Finite-element methods are studied for solving moving interface flow problems using the level set approach and a stabilised variational formulation proposed in Touré and Soulaïmani (2012; Touré and Soulaïmani To appear in 2016 Touré, Mamadou Kabirou, and Azzeddine Soulaïmani. To appear in 2016. "Stabilized Finite Element Methods for Solving the Level Set Equation without Renitialization." *Computers & Mathematics with Applications*. doi:10.1016/j.camwa.2016.02.028[CrossRef]), coupled with a level set correction method. The level set correction is intended to enhance the mass conservation satisfaction property. The stabilised variational formulation (Touré and Soulaïmani 2012; Touré and Soulaïmani, To appear in 2016 Touré, Mamadou Kabirou, and Azzeddine Soulaïmani. To appear in 2016. "Stabilized Finite Element Methods for Solving the Level Set Equation without Renitialization." *Computers & Mathematics with Applications*. doi:10.1016/j.camwa.2016.02.028[CrossRef]) constrains the level set function to remain close to the signed distance function, while the mass conservation is a correction step which enforces the mass balance. The eXtended finite-element method (XFEM) is used to take into account the discontinuities of the properties within an element. XFEM is applied to solve the Navier–Stokes equations for two-phase flows. The numerical methods are numerically evaluated on several test cases such as time-reversed vortex flow, a rigid-body rotation of Zalesak's disc, sloshing flow in a tank, a dam-break over a bed, and a rising bubble subjected to buoyancy. The numerical results show the importance of satisfying global mass conservation to accurately capture the interface position.