Fluid flow can be a very complex and often misunderstood. In the past, hydraulic structures have primarily been designed using simplified equations, design nomographs and physical models. In the last two decades, computing power and numerical algorithms have significantly improved allowing numerical modeling to be used in research and the design process. Specifically, Computational Fluid Dynamics (CFD) or the numerical solution to the Reynolds-Averaged Navier-Stokes equations, has become a viable tool in the design of hydraulic structures such as dams, spillways and fish ladders. The use of CFD compliments physical modeling and has created a new area titled composite modeling. In this presentation, the concept of CFD is briefly introduced along with physical modeling. Several design and research projects that have used CFD, including an RCC stepped-spillway project in Grace, Idaho, will be presented.