The transport of fresh concrete by pumping is an important process and widely used in practical concrete technology. This process has been applied since the beginning of the twentieth century. More recent developments of pumping equipment and findings on mineral and chemical admixtures have prompted more sophisticated research on pumping concretes. While they do not elaborate upon standard specifications, many recommendations for the composition of pumping concretes which are very useful in applications, such as ACI-304.2R reports, are available. This paper reports the results of an experimental study into the effects of concrete components, namely cement content, aggregate type, mineral, fiber, and plasticizer admixtures, on the rheology of pumping concretes. The rheological properties of concretes are examined by the Two Point Workability Test Apparatus (CTPT) originally proposed by G. H. Tattersall. The present study shows that concrete workability is improved by increasing cement content and also shows that the aggregate type only effects the rheological parameters in low cement content mixtures. In addition, yield stress and plastic viscosity are generally lower in concrete mixtures that contain natural stone rather than crushed aggregates. In addition, this study shows that the effect of mineral, plasticizer and fiber admixtures depends on cement content and admixture type.