Problems involving fluid flow across phase interfaces arise in many branches of physics and engineering, making correct description of fluid behavior near an interface an important issue. In this thesis we study the quasi-static Stokes flow of a linearly viscous fluid, comparing two different jump conditions for traction. By reproducing the results from the relevant literature we motivate the assumption of nontrivial traction jump as the limit of the solution of governing equations across a transitional layer of finite thickness with the thickness going to zero, and we compare it to the classical traction continuity condition implied by the modified Reynolds transport theorem. The original method of derivation of the nontrivial traction jump involves manipulation of terms ill-defined even in the sense of distributions. To interpret these correctly, we use the Colombeau algebra of generalized functions. We derive the form of the traction jump for radially symmetric flow rigorously and show that this result is identical to the one obtained by the original method. The theoretical results are accompanied by numerical experiments, and possible generalizations as well as physical significance of the results are discussed.