Non-Confidential Description - PSU No. 3338
“Novel Low-Cost, Glazing System to Improve Glass Panel Resistance to Earthquakes and Other Dramatic Displacements”

Keywords:
Commercial glass panels, residential/architectural glass panels, solar panels, glaze, conventional framing systems

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Background
Earthquakes over the past three decades in the United States, Japan, and elsewhere have prompted considerable attention towards developing improved earthquake resistant building systems. Most seismically isolated wall systems designed to resist earthquakes are tailored primarily for new building construction, not building retrofits, and limit aesthetic choices of a building’s exterior. Although the seismic performance of load bearing structural systems in buildings has improved, “nonstructural” or architectural building elements continue to show vulnerability to earthquake-induced damage. Forms of earthquake damage to glass wall systems include serviceability failures and ultimate failures. Examples of serviceability failures, which often require expensive building repairs, are glazing gasket dislodging, sealant damage, glass edge damage, and glass cracking. Glass fallout, which presents a life safety hazard, is the ultimate failure of most concern in glass wall systems.

Invention Description
Proof of concept was established by subjecting mock-ups of several invention embodiments to dynamic racking crescendo test conditions in a preliminary laboratory study. Using the invention, even crudely manufactured glass panels with imperfections in the vulnerable corner regions can exceed the performance of glass panels with edge finishing of the highest manufactured quality. This invention complements U.S. Patent Application Serial No. 10/233,670, which is entitled “Damage Resistant Glass Panel” (PSU Invention Disclosure No. 2487).

Advantages/Applications
The inventors believe that the invention is applicable to all new and existing buildings in seismic zones. The inventors offer the following cost observations; the percent increase in manufacturing cost will be much lower for larger glass panels, especially those made of higher value-added glazing products, such as laminated glass units, insulating glass units, and glass components manufactured with solar control coatings, reflective coatings, ceramic opacifier frits, etc. The inventors believe that the incremental manufacturing costs would be moderate for lower base-cost glass components and significantly less for higher value-added glass components. The invention offers the possibility of lowering earthquake hazard insurance premiums, lower expected costs due to post-earthquake disruptions in normal building operations, and lessens the need for more elaborate wall system design modifications to reduce earthquake-induced glass damage. The inventors also believe that these same benefits can be extended to applications that integrate solar panels into building facade and/or sloped glazing framing systems.

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