**SPECIFICATION LINE QUADRATIC** commands

**Synopsis**

The information supplied in conjunction with the SPECIFICATION LINE QUADRATIC commands allows the user to specify distributed normal and shear traction and fluid flow acting along a straight or curved LINE. Concentrated nodal values equivalent to the distributed quantities are then automatically computed by the APES computer program.

The SPECIFICATION LINE QUADRATIC commands can be used to apply a parabolic or linearly varying normal and/or tangential distribution to the following linear elements:

- Three-node line (bar) elements (L3P0).
- Six- and seven-node triangles (T6P0, T6P1d, T6P3c, T7P0, T7P3d).
- Eight-node quadrilateral elements (Q8P0, Q8P3d, Q8P4c).
- Nine-node quadrilateral elements (Q9P0, Q9P3d, Q9P4c).

If a quantity is specified over several nodes in a sequence, then this specification can be generated with a **single** input record. This is achieved by supplying, on this record, values for the beginning (**NODE_BEGIN**) and ending node numbers (**NODE_END**), as well as the numbering increments **1_INCR** and **2_INCR**. The keyword **1_INCR** is used to specify the increment between corresponding vertex node numbers; the keyword **2_INCR** is used to specify the increment between a corner node number and the adjacent mid-side node number.

The “N” and “T” command prefixes refer to the directions normal and tangential to the surface of the body being analyzed. The keywords **NP_BEGIN** and **TP_BEGIN** represent the values of pressure normal and tangential, respectively, to the body at the first (beginning) node in the line along which the pressure is applied. The keywords **NP_END** and **TP_END** represent the values of pressure normal and tangential, respectively, to the body at the last (end) node in the line along which the pressure is applied. The optional keywords **NP_MIDDLE** and **TP_MIDDLE** represent values of the pressure at a node located somewhere between the beginning and the end of the pressure distribution. In addition, suitable **HISTORY** function numbers must also be specified; these histories are used in applying the equivalent nodal loads computed by APES.

To be consistent with the order of node numbering employed in defining the element topology (refer to the descriptions of the **ELEMENT** and **GENERATE SURFACES** commands), during specification of a distributed quantity along a line, the nodes must likewise be specified in a counterclockwise sequence. For example, a quantity normal to an edge is assumed to be positive if it is directed into the element. A tangential quantity is assumed to be positive if it acts in a counterclockwise direction with respect to the loaded element (Figure 1).

Such definitions are necessary in order to avoid confusion when distributed loads are specified along the interface between two elements, such as that shown in Figure 2). In this figure the line loads, if they are assumed to act on element 1, are considered to be positive; if they are taken as acting on element 2, these same loads are negative.
Figure 1: Normal and Tangential Distributed Edge Loads Applied to a Biquadratic Lagrangian Element

Figure 2: Loads Specified Along an Interface Common to Two Elements
References