

Determining Full Stage Creep Properties from Miniature Specimen Creep Test

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Abstract : In this work, methods for determining creep properties which can be used to represent the full life until failure from miniature specimen creep tests based on analytical solutions are presented. Examples used to demonstrate the application of the methods include a miniature rectangular thin beam specimen creep test under three-point bending and a miniature two-material tensile specimen creep test subjected to a steady load. Mathematical expressions for deflection and creep strain rate of the two specimens were presented for the Kachanov-Rabotnov creep damage model. On this basis, an inverse procedure was developed which has potential applications for deriving the full life creep damage constitutive properties from a very small volume of material, in particular, for various microstructure constitutive regions, e.g. within heat-affected zones of power plant pipe weldments. Further work on validation and improvement of the method is addressed.

Keywords : creep damage property, miniature specimen, inverse approach, finite element modeling

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