

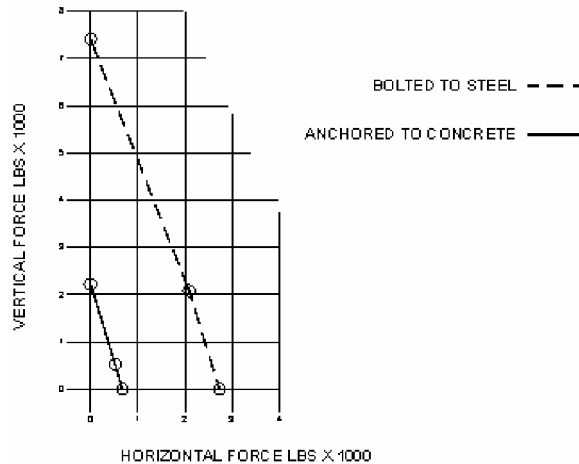
HORIZONTAL/VERTICAL SEISMIC LOAD CAPACITY ENVELOPES (VARIABLE)

All seismically rated restraints that resist both horizontal and vertical loads and that are provided by Kinetics Noise Control represent their seismic capacity with a load envelope diagram as indicated in the previous section. In some cases involving combined isolation and restraint devices however, the supported load can significantly impact the lateral, vertical or combined capacity. This requires the creation of a special load diagram appropriate to the specific load being supported.

Once developed, the vertical axis of the diagram indicates the vertical capacity of the restraint and the horizontal axis of the diagram is the horizontal capacity of the restraint in the same manner as does the "Constant" load capacity envelope. (See also D4.2)

In general, when working with a restraint that has "Variable" load capacity, increases in the supported load will make restraints more stable (and resistant to lateral loads) and will increase the applied force necessary to overcome gravity forces (and increase their effectiveness in dealing with uplift loads).

If the seismically rated isolator, however, is designed with a cantilever element that transfers the load from both the spring and the snubber to the supported piece of equipment, the actual stress in the component is the resultant of these two factors. As the supported load increases, the maximum restraint load will decrease and vice versa. This relationship is typically linear and needs to be taken into account when sizing the restraint component.



Typical "Constant" capacity Envelope

If the restraint being used is of the "Variable" capacity type, it will be obvious from the load envelopes provided. Instead of the single graph illustrating the "Constant" capacity curve as shown above, there will be 3 separate graphs as shown below.

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DOCUMENT:
D4.3
 VISCMA
 MEMBER

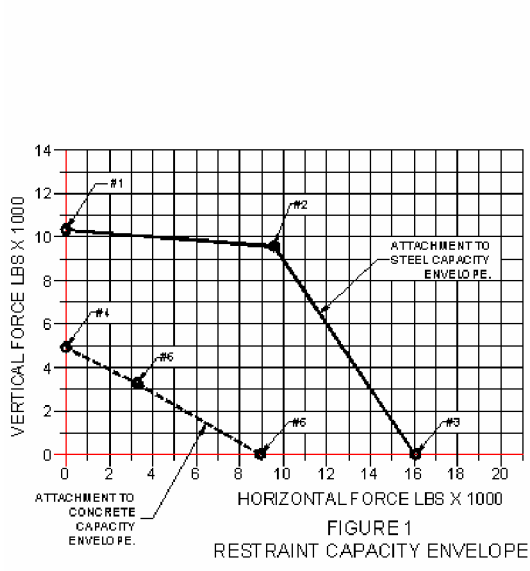


FIGURE 1
RESTRAINT CAPACITY ENVELOPE

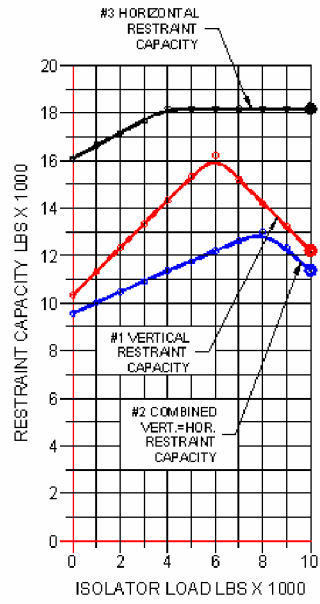


FIGURE 2
STEEL ATTACHMENT

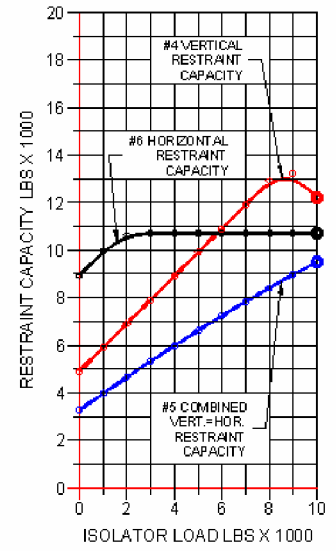


FIGURE 3
CONCRETE ATTACHMENT

Typical "Variable" capacity Envelope

It should be noted on the Variable load envelope set of graphs, that Figure 1 (the one on the left) is similar to the graph for the "Constant" capacity case. This envelope represents the capacity of the restraint if it does not support any weight. (When it is used as a restraint only and not as an isolator.)

If the restraint bears weight, a new envelope must be created.

This is accomplished using the following procedure:

- 1) To generate the seismic restraint capacity envelope for a particular load condition, first determine the static load on the isolator element.
- 2) Refer to Figure 2 or 3 depending on whether the restraint is to be through-bolted (Steel Attachment) or anchored to concrete (Concrete attachment). Locate the above static load on the "X" axis and determine the horizontal restraint capacity rating by reading the intersecting "Y" axis value from the appropriate curve (#3 or #6).
- 3) Plot this point on the horizontal axis of the restraint envelope graph.
- 4) Similarly determine and plot the vertical restraint rating drawn from curve #1 or #4 on the vertical axis of the restraint envelope graph.
- 5) Repeat for the combined rating (curve #2 or #5) and plot it at the location where both the vertical and horizontal force equal this value.
- 6) Connect the above points to generate the performance envelope for the restraint under the particular load condition.

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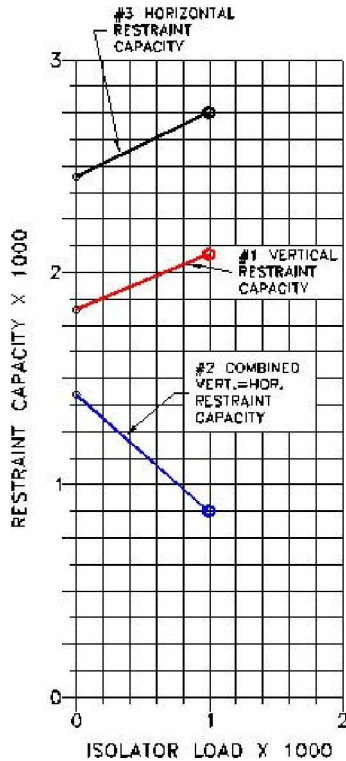
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Example

Assume we have a seismically rated restraint that supports 600 lb and we want to derive a restraint capacity curve for it.

Using the sample graph below, we can see that the horizontal capacity with a 600 lb support load is 2650 lb (Curve #3), The vertical capacity is 2000 lb (Curve #1) and the combined capacity is 1100 (Curve #2).



Plotting these values on the Restraint Capacity Envelope curve, we produce a curve that looks like the dashed line shown on the following page.

Also shown on this diagram is the unloaded restraint curve and added is a curve indicating the capacity for this particular restraint if it were to be loaded to the maximum (1000 lb.)

At this point, the curve can be applied in the same manner as the constant capacity envelope addressed in the previous section of the manual.

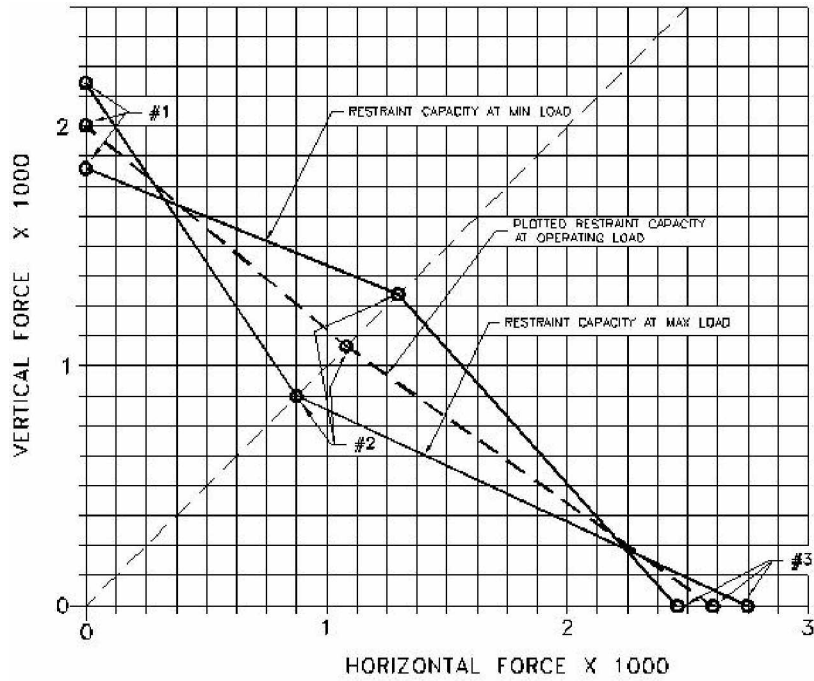
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Generated Seismic Load Capacity Envelope

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