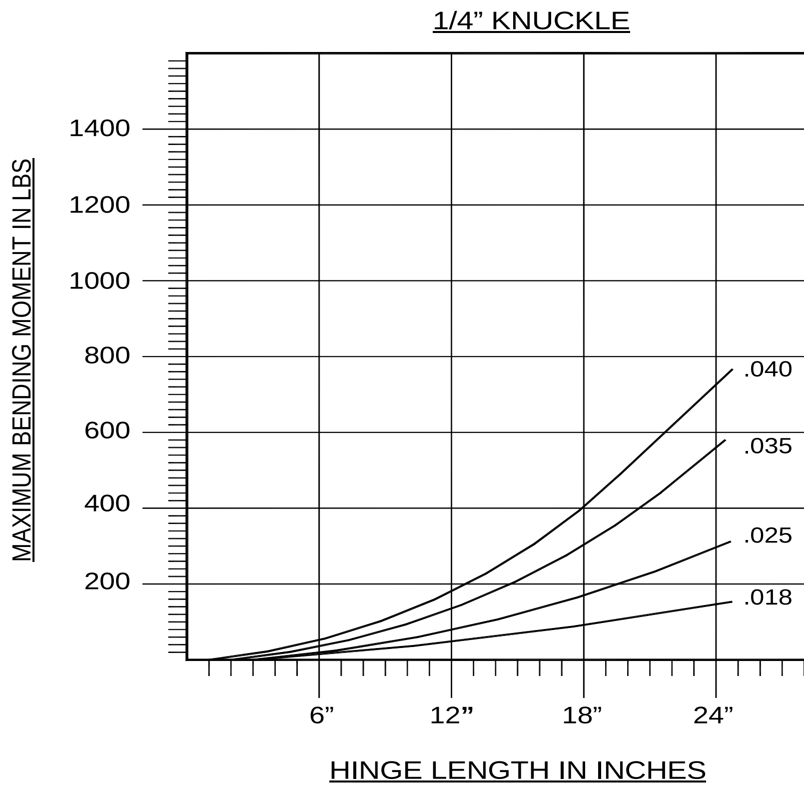
6.2 Establish the required length of hinge and calculate the load per inch.

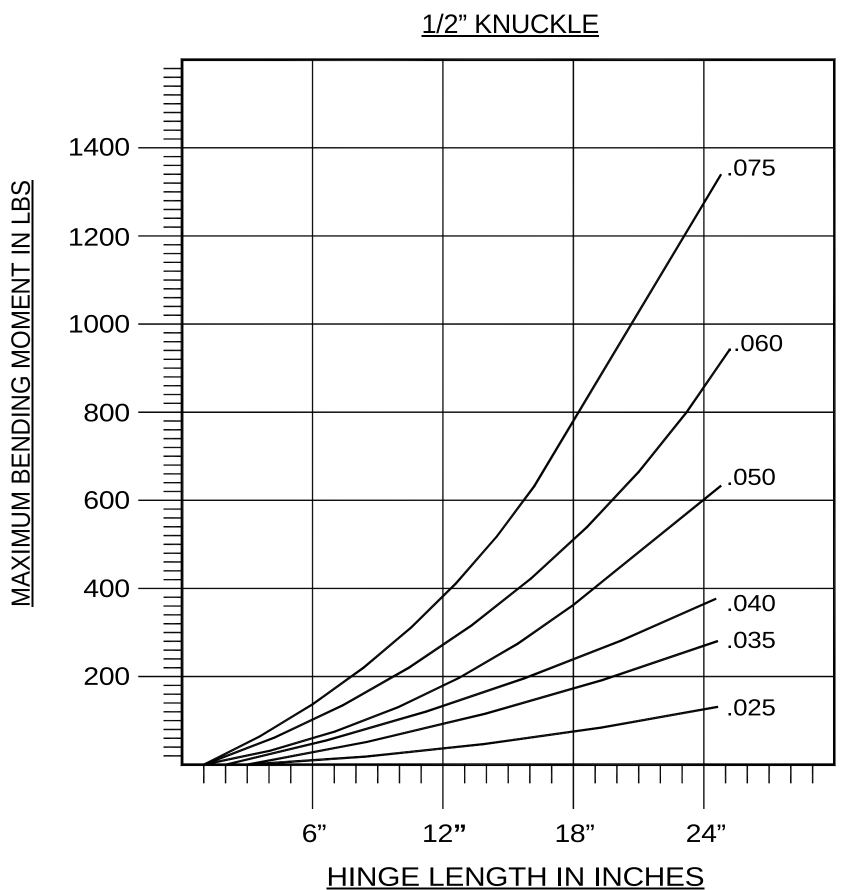
6.3 Locate the load per inch on the vertical axis of the graph.

6.4 Draw a horizontal line through that point.

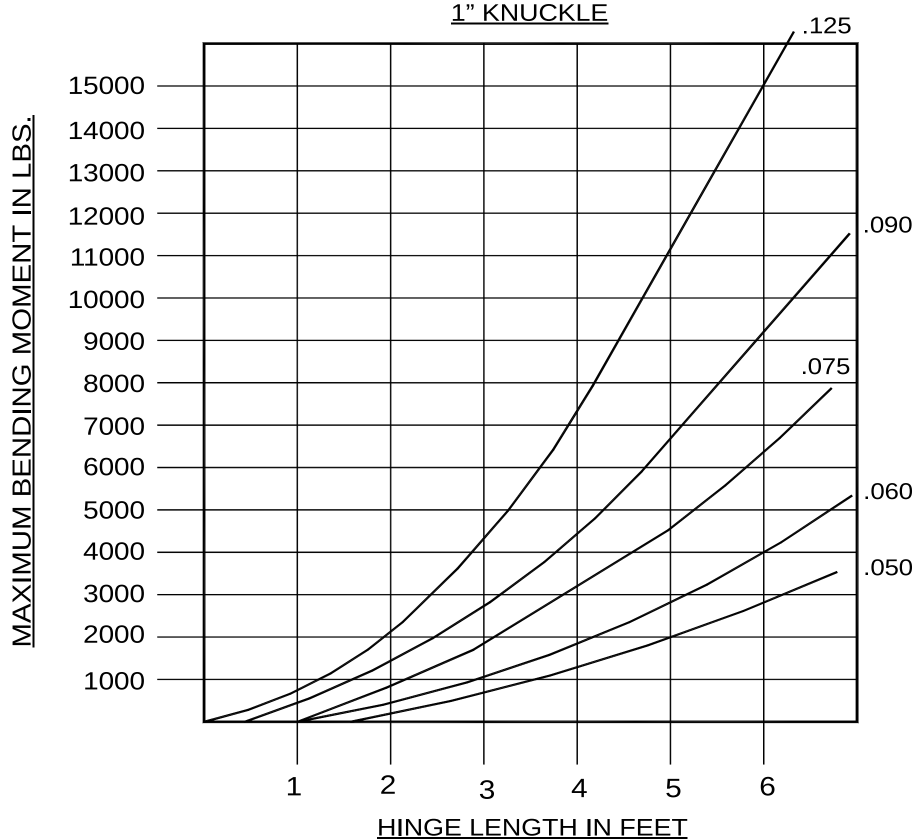
6.5 Any dot above the horizontal line represents a usable hinge.

6.6 Use this information together with 2.2 and 4. of this guide to select the appropriate hinge.


1/4" KNUCKLE
MAXIMUM BENDING MOMENT IN LBS
1400
1200
1000
800
600
400
200
.040
.035
.025
.018
6"
12"
18"
24"
HINGE LENGTH IN INCHES


1/2" KNUCKLE
MAXIMUM BENDING MOMENT IN LBS
1400
1200
1000
800
600
400
200
.075
.060
.050
.040
.035
.025
6"
12"
18"
24"
HINGE LENGTH IN INCHES

1” KNUCKLE



2” KNUCKLE