



GLAZING SYSTEM BLAST ANALYSIS

Khurasaniyah, KSA, February 2009

Nonlinear Dynamic Blast Analysis

Saudi ARAMCO wanted to ensure the safety of the glass façade of a new office building at Khurasaniyah, KSA. Based on hazard analysis, it was estimated that the glass façade of the building may be subjected to pressure as high as 0.4 psi. ASI was tasked to investigate the behavior of glass panels for the windows and doors under the effect of blast loading. Two types of glass panels are investigated: single-layer glass panels and three-layer laminated glass panel with intermediate PVB layer.

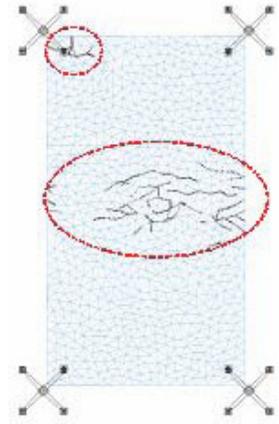
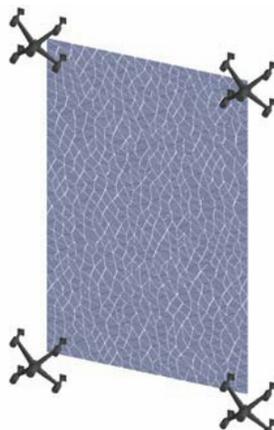


Glass Building Facade

The random nature of the cracks generated in glass required using an element mesh with a random nature. Therefore, the Voronoi diagram (Delaunay triangulation) was used for meshing the glass. The support conditions for the doors and the windows were carefully taken into consideration in the analysis.

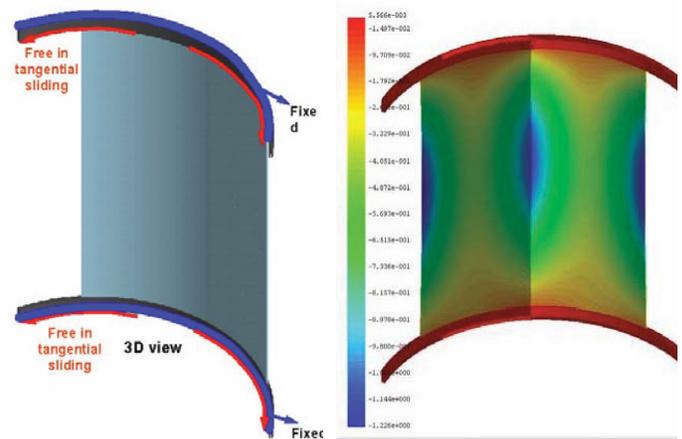


Boundary Conditions Created for Glazing Connections



Failure of the Window Panels

ASI used its Extreme Loading® for Structures (ELS) software to perform the analysis. ASI recommended strengthening the floor and intermediate glass panel using structural films attached to the inner layer. ASI performed multiple analyses with different film thickness to obtain the optimum film thickness.



Boundary Conditions for Curved Door

Stress in Curved Door

Analysis was also performed for a curved sliding door. ASI performed the analysis for multiple layers of the laminated doors to optimize the design. It was finally concluded that by using 5 layers, (8 mm glass, 16 mm air space and laminated layers of two layers of glasses, and one PVB layer, both the side doors and the curved doors are safe under the effect of the given blast pressure.

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