Appendix C

Tcl Command to Create Elastic Isotropic 3D Material

There are two types of 3D elastic isotropic material models you can create, i.e. linear elastic and nonlinear or pressure sensitive elastic materials. Section C.1 discusses the linear elastic material command, while Section C.2 examines the nonlinear elastic material command.

C.1 ElasticIsotropic3D command

nDMaterial **ElasticIsotropic3D** MatTag? E_o? ν? ρ?

The **ElasticIsotropic3D** material is the standard linear elastic isotropic three dimensional material implemented based on tensor operation. The arguments to construct the material are its tag, MatTag, Young's Modulus at atmospheric pressure E_o, Poisson's ratio ν, and mass density ρ.

C.2 PressureDependentElastic3D command

nDMaterial **PressureDependentElastic3D** MatTag? E_o? ν? ρ? n p_{ref} p_{cutoff}

The **PressureDependentElastic3D** material is the standard nonlinear elastic isotropic three dimensional material implemented based on tensor operation. The first four arguments are the same as linear elastic command described above. The pressure dependent elastic modulus is to be determined using the following formula C.1 (Manzari and Dafalias [54]). There are three more arguments for this command. n is the exponent, p_{ref} is the atmospheric pressure, while $p_{cut-off}$ is the cut-off pressure. When p' (the mean effective normal

stress) is less than $p_{cut-off}$, then $p' = p_{cut-off}$.

$$E = E_o \left(\frac{p'}{p_{ref}} \right)^n \tag{C.1}$$