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Stress Analysis of Cylindrical Pressure Vessels with Closely Spaced Nozzles by the Finite-element Method: Stress analysis vessels with two closely spaced nozzles under internal pressure Finite Element Stress Analysis for Pressure Vessel/nozzle Design Stresses in Reinforced Nozzle-cylinder Attachments Under Internal Pressure Loading Analyzed by the Finite-element Method Stress Analysis of Cylindrical Pressure Vessels with Closely Spaced Nozzles by the Finite-element Method: Vessels with two nozzles under extenal force and moment loadings Description of nozzles and tests results Design Criteria for the Spacing of Nozzles and Reinforced Openings in Cylindrical Nuclear Pressure Vessels and Pipe Analysis of Stress Concentration at a Thick-walled Pressure Vessel Nozzle Junction Effect of Nozzle Loads on the Stress Distribution Inside Unpartitioned Plug Type Headerboxes Stress Analysis of the HFIR HB-2 and HB-3 Beam Tube Nozzles Local Stress Factors of Pipe-nozzle Under Internal Pressure Stress Analysis of Some Nozzle-on-sphere Geometries Stress and Fatigue Analysis of Pressurised Vessel-nozzle Intersections with and Without Local Wall Thinning Stress Distribution Around a Forged Nozzle in a Spherical Pressure Vessel Due to Axial Load and Internal Pressure Stress Intensities for Nozzle Cracks in Reactor Vessels Stresses in Reinforced Nozzle-cylinder Attachments Under External Moment Loadings Analyzed by the Finite-element Method Stress Analysis of a Radial Nozzle Attached to a Cylindrical Shell Under Internal Pressure Photoelastic Analysis of EGCR Pressure Vessel Local Stress Due to a Radial Loading at Nozzle-pipe Connection with Different Thickness A Critical Study of the Solutions for the Asymmetric Bending of Spherical Shells Introduction to Pipe Stress Analysis Experimental Stress Analysis of EGCR Pressure Vessel Local Stress Factors of Pipe-nozzle Due to Radial Load, Circumferential and Longitudinal Moments Stress Distribution in the Regin of a Forged Nozzle in a Spherical Pressure Vessel when Subjected to (i) External Bending Moment, (ii) Combined External Bending Moment and N A INLET NOZZLE STEADY STATE STRESS ANALYSIS The Stress Analysis of Pressure Vessels and Pressure Vessel Components A 37-mm Ceramic Gun Nozzle Stress Analysis Stress Analysis of an Oblique Nozzle in a Spherical Pressure Vessel Experimental Stress Analysis of the Attachment Region of Hemispherical Shells with Attached Nozzles. Part 2b. Radial Nozzle 7. 875 In. O.D. --7. 500 In. I.D. 10. 00 In. Penetration Effect of combined loading conditions, by Donald E. Hardenbergh, Sam Y. Zamrik [and] Andrew J. Edmondson Stress Indices and Flexibility Factors for Nozzles in Pressure Vessels and Piping The Effect of Extraneous Branch Pipe Loads on the Distribution of Stress in a Pressure Vessel Model Test for Stresses and Deflections in the N.S. Savannah Reactor Vessel Model and Attachments Pressure Vessel Design Manual Influence Functions for Stress-Intensity Factors at a Nozzle Corner Pressure Vessel Design: The Direct Route Stress Analysis of Cylindrical Pressure Vessels with Closely Spaced Nozzles by the Finite-element Method Heat Conduction and Stress Analysis of Solid Propellant Rocket Motor Nozzles Stress Intensity Factors for Cracks in Pressure Vessel Nozzles Stress Distribution in Rocket Nozzle with Failure Criterion Residual Stresses in Weld Deposited Clad Pressure Vessels and Nozzles

Influence functions are computed for the calculation of stress-intensity factors along partly circular cracks in nozzle corners subjected to pressure hoop stress linearly represented in the plane of the crack. The boundary integral equations method is used. The results are compared with those of previous studies. This book explores a new, economically viable approach to pressure vessel design, included in the (harmonized) standard EN 13445 (for unfired pressure vessels) and based on linear a well as non-linear Finite Element analyses. It is intended as a supporting reference of this standard's route, providing background information on the underlying principles, basic ideas, presuppositions, and new notions. Examples are included to familiarize readers with this approach, to highlight problems and solutions, advantages and disadvantages. * The only book with background information on the direct route in pressure vessel design. * Contains many worked examples, supporting figures and tables and a comprehensive glossary of terms. A series of three computer programs has been developed that greatly simplify the stress analysis of solid propellant rocket nozzles. The first of these programs is an axisymmetric finite element heat conduction program that is used to generate the time dependent temperature distributions in the nozzle. The second program is an axisymmetric finite element stress analysis program which uses the temperature distribution determined by the first program in addition to mechanical loadings to determine the stresses, strains, and displacements throughout the nozzle. The third program is a data reduction program which has, as output, plots of stress and strain contours in the nozzle. The heat conduction and stress analysis programs may be used separately if desired. If they ar used together, information is passed from the first to the second by magnetic tape. (Author). The results of three-dimensional linear elastic stress analyses of the HFIR HB-2 and HB-3 nozzles are presented in this report. Finite element models were developed using the PATRAN pre-processing code and translated into ABAQUS input file format. A scoping analysis using simple geometries with internal pressure loading was carried out to assess the capabilities of the ABAQUS/Standard code to calculate maximum principal stress distributions within cylinders with and without holes. These scoping calculations were also used to provide estimates for the variation in tangential stress around the rim of a nozzle using the superposition of published closed-form solutions for the stress around a hole in an infinite flat plate under uniaxial tension. From the results of the detailed finite element models, peak stress concentration factors (based on the maximum principal stresses in tension) were calculated to be 3.0 for the HB-2 nozzle and 2.8 for the HB-3 nozzle. Submodels for each nozzle were built to calculate the maximum principal stress distribution in the weldment region around the nozzle, where displacement boundary conditions for the submodels were automatically calculated by ABAQUS using the results of the global nozzle models. Maximum principal stresses are plotted and tabulated for eight positions around each nozzle and nozzle weldment. Results o through-thickness residual stress measurements are provided for a variety of samples of weld deposited 308/309L stainless steel and Alloy 600 cladding on low-alloy pressure vessel ferritic steels. Clad thicknesses between 5 and 9mm on samples that vary in thickness from 45 to 200mm were studied. The samples were taken from flat plates, from a spherical head of a pressure vessel, from a ring-segment of a nozzle bore, and from the transition radius between a nozzle and a pressure vesse shell. A layer removal method was used to measure the residual stresses. The effects of uncertainties in elastic constants (Young's modulus and Poisson's ratio) as well as experimental error are assessed. All measurements were done at room temperature. The results of this work indicate that curvature plays a significant role in cladding residual stress and that tensile residual stresses as high as the yield stress can be measured in the cladding material. Since the vessel from which th spherical and nozzle corner samples were taken was hydrotested, and the flat plate specimens were taken from specimens used in mechanical fatigue testing, these results suggest that rather high tensile residual stresses can be retained in the cladding material even after some mechanical loading associated with hydrotesting and that higher levels of hydrotest loading would be required to alter the cladding residual stresses. A series of shooting tests was conducted on a 37-mm gun fixture with ceramic nozzles. The primary concern for the design and test of the ceramic nozzle is the combination of the thermal stress and dynamic ballistic stress during the launch. On the basis of previous thermal analysis, a transient sequentially coupled finite-element model is performed to investigate the thermal stresses due to the large temperature gradient and coefficient mismatch of thermal expansion between the ceramic nozzle and the steel holder. The fully-coupled thermal stress analysis is conducted for verification. A DYNA3D model is used to perform the dynamic stress analysis due to the interior ballistic load on the ceramic nozzle. Three candidate ceramic materials, SN47, STK4, and ZRO2, are investigated and compared with the conventional steel nozzle. All the stress components from both thermal and dynamic loads are determined. These predictions are significant to the selected ceramic materials for the nozzle design. The report presents the results of investigations conducted on a hemisphere with a radial nozzle of 7.875" O.D. and 7.500" I.D. and 10" penetration into the hemisphere. Stress values were determined for the following five types of loadings: (1) internal pressure applied to the hemisphere and nozzle assembly, (2) an axial load applied collinear with nozzle, (3) a pure bending moment, or axial couple, applied to the nozzle, (4) a transverse or shear load applied normal to the nozzle, and (5) a pure torque applied in the radial plane of the nozzle. The Stress Analysis of Pressure Vessels and Pressure Vessel Components, Volume 3 deals with t basic principles and concepts underlying stress analysis of pressure vessels and related components used in the nuclear energy industry. Among the components subjected to stress analysis are pressure vessel branches, pressure vessel ends, lo attachments, and flanges. Smooth and mitered pipe bends, externally pressurized vessels, and creep effects in structures ar also analyzed. This book is comprised of 11 chapters that explore the main problems of structural analysis related to the design of metal pressure vessels and components. After introducing the reader to the basic principles of stress analysis, it turns to nozzles in pressure vessels. The shakedown analysis of radial nozzles in spheres is described for pressure, thrust, moment, shear, and combined loading. The problem of pressure vessel ends is treated next, along with local loads applied to pressure vessel shells at nozzles and local attachments such as support points. An analysis of pressure vessels using a computer is also presented. The final chapter describes the analysis of ligament stresses in pressure vessels and includes a discussion on arrays of holes with reinforcement. This volume will be of value to nuclear and structural engineers as well as designers and research workers in the nuclear industry. Introduction to Pipe Stress Analysis offers a practical approach to analytical piping design. Many approaches to design are presented that are used in engineering consulting companies but are not available in books. Engineering equations from many piping codes are used and discussed. Covered are problems encountered in the determination of pipe wall thickness and span limitations, the design of piping configurations and of supports and connections that may be subject to varying temperatures and loads, and the making of connections to rotating and nonrotating machinery. Contains worked examples and computer programs for piping analysis.