

## DESIGN AND ANALYSIS WITH NUMERICAL METHOD OF GANTRY CRANE MAIN BEAM

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**Keywords:** Gantry crane, Main beam, Design and analysis, Finite element method.

**Abstract.** Nowadays, mostly in shipbuilding, gantry cranes are needed in many areas. With evolving technology, the sizes of the structures are growing too. Generally, in the construction of these structures gantry cranes are preferred for lifting heavy loads. In this study, a 2x400 ton gantry crane main beam is designed and analysis with numerical method is performed. The working load acting on the main beam is 800 tons. In the analysis of the main beam construction, the self-weight of the main beam, working load and dynamic loads arising due to the crane movements are considered. After analytical calculations, the main beam is modeled as a three dimensional design and the analysis of the construction is performed using finite element method with the help of an analyses program. The analysis is performed for three cases. In the first case, the analysis is performed by considering only self-weight of the main beam. In the second case, the analysis performed under the influence of working load (while two trolleys on the main beam are in various positions); and in the third case, both the working load and the dynamic loads arising due to the crane movements are considered in the analysis. In this study, the stress values obtained from the analysis are examined and it is identified that some regions in the design are needed to be revised and the results obtained from analytical calculations are compared with the results obtained with the finite element method. As a result, using finite element method in the analysis is appropriate and this method provides great convenience in the calculations.

### Introduction

Shipping has a very high importance about travelling of people and transportation of commercial goods around the world. In the construction phase of the ships, many massive parts might be necessary for construction and need to be moved. Mostly in shipyards, and in many other places gantry cranes are preferred to transport massive parts.

In this paper, a 2x400 ton gantry crane main beam is designed. Analytical stress calculations and analysis with numerical method are made. Afterwards the results of analytical calculations and analysis are compared and discussed.

### Design and Model

Cranes are designed in order to the requirements of the working conditions in the enterprise. The predetermined technical datas of the 2x400 ton gantry crane are shown in the Table 1.

Table 1. Technical data of the 2x400 ton gantry crane

Crane type	Gantry crane
Lifting capacity	2 x 400000 kg
Length of the trolley rail	100000 mm
Useful lifting height	60000 mm
Material	St 37-2, St 52-3

On the basis of the above data, it can be said that the usable length of the main beam is 100 meters. The full length of the main beam is 106 meters. The main dimensions and 3-D model of the gantry crane are shown in the Fig. 1.



Fig. 1 Main dimensions and 3-D model of the gantry crane

# Gantry Crane Design Calculations

**Albert A Gayle**



## **Gantry Crane Design Calculations:**

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## **Table of Contents Gantry Crane Design Calculations**

1. Understanding the eBook Gantry Crane Design Calculations
  - The Rise of Digital Reading Gantry Crane Design Calculations
  - Advantages of eBooks Over Traditional Books
2. Identifying Gantry Crane Design Calculations
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Gantry Crane Design Calculations
  - User-Friendly Interface
4. Exploring eBook Recommendations from Gantry Crane Design Calculations

- Personalized Recommendations
- Gantry Crane Design Calculations User Reviews and Ratings
- Gantry Crane Design Calculations and Bestseller Lists
- 5. Accessing Gantry Crane Design Calculations Free and Paid eBooks
  - Gantry Crane Design Calculations Public Domain eBooks
  - Gantry Crane Design Calculations eBook Subscription Services
  - Gantry Crane Design Calculations Budget-Friendly Options
- 6. Navigating Gantry Crane Design Calculations eBook Formats
  - ePub, PDF, MOBI, and More
  - Gantry Crane Design Calculations Compatibility with Devices
  - Gantry Crane Design Calculations Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Gantry Crane Design Calculations
  - Highlighting and Note-Taking Gantry Crane Design Calculations
  - Interactive Elements Gantry Crane Design Calculations
- 8. Staying Engaged with Gantry Crane Design Calculations
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Gantry Crane Design Calculations
- 9. Balancing eBooks and Physical Books Gantry Crane Design Calculations
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Gantry Crane Design Calculations
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Gantry Crane Design Calculations
  - Setting Reading Goals Gantry Crane Design Calculations
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Gantry Crane Design Calculations

- Fact-Checking eBook Content of Gantry Crane Design Calculations
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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