THE DESIGN OF STRUCTURE FOR LIFTING HEAVY LOAD

by

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Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Engineering (Hons)
(Mechanical Engineering)

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CERTIFICATION OF APPROVAL

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Approved by,

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UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

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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.

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BEH HARK KEAT

ABSTRACT

There are a total of 5,285,131,600 matrix ton of cargos being import and export from the world's top 15 seaports in year 2010, import and export is a very important economic issue in the world today. However, handling of containers is troublesome and very time consuming. Containers are normally in a stack of 5 to 6 in seaport. When the bottom one needs to be removed, we need to remove the entire top container one by one. This is very slow and not efficient. Thus, we need a method that is able to remove the container without removing the top container one by one. The Mobicon system has a product name mobicon that are able to move containers to designated area. According to that concept and with the help of some clamps, removing the bottom container without removing the top container one by one becomes possible. We only need to clamp all the top containers and take out the container we need. After the data collection and comparison of the efficiency of this new method with the old container removing method, the efficiency of the new system is proven 400% better than then old system. Besides, the feasibility of the system to work in reality will also be simulated with ADAMS.

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ABBREVIATIONS AND NOMENCLATURES

CPU: central processing unit

L: Length (meters)

W: Width (meters)

H: Heigth (meters)

Tx: Actual time needed for existing system (seconds)

tn: Ideal time needed for new system (seconds)

η: Efficiency of new system (%)

Tn: Actual time needed for the new system (seconds)

ηoverall: Efficiency of new system compared to old system (%)

2D: 2 dimensional

N: Newton

Top width: B1

Top thickness: t1

Web thickness: t3

Web height: h

Bottom width: B2

Bottom thickness: t2

Span: L

Total girder length: Ltotal

Cross-sectional area of section: A

Unit girder weight: g

One girder weight: G1

Total girder weight: Gw

Moment of inertia about x-x axis: Ixx

Moment of inertia about y-y axis: Iyy

Modulus of section about x-x axis: Zxx

Modulus of section about y-y axis: Zyy

Radius of Gyration: Ry

SWL: safe working load

Maximum vertical bending moment: Mx

Maximum bending stress: Sx

Horizontal force due to girder weight: Wy

Horizontal force due to crane load: Fy

Horizontal force due to wind: Fw

Transverse bending moment: My

Transverse bending stress: shb

Total bending stress: stb

Permissible Bending Stress: sp,b

Shear stress: ss

Combine bending & shear stress: scomb

Permissible combined stress: sp,comb

Permissible vertical deflection: dvp

E: Young Modulus

Permissible horizontal deflection: hp

Vertical deflection based on vertical load: dv

Horizontal deflection based on horizontal load: dh

Uniform load: sq

Horizontal force due to crane load: Fhc

Horizontal force due to wind load: Fhw

Bending moment due to horizontal force: sr

Total bending moment: st,b

Max bending stress: smax

Permissible bending stress: sp

Allowable deflection: dallow

Maximum deflection: dv

Height of aux leg: haux

Weight of aux.leg: Gaux

Maximum Axial Load: Pmax

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