MATERIAL FLEXURAL ELASTIC command

Synopsis

The MATERIAL FLEXURAL ELASTIC command is used to specify the parameters associated with an isotropic linear elastic material idealization for flexural (i.e., beam and frame) elements.

Syntax

The following syntax is used to describe an isotropic elastic material idealization for flexural elements:

```
MATERIAL FLEXURAL ELASTIC NUMBER #
    (DESCRIPTION "string")
    (MODULUS #.#) (POISSONS_RATIO #.#)
    (WINKLER_Rotational #.#) (WINKLER_Translational #.#)
```

Explanatory Notes

- The NUMBER keyword is used to specify the (global) number of the material associated with the isotropic linear elastic idealization. The default material number is one (1).

- The optional alphanumeric string associated with the DESCRIPTION keyword must be enclosed in double quotes (""). It is used solely to describe the material being idealized to the analyst. The DESCRIPTION string is printed as part of the “echo” of the material.

- The keyword MODULUS is used to specify the value of the elastic modulus $E$. The default value is equal to 3.0e+05.

- The keyword POISSONS_RATIO is used to specify the value of the Poisson’s ratio $\nu$. The default value is equal to 0.0.

- The keyword WINKLER_ROTATIONAL is used to specify a rotational Winkler spring stiffness (units of $F$) that will be associated with the element. The default value is equal to 0.0.
• The keyword **WINKLER_TRANSLATIONAL** is used to specify a translational Winkler spring stiffness (units of $FL^{-2}$) that will be associated with the element. The default value is equal to 0.0.

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**Theoretical Considerations**

The model of Winkler [5] assumes a continuous elastic foundation consisting of closely spaced, independent linear springs. Further details pertaining to basic elastic and viscoelastic foundation models are given by Kerr [4]. The analysis of beams resting on Winkler foundations using the finite difference method is discussed in Section 3.4 of [2].

Cook et al. [1] discuss the finite element solution to this problem. Further details pertaining to the derivation of the element equations are given in [3].

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**Example of Command Usage**

The following command is used to specify a typical isotropic elastic material for flexural elements:

```plaintext
mat flex elastic number 1 &
   desc "exotic material for beam elements" &
   modulus 20.0e+05 winkler_trans 1.0e+04
```
Bibliography


