

# Design and Fabrication of a multi-purpose Wheel chair cum stretcher

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## Abstract

Patients in hospitals always want to overcome the problem of travelling or carrying from wheelchair to stretcher or from stretcher to wheelchair which makes it kind of uncomfortable for both the patient and handler. An attempt has been made to design a wheelchair with the benefits of both wheelchair and stretcher in single unit. It has an added advantage because in hospitals and airports we need to provide both stretcher and wheelchair for their respective uses which makes them costly. But by using this, multi usable one we can reduce the overall cost as it can be used as both wheelchair cum stretcher based on a person's requirement. For the future, there is always scope for improvement, such as to make it motorized using motors which helps disabled people to drive or operate it themselves. We can also make it renewable using solar energy so that the use of batteries and other electricity equipment is limited and so thus we can make it solar powered convertible wheelchair cum stretcher by use of solar panels which makes it more efficient.

## 1) INTRODUCTION

The term DISABILITY is a condition where movement of people becomes limited which prevents them to do a task better. Disability may be associated to physical or mental attributes. "Disabilities is a term, covering impairments, activity limitations, and participation restrictions. An impairment is defined as a problem in the body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in the life situations. Thus, disability is a complex phenomenon as it is reflecting an interaction between features of a person's body and features of the society in which she or he lives"[1]

As per the World Health Organization(WHO), disabilities could be categorized into:[2]

1. Physical Disabilities
2. Sensory Disabilities
3. Intellectual Disabilities

#### 4. Mental health and emotional disabilities

Bag (2017) has demonstrated in his work how the wheel chair cum stretcher is used to disabled people ,people in hospitals while shifting to bed. It also tell us about the forces acting on the wheelchair cum stretcher and materials, components to be required to construct the wheel chair cum stretcher. U.S. Department of Veterans Affairs had provided the exact number of people who would use such a device. To obtain the set result, they collected information about number of people suffering from set disease, and the percentage of people that would actually be needing a smart chair. Though the results collected relate to the USA, we could see the potential of our product and thus justify the time we put into it.

Around the world, rise in the number of patients is surging on day-to-day basis which is quiet alarming with respect to the basic amenities available in the hospital. While shifting the patients from wheelchair to stretcher or vice-versa, wheelchair to bed, stretcher to bed, patient suffers a lot due to lack of comfort in them. Hence, shifting of patient is a common problem for nurses. To minimize the efforts of nurses and ward persons, an effort has been made to make a wheelchair cum stretcher for patients in medical facilities or other places.

## 2) Research Methodology

### Wheelchair International Standards

As with any thing being mass produced, and the fact that this is for disabled people, there has been a lot of research done to find the right measurements for each and every part of a wheelchair. And the image below details the widely accepted results of the research.

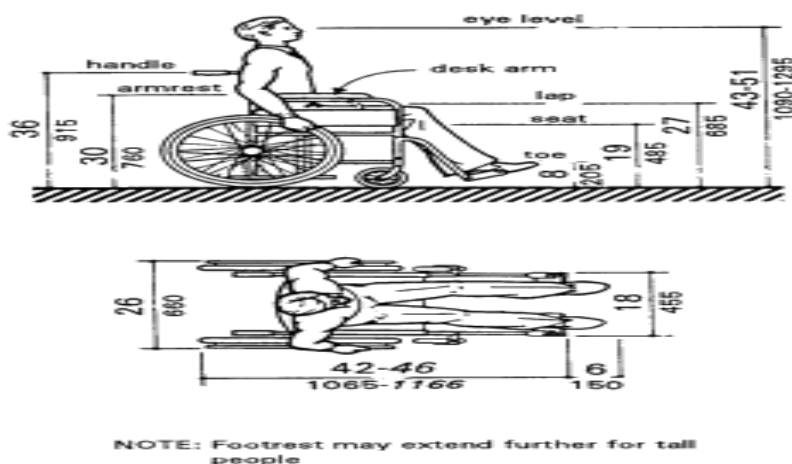


Figure 1: Wheelchair Standard Dimensions

Though these are the accepted standards, people can have a wheel chair made exactly to match their requirements. The measurements mentioned above are for the mass produced wheel chairs use in hospitals, and public places like railway stations etc.

### **2.1 Base structure**

This provides the support for the entire design. Materials considered for this product are aluminium, mild steel etc. Mild steel is selected.

### **2.2 Rear wheels**

Two rear wheels are used and connected with same shaft to each other. The wheels support the weight of entire structure.



Figure 2 : Rear wheels

### **2.3 Casters**

The caster wheels or simply casters are attached to the body of the chair with the help of the bearings. A caster is defined as an wheel that is used to mount at the bottom of any larger object (like "vehicles") which enables that the object can be moved easily. They are available in different sizes, and they are made up of different materials such as rubber, steel, plastic, nylon, aluminium. Caster wheels are placed in front to balance and change direction.



Fig 3: Front caster wheel

#### 2.4 Main base structure

The seat is put on the base which is welded to the shaft of the wheels. Wheels can be removed also as they are fitted using nuts and bolts.

### 3) DETAIL DESIGN

This design of wheelchair cum stretcher is made in such a way that when it is turned to stretcher form, its height can be adjusted to any distance as per the comfort of patient. It can be changed from wheelchair mode to stretcher mode and vice versa by the staff as well as the patient. The following components of this design made this possible:

- a. Backrest
- b. Seating Portion
- c. Leg support

When the design will be in the wheelchair form, ratchets mounted on the joints will be in locked position which assures the safety while converting from one mode to other.



Fig 4: Design part of stretcher



Fig 5: Design part of Wheelchair

#### 4) TECHNICAL DETAILS OF THE SETUP

**MATERIAL USED: (ASTM A36 Mild/Low Carbon Steel)**

#### PROPERTIES OF MILD STEEL

##### Introduction:

In this project, we have used ASTM A36 steel which is one of the most commonly used mild and hot-rolled steel. It has superior weld ability and thus, suitable for different machining processes.. ASTM A36 steel can be molded into rectangle bar, square bar, circular rod, steel shapes such as H-beams, channels, angles and I-beams.

##### Chemical Composition

**Table 1**

Material	Percentage
Carbon	0.25 to 0.29 %
Copper	0.20 %
Iron	98.0 %
Manganese	1.03 %
Phosphorous	0.040 %
Silicon	0.280 %
Sulfur	0.050 %

**MATERIAL USED :****Table 2**

S.no	Items	Quantity	Specifications	Material Used
1	Front wheels	2	100mm Dia	Plastic
2	Square Pipe	15	¾ inch	MS
3	Flat Sheet	14 Sqft	16 gauge	MS
4	Rear Wheels	2	622mm Dia.	SS and Rubber
5	Hinged Pins	4		MS
6	Screw with nut	2		MS
7	Round pipe	2		MS

**5. CONCLUSION**

Many people around the world suffer from diseases where it becomes difficult for them to move freely. Wheelchair becomes the best option for them. And, to make their life more comfortable, this design of wheelchair cum stretcher is introduced which will ease the process of shifting them from wheelchair to stretcher and vice versa.

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