



Review on Design and Fabrication Of Barbara Hasingo

¹Mahesh Kanojiya ²Faizan Khan ³Prajwal Taywade

¹Assistant Professor, ²UG Scholar, ³UG Scholar

¹Mechanical Engineering,

¹Nagpur Institute of Technology, Nagpur, Maharashtra, India

Abstract: The design and fabrication of portable ladder is done to reduce the human effort required for the maintenance work or other work which are at very high distances. The proposed ladder is designed for the organization (Engineering College) so that the work for the high distances can be done easily. Various types of ladders are available and the one selected is designed. The material used is cast iron. The ladder works in the three position Forward, Neutral and Reverse positions. The rope drive is used for the lifting and lowering the ladder. Ratchet mechanism is use for the locking of the ladder at high distances. A safety lock is also provided for the locking of the ladder. The maximum distance that can be reached by the ladder is 32 fits. Ladder can bear a load of 300 kg. The ladder rope can bear the tension of 500 kg. Later on, the analysis of the ladder is done on Ansys software and found that the design is safe.

Index Terms - Design, Fabrication, Ladder, Portable, Multipurpose.

1) Introduction

A ladder is a step made up of two parallel elements connected by stairs; to go up or down. He has ascending steps through which the user can climb as well as move heavy loads using ladders. There are two basic types of ladder, hard ladder and rope ladder, hard ladder is one Can be applied to vertical surfaces such as walls while the rope ladder is a hangable type. The vertical members of a ladder are often called beams or style. Rigid ladders are usually portable, but sometimes they permanently attached to buildings. A ladder is a series of vertical or sloping rungs or steps. up and down. There are two basic types of ladders: A rigid ladder that is self-supporting or on which you can lean A vertical plane and a rope ladder that can be hung From above. The purpose of using the ladder is Different work processes in different industries and industries Residential areas. Ladder on the market is heavy, It takes up a lot of space and serves a single purpose. apart from As a result, it's not as stable as it should be, leading to overkill. number of accidents worldwide. stiff vertical bar Conductors are called stringers or rails or spars. a hard ladder Usually wearable, but some types are permanently attached to one structure or device.

2) Problem Background.

Ladders are become a frequent fixture in human institutions. Ladders come in many varieties on the global market, including permanent ladders, extension ladders, step ladders, orchard ladders, and others. The main function of a multipurpose ladder is to assist people in carrying out their tasks, particularly those that are located in difficult-to-reach places up high, and to do so without taking up a lot of room. Time can be saved, efficiency can be improved, and storage space can be reduced. As a result of community needs, numerous different types of multipurpose ladders have been developed. Flexible ladder that is portable, foldable, and simple to use. Also, it comes in a variety of sizes and designs so that customers can select the most appropriate one.

3) Problem Identification

As we all know, ladder is one of the important things to help human to do their job at the high place but most of it is big, hard to bring and need a lot of space to store. Furthermore, each ladder has its own use and specific use. It's limited to do other job than the specification. Some of ladder is not long lasting. To reduce this problem, one product must be created to fulfill the customer needed.

4) Literature Review

A ladder is a steps consisting of two parallel members connected by rungs; for climbing up or down. It is ascending stages by which somebody or something can climb the ladder. There are two types: rigid ladders that can be leaned against a vertical surface such as a wall, and rope ladders that are hung from the top. The vertical members of a rigid ladder are called beams (US) or stiles (UK). Rigid ladders are usually portable, but some types are permanently fixed to buildings Subsection Rigid ladders are available in many forms, including:

- Extension Ladder - A fixed ladder that is split into two or more lengths. Convenient storage; length can be pushed or pushed together for storage Maximize ladder length. Since it is possible to install a pulley system, Ladder can be easily extended and locked by a ground operator A place with claws and claws
- Stepladder - Hinged in the middle to form an inverted V with braces to hold it in place Two halves at a fixed angle
- Orchard Ladder - A three-legged stepladder with three legs. inserted between branches to pick fruit Telescoping ladder rails consist of concentric or rectangular tubes that can be slotted together Nest and store
- Hook Ladder – A rigid ladder with a hook-on top to grab onto the window frame

5) Proposed design. The above requirements are Consists of a compact, foldable and versatile ladder 12 with equal long spars (rectangular cross section) Short rungs (square sections) separated by what you want Ladder deployment distance. two stabilizer Fixed in extreme positions with rubber pads Gives structure stability. the entire product is shared into four equal parts; each consisting of two stiles and three stiles' Sprouts; connected by a common mechanism for making ladders Foldable.

6) Specific Project Objective. The main goals of this project are:

- I. Design and manufacture of functional multi-purpose ladders.
- ii. create additional new features, creative and innovative designs;
- iii. It can carry a maximum weight of 150kg.Design and manufacture of a multi-purpose ladder prototype based on

7) Advantage and disadvantage of Foldable Ladder.

7.1 Advantages

- Foldable
- Stable
- Adjustable high (can be form into many shapes for different high)
- Did not use a lot of space to store

7.2 Disadvantages

- Heavy
- Difficult to bring



Fig. 01: Inner Ladder Part

8) Conclusion

In summary, the finished product fulfils a variety of functions despite being straightforward and uncomplicated from a design standpoint. The fabrication procedure was carried out at a mechanical workshop on a College campus with limited resources. As a result, it may be argued that local Indian manufacturers, who typically possess fairly basic machinery, will find it rather simple to produce it.

Also, the finished item is quite portable and tiny. The components needed, which are readily available in the market, include stiles, rungs, friction pads, fasteners, etc. The product has a maximum load bearing capacity of 300 kg. The development and manufacturing processes took minute elements into consideration. However, based on the requirements, alterations can also be made to the design. Fabrication also involves product maintainability.

9) References

- [1] R.K.Rajput "A text book of Manufacturing Technology." Laxmi Publication (P) ltd.- Manufacturing process- 899 pages.
- [2] R.S.Khurmi and J.K.Gupta "A Text book of Workshop Technology: Manufacturing processes". Published by S Chand and Company Ltd. (2012)
- [3] OSHA ladder guidelines including OSHA approved rung spacing requirements.
- [4] Cutler, Deborah and Thomas J. Cutler (2005). Dictionary of naval terms. Naval institute press, Annapolis, Maryland. ISBN 987-1-59114-150-1
- [5] V Raghavan. "Physical Metallurgy, principles and practises."
- [6] "Failure analysis of an aluminium extension portable ladder" by Abdel-Hakim Bouzid, Department of mechanical engineering, Montreal, Canada.
- [7] "Step ladder instability and dynamic loading" by Oren Masory, Mechanical engineering department, Florida Atlantic University.
- [8] "Torque analysis of sliding ladder" by Kirk T. MacDonald, Princeton university, Princeton. NJ08544
- [9] "Aluminium ladder specification" by Thompson Fabrication LLC, Tarrant.
- [10] Design of compact ladder" by Mohammad tabrez Nakum, Kishan Kansagava in IRJET (volume 3, issue 10- oct 2016) ISSN: 2395-0056
- [11] Dewar, M.E. (1977) Body Movements in Climbing a Ladder.Ergonomics. <http://dx.doi.org/10.1080/00140137708931602>