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Short Communication

Design of Containment Capsule for Covid-19 Patients Transport

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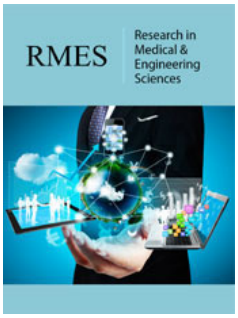

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Abstract

Due to the pandemic of the Covid-19 virus and joining the efforts around the world to fight the decease the Unit of Investigation of Mechanical Engineering of USAC designed a containment capsule for the transport of patients in ambulances. The objective was a design light, foldable, easy to carry, easy to build, with materials that can be found in the market and as cheap es possible. The team designed the capsule with the aid of different 2D and 3D CAD software and selected the materialsto fullfil thecharacteristics desired of the capsule. The result is a design that will help the Health workersto transport patients of Covid-19 in ambulance significantly reducingthe risk of contagion.

Keywords: Design, Covid-19; Health; Containment; Capsule; Materials; CAD

Abbreviations: CAD: Computer Aided Design

Introduction

Due to the Covid-19 pandemic that has taken many lives around the world, a lot of projects and initiatives to fight this decease were born. In different countries concepts of capsules to isolate Covid-19 patients to avoid direct contact with the health workers during their transportation in ambulances or other media. To help the health workers to be more safe during the transportation of Covid-19 patients , the Investigation Unit of Mechanical Engineering of the San Carlos University designed a capsule easy to carry to different places (due to the geographic structure in some places), light, corrosion resistant, easy to build with available materials and components and as cheap as possible(to make it possible its mass production if required). The design of a foldable containment capsule was the idea proposed by the Investigation Unit of Mechanical Engineering. In this article is explained the design and the selection of materials to build a containment capsule that will fulfill all the characteristics previously exposed.

Materials and Methods

The methodology to design the containment capsule was the selection of materials for their mechanical properties an availability in the market, followed by the design of the internal and external structure using 2D and 3D CAD software. To make the capsule as light as possible the material selected to make the structure that will hold the plastic is aluminum. The aluminum is light, has a great corrosion resistance and its strong enough to hold support the plastic [1-5]. This is important because the capsule may be subjected to adverse weather conditions. To isolate the patient as much as possible, the rigid structure is covered in 40-gauge clear polyethylene plastic. This a common plastic that has a lot of applications, and it´s thick enough to separate the patient and the Health Workers. Due to the fact that has a lot of applications it´s easy to find, so its availability is other advantage. Also is a very flexible material and it is performing well at low temperatures. Other factors of the polyethylene are its isolating properties, its odorless character, its resistance to corrosion, its low water-steam transmission, and its price [2,3]. To filter the air that flow in and out of the capsule the decided to use something simple that already exist worldwide. Medical grade filters were chosen to use in the capsule. With this type of filters, the risk of contagion is lower for the health workers involved in the process of covd-19 patient's transport.

Results and Discussion

The team designed a foldable capsule design using different diameter aluminum tubes that will slide inside each other. The 3D design of the structure is shown in the Figure 1. The folded structure is shown in the Figure 2. The aluminum structure can be separated in 3 parts, which are shown in Figure 3. The capsule is designed to be attached to a stretcher, for ambulance or other vehicles transport. With straps in the sides to be easily attached and unattached. The final design of the containment capsule is shown in Figure 4.

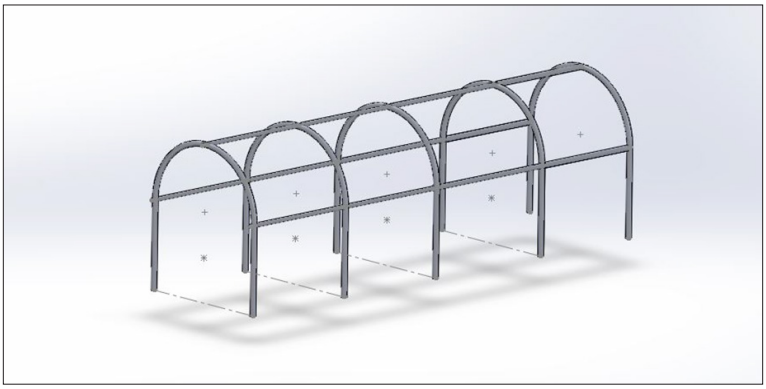

Figure 1: Rigid structure design.

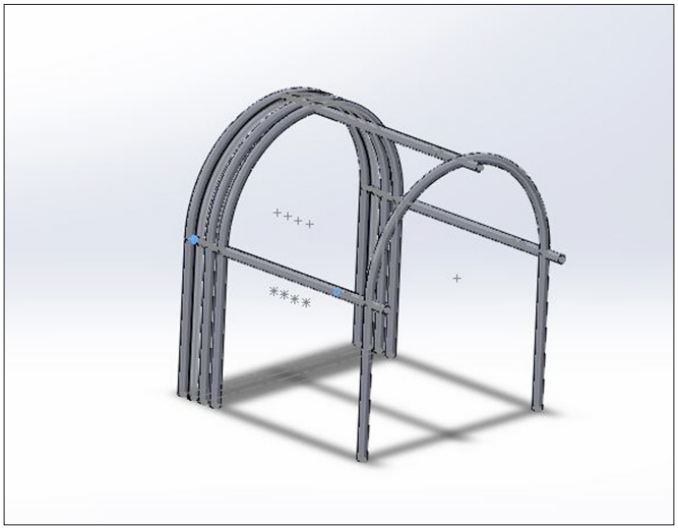

Figure 2: Folded structure.

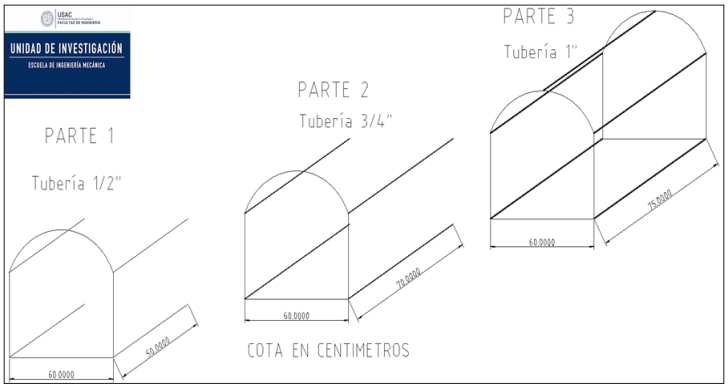

Figure 3: Structure divisions.

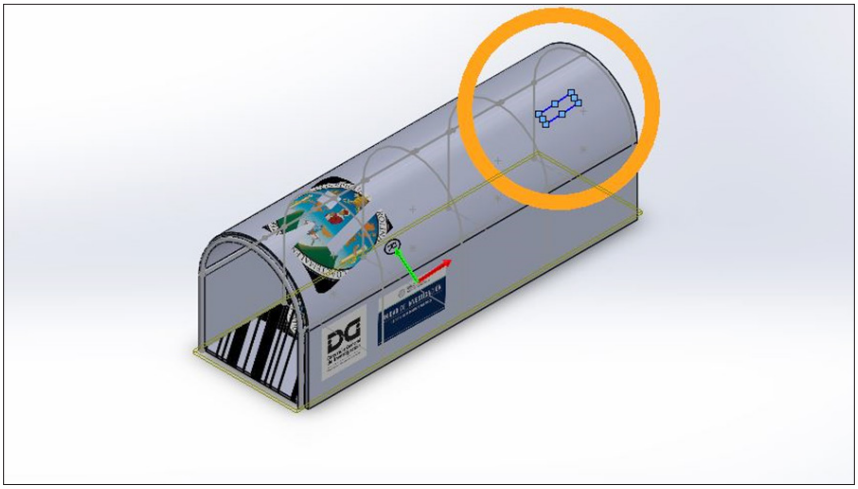

Figure 4: 3D design of containment capsule.

Conclusion

The design and selection of materials allow the containment capsule to be valuable option to reduce significantly the risk of contagion in the health workers during the transportation of Covid-19 patients. Due to the mechanical and chemical properties of the materials the capsule will be light, corrosion resistant and rigid. Thanks to the foldable design using the aluminum tubes, the containment capsule will be easy to carry to different places with difficult access.

Acknowledgment

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