

# 3D model for outreach purposes based on "Steel Tank Status Report" presentation by Michael Schneider on April 28th, 2022 from WCD Mechanics meeting (Meetings of the detector WG)

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This manual presents a 3D model for outreach purposes of the SWGO project. The tank presented here has been divided into pieces to easier the 3D print work. As the title indicates, the model shown is based on the document "Steel Tank Status Report" by Micheal Schneider from April 28th, 2022, presented at the WDC Mechanics meeting. Some dimensions are exaggerated<sup>1</sup> for didactic purposes such as the PMT size and the thickness from Tyvek paper and the Bladder.

## Considerations on assembling and printing.

Before printing the presented model some considerations must be taken into account according to the following indications:

1. The following model was designed with a scale of 1:10 in mind so, depending on the 3D printer used it is likely that the space on the printing surface might be not enough so it would be necessary to scale down the model with the slicer tools.
2. The model was divided into the following pieces, before assembling you must be sure that all parts were printed
  - PVC pipes which form the tank structure (3) these are subdivided into the following 3 sections for a optimized printing process.<sup>2</sup>
    - DownSectionTank.stl
    - CenterSectionTank.stl
    - UpSectionTank.stl
  - One model with an exaggerated scale from the double PMT
    - PMT.stl
  - Bladder and Tyvek crossections. The Tyvek paper has its width exaggerated.
    - Bladder.stl

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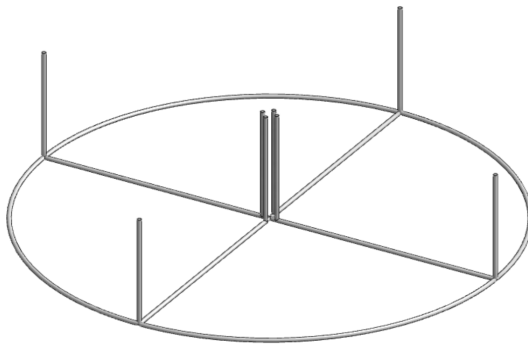
<sup>1</sup>3 extra models where PVC pipes thickness is exagerated are included in case of 3D printing with a surface smaller than 22cm (8.66 in). These models are compatible with any of the other models listed in this document so, in case of needed, it is totally possible to use them for better structural strength.

<sup>2</sup>It is likely that the models SecciónAbajoTanque.stl y SecciónArribaTanque.stl give some problems when printed depending on the printer. In case that some problem with these models occurs these models were subdivided into pieces. Every section consists of one circular piece alongside its respective pipe number.

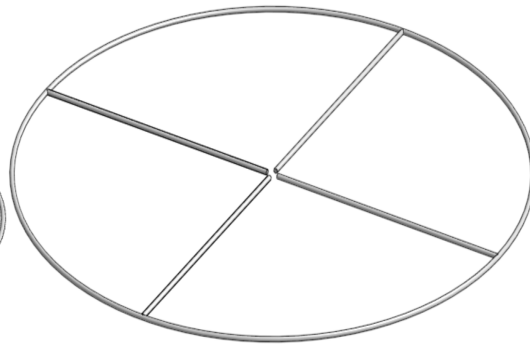
- Tyvek.stl
  - The metal coating upper part; is divided into two parts.
    - Coating.stl
  - The metal coating bottom part.
    - Bottom.stl
  - Tank's lid.
    - Lid.stl
3. Please note that if you want to rescale this model, **all** parts must be rescaled to the same proportion.
  4. Printed joints are avoided to elude problems regarding the physical limitations of each 3D printer. Instead, it is necessary to use glue to assemble the parts that require it.
  5. It is recommended to use a cyanoacrylate-based glue.
  6. Although it's not recommended print the model together, it is plausible. So. if you wish to do so, and STL complete model is included with the rest of models.

## Parts and models.

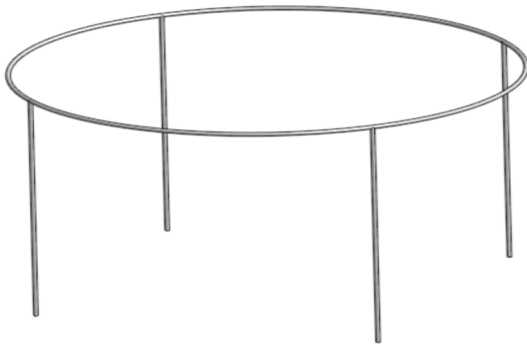
The following pictures show each model in recommended printing color.



(a) DownSectionTank.stl



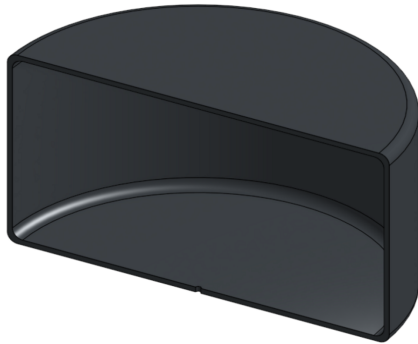
(b) CenterSectionTank.stl



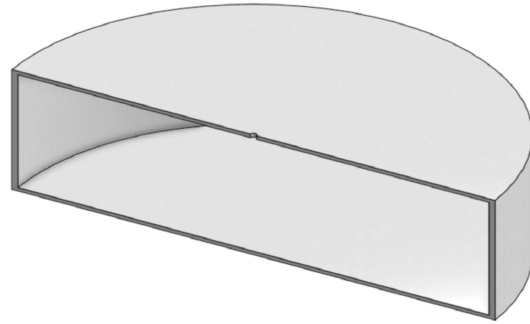
(c) TopSectionTank.stl



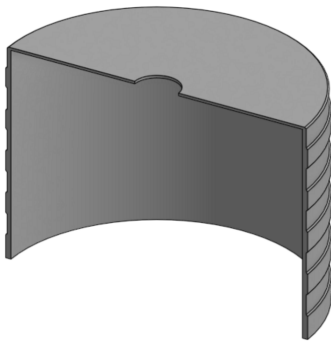
(d) PMT.stl



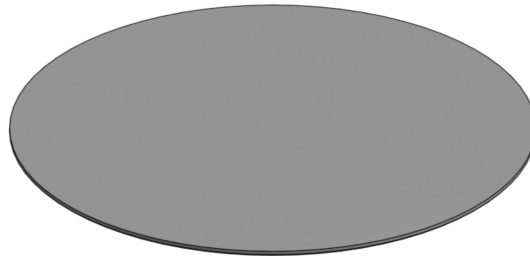
(e) Bladder.stl



(f) Tyvek.stl



(g) Coating.stl



(h) Bottom.stl

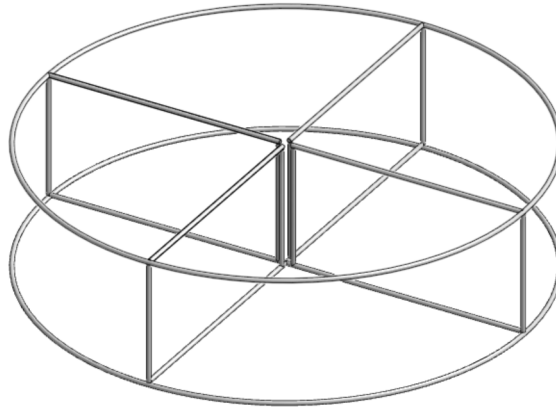


(i) Lid.stl

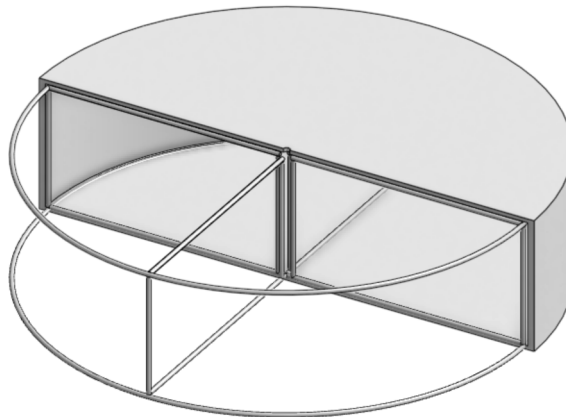
## Assembling instructions.

To assemble the model, follow the instructions and diagrams below.

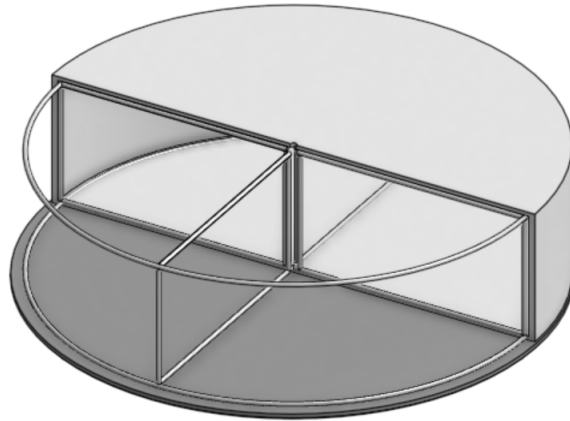
1. Glue the parts DownSectionTank.stl and CenterSectionTank.stl so that the pipes are aligned.



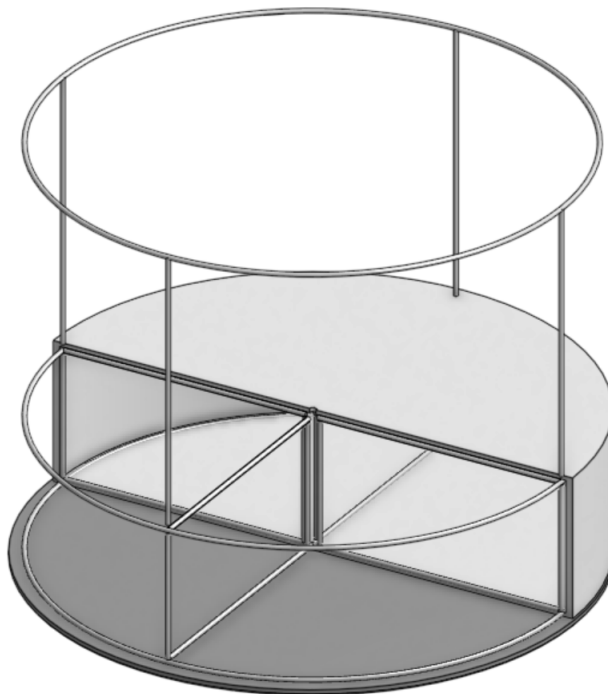
2. Insert the bove part inside the Tyvek.stl; it is recommended to glue all the pipes to increase stability.



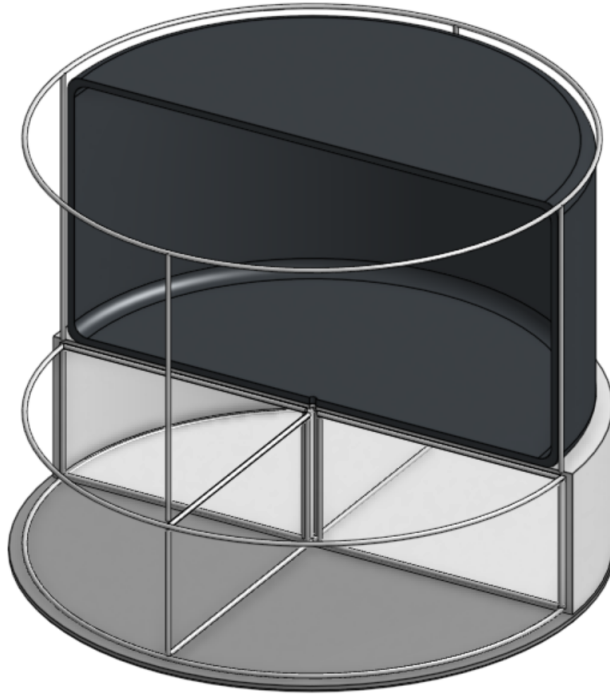
3. Glue the parts from step 2 to Bottom.stl.



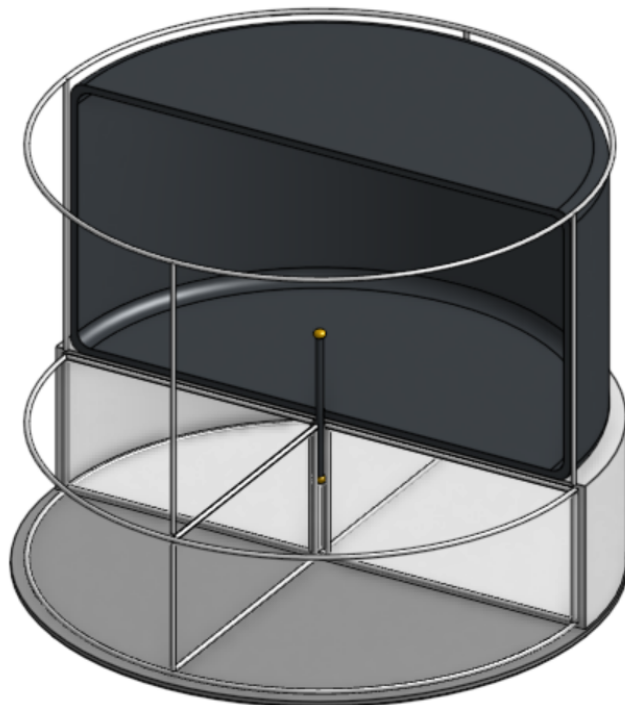
4. Place UpSectionTank.stl on the already assembled parts, glue the pipes of this part as follows:



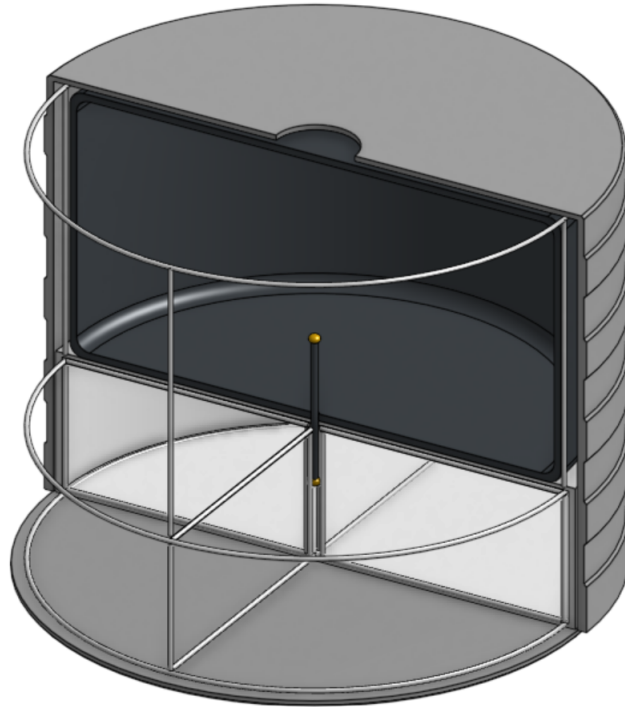
5. Insert part Bladder.stl in the already assembled and glue it to Tyvek.stl



6. Glue the PMT between the central section of the DownSectionTank.stl



7. Insert everything in Coating.stl and glue it.



8. Glue Lid.stl to one of the Coating.stl parts. Then join (DO NOT GLUE) the other Coating.stl part so it can be removed and show the inside of the tank. The final model should look like this:



## Observations, recomendations and warnings.

The following is a list of recommendations to consider regarding the printing and assembly of the model:

- It is recommended, for the sake of model strength and durability, that the thickness of the tubes in parts (a) to (c) should not be less than 1.2 centimeters.
- It should be noted that the minimum width a printed part can have will depend on the nozzle used. If feasible for the institution, it is recommended to use a 0.2mm nozzle.
- As for parts (e) and (f), it is possible to divide them into two sections by cutting the cylinder in half, eliminating the need for supports and reducing material consumption. Alternatively, they can be printed using the rectangular cross-section as the base and utilizing the model's arc. However, for aesthetic purposes, this is not recommended.
- For part (d), it is also recommended to divide it into two pieces and use a brim or a raft to avoid torque-related issues.



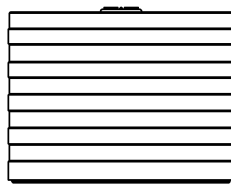
## Attachments

The following resources are attached to this document:

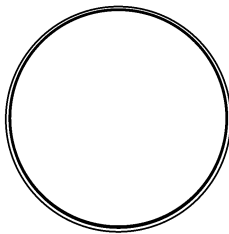
**Link to Onshape, to preview the model in CAD format.**

<https://cad.onshape.com/documents/197dfa1923a6aa0a26f684dd/w/1628a27c631645b582f07864/e/ba31f3f728d35d270fa34348?renderMode=0&uiState=63edb36669b1181978bbbed15>

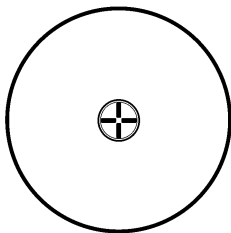
**Mechanical drawing from the model.**



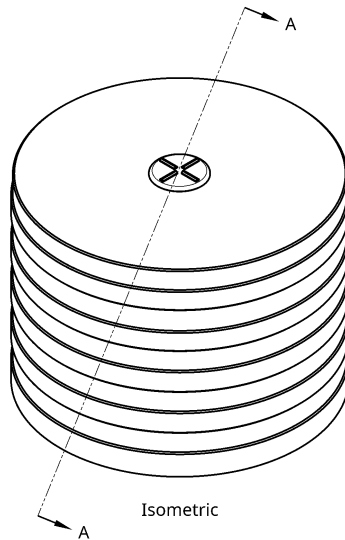
Frontal view



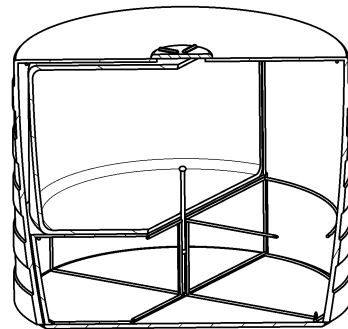
Bottom view



Top view



Isometric



Section view A - A

Photos of a real print.

