

CERTIFICATION OF APPROVAL

**Preliminary Stress Analysis on Beam Surface As A Result of Char
Expansion In A Fire Exposed Intumescent Coating**

by

Muhammad Fadhlilah Bin Abdul Rahim

A project dissertation submitted to the
Mechanical Engineering Programme
Universiti Teknologi PETRONAS
in partial fulfilment of the requirement for the
BACHELOR OF ENGINEERING (Hons)
(MECHANICAL ENGINEERING)

Approved by,

(AP Dr Bambang Ariwahjoedi)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

January 2009

SAMPLE OF CERTIFICATION OF ORIGINALITY

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

MUHAMMAD FADHLILAH BIN ABDUL RAHIM

ABSTRACT

Intumescent coating is one of the most popular fire-retardant methods being used nowadays. During a fire event, the coating will expand to create a fire insulation layer on the structure it is protecting called char. When the coating expanded however, stress is created on the char. The objective of this project is to analyze the stress created on the beam-char interface. First, the preliminary 1- dimensional analytical calculation was done to predict the behavior of stress. The types of loading considered in the analytical calculation were uniaxial load and buckling. For 3-dimensional case, the expansion was simulated in ANSYS. The analytical calculations showed that the middle span of the interface experienced high stress. It was observed that the longer the interface, the higher the stress would be. It was also found that the beam interface was in tension while the char interface was in compression. This was parallel with the results obtained by using ANSYS in the 3-dimensional analysis. From the buckling analysis, it was found that the critical load before the buckling can happen is higher when the length of the beam-char interface is longer. Hence it was recommended to apply the intumescent coating in stripes to reduce the interfacial length.

ACKNOWLEDGEMENT

Throughout the progress of my Final Year Project, I would like to acknowledge my family for always being there to provide moral support to me as well as to help me towards completing my project

Appreciation also goes to my FYP supervisor AP Dr Puteri Sri Melor Megat Yusof. During the progress of the project, Dr. Puteri provided lots of feedback that is related to the project especially on how I present my project. Besides that, she always encouraged me to do the best and for being supportive and guide me through my mistakes to make the project better.

Deepest gratitude goes to my FYP co-supervisor, Dr Bambang Ariwahjoedi for helping towards completing my FYP as well as his willingness to share with me his valuable experience on the topic. In addition to that, Dr. Bambang also helped me in providing more alternatives for the project so that with more choices, chances that a better alternative can be found.

Thank you also to all lecturers that directly and indirectly involved in making this project a success. Last but not least, a special thanks to my colleagues for their support and company in making this project to be proud of. Thank you to all of you.