

Detector Req ID	Detector Functional Requirement Description	Parent Req ID	Parent Req ID	Parent Req ID	Parent Req ID
FR.Det.LAr	The detector project shall include all systems necessary for design, construction, installation and operation	Link to LBNE			
FR.Det.LAr ConstCost	The detector project shall consider the design and construction cost of the facility	FR.Det.LAr			
FR.Det.LAr OperCost	The detector project shall consider the cost of operating the facility	FR.Det.LAr	<u>FR.Phys.LAr Oper.</u>		
FR.Det.LAr ESH	The facility shall operate in a safe condition at all times and in all phases (construction, installation, start-up, commissioning, operation, upset, emergency and shutdown).	FR.Det.LAr			
FR.Det.LAr ESH.STD	The order of preference for regulations, codes and standards shall be in the following order: 1) Statutory regulations, 2) Project specifications, 3) Codes and standards and 4) Published design guidelines and recommended practices.	FR.Det.LAr ESH			
FR.Det.LAr ESH.AHU	The primary Authority Having Jurisdiction (AHJ) is the City of Lead, South Dakota (Rephrase and put in LBNE)	FR.Det.LAr ESH			
FR.Det.LAr ESH.Seismic	The detector and associated systems shall be designed to withstand seismic accelerations expected in the locale of these systems	FR.Det.LAr ESH			
FR.Det.LAr Purity	The argon purity shall be high enough to allow the detection minimum ionizing particles at all locations within the detector active volume	FR.Det.LAr	<u>FR.Phys.LAr Tracking</u>		
FR.Det.LAr Cryo	The cryogenics system shall include all systems necessary for the receipt of LAr and LN2, LAr acceptance, LAr transport to the cryostat and storage in the detector cryostat	FR.Det.LAr			
FR.Det.LAr Cryo.ESH.ODH	Fermilab ES&H Manual #5064, Oxygen Deficiency Hazards (ODH) shall be used as the design guideline for cryogenic systems.	FR.Det.LAr Cryo	FR.Det.LAr Purity		
FR.Det.LAr Cryo.CoolDown	The system shall be designed to cool down the cryostat with argon gas to 120K. This requirement ensures that contaminants in detector components are frozen in place before liquid argon is introduced to the cryostat	FR.Det.LAr Cryo	FR.Det.LAr Purity		
FR.Det.LAr Cryo.CoolDownRate	The detector cool-down rate shall be chosen to ensure that temperature induced differential stresses in the detector do not exceed the yield stress of the detector components	FR.Det.LAr Cryo			
FR.Det.LAr Cryo.Recirc	The system shall allow recirculation and purification of the liquid argon inventory with a turnover rate < 10 days	FR.Det.LAr Cryo	FR.Det.LAr Purity		
FR.Det.LAr Cryo.Relief	The system shall provide an argon gas boil off recovery and reliquefaction system	FR.Det.LAr Cryo	FR.Det.LAr Purity		
FR.Det.LAr Cryo.Purify	The purification system shall be capable of removing contaminants from the cryostat prior to filling and shall maintain purity during operation	FR.Det.LAr Cryo	FR.Det.LAr Purity		
FR.Det.LAr Cryo.Monitor	The system shall provide a monitoring and control system	FR.Det.LAr Cryo			
FR.Det.LAr Cryo.NoNoise	The cryogenics system shall be designed so as not to introduce any noise into the electronics	FR.Det.LAr Cryo	FR.Phys.LAr Tracking		