

Public Abstract

First Name:Daniel

Middle Name:Wayne

Last Name:Looten

Adviser's First Name:Glenn

Adviser's Last Name:Washer

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:EVALUATING THE VARIABLES THAT IMPACT ULTRASONIC TESTING

The goal of this research was to improve the quality control process for steel fabrication to improve the reliability, safety and quality of welded steel components. The objectives of this project were to explore the relationship between the capabilities of ultrasonic testing (UT) and phased array ultrasonic testing (PAUT) and the requirements for flaw detection and characterization. This research assessed the variables that impact UT measurements to improve the methodology used to inspect steel welds in structural components.

This research explored the variables that influence the ultrasonic response to improve which include: length measurement, beam spread, attenuation, defect orientation, transducer rotation, wedge angle and defect sizing. The results from these tests were then compared to the American Welding Society (AWS) UT procedure used to inspect structural components in steel bridges. The findings from the length measurement test indicated that defects smaller than the transducer were typically oversized. The results from the defect orientation and wedge angle tests indicated that the defect's orientation and the wedge angle greatly affected the reflected amplitude. The results from the attenuation tests indicated that the assumptions made in AWS acceptance criteria were inaccurate.

The results from this research will then be used in the development of PAUT. This thesis contains test procedures developed for PAUT. The PAUT procedures will evaluate the variables measured in this research for UT. The results from the PAUT tests will then be used to develop a procedure for PAUT inspection.