The use of high-strength steel sheets to reduce car weight is drawing much attention from the viewpoint of environmental preservation. However, high-strength steel sheets are much inferior to ordinary steel sheets in formability. In order to find the forming method and conditions suitable for high-strength steel sheets, the forming limit in sheet forming processes has to be correctly predicted. The author has recently proposed an approach to predict the forming limit by introducing criteria for ductile fracture into the finite element simulation of sheet metal forming processes. In the criteria the occurrence of ductile fracture is estimated by the macroscopic stress and strain during forming which are calculated by the finite element simulation. In the previous study, the possibility of the application of some criteria for ductile fracture to the high-strength steel sheets was examined. The forming limits of a few types of high-strength steel sheets under various strain paths from balanced biaxial to uniaxial tension were examined by the Marciniak-type in-plane biaxial stretching test, and they were compared with those derived from the ductile fracture criteria. As a result, it turned out that the fracture strains derived from the criterion by Cockcroft and Latham gave the best fit to the experimental results. In this study, as fundamental 3-dimensional press forming processes, square cup deep drawing, T-shape forming and stretch forming with a hemispherical punch is analysed by the finite element method combined with the ductile fracture criterion. The dynamic explicit finite element program LS-DYNA ver.970 with thin shell is used. The calculations are carried out for various blank geometries and frictional conditions. The comparison of the simulation results with the experimental results demonstrates that the fracture initiation site and the limiting dome height are successfully predicted by the present approach.