national accelerator laboratory

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COMMENTS ON "BOOSTER ENCLOSURE ACCESS CONTROL" (TM-242)

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"Booster Enclosure Access Control", TM-242 is a very preliminary description of a modus operandi of a safety system. Since many details are seemingly purposely left vague, a series of comments are presented which may be useful in filling in some of the many missing details.

1. Status Signs.

1.1 "Status signs" are for those not well trained and who should not be in "forbidden territory". Status signs are needed at frequent space intervals. The legend must be clear to all, and must be brief.

1.2 Suggested Status Signs.

	SIGN	CONDITION	LOCATION INSIDE ENCLOSURE	LOCATION ACCESS TO ENCLOSURE
a.	BEAM LOCKED OUT	*open status*	✓	✓
b.	SEARCH IN PROGRESS-SAFETY KEY REQUIRED	1. during *search & secure* 2. *closed status* but *beam locked out*	✓	✓
c.	DANGER - HIGH RADIATION AREA - KEEP OUT	*beam unlocked*	-	✓
d.	DANGER - HIGH RADIATION AREA - SCRAM	*beam unlocked*	✓	-

Signs (c) and (d) should be actuated by status logic and/or by radiation detectors. Signs (c) and (d) must conform to AEC specifications.

2. Interlocks.

2.1 There should be redundancy in the interlocks, the key-trees should be on one branch and the door and light interlocks on another branch. The two branches are AND'ed together at appropriate logical points in the safety system, preferably at each device being interlocked.

2.2 More than one device must be used to lock out the proton beam.

2.3 All interlocks must be fail-safe.

2.4 All safety interlocks must be positive acting, namely, if access is required to the booster enclosure during "closed status", then a key-tree must be enabled by a signal from the interlocked devices saying that they are actually in the "beam locked out condition" before a key may be withdrawn from the key-tree.

2.5 Testing of interlocks must mean exactly that. The operation of a door or light beam must lock out the beam and someone must verify the proper locking out of the beam. This test must go beyond testing the lights at the door being tested.

2.6 It should be possible to lock out a safety key-tree with a special key so that no key may be removed from it.

2.7 The safety key operated override boxes to bypass doors and light beams must be spring-loaded to prevent a single man with a handful of keys from defeating the system.

3. Miscellaneous Comments.

3.1 Experience at other accelerators has shown that dimming of lights and voice announcements are useless for conveying any messages.

3.2 Good status signs and horn blasts are useful to inform occupants of impending changes in status.

3.3 "Crash buttons" or "whatnots" must be clearly labeled. They must kill every form of power except emergency lighting and ventilation fans.

3.4 Random use of TV monitors may be fun, but have no place in a safety system.

3.5 Telephones between access doors and control rooms may be made part of the access control system as a third level of redundancy.

3.6 A key-tree interlock or access door interlock must not be relied upon or used to turn off beam routinely. This must be done from the control room before entry is authorized. See 2.4.

3.7 Specific procedures for first entry to the enclosure following beam injection must be established.

3.8 The interactions between linac and booster, as well as booster and the main accelerator must be considered carefully. The effects of each safety system on the other safety systems must neither disrupt operation or maintenance of other accelerators, nor endanger any personnel.