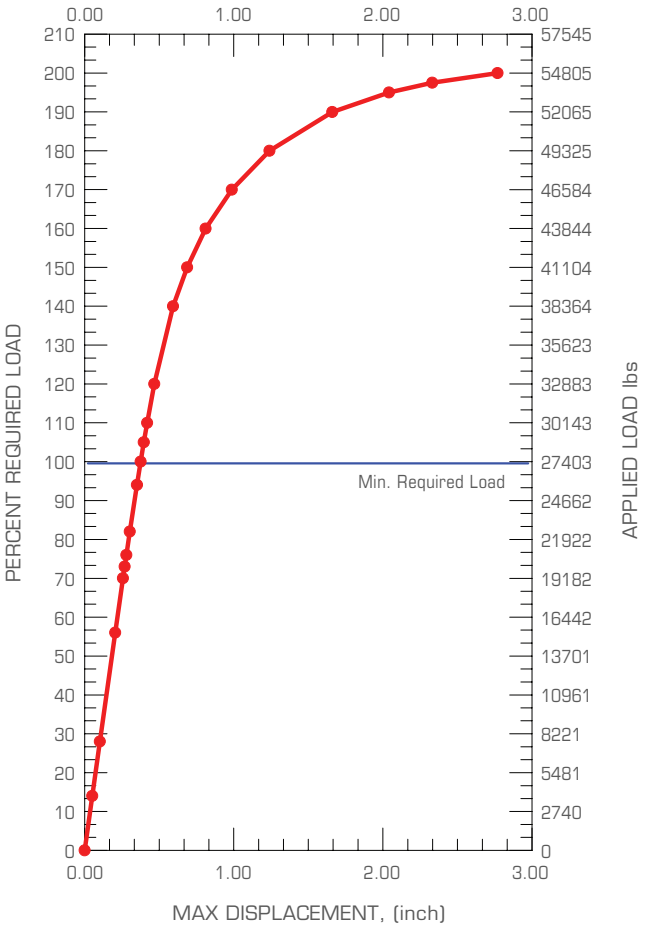
HLA ENGINEERS, INC.

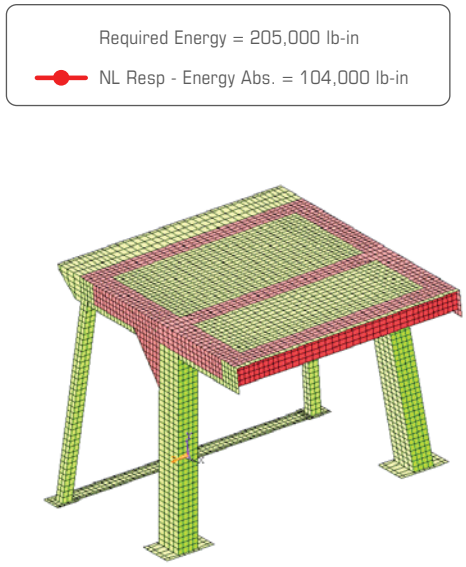
ELASTIC PLASTIC DEFORMATION AND RESPONSE OF A ROLL-OVER PROTECTIVE STRUCTURE

PURPOSE: Structural stress analysis, load deflection response and plastic deformation of the roll-over protective device

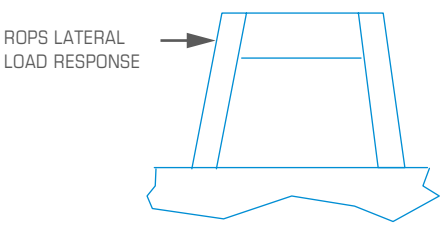
All roll-over protective devices are required by SAE to be designed to a minimum load carrying capacity and plastic energy absorption criteria. They must also be capable of maintaining the driver limiting volume. An FEA model was developed to stimulate the lateral and vertical loads for a plastic analysis of a roll-over protective device. The graph below shows the load deflection response of a typical ROPS under a lateral load. While the minimum required load has been satisfied, the ROPS load deflection response becomes flat before the energy requirement is met and the DLV is violated. This ROPS was further redesigned to meet load, energy and DLV requirements. The structural connections were checked for bolts and welds to meet allowable stresses under these loads.

LOAD DISPLACEMENT PLOT FOR LATERAL LOAD





ROPS — LOADS AND BC



8617 Ambassador Row, Suite 100, Dallas, Texas 75247 | T: 214.267.0930 | F: 214.267.0970 | hlaengineers.com