



**Fermilab**  
ES&H Section

November 24, 1998

TO: Mike Gerardi  
FROM: Kamran Vaziri  
SUBJECT: Shielding Assessment Methodology

I have reviewed the two methodologies using two different sets of parameters to assess radiation shielding by the Beams Division. Comparison of the two methods shows differences from 0.5 to 1 ft. These are not significant differences by themselves, given the level uncertainties in the original calculations and the subsequent parameterizations. However, to be consistent through out the lab and the rest of the accelerator community, I recommend using the methodology that used 0.8 power energy scaling. This scaling is the accelerator community standard and has been verified at Fermilab through experimentation (see Marcia Torres' Ph.D. thesis). Since, the two methodologies agree, it is recommended that only in the new assessments this methodology to be used.

It should also be noted that FRCM requires a one-hour beam loss for the accident scenario. However, given the many levels of safety interlocks, machine diagnostic devices, administrative controls and some times the machine's own limitations, this time may be unreasonably long. In such cases, shorter times may be used, but the justification should be approved by the ES&H section and the supporting documentation to be kept in the shielding records.

Please call me if you had any questions regarding the above points.

References: J. D. Cossairt, "Topics in Radiation at Accelerators: Radiation Physics for Personnel and Environmental Protection", FermilabTM-1843.  
J. D. Cossairt, "A Collection of CASIM Calculations", Fermilab Report TM1140, 1982.  
A. I. Malensek, "Empirical Formula for Thick Target Particle Production", Fermilab Report FN-341, 1981.  
A. Van Ginneken and M. Awschalom, "High Energy Particle Interactions in Large Targets", vol 1, US Government Printing Office, 1983.  
A. I. Malensek, "Experimental Halls Methodology", 6/12/1991.  
Marcia Torres, "Neutron Radiation Fields Outside Shielding at the Fermilab Tevatron", Ph.D. Thesis 1996.

cc: Don Cossairt

File: Beams Division Shielding Methodology

Attachment 5