

Advisory Preliminary SEDR  
CRT Upgrade DC Distribution  
7.15.16

Attendees: Linda Bagby, Rui An, David Lorca Galindo  
Reviewer: Steve Chappa  
Scribe: Linda Bagby

An advisory preliminary safety design review was conducted on the CRT Upgrade DC Distribution for compliance with the Fermilab Engineering Design Standards document. David presented MicroBooNE DocDB#5990 on behalf of the design team. The following recommendations were offered by Steve.

#### Power Supply

1. Label the rear panel of the power supply, module outputs and sense line connector.
2. Generate a drawing showing the power supply labeling plan with stud name and cable colors.
3. Use right angle square lugs, rather than ring terminals, to connect cables to power supply studs to prevent shorts.
4. Use and document proper hardware stack to connect power cables to power supply studs: cable lug/washer/ lock washer/nut.
5. Cover exposed power studs with Lexan.

**All recommendations have been included in the design and will be implemented as soon as the power supply arrives to Fermilab.**

#### DC Distribution Box

1. Slide 3: Correct gauge for Distrelec 2533, not 18AWG.

**After DC design has been modified: Maximum current is 7.5 A. 18 AWG wire is rated to 12 A.**

2. Slide 6: Note ground wire gauge as same as power leads.

**DC is grounded at the power supply.**

3. Provide a means of securing the flat cable within the DC Distribution box such that the electrical connections within the Distrelec 2533 (Item 5) are not inadvertently stressed if the flat cable is pulled.

**Two zip ties are used to surround the 5 wires black cable (item 4) in the internal side of the power distribution box. This release the stress of the Distrelec connector (item 5) in case the cable is pulled from the outside.**

#### Lapp Kabel cable

1. Power supply module current limiting features that are accessible to users via software are not an acceptable means of limiting power supply output currents.
2. The maximum output of a given power supply module is 30A. Per the Fermilab Engineering Design Standards document, page 5, each wire within the 12 conductor, 19AWG cable can handle ~5A (20AWG:4A/18AWG/6A). The design shows 5 parallel conductors each for power and return. In a bundle of 10, 19AWG can handle between 4 and 6A. 5A was defined as the limit. The maximum load for a given power supply module is 10 FEMs, each with an inline

fuse of .75A, for a total of 7.5A. David commented that the design should allow for 10A for each power supply module load to accommodate using the system for other experiments. The parallel wire configuration of 19AWG conductors does not meet the 10A requirement.

3. Suggestion: Change the multiconductor 19AWG cable to a twisted pair 10AWG (35A) with 18AWG twisted pair for the sense lines. Replace bridge connector (3a) with a unit equipped with built-in input fusing to limit current to 10A. Insure all downstream components, up to FEM fuse, can handle 10A.

**We have modified the design for using a two wires 10AWG from the power supply to a 7.5 A in-line fuse and two wires 12 AWG from the in-line fuse to the power distribution box. The two 10AWG conductors are rated to 35 A. The two 12AWG wires are rated to 21 A.**

Note: Steve commented that the documentation provided was excellent and the team should be commended for the level of detail presented.