Available online at http://www.journalijdr.com

IJDR

International Journal of
DEVELOPMENT RESEARCH

ISSN: 2230-9926

International Journal of Development Research
Vol. 06, Issue, 05, pp. 7821-7823, May, 2016

Full Length Research Article

DESIGN OF AN OVER HEAD PLATE GANTRY GIRDER

[1,*]Venkatesh, A., [2]Vignesh, S., [3]Iyappan, S., [4]Vignesh Kumar, P., [5]Tamilvanan, G. and [6]Vijaya Sarathy, R.

[1,2,3,4]B.E Final Year Students, Department of Civil Engineering, P.R Engineering College, Vallam, Thanjavur
[5,6]Assistant professor, Department of Civil Engineering, P.R Engineering College, Vallam, Thanjavur

ARTICLE INFO

Article History:
Received 26th February, 2016
Received in revised form
14th March, 2016
Accepted 27th April, 2016
Published online 31st May, 2016

Key Words:
Thuvakkudi,
Utilization,
Recommended,
Mechanisms.
Consideration.

ABSTRACT

This project deals with the planning, designing, and estimation of the industrial PLATE GANTRY GIRDER, located near Thuvakkudi, Trichy district. Overhead plate girder is subjected to various types of load. Girder is the critical assembly component of overhead crane. Currently research is being carried out to improve the strength structure of overhead crane girder. These new efforts help to overcome overhead crane girder failure. The girder is supported on a suitably formed seat and it is also connected to the column near the top flange in each case in order to restrain it from lateral bending and twisting at the support point. Material handling is an important practical consideration in the design of new manufacturing and distribution systems and research into better material handling systems and practices is important. Material handling uses different equipment and mechanisms. The structure is designed as per Indian standard codes and necessary drawings added in this project. The 400kN capacity of gantry girder is designed, the three cranes were used in the working site. Three cranes are used to lifting the heavy steel jobs. when the three cranes are moving at the same time and same direction. In this project work an over head plate gantry girder has been planned and designed. The drawings of the girder were drawn using AUTOCAD software. As result of this, it was understood that how a structure could be planned and designed. The utilization value of Indian codes, other recommended codes and some software was understood.

INTRODUCTION

A crane is mechanical equipment for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine. A crane with a single or multiple girder movable bridge, carrying a movable trolley or fixed hoisting mechanism, and traveling on an overhead fixed runway structure is known as overhead crane. Material handling is a vital component of any manufacturing and distribution system and the material handling industry is consequently active, dynamic, and competitive. Material handling is an important practical consideration in the design of new manufacturing and distribution systems and research into better material handling systems and practices is important. Material handling uses different equipment and mechanisms called Material handling equipment.

Corresponding author: Venkatesh, A.,
B.E Final Year Students, Department of Civil Engineering, P.R Engineering College, Vallam, Thanjavur.

Main component of overhead crane is girder beam which transfers load to its structural member. In the early stage, there was few software available used Finite Element Analysis (FEA) technique. In present, Structural analysis of girder can be done by different software using Finite Element Analysis (FEA) technique.

Site location: Thuvakkudi

Zone: Trichy.

Software used: AUTO CAD.

LITERATURE REVIEW

Literature review is one of the scope studies. It helps in a way to get the information regarding structural analysis of overhead crane bridge girder. From the early stage of project various literature studies have been done.

Research journals, books, printed or online conference article were the main source in project guides.

M. Euler, U. Kuhlmann (2011) had presented in his paper about multi axial fatigue problem using Finite Element Analysis (FEA) technique. Multi axial fatigue problem is created due to wheel load and block rail fastened by longitudinal fillet welds. At the point of wheel load application the top region of the runway girder is subjected to a stress field comprising local stress components induced by the concentrated load. Here author had tested two crane runway girders under proportional multi axial loading, i.e. under flexural bending and stationary wheel load, both simultaneously pulsating. The paper presents the fatigue evaluation of these tests using different local concepts.

Camelia Bretotean Pinca, Gelu Ovidiu Tirian and Ana Josan (2009) had used shell type elements with three or four nodes per element in order to find out the best sizes for resistance structure in tension and deformation state Ozden Caglayan, Kadir Ozakgul, Ovunc Tezer, Erdogan Uzgider (2010) had studied about fatigue life of crane runway girders. Detailed finite element models of the crane runway girders were prepared using shell and beam elements. Ismail Gerdemeli, Serpil Kurt and Metinyıldırım M.Sc.(2010) had carried out the research on developing new Finite Element Analysis(FEA) technique and here they had used new techniques rather than using old Finite Element Methods(FEM). All calculations of elements related rubber tired container stacking crane were done and then it was modeled. In addition of this, they stress and deformation analysis of crane bridge girder and buckling analysis of the crane legs were performed. workbench was also used for Finite Element Method (FEM) and modeling was done on Autodesk Inventor 2010 program. Comparison of calculations regarding Stress, deformation and buckling analysis were done by author. There is no significant difference between the analysis and calculation result for the stresses and deformations.

Ozden Caglayan, Kadir Ozakgul, Ovunc Tezer, Erdogan Uzgider (2010) had studied about fatigue life of crane runway girders. Detailed finite element models of the crane runway girders were prepared using shell and beam elements. Here Finite Element Analysis (FEA) technique is used for calculating remaining fatigue life. Quasi-static load tests were conducted with the help of overhead cranes that travelled with crawling speed. Strain data was collected by using transducers mounted on preselected locations of the crane runway girders. These data were then used to refine the finite element models. Numerical analyses by means of the calibrated finite element models were performed to evaluate the remaining fatigue life.
Naseer (2009) had found the fact during his study that crane structures may have many forms of space structures. It is not economical and logical to perform experimental model analysis for such type of structures.

DESIGN DETAILS

Plate Girder Design

- crane capacity = 30 tones = 30000 kg ×9.81= 400 kN
- weight of crane = 100 kN
- total span of crane = 30 m
- minimum hook approach = 1.2 m
- wheel base of crane = 3.6 m
- span of gantry girder = 7 m
- mass of rail section = 30 kg/m
- height of rail section = 75 mm

S.NO	DESCRIPTION OF WORK	QUANTITY (l×b×d) m^3	RATE	PER	AMOUNT (Rs)
1.	Earth work excavation for foundation	65	2000	M^3	13,000
2.	R.C.C for M20 grade of concrete	65	8000	M^3	5,20,000
3.	FABRICATION OF STEEL 1) column section 2) beam section 3) girder plate	 23.04 46.83 13.32	 58,000 58,000 58,000	 tones	 8,90,800 19,96,000 10,04,800

$F_y = 250$ N/mm^2 $E = 2\times 10^5$ N/mm^2

Beam- Column Design

- Column of effective length = 6m
- Axial load = 400 kN
- Equal end moments = 70 kN.m

Footing Design

- Capacity of crane = 300 kN
- self weight of crane = 100 kN
- self weight of beam section = 40 kN
- self weight of column 20% of axial load= 88 kN
- total load = 550 kN
- factored axial load = 1.5 × 550 = 825 kN

To design the 1000 kN loaded footing.

ESTIMATION

Cost of foundation - 5,33,000
Cost of steel fabrication - 39,91,600

Total Cost of Proposed Construction Is Rupees is 45 Lakhs.

Conclusion

- In this project work an over head plate gantry girder has been planned and designed.
- The drawings of the girder were drawn using AUTOCAD software.
- The 400kN capacity of gantry girder is designed, the three cranes were used in the working site.
- Three cranes are used to lifting the heavy steel jobs.

- As result of this, it was understood that how a structure could be planned and designed.
- Thus the estimation details of this project is calculated and its enclosed.
- The utilization value of Indian codes, other recommended codes and some software was understood.

REFERENCES

Alkin, C., Imrak, C. E. and Kocabas, H. 2005."Solid Modeling and Finite Element Analysis of An Overhead Crane Bridge", Actapolytechnica Vol. 45.

Camelia Bretotean Pinca, Gelu Ovidiu Tirian, Ana Josan, "Application of Finite Element Method to an Overhead Crane Bridge", Issue 2, Volume 4, 2009.

Dr. Pumnia, B.C. and Ashok Kumar Jain, 1998. "design of steel structures", 1ST SEPT.

Euler, M. and Kuhlmann, U. 2011."Crane runways - Fatigue evaluation of crane rail welds using local concepts", *International Journal of Fatigue*, 2011.

Ismail Gerdemeli, Serpil Kurt, Hasan Onur Alkan, "Main girder beam design and finite element analysis of 2/160 gantry crane",14th International Research/Expert Conference, Trends In The Development Of Machinery and Associated Technology, 2010.

Ozden Caglayan, Kadir Ozakgul, Ovunc Tezer, Erdogan Uzgider, 2010. "Fatigue life prediction of existing crane runway girders", *Journal of Constructional Steel Research*.

Vlada Gasic, Milorad Milovancevic, Zoran Petkovic, 2010. "FEA Implementation in Moving Load Problem at Bridge Cranes", Machine design, ISSN 1821 1259.

****