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Crystalline metals in the nuclear energy system often suffer from the radiation-induced embrittlement which is resulted from the interaction between dislocation motions and the irradiation-induced changes in microstructures. This transition to the brittle failure may lower the mechanical stability of the irradiated components, posing significant threats to the operation and security of the entire mechanical system. In contrast to the crystalline metals, amorphous alloys, often called metallic glasses, have a different plasticity mechanism that does not involve the dislocation motion and hence are expected to exhibit the different irradiation effects on the mechanical from their crystalline counterparts. In this study, we investigated the mechanical properties of the $Zr_{57}Nb_5Al_{10}Cu_{15.4}Ni_{12.6}$ metallic glass specimens irradiated by the protons through compression experiments on the nanopillars with 200 nm and 400 nm diameters at various strain rates. The energies of the protons were properly chosen between 30 keV and 200 keV to ensure the nearly uniform radiation damage depth profile to ~1.5 micron. The experimental results were also corroborated by the molecular dynamic simulation to fully understand the atomic level processes associated with the proton irradiation and mechanical behavior in the metallic glasses.