Hydroxymethyl radical (CH$_2$OH) is an important radical in modeling combustion flame chemistry as well as chemistry in the interstellar medium. We have recently observed high resolution jet cooled infrared spectra of CH$_2$OH, which reveal a rich pattern of splittings due to large-amplitude torsional tunneling of the COH moiety with respect to the methylenic framework. In order to facilitate a detailed analysis of these tunneling splittings, we have pursued high level ab initio CCSD(T) calculations of the multidimensional torsional tunneling potential energy surface using a MOLPRO package with correlated cc-pvnl-f12 basis sets and extrapolated to the complete basis set limit (CBS). Such high level potential energy surface calculations as a function of intrinsic reaction coordinate (IRC) reveal novel multidimensional tunneling dynamics and make possible preliminary estimates of the barrier height and tunneling splittings in the ground vibrational state.