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Concrete Reinforcing Reinvented

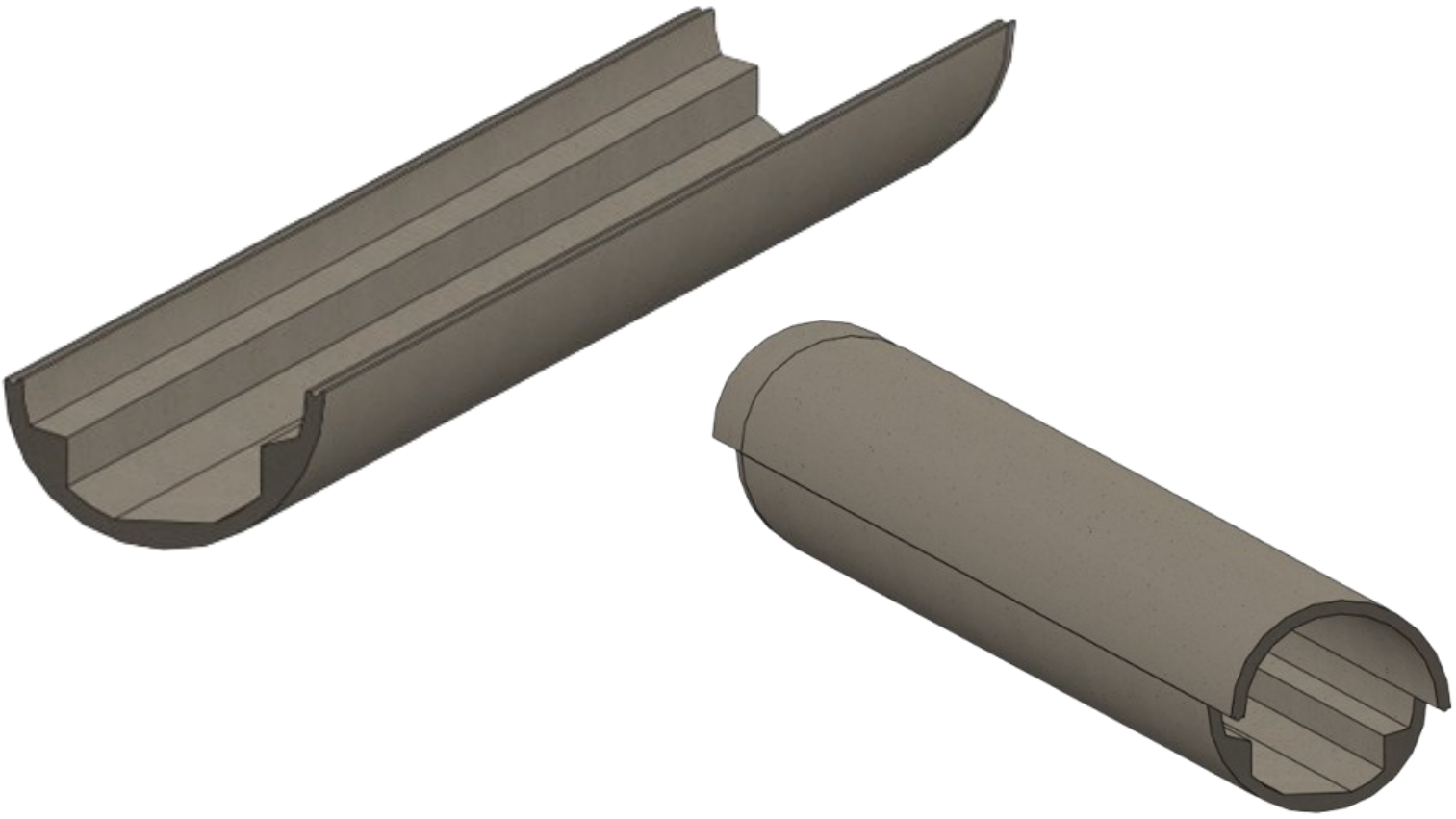
HYPERLOOP INFRASTRUCTURE

The majority of current proposals for Hyperloop tube infrastructure have been based on Steel as material of choice. We believe that it is not financially and environmentally viable to build the Hyperloop Vacuum tube with Steel tubes and bellow joints.

We believe that Concrete is the solution, but not just using the currently known technologies since the required dynamics and permeability for the tube exceeds what is obtainable from the current state of the art.

Our proposed solution

It is to build the tubes by assembling two half concrete tubes that will be joined together using polyurethane. In this way, the proposal will strongly facilitate not only the element production, but also the installation of the various rails, coils etc.



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Once the two halves will be glued together, they will be wrapped “in tension” with a resin impregnated FRP roving. The wrapping will happen with multiple layers. The initial wrappings will have a variable helix angle close to 0 to maximize axial compression. The helix angle and the roving tensioning force can be customized to the local stresses.

Continuing the wrapping with variable helix angles, the tube will arrive to be more and more covered. The final layers will be with an almost orthogonal helix angle with the scope of guaranteeing full cover of the concrete surfaces to ensure the required permeability and create radial compression to insure the top and the bottom halves of the tube will work as a structural unit. Having the joint between sections at almost the neutral axis (considering the tube spanning between supports) helps because in this area as the stresses will be low, and because the dynamics and the poor behavior of concrete absorbing energy (low resilience) the radial post compression will decrease significantly any risks. Radial post compression will also help with buckling, and taking side loads generated from the pod’s centrifugal forces.

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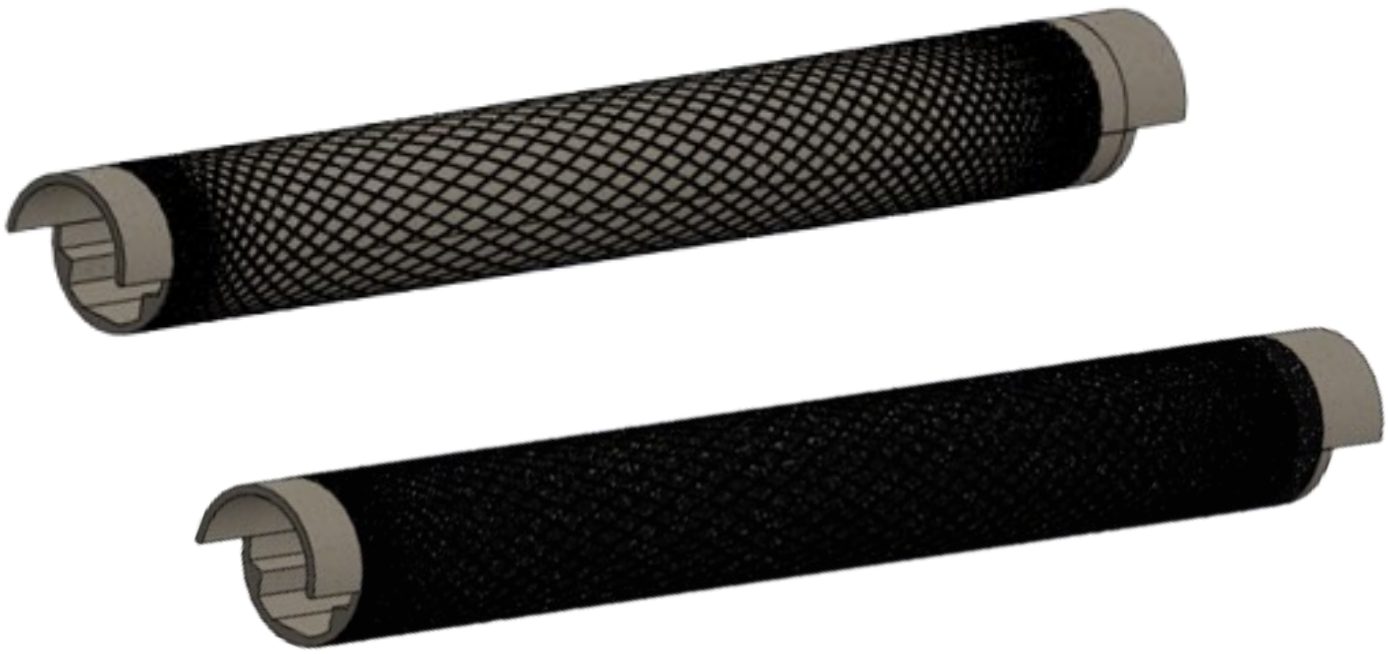
Main stresses from centrifugal forces will have direction along the tube axis, but since the load will be concentrated on few specific locations, then tensions stresses will be created with a direction orthogonal to the main stresses.



Another important issue is the thermal expansions joints. Our proposed method incorporates the possibility of creating low-cost joints that can be easily serviced.