SEISMIC STRUCTURAL PERFORMANCE SUMMARY

Building Type: Special RC Frame, designed per 2003 IBC
Building Design ID: 1015
Number of Stories: 12
Fundamental Period (sec): 2.13

MONOTONIC AND CYCLIC STATIC PUSHOVER RESULTS

Figure 1. (a) Monotonic static pushover, and (b) peak interstory drift ratios throughout monotonic static pushover
Figure 2. Incremental Dynamic Analysis, showing responses only for ground motions not causing collapse:
(a) peak roof drift ratio using Set FF and $S_a_{ATC-63}(T=1.0s)$,
(b) peak roof acceleration using Set FF and $S_a_{ATC-63}(T=1.0s)$,
(c) peak roof drift ratio using Set FFext and $S_a_{g.m.}(T_1)$,
(d) peak roof acceleration using Set FFext and $S_a_{g.m.}(T_1)$. 
INCREMNENTAL DYNAMIC ANALYSES TO COLLAPSE

Figure 3. Incremental Dynamic Analysis to collapse, showing:
(a) both horizontal ground motion components using Set FF and $SA_{ATC-63}(1s)$,
(b) both horizontal ground motion components using Set FFext and $Sa_{g.m}(T_1)$,
(c) only controlling ground motion components using Set FFext and $Sa_{g.m}(T_1)$. 
**Figure 4.** Collapse cumulative density functions, showing:
(a) both horizontal ground motion components using Set FF and $S_{ATC-63}(T=1.0s)$,
(b) both horizontal ground motion components using Set FFext and $S_{g.m.}(T_1)$,
(c) only controlling ground motion components using Set FFext and $S_{g.m.}(T_1)$. 
DISPLACEMENTS PRECEDING COLLAPSE

Figure 5. Collapse cumulative density functions of peak drifts from highest earthquake intensity that did not result in collapse of the structure, based on ground motion Set FFext.

SUMMARY STATISTICS

Table 1a. Summary of collapse responses, without any adjustment for proper $\varepsilon$, using $S_{a,\text{ATC-63}(1s)}$, and ground motion set FF for collapse capacity and set FFext for collapse drifts.

<table>
<thead>
<tr>
<th></th>
<th>Median [g or drift] or Probability</th>
<th>$\sigma_{\text{LN,RTR}}$</th>
<th>$\sigma_{\text{LN,model}}$</th>
<th>$\sigma_{\text{LN,total}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_{a,\text{col,ATC-63}(1s)}$, all comp. (Set FF):</td>
<td>1.90</td>
<td>0.41</td>
<td>0.50</td>
<td>0.65</td>
</tr>
<tr>
<td>$P[\text{Collapse} \mid S_{a,\text{col,ATC-63}(1s)} = 0.9g]$:</td>
<td>0.14</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Roof drift preceding collapse:</td>
<td>0.021</td>
<td>0.19</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Max. story drift preceding collapse:</td>
<td>0.061</td>
<td>0.24</td>
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<td>--</td>
</tr>
</tbody>
</table>

Table 1b. Summary of collapse responses, without any adjustment for proper $\varepsilon$, using $S_{a,\text{g.m.}(T1)}$ and ground motion set FFext.

<table>
<thead>
<tr>
<th></th>
<th>Median [g or drift]</th>
<th>$\sigma_{\text{LN,RTR}}$</th>
<th>$\sigma_{\text{LN,model}}$</th>
<th>$\sigma_{\text{LN,total}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_{a,\text{col,g.m.}(T1)}$, all comp.:</td>
<td>0.68</td>
<td>0.38</td>
<td>0.50</td>
<td>0.63</td>
</tr>
<tr>
<td>$S_{a,\text{col,g.m.}(T1)}$, controlling comp.:</td>
<td>0.62</td>
<td>0.39</td>
<td>0.50</td>
<td>0.64</td>
</tr>
<tr>
<td>Roof drift preceding collapse:</td>
<td>0.021</td>
<td>0.19</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Max. story drift preceding collapse:</td>
<td>0.061</td>
<td>0.24</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
MECHANISMS FORMING NEAR COLLAPSE

(a) 68% of collapses  (b) 26% of collapses

(c) 3% of collapses  (d) 3% of collapses

Figure 6. Diagrams showing the collapse modes for all 80 (38) records of ground motion set FFext.
EFFECTS OF $\varepsilon$ (INDICATOR OF SPECTRAL SHAPE) ON COLLAPSE CAPACITY

Figure 7. Relationship between collapse capacity and $\varepsilon$, using both horizontal ground motion components and Set FFext, using the:
(a) Abrahamson and Silva (1997) attenuation and $S_{a_{\text{comp}}}(T_1)$,
(b) Abrahamson and Silva (1997) attenuation and $S_{a_{\text{g.m.}}}(T_1)$.
Note: Boore, Joyner, and Fumal (1997) attenuation not applicable for $T_1 > 2.0$ seconds, so it is not used here.