In this study, photo–neutron cross–sections of \((\gamma,3n)\) reactions for several structural fusion materials such as \(55\text{Mn}, 65\text{Cu}, 94\text{Zr}, 98,100\text{Mo}, 181\text{Ta}\) and \(186\text{W}\) have been investigated in the incident photon energy range of 20-110 MeV. Theoretical cross-section calculations, based on theoretical nuclear reaction models, have been carried out using the PCROSS, EMPIRE 3.1 and TALYS 1.6 codes. EMPIRE 3.1 exciton, TALYS 1.6 two component exciton and TALYS 1.6 pre-equilibrium models have been used to calculate the pre-equilibrium photo-neutron crosssections. For the equilibrium cross-section calculations, PCROSS Weisskopf–Ewing model has been preferred. The calculated results have been compared with each other and against the experimental nuclear reaction data (EXFOR). Except the \(65\text{Cu}(\gamma,3n)62\text{Cu}\) reaction, all model equilibrium and pre-equilibrium cross-section calculations exhibit generally good agreement with the experimental values for all reactions used in this study. TALYS 1.6 two component exciton model can be recommended, if experimental photo-neutron cross-section data are not available or are unlikely to be produced because of the experimental difficulties.