The ability of an opening to withstand the rigors of commercial, industrial and institutional applications is attributable to many factors. Two of the most critical of these are the ability to remain “true” in the opening and withstand the static and live loads applied to the assembly.

Given that the majority of the weight of a door is transmitted through the upper most hinge, and to a lesser extent, the balance of the hinges, these are some of the most important components in the assembly.

There are several hinge reinforcing designs utilized throughout the industry. Of these, Fleming’s “High Frequency” design has demonstrated superior performance characteristics through independent testing as outlined below.

The purpose of the investigation was to perform a comparative analysis on the resistance to distortion and the load carrying properties of two designs of hinge reinforcement; the Fleming “High Frequency” 10 gage type (Figure 1) and a 9” x 1-3/8” x 3/16” CRS standard design (Figure 2).

The tests were conducted by the Physical and Chemical Analysis Department of UL under the direction of a UL Staff Engineer.

In order to determine a method of testing, an analysis was conducted regarding the worst possible door and frame position, resulting in the most severe bending of the reinforcement. A door opened 90° would result in creating shear stress on the weldments and the hinge mounting screws, which would reduce the load forces on the reinforcing. However, a door in the closed position, with an eccentric load, as created by the weight of the door acting through the top hinge and pulling away from the frame, was deemed by UL to be the most critical orientation.

Test apparatus was fabricated and mounted so as to create distortions only in the reinforcement. The rig was situated and load was applied in a manner duplicating those found in field applications.

The reinforceings were individually subjected to load and measured up to 820 lb. force. The resultant deflections were plotted and are shown on the next page.
The deflection recorded for both reinforcings at the 820 lb force level was 1/8". With two (2) identical reinforcings acting in combination (as in a door and frame assembly), the cumulative deflection would be 1/4", rendering the assembly inoperable.

In practical terms, an opening would become dysfunctional once the reinforcings had deflected to a total equaling the clearance allowed between the door and frame. This dimension would typically be 3/32" for the opening or 3/64" per reinforcing bar.

As illustrated the 3/16" thick CRS design reached this critical point at 300 lbs force. The Fleming High Frequency design required a 400 lb. load to reach the same deflection. This represents an increase in load carrying capacity of 33.3%. This also indicates a similar improvement with respect to the ability to withstand abuse in on-site applications.

Based on these tests the Fleming 10 gage “High Frequency” hinge reinforcing, when compared to a 3/16” thick CRS, is superior. To quote UL’s report, “… the 10 gage top hinge reinforcement performed as well as or better.”

All Fleming door and frame product (except TW and R-Series frames) are provided with this “high frequency” hinge reinforcing at each cut-out, as a standard.

Copies of the UL Report are maintained on file with Technical Services, Ajax and are available upon request.