

## Design and Development of a Multipurpose Ladder for Commercial Applications



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**Abstract:**

Whether you have tall kitchen cabinets, painting work or an attic storage space, having a ladder in your household repertoire is a must. Today, we prefer to think of them as tools for reaching roofs and upper stories that can be broadly categorized as portable ladders or fixed access ladders. Ladders are usually derived to reach the higher position where the work has to be carried out. Present design of ladders is not user-friendly and creates fatigue. The aim of the project is to design and develop a multipurpose ladder for commercial applications.

A product study of the existing ladders has been carried out for evaluating the structure and working mechanism. Study of product environment was carried out for the targeted user group. Based on the research the needs are portability, low cost, less maintenance, safety and should be easy to carry. Product Design Specification (PDS) was then derived and different concepts were generated based on QFD and mood boards. The complete study of the design of ladder focusing on the product usage was carried out. The new concept has the simple mechanism which creates manually operated linear movement to move from one place to another. Thus avoided the fatigue on the user and can be operated without getting down.

Concepts were generated with reference to the Quality Functional Deployment (QFD) and Product Design Specification (PDS). The final concept was developed using visualization software like CATIA and rendering was done using Keyshot software. A 1:1 scaled prototype was developed to validate the proposed design. Design evaluation was carried out with various users and the feedback was positive and satisfactory.



**Various concepts multipurpose ladder**



**Final concept**