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DESIGN AND DEVELOPMENT OF FABRICATION DRAWINGS FOR TWIN SEATER WHEEL CHAIR

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Abstract— All over the world number of disabled individuals is increasing every year. Mobility aids are useful for patients for transportation and a replacement for walking especially in indoor and outdoor environment. Transferring the patients from wheelchair to stretcher or to the medical bed is always an issue for the attendant or helper. Understanding the various issues regarding the mobility equipment and introducing a better design will be an asset for the medical field and helping hand for disabled individuals. There is a need for a wheelchair cum stretcher to facilitate the disabled patient's mobility and to provide a novel medical equipment for use in the Indian hospitals. Here we are developing a system which is capable of shifting various positions (Chair, Semi-Chair and Stretcher) manually. These positions can be achieved by a lead screw connected with a hinge joint. Lead Screw translates turning motion into linear motion. Also the height of the stretcher can be adjusted using a Hydraulic jack manually. It is placed horizontally which pushes against a lever which lifts the main arm. And also there is a lid on chair which can be opened to eliminate human waste. This is a cost reducing project which helps mainly paralyzed patients to do their daily things. The design data is obtained from the existing product and the dimensions are altered as per the requirement .The 3D modeling and the development of manufacturing made in by using of CATIA V5 software. The main aim of this paper is to create manufacturing drawings.

Keywords— Mobility device, Wheel Chair for fabrication, Hydraulic Jack, Transportation

I. INTRODUCTION

A wheelchair is a wheeled mobility device in which the user sits. The device is propelled either manually (by turning the wheels by the hand) or via various automated systems. Wheelchairs are used by people for whom walking is difficult or impossible due to illness (physiological or physical), injury, or disability. People with both sitting and walking disability often need to use a wheel bench. The earliest records of wheelchairs date back to the 6th century, and were found inscribed on a stone slate in China. Later dates relate to Europeans using this technology, dating back to the Renaissance. The various types of wheelchairs are manual wheelchairs, electric-powered wheelchairs and sport wheelchairs. A basic standard manual wheelchair incorporates a seat and back, two small front (caster) wheels and two large wheels, one on each side, and a foot rest. Wheelchairs are often variations on this basic design, but there are many types of wheelchairs, and they are often highly customized for the individual user's needs. The seat size (width and depth), seat-to-floor height, footrests/leg rests, front caster outriggers, adjustable backrests, controls, and many other features can be customized on, or added to, many basic models, while some users, often those with specialized needs, may have wheelchairs custom-built. Various optional accessories are available, such as anti-tip bars or wheels, safety belts, adjustable backrests, tilt and/or recline features, extra support for limbs or neck, mounts or carrying devices for crutches, walkers or oxygen tanks, drink holders, and clothing protectors. Experiments have also been made with unusual variant wheels, like the omni wheel or the mecanum wheel. These allow more directional movement options. Manual wheelchairs: Manual wheelchairs are those that require human power to move them. Many manual

wheelchairs can be folded for storage or placement into a vehicle, although modern wheelchairs are just as likely to be rigid framed.

II. OBLECTIVE & METHODOLOGY

2.1. Objective

The aim of this paper is to redesign the existing wheel chair in to our own dimensions. After designing of wheel chair parts should be assembled. Total wheel chair parts are created as a drafting file for fabrication purpose.

2.2. Methodology

- To Study of the wheel chair and its design
- To do part modeling of wheel chair by using CATIA V5
- After designing the parts , assemble the parts
- For manufacturing purpose represent the parts in drafting file
- Structural analysis of wheel chair chassis
- Analysis is carried out for mass of two persons sitting in the wheel chair
- Mass of 160 kgs and 200 kgs for 2 persons are applied in the analysis
- The deflections, bending moments, shear forces, bending stresses and axial direct stresses are plotted for analyzing the structural behavior of the wheel chair.
- Design modifications for the chassis are considered in order to have a high reliable structure which can withstand higher loads

III. 3D MODELING OF WHEEL CHAIR

The design of Wheel Chair is performed by using cad software CATIA. The load distribution in the chassis should be uniform. The structural design gives the idea about the chassis. Design gives the optimum size and shape of the wheel chair chassis.

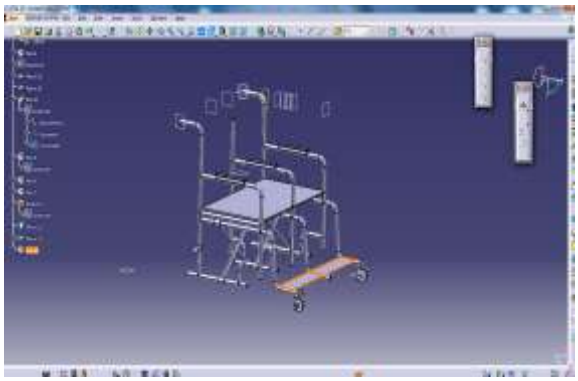


Figure 1: Wheel Chair Full Chassis

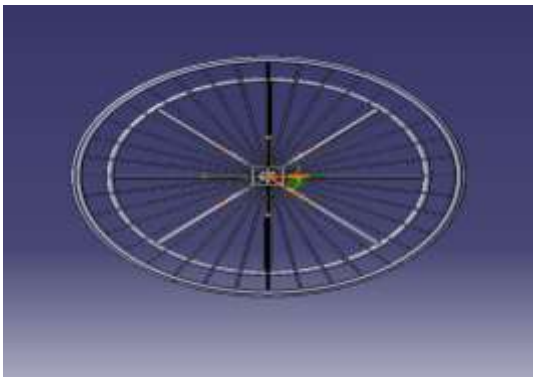


Figure 2: Rim Wheel Design

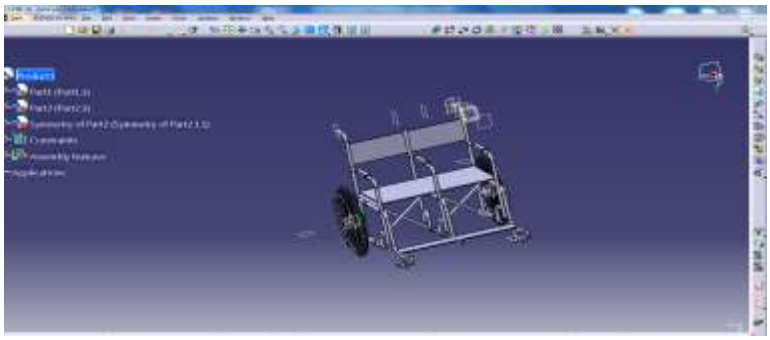


Figure 3: Assembled Body Of The Wheel Chair

The design data for design of the wheel chair is provided below with the help of Drafting Module present in CATIA software.

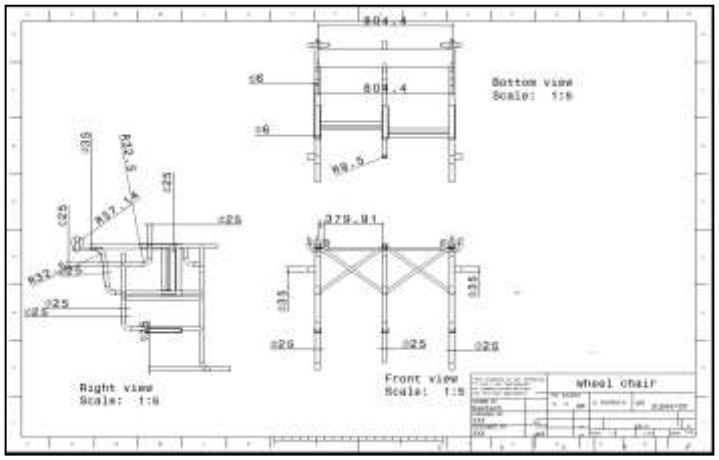


Figure 4: Wheel Chair Chassis

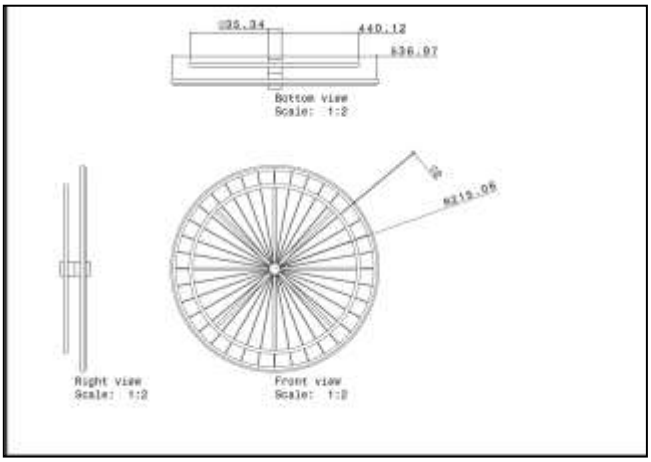


Figure 5: Wheel Chair Rim

3.1. Material specification

Table 1: Properties of ALUMINIUM T6

Sl NO	Property	ALUMINUM T6
1	Young's Modulus	68900 N/mm^2
2	Density	2700e-12 tn/mm^3
3	Poisson ratio	0.33

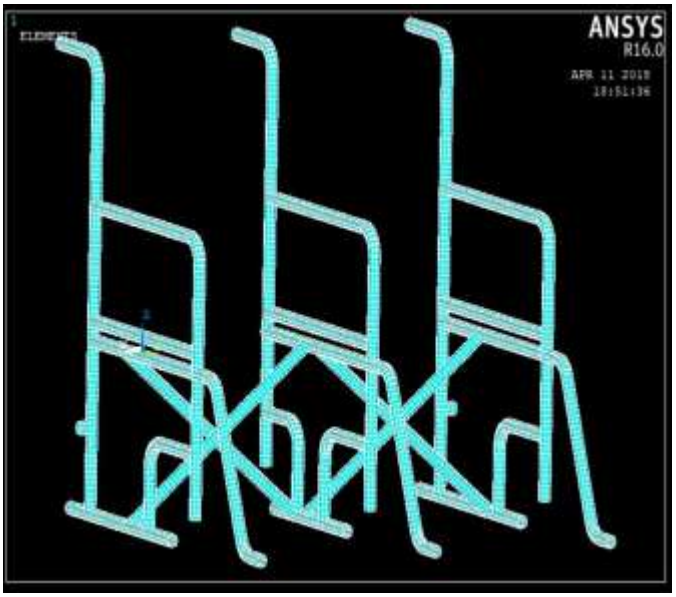


Figure 6: Finite Element Model

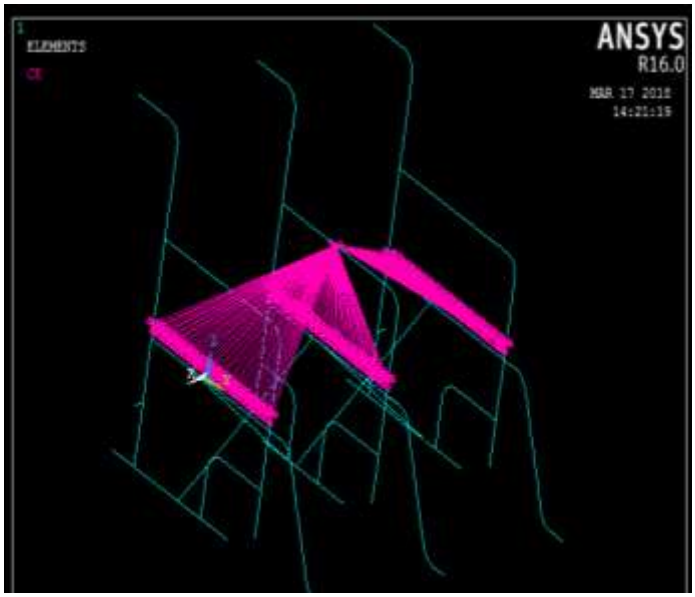


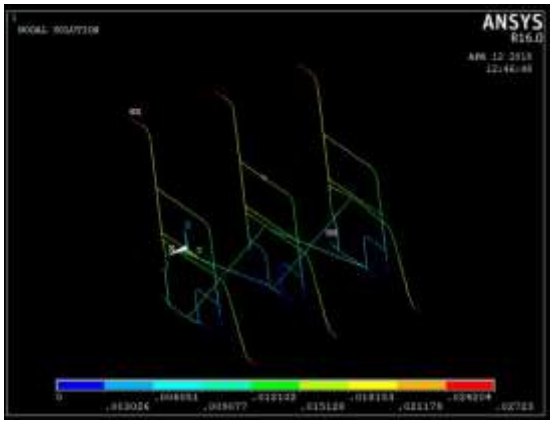
Figure 7: Mass Element Coupled With The chassis

3.2. Boundary conditions

The mass element is given the value of mass which is to be considered as the person's weight. The gravitational force is also provided which acts as force on the wheel chair chassis. The weights 160 kgs and 200 kgs for 2 persons are considered in the analysis

IV. RESULTS (STATIC ANALYSIS WITH 160 KGS & 200 KGS)

4.1. Deformation & Bending stresses



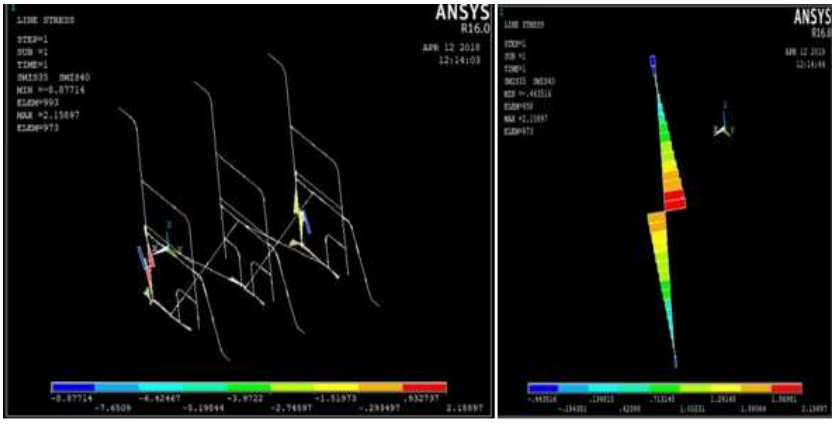


Figure 8: Deformation of the Model Figure 9: Bending Stresses Developed at various positions

4.2. Bending Moment

4.1

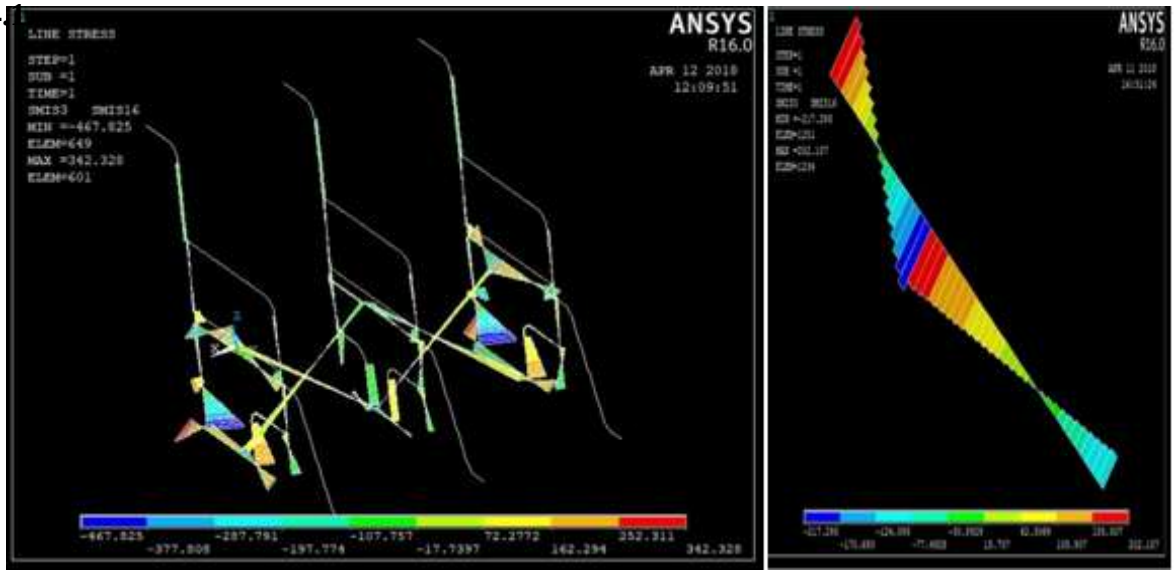


Figure 10: Bending Moment at various positions

4.3. Axial Direct Stresses

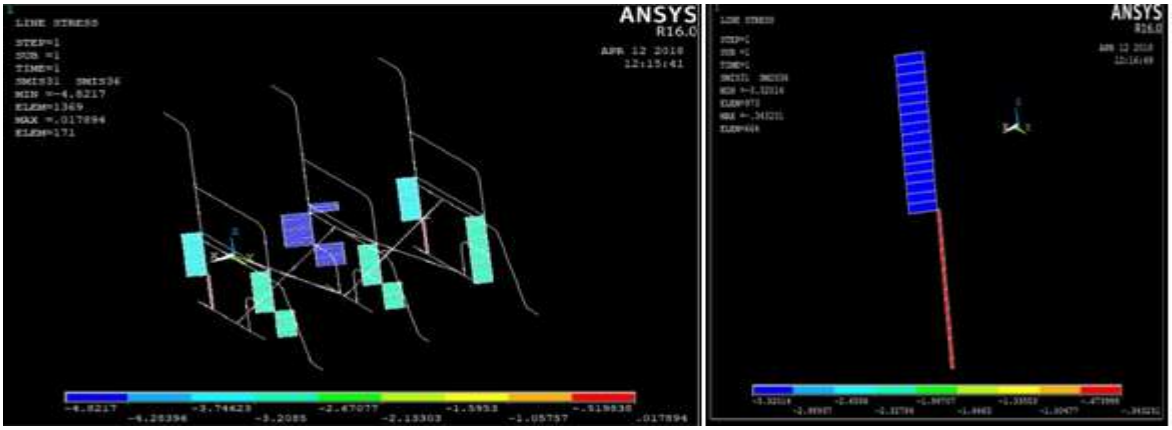


Figure 11: Axial Stresses Developed at various positions

4.4. Shear forces

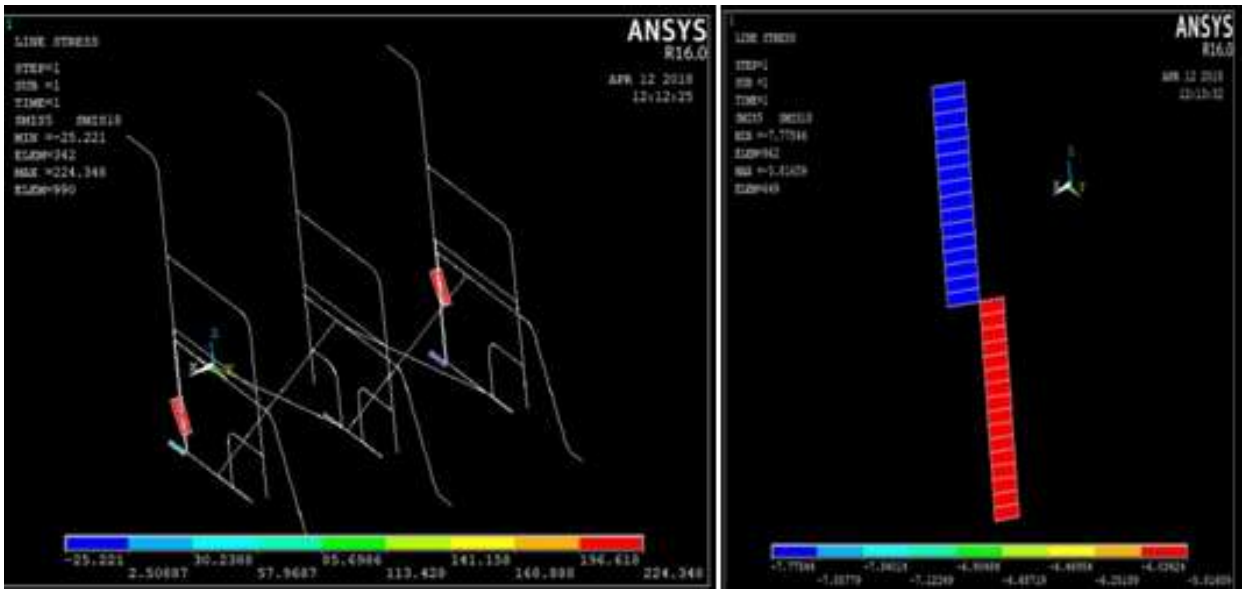


Figure 12: Shear Forces Developed at various positions

Results of the analysis for 160kg load are represented in the table below

Table21: Forces & Stresses Induced at 160kg

SL NO	MECAHNICAL CHARACTERSTICS	RESULT
1	TOTAL DEFORMATION	0.0272 mm
2	BENDING STRESSES	2.158 N/mm^2
3	BENDING MOMENTS	342.32 N-mm
4	AXIAL DIRECT STRESSES	0.0178 N/mm^2
5	SHEAR FORCES	224.34 N

Results of the analysis for 200kg load are represented in the table below

Table22: Forces & Stresses Induced at 200kg

SL NO	MECAHNICAL CHARACTERSTICS	RESULT
1	TOTAL DEFORMATION	0.0327 mm
2	BENDING STRESSES	2.68 N/mm^2
3	BENDING MOMENTS	423.60 N-mm
4	AXIAL DIRECT STRESSES	0.0213 N/mm^2
5	SHEAR FORCES	279.58 N

V. CONCLUSION

The present work is represent that to design and development of twin seater convertible wheel chair concept, with motivation of transporting the patients in hospitals and emergency areas, and this work adopting various safety measurement in different stages. We identified the mechanism, ergonomic design and safety was most important. So that a multifunctional medical aid focusing on the improvement and self-reliability of multiple disabled people. Modifications made in the prevailing equipment meant for the disabled ones will be of great use in upcoming time.

REFERENCES

[1] Smitesh Bobde,Ninad Borkar, Saurabh Apte, Shubham Ghuguskar "Automated Wheelchair Convertible Stretcher" International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395 -0056, p-ISSN: 2395-0072 Volume: 04 Issue: 03, Mar 2017.

[2] Rashid Ahmed K., Safar Abdul Razack , Shamil Salam , Vishnu Prasad K.V.,Vishnu C. R. "Design and Fabrication of Pneumatically Powered Wheel Chair-Stretcher Device" International Journal of Innovative Research in Science, Engineering and Technology, ISSN(Online) :2319-8753 ISSN (Print) : 2347-6710, Vol. 4, Issue 10, October 2015.

[3] Arunkumar S M , Abhijith P K , Haneepsab A Karoshi , Chetan C "Design and Fabrication of Stretcher cum Wheelchair" International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137 Volume – 02, Issue – 05, May – 2017, PP – 90-96.

[4] Zerui Xiang, Jinyi Zhi, Shiyu Dong, Bochu Xu, "Study on Characteristics of the Wheelchair-User Combination," Journal of Biosciences and Medicines, 2016, 4, 9-17 Published Online June 2016 in SciRes. http://www.scirp.org/journal/jbm http://dx.doi.org/10.4236/jbm.2016.46002

[5] Masatomo Shibata, Chao Zhang, Takakazu Ishimatsu, Motohiro Tanaka, Joel Palomino, "Improvement of a Joystick Controller for Electric Wheelchair User" Modern Mechanical Engineering, 2015, 5, 132-138 Published Online November 2015 in SciRes. http://www.scirp.org/journal/mme http://dx.doi.org/10.4236/mme.2015.54013

[6] Tohru Kawabe, "Robust MPC Method for BMI Based Wheelchair" Intelligent Control and Automation, 2011, 2, 340-350 doi:10.4236/ica.2011.24039 Published Online November 2011 (http://www.SciRP.org/journal/ica)

[7] Nguyen Thanh Hai , Nguyen Van Trung , Vo Van Toi, "Mean Threshold and ARNN Algorithms for Identification of Eye Commands in an EEG-Controlled Wheelchair" Engineering, 2013, 5, 284-291 http://dx.doi.org/10.4236/eng.2013.510B059 Published Online October 2013 (http://www.scirp.org/journal/eng)

[8] AngappanKumaresan, Nagarajan Mohankumar, Mathavan Sureshanand, Jothi Suganya, "Enhancing the Efficiency of Voice Controlled Wheelchairs Using NAM for Recognizing Partial Speech in Tamil" Circuits and Systems, 2016, 7, 2884-2892 Published Online August 2016 in SciRes. http://www.scirp.org/journal/cs http://dx.doi.org/10.4236/cs.2016.710247.

[9] Rashid Ahmed K., Safar Abdul Razack, Shamil Salam, Vishnu Prasad K.V., Vishnu C. R.," Design and Fabrication of Pneumatically Powered Wheel ChairStretcher Device", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 10, October 2015.

[10] Rajeev V. R, Ramjith Krishnan R, Prof. K Gopalakrishna Pillai," Fabrication of Advanced Wheelchair cum Strecher", Internation Journal of Engineering Studies and Technical Approach, Volume 02, No. 2, February 2016.

