张元海,李乔,蔺鹏臻.宽翼缘梁温差自应力级数解[J].计算力学学报,2011,28(1):91~95

宽翼缘梁温差自应力级数解

Series solution of temperature difference self-stress in wide-flange beams

投稿时间： 2009-04-09 最后修改时间： 2009-11-13

DOI：10.7511/jslx201101017

中文关键词： 宽翼缘梁 温差自应力 级数解 平面应力问题 艾瑞应力函数

英文关键词:wide-flange beam temperature difference self-stress series solution plane stress problem Airy stress function

基金项目:甘肃省自然科学基金(3ZS042-B25-032);甘肃省高等学校研究生导师科研(0804-09)资助项目.

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中文摘要:

为了充分反映宽翼缘梁的温差自应力分布特点,克服按梁理论计算温差自应力时的不足,本文从弹性力学的分析方法入手,按平面应力状态分析翼缘板和腹板的温差应力。根据翼缘板与腹板连接处的变形协调及平衡条件建立补充方程,求解艾瑞应力函数中的积分常数,导出翼缘板与腹板的温差应力及位移的解析式。对一宽翼缘T梁的计算表明,当翼缘板相对于腹板发生温差变化时,沿其宽度的纵向温差自应力分布很不均匀,在翼缘板根部较大而在悬臂端则显著减小,按通常基于梁理论的计算方法,无法反映这种应力分布规律。

英文摘要:

In order to reveal fully the distribution of the temperature difference self-stress in wide-flange beams and improve the conventional beam-based analysis method, a refined analytical method is presented which is based on the mechanics of elasticity. The flange and web plates are considered to be in a state of plane stress under temperature difference. The condition of the deformation compatibility and equilibrium at the connection of the flange and web plates is used to establish additional equations by which the constants of integration in the Airy stress function are evaluated. The analytical expressions of the temperature difference stress and displacement in the flange and web plates are derived. Numerical results of a wide-flange T-shape beam show that, the longitudinal self-stress in the flange plate under temperature difference to web plate is distributed very non-uniformly along its width. Greater stress occurs near the fixed edge while much smaller stress at the free edge in the flange plate. This distribution characteristic of the temperature difference self-stress can't be reflected by the conventional analytical method based on the beam theory.

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