TECHNICAL BULLETIN B001

BENEFITS OF THE R2 FOCUS™ BEARING SYSTEM

Continuous Hinge Bearing Systems – General Information

Any continuous hinge can be expected to outperform a butt hinge installation because the load is distributed along the entire length of the door and frame. A continuous hinge creates an uninterrupted seam that can firmly hold a door in place, as opposed to butt hinges which transmit highly concentrated stresses to just a few points along the hinging axis.

By spreading those stresses and the shock loads that accompany them, a continuous hinge does a much better job of utilizing the inherent strength of formed sheet metal or wood doors and frames. ROTON and its imitators accomplish this, but the geared hinge concept needed further refinement.

The bearings in these hinges are spaced evenly along the entire length of the hinge, without regard for the origins of the destructive loads encountered under normal conditions of door operation. One of these conditions is caused by the bending of the door, the frame and its hinges as the door is opened and closed. No door (or frame) is manufactured and installed with its meeting edges optically straight, because that is not inherent in the forming of sheet metal or wood and is certainly not typical of the construction process at the job site.

Frames are seldom braced adequately and are often slushed into place in a bowed or bent condition. Wood doors are often warped during storage or, after installation, pick up moisture at different rates on their opposing sides when closed. Metal doors are subject to internal fabrication stresses during forming and welding. They are also subject to temperature differences following installation which result in curvature, especially on exterior openings that must endure extremes of heat and cold on one side only. Doors subject to impact damage place additional, permanent stress on all of the door components.

Inevitably, the curved edges and surfaces which must be joined by the hinging system create problems which can drastically affect the life of the opening. Any curve formed by the joint is *reversed* each time the door is opened and closed, tending to:

1. Rip the top and bottom butt hinge loose from a three-hinge system and unroll their knuckles.

2. Create needless stress on the fasteners at both ends of a continuous hinge, and produce crushing loads on the bearings nearest to the top and bottom ends of conventional continuous hinges, all because the leaves are vertically locked together along their entire lengths by the bearings themselves. The end bearings are thereby subjected to crushing loads when the door is in one position, and then relaxed when the door is moved to another, because the curve along the door and frame is reversed and curves in the opposite direction. The end bearings quickly lose their ability to contribute anything to door support (which is their only function), leaving the job to the rest of the bearings nearer to the mid-height of the door.

If a hinge system had a capability to slide a bit to allow its leaves to adjust to a curved axis without damage and yet support the heaviest door, it could accommodate these destructive reversing cycles. That is exactly what the R2 Hinge FOCUS™ Bearing System is designed to do.

FOCUS™ concentrates 35 bearings in less than 26 inches at the mid-height of a 7 foot door. That's the ideal location for supporting the door weight. Here's why:

1. Because every R2 hinge is *free to slip* near its ends to accommodate door/frame curvature with no damage to its bearings, it allows virtually identical load-sharing between the bearings in place of the crush-and-relax cylic loading of every other bearing system, including butts.

2. An aluminum extruded continuous hinge, by definition, has the same profile from one end to the other. Yet, it is well known that any door behaves as a cantilevered system, with the top of the door pulling outward from the frame while forcing the bottom end into compression. Those stresses increase in proportion to the distance from the center, so it makes sense to eliminate bearing cutouts near the ends of the hinge to increase the strength needed to resist these lateral loads. On the other hand, the central portion of the hinge, which is relatively free of *lateral* loading, is an ideal place to support the *vertical* door weight. That way, the hinge structure uses its extruded profile most efficiently… resulting in the strongest, most durable design. Tensile strength at the top, compressive strength at the bottom. Handle gravity in the middle.

We're able to do that because R2 also developed the TORQUE-RESISTANT BEARING. These wear-resistant blocks are keyed to the internal profile of a high-tech covering channel to resist twist, rocking and the consequent scrubbing of the bearings end surfaces, which is the second major cause of bearing failure. By keeping each bearing perpendicular to its axis in all dimensions, R2 bearings are reduced in length, allowing more useful bearing surface with only a small fraction (15%) of the metal cut away, while every competitor removes 40%. Best of all, R2 puts the bearings where they're most needed, and lets the ends of the hinge do a better job making door sag a thing of the past.

An added benefit of carrying the door weight at the mid-height of the hinge is the ease with which it can be trimmed in the field. While all continuous hinges are furnished with extra holes at both ends, the extra holes at the bottom are needed only to keep continuous hinges unhanded. The bottom end of an R2 hinge can safely be trimmed without losing any bearing support.

R2 hinges develop the full potential of the door and frame to work together, flexing just a bit as a team instead of fighting for survival as individual components, never knowing which will fail first. Centrally concentrated, torque-resistant bearings are patented, exclusive features of every R2 hinge that combine to provide the performance you'd expect from the inventor and pioneer of the geared continuous hinge.