In this study, the buckling analysis of homogeneous and non-homogeneous orthotropic, thin walled truncated conical shells under axial load and in large deformation has been investigated. First, the governing relations are derived using the large deformation theory with von Karman–Donnell-type of kinematic non-linearity. Then modified Donnell type stability and compatibility equations of non-homogeneous orthotropic thin-walled truncated conical shells in large deformation are obtained and solved analytically. Finally, influences of the non-homogeneity, orthotropy and the variation of the shell geometry on the non-linear axial buckling load are investigated. Comparing the results of this study with those in the literature validates the present analysis.