

THE DESIGN OF STRUCTURE FOR LIFTING HEAVY LOAD

by

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CERTIFICATION OF APPROVAL

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Approved by,

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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.

BEH HARK KEAT

ABSTRACT

There are a total of 5,285,131,600 metric 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 the 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: Height (meters)

T_x: Actual time needed for existing system (seconds)

t_n: Ideal time needed for new system (seconds)

η: Efficiency of new system (%)

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

η_{overall}: 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: L_{total}

Cross-sectional area of section: A

Unit girder weight: g

One girder weight: G₁

Total girder weight: G_w

Moment of inertia about x-x axis: I_{xx}

Moment of inertia about y-y axis: I_{yy}

Modulus of section about x-x axis: Z_{xx}

Modulus of section about y-y axis: Z_{yy}

Radius of Gyration: R_y

SWL: safe working load

Maximum vertical bending moment: M_x

Maximum bending stress: S_x
Horizontal force due to girder weight: W_y
Horizontal force due to crane load: F_y
Horizontal force due to wind: F_w
Transverse bending moment: M_y
Transverse bending stress: s_{hb}
Total bending stress: s_{tb}
Permissible Bending Stress: $s_{p,b}$
Shear stress: s_s
Combine bending & shear stress: s_{comb}
Permissible combined stress: $s_{p,comb}$
Permissible vertical deflection: d_{vp}
E: Young Modulus
Permissible horizontal deflection: h_p
Vertical deflection based on vertical load: d_v
Horizontal deflection based on horizontal load: d_h
Uniform load: s_q
Horizontal force due to crane load: F_{hc}
Horizontal force due to wind load: F_{hw}
Bending moment due to horizontal force: s_r
Total bending moment: $s_{t,b}$
Max bending stress: s_{max}
Permissible bending stress: s_p
Allowable deflection: d_{allow}
Maximum deflection: d_v
Height of aux leg: h_{aux}
Weight of aux.leg: G_{aux}
Maximum Axial Load: P_{max}

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