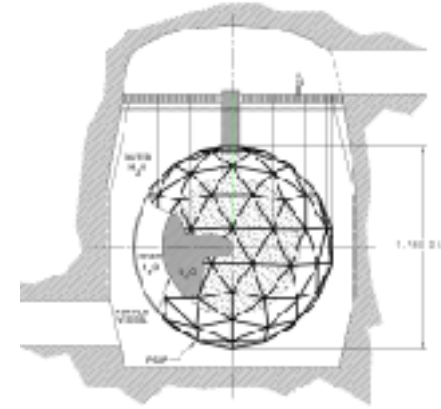


Sudbury Neutrino Observatory PMT Support Structure

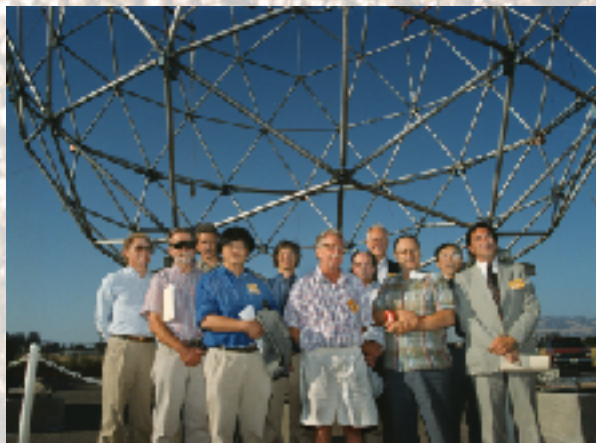
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PMT Support Structure Group at LBNL

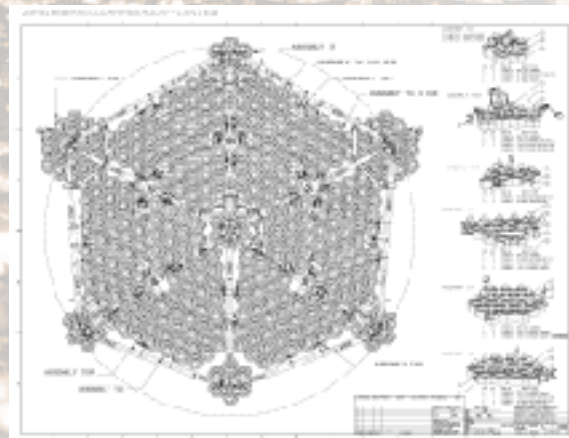
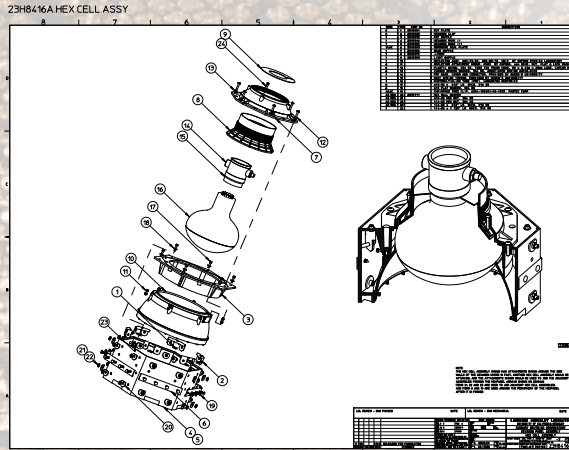
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PMT Support Structure Design Criteria

- Total mass 70,000 kg dry: 3600 kg wet. Maximizing the collection of optical signals from the D₂O target while minimizing a variety of background sources
- Maintaining performance and integrity of the array with no required maintenance for > 10 years in ultrapure water
- Minimizing the mass of components and fabricating array from low radioactivity materials
- Maintaining highly impermeable water and light barrier between the inner and outer light water regions
- Producing and fabricating the array from materials inimical to biological growth with low leaching and electrolytic characteristics, and low magnetic susceptibility
- Simple underground installation



Geodesic Sphere

- 889-cm radius 3-Frequency Icosahedron Geodesic Sphere
- 92 nodal connections with the 270 struts, the topmost node is replaced with toroidal ring to accommodate AV chimney
- 3 strut lengths with similar linear dimensions.
- Additional toroidal rings guide AV ropes through PSUP
- The geodesic sphere is suspended on 15 SS wire rope cables and secured to cavity floor with anchor cables
- All Stainless Steel 304L construction with <3 ppb [U,Th]
- Low activity welded construction, SS mass <18,000 kg
- CR Class 1000 achieved throughout fabrication/installation

PMT/Reflector Panel Arrays

- PMTs secured in ABS (Acrylonitrile-Butadiene-Styrene) black plastic hexagons with light reflectors
- ABS and SS304L mounting hardware < 3ppb [U,Th], Class 1000
- 751 panel arrays of between 7 and 21 PMTs
 - 9522 Hexagons
 - 60 AV ropes
 - 6 Calibration devices
 - 18 Connector studies
 - 9438 PMTs facing inwards
- Hexagons cover ~ 85% of the surface area at ~845cm radius
- Panels form water tight (99.95% "impermeable") and light tight (~95%) barrier

PMT Support Structure and PMT Array

- 9438 inward facing 8" PMTs with light concentrators resolving D₂O + 1 m H₂O shell
- 91 outward facing 8" PMTs + array of 23 PMTs on sleds suspended in H₂O
- Calibration device and water monitoring and circulation access through and mounted on PSUP
- ABS plastic and SS304L <3 ppb [U,Th]
- CR Class 1000 installation ~120 g mine dust on entire sphere
- Installed with < 2/3 of allocated schedule and manpower
- Anticipated 10-15 year life span without maintenance
- Positions and alignments known to ~cm and stable

