

# STRUCTURAL HARDENING & MECHANICAL / ELECTRICAL REDUNDANCIES - DESIGN TRENDS

June 20, 2007

Note: *Blue highlighted text identifies increase design from previous model*

ITEM	A TYPICAL OFFICE BUILDING	B MINIMAL SURVIVABILITY	C LOW-LEVEL PROTECTION / CONTINUITY OF OPERATIONS	<b>RECOMMENDED</b> D NATIONAL DESIGN TRENDS	E HARDENED / BUNKER DESIGN
<b>Total / GSF</b>	<b>\$185.00</b>	<b>\$260.00</b>	<b>\$296.00</b>	<b>\$340.00</b>	<b>\$450.00</b>
<b>Structural Frame</b>	\$36.00 <ul style="list-style-type: none"> <li>Structural steel frame.</li> <li>Pre-cast concrete plank or composite metal deck above grade flooring system.</li> <li>Steel joist and deck roof system.</li> <li>Shear walls or diagonally braced frames used for lateral load resistance.</li> </ul>	\$52.00 <ul style="list-style-type: none"> <li>Monolithic, all concrete poured in place system (used for frame, above grade flooring, and roof system and inherently provides lateral bracing).</li> </ul>	\$55.00 <ul style="list-style-type: none"> <li>Monolithic, all concrete poured in place system (used for frame, above grade flooring, and roof system and inherently provides lateral bracing) designed to withstand 150 mile per hour wind loads (wind pressures 2.75 times those of a typical building).</li> </ul>	\$59.00 <ul style="list-style-type: none"> <li>Monolithic, all concrete poured in place system (used for frame, above grade flooring, and roof system and inherently provides lateral bracing) designed to withstand 150 mile per hour wind loads (wind pressures 2.75 times those of a typical building).</li> <li>Internal safe zone designed to withstand FEMA 350 required wind loads of 250 miles per hour (wind pressures 8 times those of a typical building) with limited openings.</li> </ul>	\$76.00 <ul style="list-style-type: none"> <li>Monolithic, all concrete poured in place system (used for frame, above grade flooring, and roof system and inherently provides lateral bracing) entirely designed to withstand FEMA 361 required wind loads of 250 miles per hour (wind pressures 8 times those of a typical building).</li> </ul>
<b>Exterior Envelope</b>	\$29.00 <ul style="list-style-type: none"> <li>Typical commercial single ply or built up roofing system.</li> <li>Tilt up pre-cast concrete panels or concrete block and brick cavity wall construction.</li> <li>Commercial aluminum window glazing.</li> </ul>	\$44.00 <ul style="list-style-type: none"> <li>Redundant roof provided by typical commercial membrane system plus monolithic concrete roof structure.</li> <li>Tilt up pre-cast concrete panels or reinforced concrete block and brick cavity wall construction designed to withstand Minnesota Building Code required windloads.</li> <li>Commercial aluminum windows and security (laminated) glazing.</li> </ul>	\$48.00 <ul style="list-style-type: none"> <li>Redundant roof provided by membrane system mechanically fastened to the structure to resist high wind conditions plus sloped monolithic concrete roof structure.</li> <li>Tilt up pre-cast concrete panels or reinforced concrete block and brick cavity wall construction designed to withstand FEMA 350 required wind loads.</li> <li>Hurricane windows with security (laminated) glazing designed to resist 150mph winds.</li> </ul>	\$52.00 <ul style="list-style-type: none"> <li>Redundant roof provided by membrane system designed for high wind conditions plus monolithic concrete roof structure with fluid applied waterproofing system.</li> <li>Tilt up pre-cast concrete panels or reinforced concrete block and brick cavity wall construction designed to withstand FEMA 350 required wind loads.</li> <li>Hurricane windows with security (laminated) glazing designed to resist 150mph winds, but not projectiles.</li> </ul>	\$88.00 <ul style="list-style-type: none"> <li>Redundant roof provided by fully redundant envelope (double structure, each with its own roof membrane system designed for high wind conditions plus fluid applied waterproofing system over monolithic concrete roof structure).</li> <li>Tilt up pre-cast concrete panels or reinforced concrete and brick cavity wall construction designed to withstand FEMA 361 required wind loads.</li> <li>No windows to the exterior to prevent projectile intrusion.</li> </ul>
<b>Interior Build-Out</b>	\$40.00 <ul style="list-style-type: none"> <li>Gypsum board on steel stud interior painted walls.</li> <li>L Lay-in acoustical ceiling tile system.</li> <li>Carpeted or vinyl composition tile floor finishes directly over floor structure.</li> </ul>	\$42.00 <ul style="list-style-type: none"> <li>Gypsum board on steel stud interior painted walls.</li> <li>L Lay-in acoustical ceiling tile system.</li> <li>Carpeted or vinyl composition tile floor finishes over raised floor system in areas with technology equipment.</li> <li>Carpeted or vinyl composition tile floor finishes directly over floor structure in non-critical areas.</li> </ul>	\$50.00 <ul style="list-style-type: none"> <li>Concrete block painted walls surrounding critical areas.</li> <li>Gypsum board on steel stud interior painted walls at non-critical areas.</li> <li>L Lay-in acoustical ceiling tile system.</li> <li>Carpeted or vinyl composition tile floor finishes over raised floor system in areas with technology equipment.</li> <li>Carpeted or vinyl composition tile floor finishes directly over floor structure in non-critical areas.</li> </ul>	\$56.00 <ul style="list-style-type: none"> <li>Reinforce concrete block painted walls designed to withstand FEMA 350 required lateral loads surrounding critical areas.</li> <li>Gypsum board on steel stud interior painted walls at non-critical areas.</li> <li>L Lay-in acoustical ceiling tile system.</li> <li>Carpeted or vinyl composition tile floor finishes over raised floor system in areas with technology equipment.</li> <li>Carpeted or vinyl composition tile floor finishes directly over floor structure in non-critical areas.</li> </ul>	\$60.00 <ul style="list-style-type: none"> <li>Reinforce concrete block painted walls designed to withstand FEMA 361 required lateral loads surrounding critical areas.</li> <li>Gypsum board on steel stud interior painted walls at non-critical areas.</li> <li>L Lay-in acoustical ceiling tile system.</li> <li>Carpeted or vinyl composition tile floor finishes over raised floor system in all areas.</li> <li>Carpeted or vinyl composition tile floor finishes directly over floor structure in non-critical areas.</li> </ul>
<b>Mechanical Systems</b>	\$40.00 <ul style="list-style-type: none"> <li>Single variable air volume system.</li> <li>Single air conditioning system.</li> <li>Wet pipe fire suppression system throughout.</li> </ul>	\$50.00 <ul style="list-style-type: none"> <li>Single constant volume system for critical areas.</li> <li>Dual 2/3 capacity communications equipment room air conditioning.</li> <li>Clean agent fire suppression in communications equipment room, wet sprinkler system in non-critical areas.</li> </ul>	\$54.00 <ul style="list-style-type: none"> <li>Dual 50% capacity constant volume system for critical areas.</li> <li>Dual 100% redundant communications equipment room air conditioning.</li> <li>Dual 100% redundant water heaters.</li> <li>Double interlock pre-action fire suppression system for critical areas.</li> <li>Clean agent fire suppression in communications equipment room.</li> </ul>	\$70.00 <ul style="list-style-type: none"> <li>Dual 100% capacity constant volume system for critical areas.</li> <li>Dual 100% redundant communications equipment room air conditioning.</li> <li>Dual 100% redundant water heaters.</li> <li>Double interlock pre-action fire suppression system for critical areas.</li> <li>Clean agent fire suppression in communications equipment room.</li> <li>Domestic water storage system.</li> </ul>	\$82.00 <ul style="list-style-type: none"> <li>Dual 100% capacity constant volume system with dual duct distribution systems for critical areas.</li> <li>Dual 100% redundant communications equipment room air conditioning.</li> <li>Dual 100% redundant water heaters.</li> <li>Double interlock pre-action fire suppression system for critical areas.</li> <li>Clean agent fire suppression in communications equipment room.</li> <li>Domestic water storage system.</li> <li>Clean agent fire suppression system below raised floors.</li> <li>Dual sanitary services.</li> </ul>
<b>Electrical Systems</b>	\$22.00 <ul style="list-style-type: none"> <li>Single utility feed for normal power.</li> <li>Single diesel generator for back-up of life safety systems.</li> <li>Single path power distribution.</li> </ul>	\$46.00 <ul style="list-style-type: none"> <li>Single utility feed for normal power.</li> <li>Single diesel generator for back-up of critical systems.</li> <li>Single path power distribution.</li> <li>Data center grounding.</li> <li>Single Uninterruptible Power Source for critical systems.</li> </ul>	\$57.00 <ul style="list-style-type: none"> <li>Single utility feed for normal power.</li> <li>Single diesel generator for full building back-up.</li> <li>Dual Uninterruptible Power Source (UPS) – 100% redundant critical systems &amp; 50% each for workstations.</li> <li>Data center grounding.</li> <li>Dual path power to communications equipment, single path power distribution otherwise.</li> </ul>	\$70.00 <ul style="list-style-type: none"> <li>Single utility feed for normal power.</li> <li>Two 100% redundant diesel generators for full building back-up.</li> <li>Dual Uninterruptible Power Source (UPS) – 100% redundant for all systems.</li> <li>Dual path power to communications equipment</li> </ul>	\$100.00 <ul style="list-style-type: none"> <li>Dual utility feeders for normal power.</li> <li>Two 100% redundant diesel generators for full building back-up.</li> <li>Dual Uninterruptible Power Source (UPS) – 100% redundant for all systems.</li> <li>Dual path power to communications equipment and workstations.</li> <li>Full building grounding.</li> </ul>
<b>Miscellaneous</b>	\$18.00 <ul style="list-style-type: none"> <li>Overhead &amp; profit, bonds and building pad related site development costs.</li> </ul>	\$26.00 <ul style="list-style-type: none"> <li>Overhead &amp; profit, bonds and building pad related site development costs.</li> </ul>	\$32.00 <ul style="list-style-type: none"> <li>Overhead &amp; profit, bonds and building pad related site development costs.</li> </ul>	\$33.00 <ul style="list-style-type: none"> <li>Overhead &amp; profit, bonds and building pad related site development costs.</li> </ul>	\$44.00 <ul style="list-style-type: none"> <li>Overhead &amp; profit, bonds and building pad related site development costs.</li> </ul>