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LONGTERM TEST OF NCD ANCHOR SYSTEM

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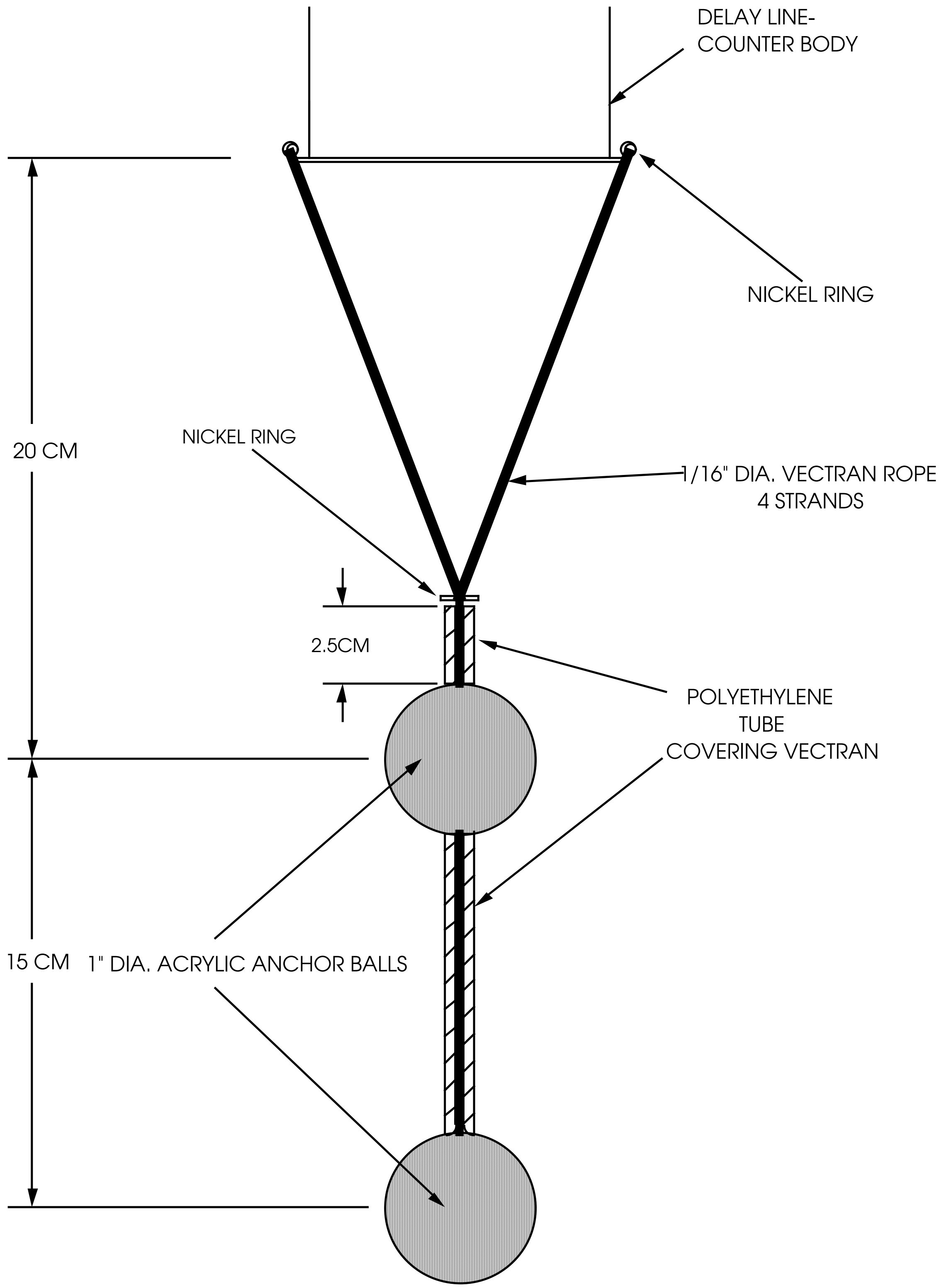
1) Introduction:

The Sudbury Neutrino Observatory (SNO) will deploy an array of 96 strings of ^{3}He filled proportional counters in a spherical acrylic vessel containing 1000 tonnes of D_2O. The strings vary in length from 4 to 11 meters and since they are buoyant, they must be anchored to the bottom of the containment vessel. The buoyant loads range from 8 to 23 kg and the design life of the experiment is 10 years. The system that anchors the detector strings to the containment vessel must be able to safely tolerate this maximum load for at least the design life of the experiment. The following describes a long-term test designed to test all components of the string anchor.

2) Description of String Anchor System:

A schematic diagram of the NCD anchor system is shown in figure I. The end of a string of detectors terminates in a flanged end cap. This end cap has four symmetrically located holes. A Vectran line is attached to each hole by a CVD nickel ring. These four Vectran lines then pass through another nickel ring and into a system of two acrylic balls separated by polyethylene tubes. The upper acrylic ball is used to grasp the detector string during deployment the lower acrylic ball is engaged into one of 96 acrylic attachment points are bonded to the inner shell of the acrylic vessel. These attachments are the subject of another long-term test, currently of 8 years duration.

FIGURE 1: NCD ANCHOR ASSEMBLY



3. Long Term Test Hardware:

The long term test hardware is shown in figure 2. Two detector ends with anchors attached are laser welded together. This allows two anchors to be tested at one time. These detector ends and anchors are fabricated from the same components as the actual NCD array. All fabrication procedures are identical to those used in the construction of the NCD array. The lower anchor is attached to an acrylic attachment point fixed at the bottom of a transparent acrylic tube. The upper anchor is attached to another acrylic attachment point that is free to slide within the transparent tube. This slider is equipped with a suspension hook which allows the whole test assembly to be hung. The bottom of the transparent tube also is equipped with a hook to which a 61kg weight is suspended, this is slightly in excess of 2.5 times the maximum load seen by the anchors. After the test hardware has been suspended and loaded the transparent tube is filled with 18 meg ohm water.

4. Results to Date:

The test hardware was loaded on August 18 1998 and has been under test for approximately one year. The temperature throughout the test was a constant 20C. The apparatus was inspected through the transparent tube at approximately one month intervals. No change was detected in the anchor assemblies.

5. Discussion:

Although high purity water was used for the test, no effort was made to maintain purity. This is not a concern since the Vectran, nickel and acrylic have all been tested in ultra pure water. The tests were conducted at a higher temperature (20C) than that of the actual experiment (10C). This is conservative since chemical reactivity roughly doubles for every 10C rise in temperature. The test will continue through the duration of the SNO experimental program.

FIGURE 2. SCHEMATIC - NCD ANCHOR TEST