

Wick Drains and Relief Wells

Introduction

This document describes the implementation of wick drain or relief well elements in *RS2*. Wick drains and relief wells in *RS2* are based on embedded elements, with additional parameters to account for the properties of the rock/soil interface with the wick drain/relief well.

Embedded Wick Drain / Relief Well

In *RS2*, a special type of element is used called an embedded element, which can be used to model structural support such as wick drains or relief wells. Embedded elements are elements which do not conform to the mesh. This simplifies meshing requirements and increases computational speed. Nodes are introduced at the intersections of the embedded element and a triangular element. The formulation of the embedded element is similar to the original element except that virtual nodes are linked to the solid element.

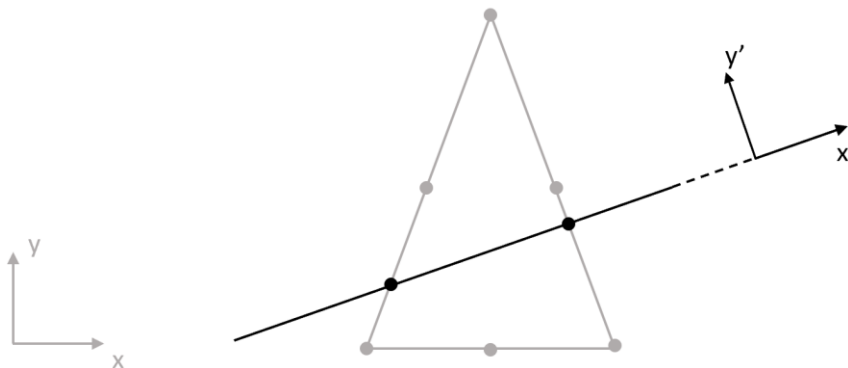


Figure 1 - Geometry of an embedded 1D element.

The matrix (B) of an embedded beam element is derived from the B^b matrix of the 1D element by the relation:

$$B = N^{bs} B^b$$

where B^b is the matrix of the 1D element

N^{bs} is the mapping matrix from the 1D element to the solid element

$$N_i^{bs} = N_i^s$$

where N_i^s are the shape functions of the solid element at node i

The stiffness matrix of the embedded 1D element is then derived using the following expression:

$$K = \int B^T D B$$

where D is the permeability material matrix.

The stiffness matrix can then be calculated numerically using Gauss integration or Lobatto integration scheme.