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Neutron Detector Shielding Using Boron and Water[1] FREDERICK JUNG, ANDREAS BEST, ANI APRAHAMIAN, MICHAEL WIESCHER, University of Notre Dame — There has always been a need to develop better shielding for particle detectors from background radiation. With the development of DUSEL (Deep Underground Science and Engineering Laboratory at Homestake), new opportunities exist to make measurements away from the surface cosmic radiation. Doing measurements underground, coupled with better shielding, allows measurements of reactions that are too weak to observe otherwise. Underground, we can take advantage of thousands of meters of rock to shield detectors from cosmic background radiation. Even this rock can be insufficient, as a naturally occurring radioisotopes found in the rock can yield many kinds of radiation, such as gamma rays, beta rays, alpha particles, neutrons, and other fission products. We are designing and testing a shield made for our proportional neutron detectors made of boron and water. Water is used to slow down, or thermalize, the neutrons. Boron is in turn used to capture the incoming neutrons, due to its large neutron capture cross section. This shield was tested and the data has been analyzed, showing that we can achieve a factor of 63 reduction in the number of neutrons detected. We will also scale down this design so that it can provide background protection to detectors in the Nuclear Structure Laboratory at the University of Notre Dame.

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