CE 890: Graduate Seminar

Topic: Plastic Buckling of Hemispherical Shell Subjected to Concentrated Load at the Apex

Date: November 10, 2010

Time: 4.00p.m. (refreshments at 3.45 p.m)

Place: 1052 Rathbone Hall

Presenter: Shahin Nayyeri Amiri

Advisor: Dr. Hayder Rasheed

Abstract: This study presents the analytical, numerical, and experimental results for metal hemispherical shell into the plastic buckling range and it illustrates the importance of geometry changes on the buckling load as well. Hemispherical shell is rigidly supported around the bottom circumference and the load is vertically applied by rigid cylindrical boss at the apex. Mechanisms for the initial buckling and subsequent propagation of the plastic deformation for rigid-perfectly plastic shells are formulated on the basis of Drucker and Shield's limited interaction yield condition. The effect of the radius of the boss, used to apply the loading, on the initial and final collapse load is studied. In the numerical model, the material is assumed to be isotropic and linear elastic perfectly plastic without strain hardening obeying the Tresca and Von Mises yield criterion. In the end, the results of analytical solution are compared and verified with numerical solution results by using ABAQUS software. Good agreement is observed between the load-deflection curves that have been obtained from three different approaches.

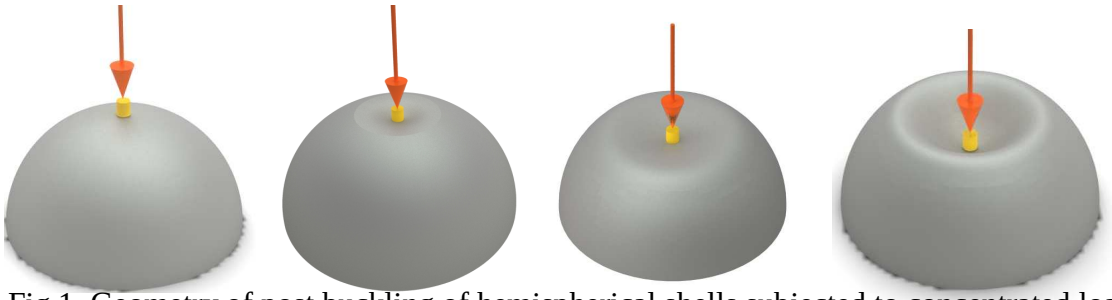

Fig 1. Geometry of post buckling of hemispherical shells subjected to concentrated load

Fig 2. Different size of bosses, hemispherical shells and rigid support used for experimental study

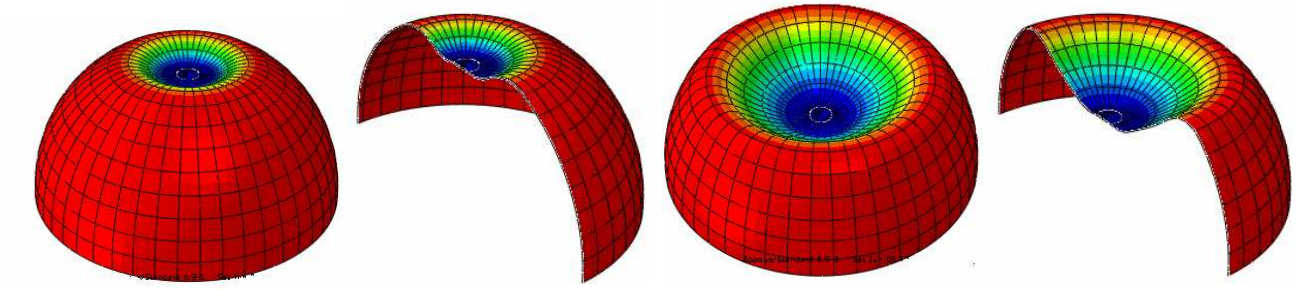

Fig 3. A typical mesh for inelastic finite element analysis