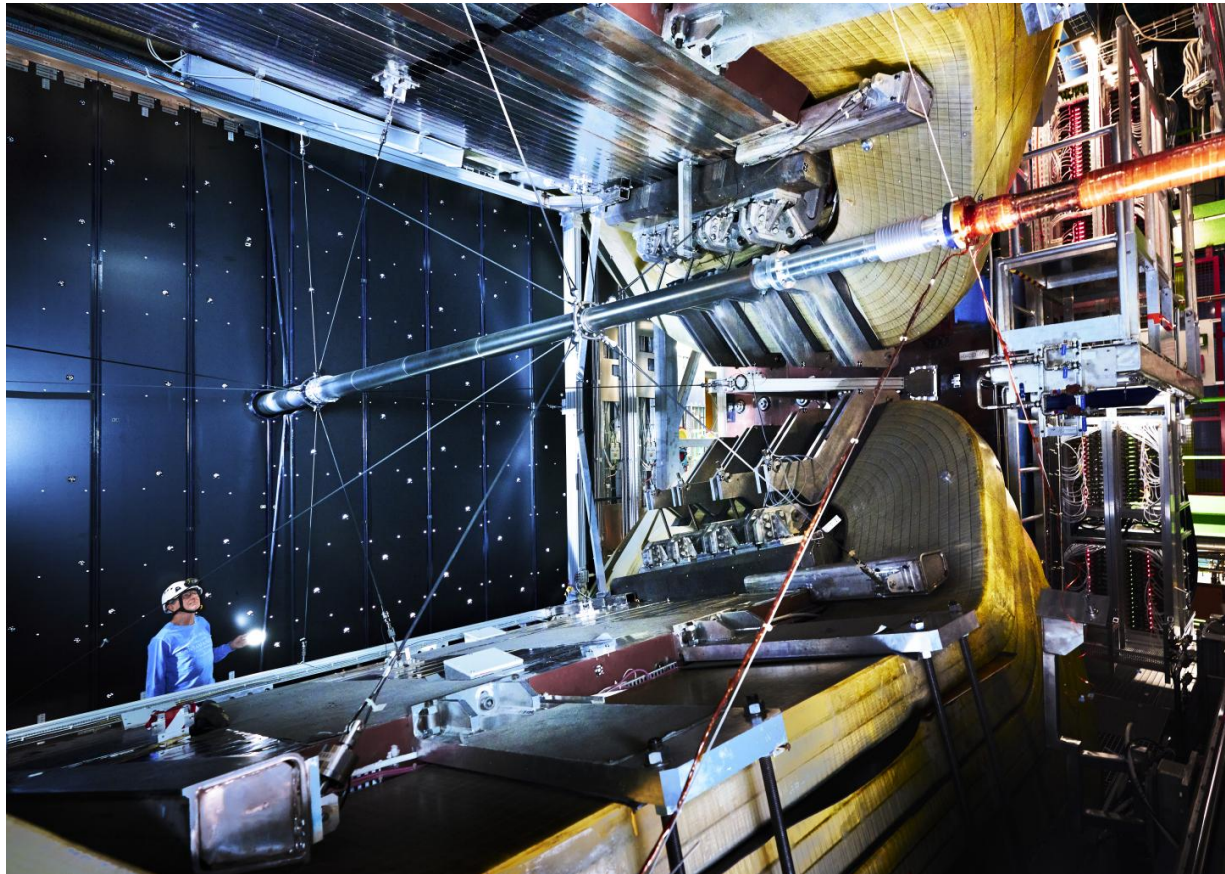


## LHCb Magnet Station Mock-up Space request

The LHCb experiment is one of eight collider experiments situated around the Large Hadron Collider at CERN. The LHCb magnet is built underground near the town of Ferney-Voltaire, France. Click this link to use google to walk through the experimental area.

[https://artsandculture.google.com/streetview/lhcb-detector/QQG2a2JP2ZUvGg?sv lng=6.096379356170019&sv\\_lat=46.2413209662&sv\\_h=331.27749500421294&sv\\_p=16.769722195793165&sv\\_pid=RICPOtwBOnUAAAQJODj1Bq&sv\\_z=0.0003781142836188911](https://artsandculture.google.com/streetview/lhcb-detector/QQG2a2JP2ZUvGg?sv lng=6.096379356170019&sv_lat=46.2413209662&sv_h=331.27749500421294&sv_p=16.769722195793165&sv_pid=RICPOtwBOnUAAAQJODj1Bq&sv_z=0.0003781142836188911)



Man standing between the LHCb magnet and first Sci-Fi detector plane. The access platform is very narrow, and it is how we will transport and install the LHCb Magnet Station Scintillator panels. Photo credit: <https://home.cern/science/experiments/lhcb>

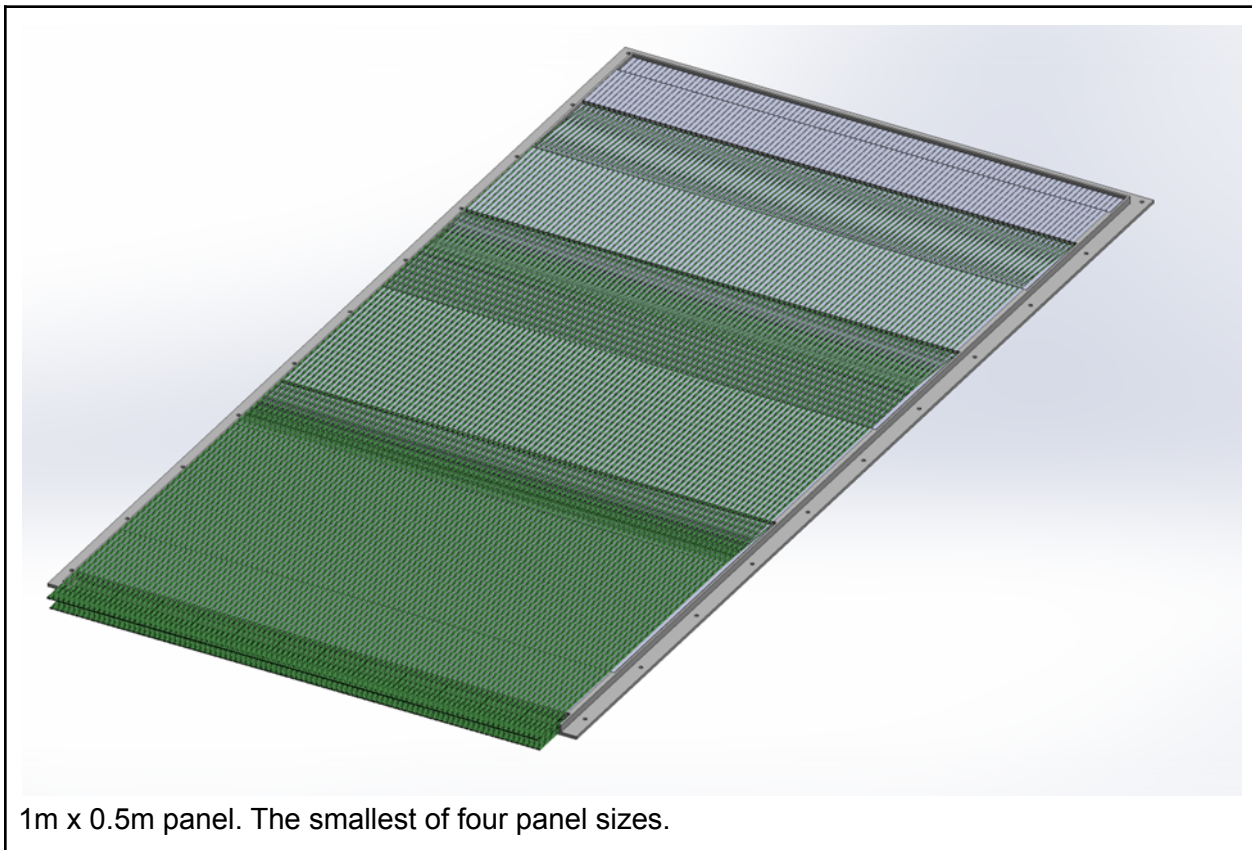
Our project is to build and install the LHCb magnet station, a scintillation detector package located inside the magnet. The detector is separated into four quadrants with 28 panels in each quadrant. Each panel contains 96 scintillating bars with a wavelength shifting optical fiber that will be routed to the DAQ outside of the high radiation area (~6m away). This means there are 2688 optical fibers that will be routed to the DAQ for each quadrant of the detector. If each optical fiber is 0.5mm in diameter, the required area for 2688 optical fibers is 672mm<sup>2</sup>, or about

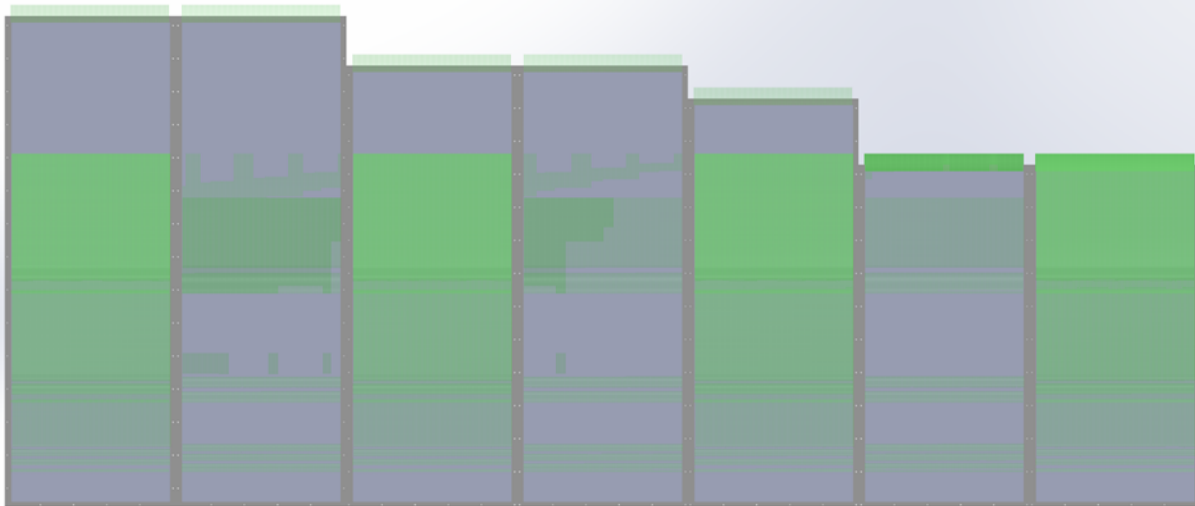
1.04in<sup>2</sup>. Although this number is small, it assumes a 0.785 packing factor which may not be possible.

The beam line is suspended by a spider web of cables and we cannot risk damaging these cables by entering the magnet to install or troubleshoot issues with the magnet station scintillator panels. Thus, we slide the panels into and out of the magnet volume using a rail mounted to the magnet frame. The panels will have latching features that connect adjacent panels, a feature we need to test.. We will also need to practice installation of the panels so that we know how to manage the optical fibers that will be routed to DAQ. We also need to know if there will be any physical constraints that arise from the latching and sliding features of the panels.

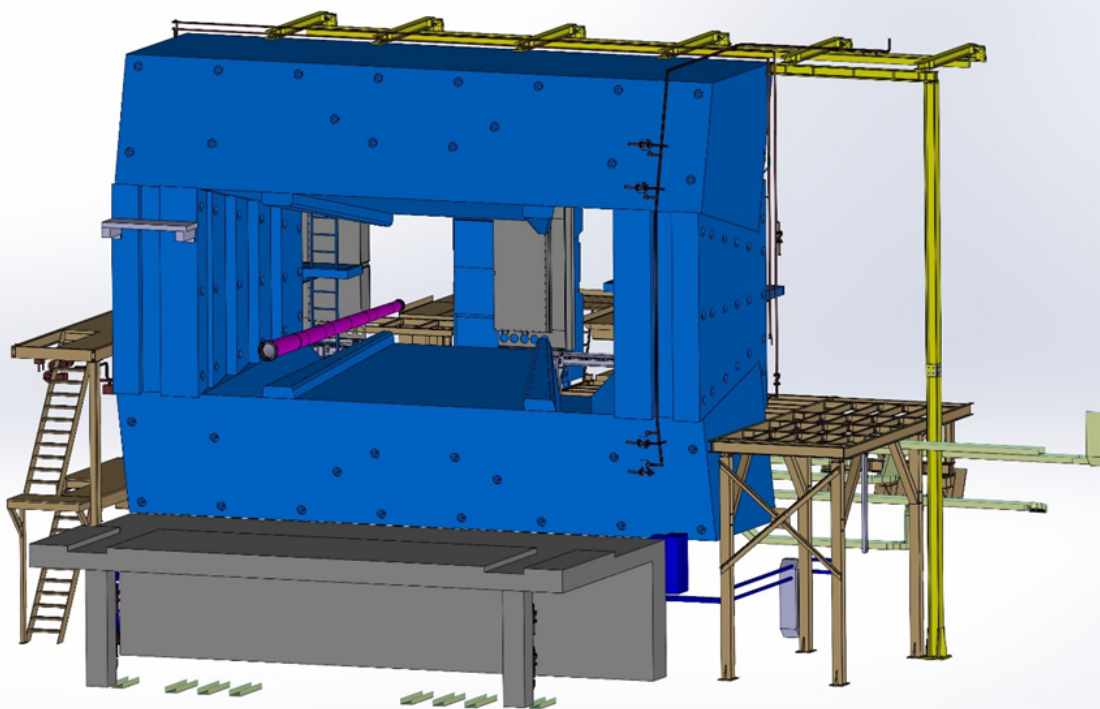
For these reasons we need to build a wooden mock up of one quadrant of the LHCb magnet station. The physical mock up has a 200" x 100" floor space requirement. If we also include space for working on the detector and the wooden frame of the mock up, our total floor space requirement grows to approximately 240"x240" or 20'x20'.

The work area should be in an area with sprinkler heads to provide fire protection. We will be using wood cutting saws and other hand tools. Tools will be removed from the area each day and will not be available to passers-by who are not skilled in using these tools. For this reason, an IWD should not be required as only skilled team members will be working on this project.

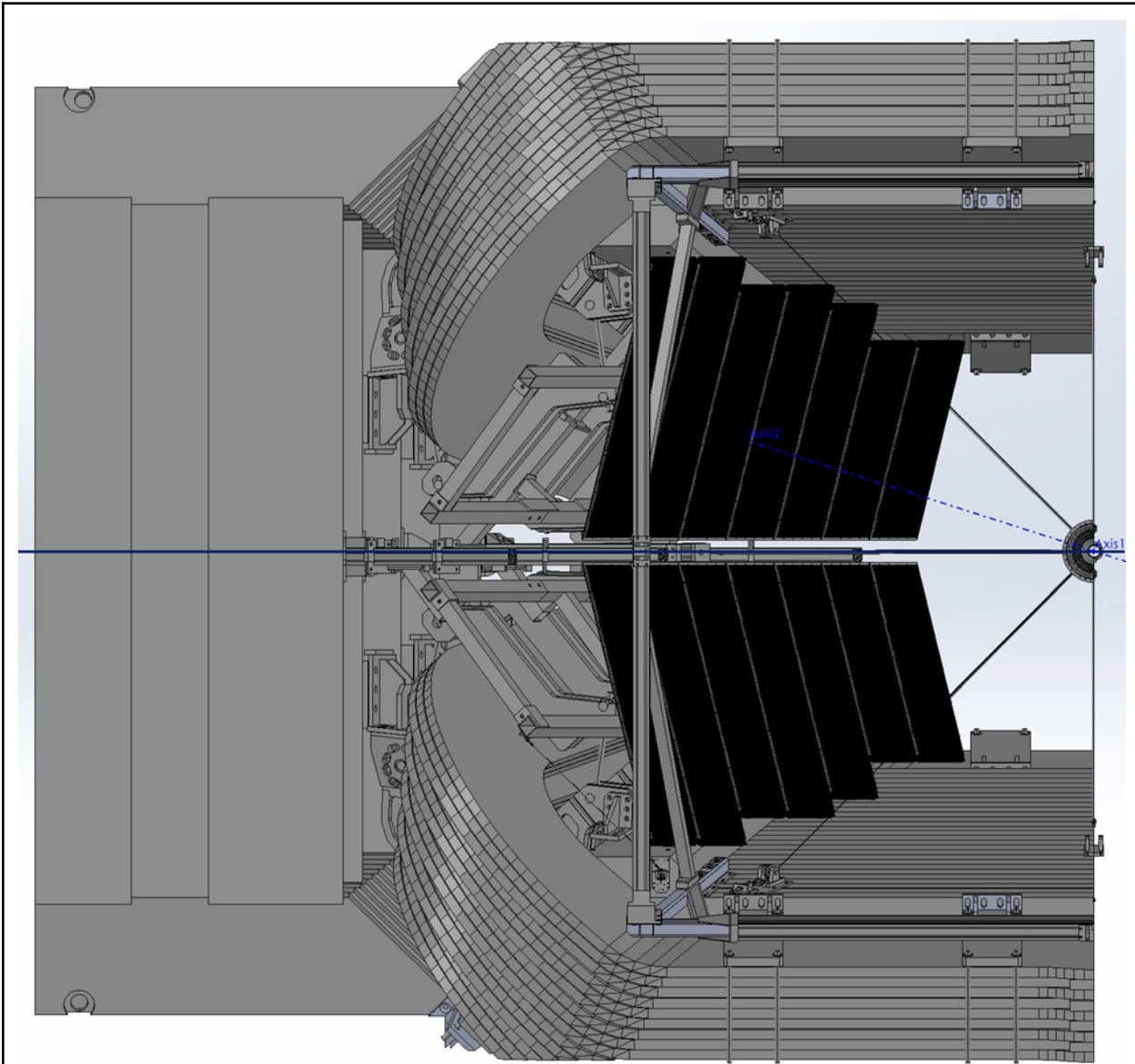




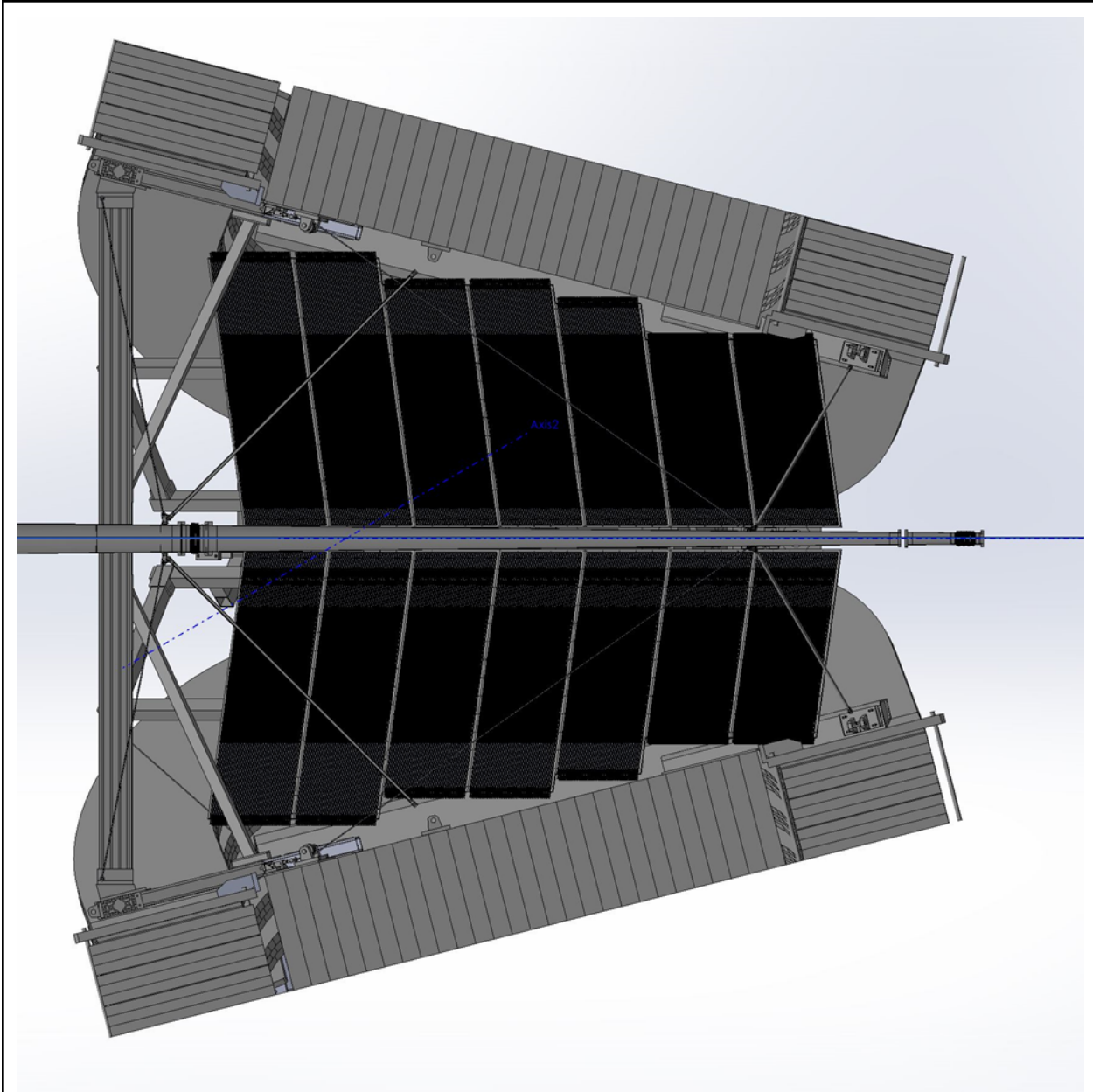
Seven panel scintillator assembly. Each panel is 0.5m long. The shortest panel is 1m, while the longest is 1.45m. Each panel contains 96 scintillating bars.



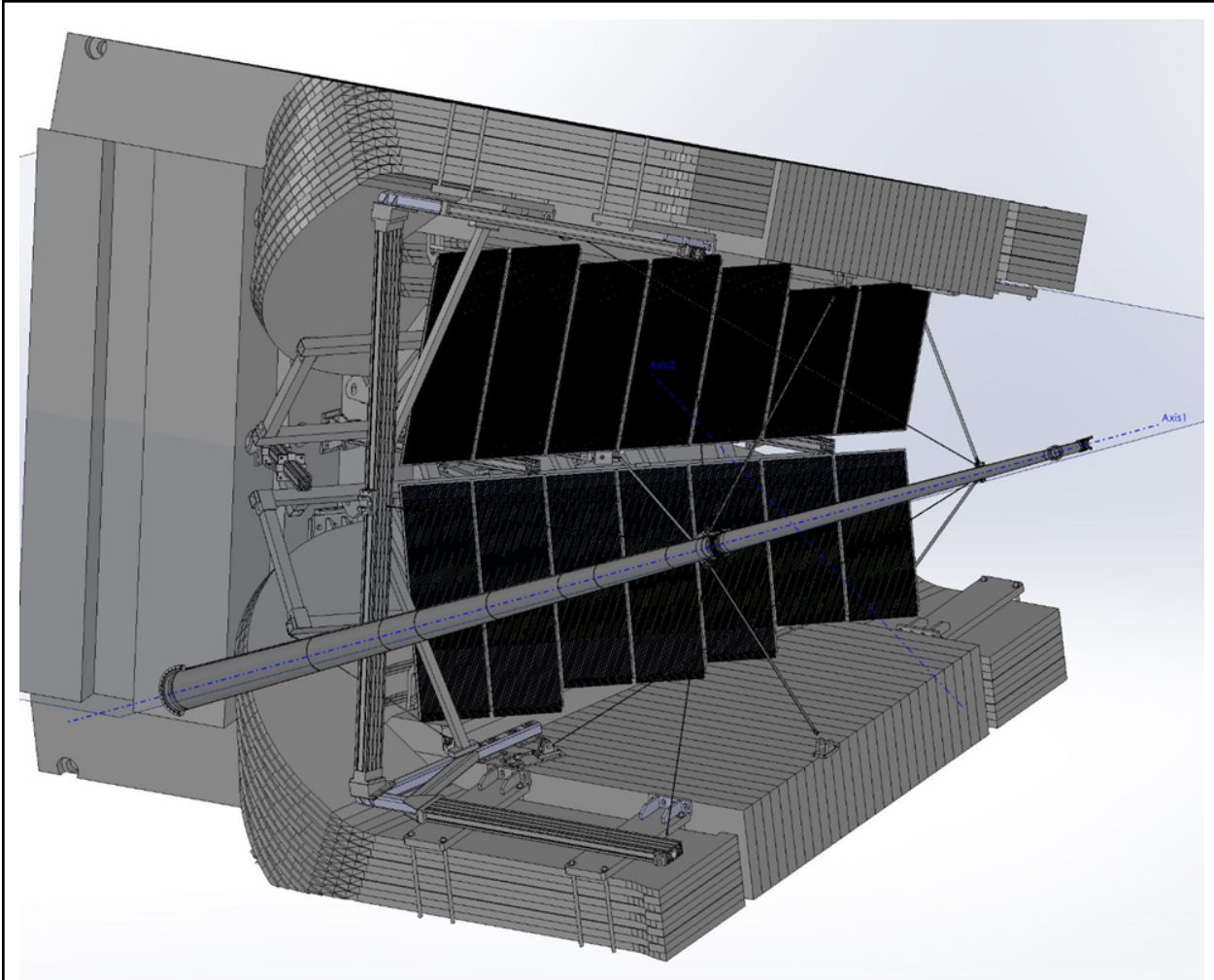
Skeleton CAD model of the LHCb magnet without the Sci-Fi detector. The access platform is not shown. See where the man is standing in <https://home.cern/science/experiments/lhcb>



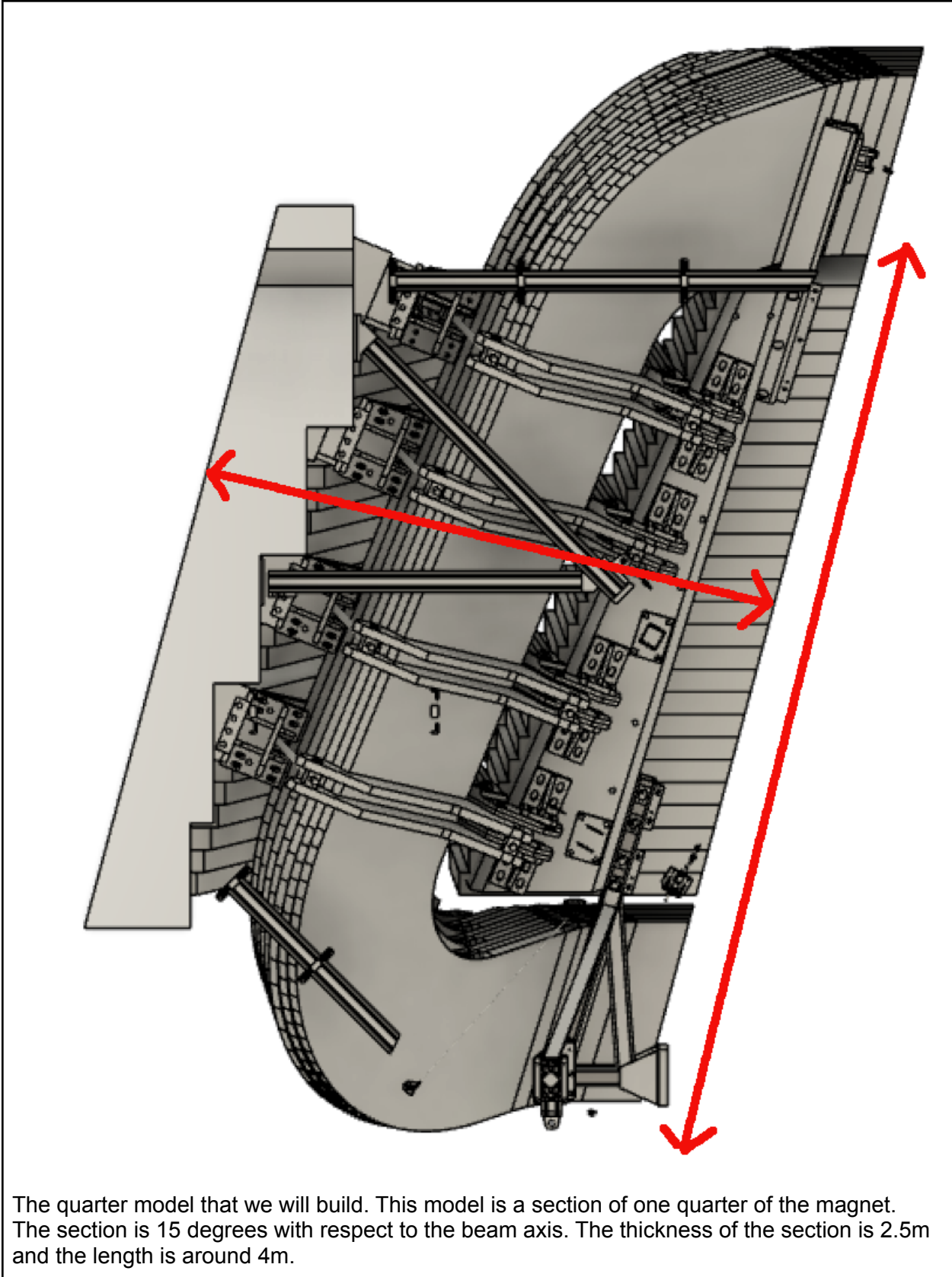
Front view of LHCb magnet half model. The gray model is built from a 3D scan of the magnet. The large black planes are detector panels and make up two quadrants of the magnet station detector package.

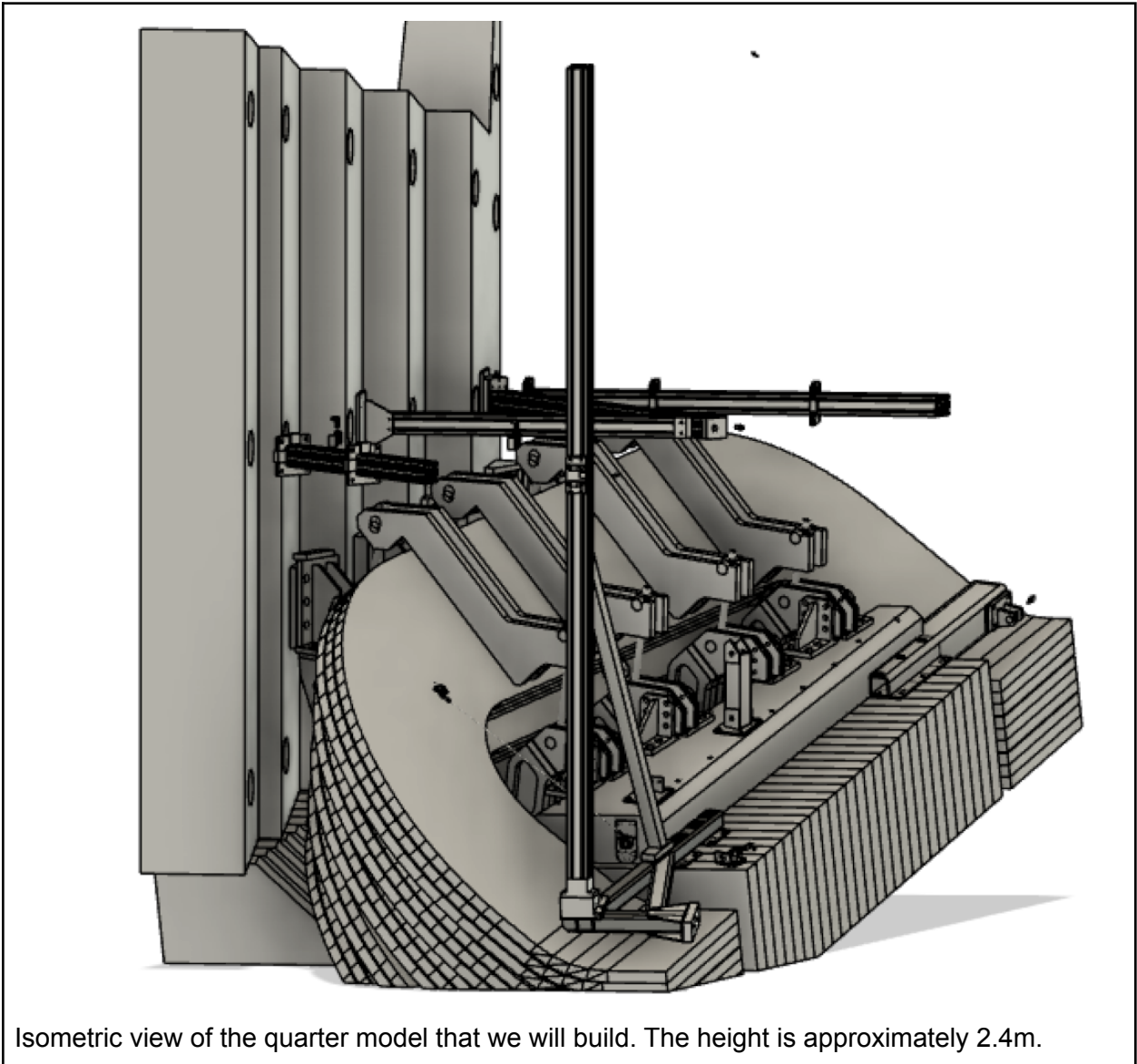


Side view of detailed LHCb half magnet model with two quadrants of the magnet station detector package.



ISO view of detailed LHCb half magnet model with two quadrants of the magnet station detector package.



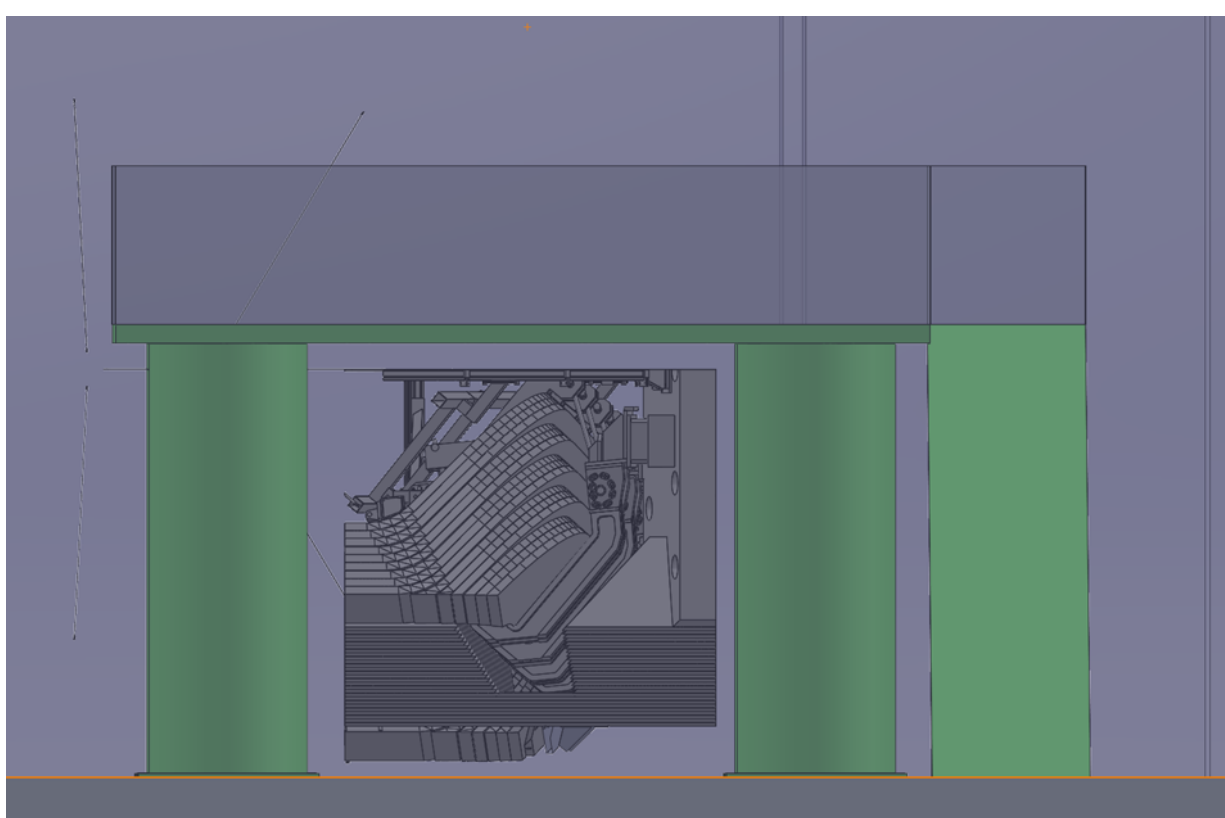


Isometric view of the quarter model that we will build. The height is approximately 2.4m.

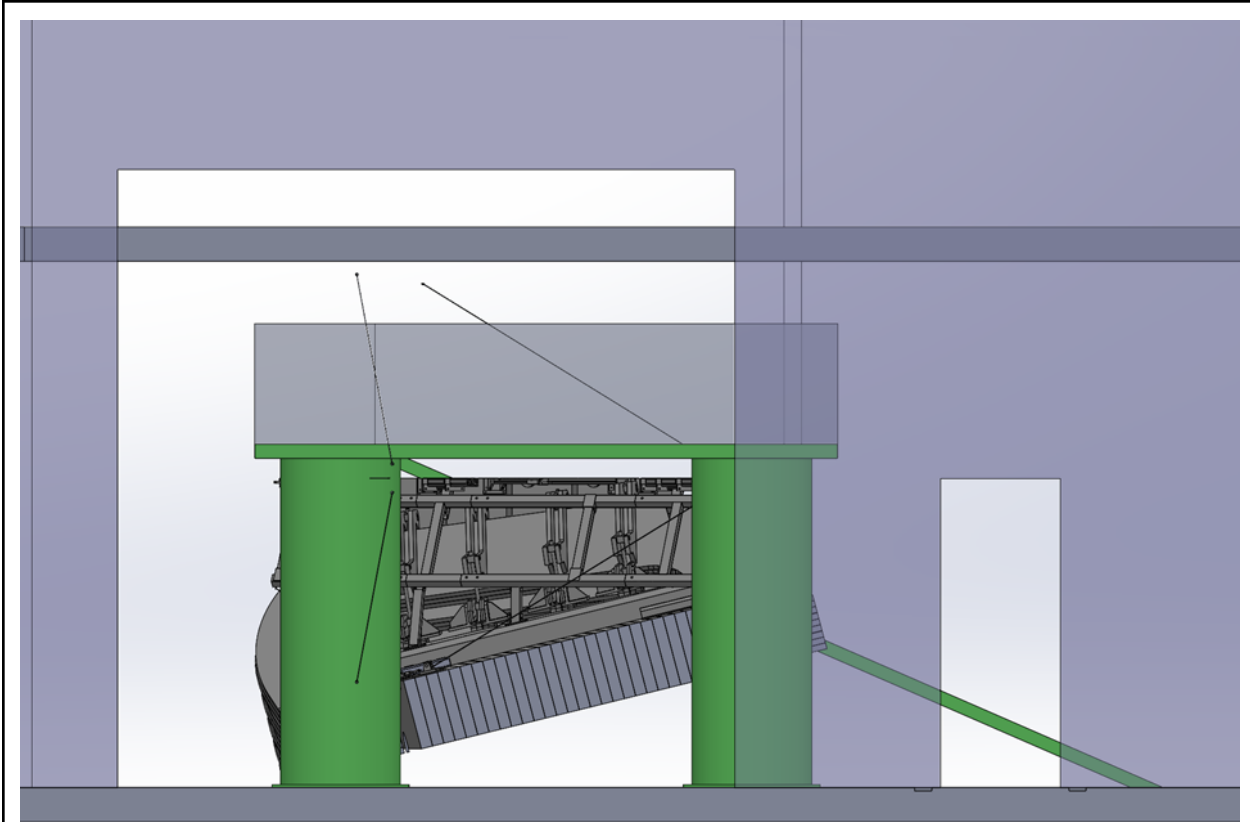




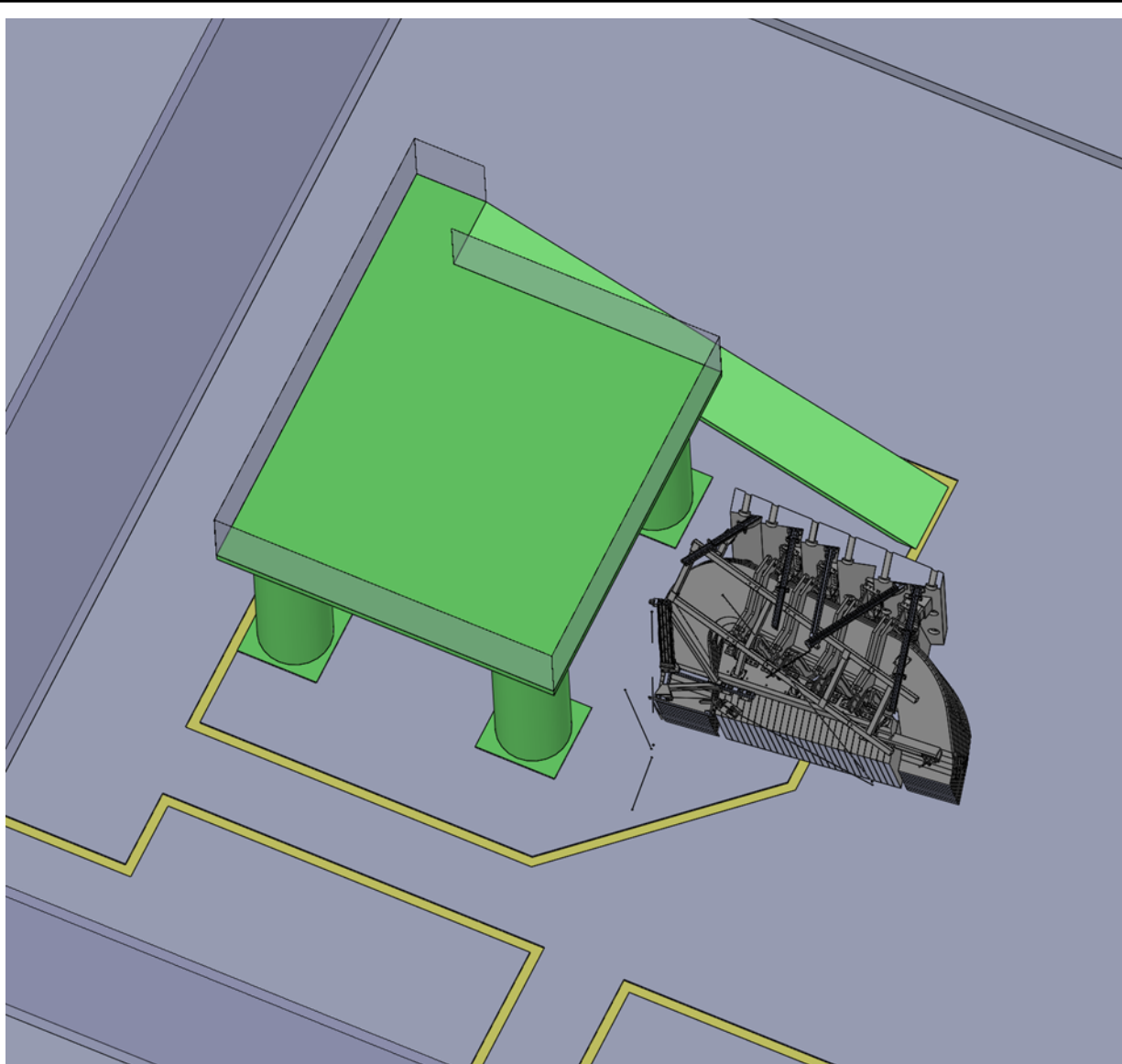
Proposed work location in building 53-0365. Work boundaries mostly coincide with yellow tape.



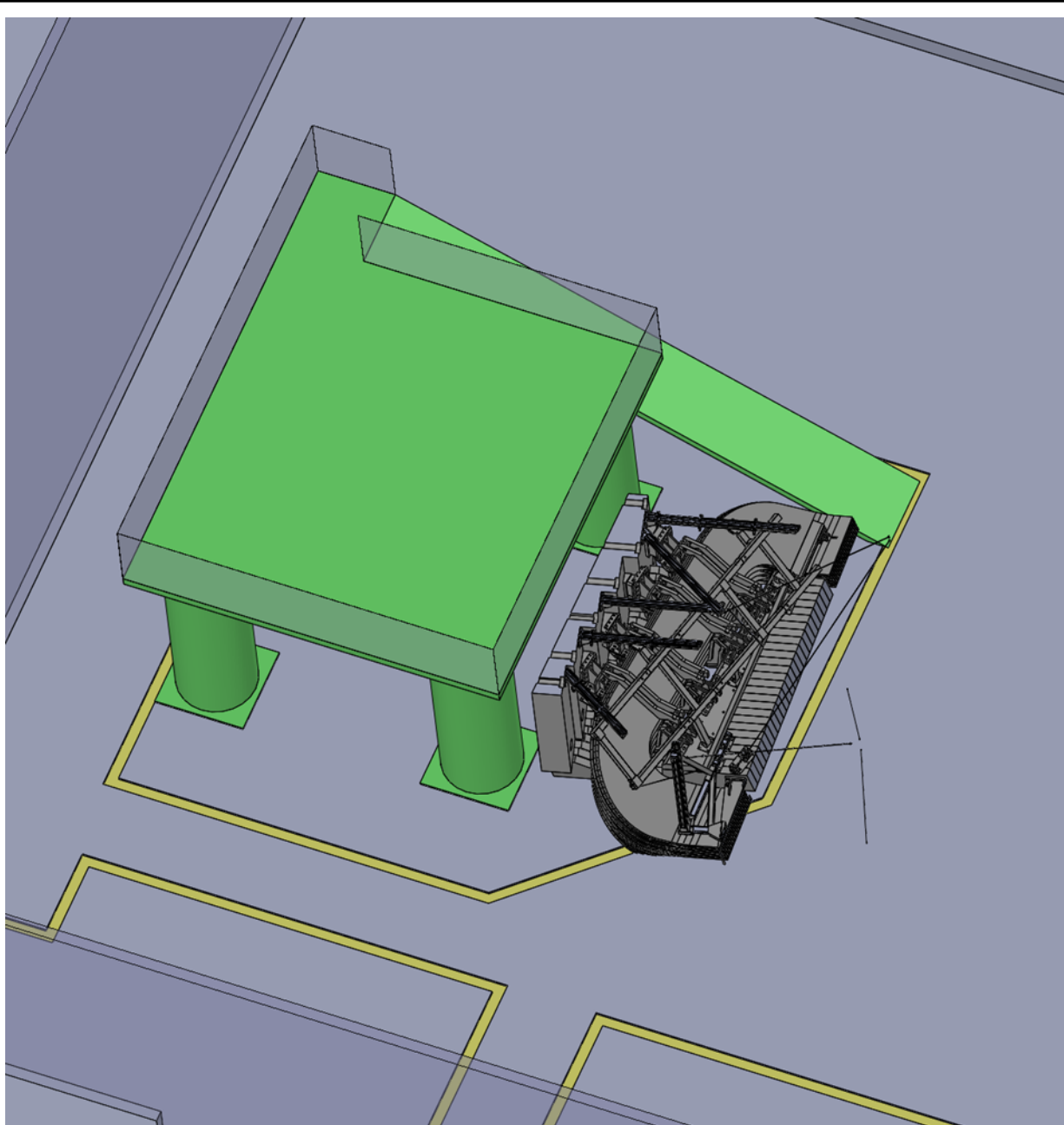
A side view of the quarter magnet model beneath the existing structure in building 53-0365. This view shows the storage location of the mock up. The mock up will be rolled into the storage location when not in use.



A front view of the quarter magnet model in the storage location.



Isometric view of the quarter magnet model next to the existing structure in building 53-0365.



Quarter model of the magnet shown in a working location. The space underneath the structure is available for work while the magnet mockup can be easily accessed.