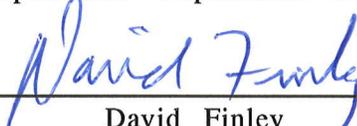


ACCELERATOR DIVISION ADMINISTRATIVE PROCEDURE
ADAP-11-0001
ENTRY INTO AND STARTUP AFTER A MAJOR SHUTDOWN
OF THE ACCELERATOR COMPLEX

RESPONSIBLE DEPARTMENT : ADHQ

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1.0 PURPOSE AND SCOPE

The purpose of this procedure is to describe how the Fermilab Accelerator complex is turned back on after the extended shutdowns that occur between running periods. A major shutdown is typically greater than a month long, or the Tevatron is warmed up to room temperature, or extensive accelerator maintenance or improvement work has taken place, or a changeover between collider and fixed target modes has been done. This procedure does not address the shorter, controlled shutdowns that occur during the course of a run for maintenance and repair of specific components, or improvements to a few specific subsystems.

1.1 POLICY

It is the Accelerator Division Policy that beam will not be introduced into any accelerator until

- a. equipment and components are configured in a manner to safely allow acceleration of beam.
- b. operational beam limits have been established consistent with the requirements of the safety envelope contained in the current Safety Assessment Document for the Accelerator Complex.

2.0 RESPONSIBILITIES

2.1 AD ASSOCIATE DIVISION HEAD FOR OPERATIONS

The AD Associate Division Head for Operations is responsible for preparing this document and updating it on an as-needed basis. If the position is unfilled, the Head of Operations will serve.

2.2 AD ASSOCIATE DIVISION HEAD FOR ENGINEERING

The AD Associate Division Head for Engineering is responsible for coordinating shutdown activities and assuring that necessary maintenance is carried out.

2.3 AD DEPARTMENT HEADS

All department heads are responsible for ensuring that the provisions relevant to their departments are carried out. In the event of a change in departmental procedure that affect accelerator startup the AD department heads are responsible for ensuring that the AD Associate Head for Operations is informed. In addition the AD Department Heads (or their designees) have to sign-off on the relevant restart sheets and checklists.

2.4 AD DIVISION HEAD

The AD Division Head is responsible for overseeing that the provisions of this procedure are carried out. The AD Division Head is responsible for sending the memos to the Operations Department Head to permit restart of the various systems.

The AD Division Head is also responsible for designating a major shutdown. Such a designation is accomplished by a memo to the AD Operations Department Head rescinding authorization to introduce and accelerate beam in the accelerator complex until re-authorized in writing as described in this procedure.

3.0 ACCELERATOR STARTUP PROCEDURE

3.1 ACCELERATOR COMPLEX

The Accelerator Complex consists of the Proton Source, Antiproton Source, Main Ring, Tevatron and Switchyard systems.

3.2 BEAM PERMITS

During a run there is a beam permit for each of the accelerator systems (an example of one is given in Attachment 1). These permits are usually created before the beginning of a run and indicate the maximum beam power allowed in the appropriate accelerator system. The beam power limits are determined by the Division Head in consultation with the ES&H Section Head and are contained within the Safety Envelope limits. In general the operational beam permit limit will be less than or equal to 90% of the Safety Envelope limit. Beam permits are reviewed by the AD Operations Department Head and the AD Systems Department Head for the accelerator in question, the AD Associate Head for Operations, and approved by the AD Division Head. These permits are read and signed by the Operations Department personnel to indicate that they have understood the beam power limits and are posted in the AD Main Control Room.

The complete list of beam permits are

- a. Linac Beam Permit
- b. Booster Beam Permit
- c. Antiproton Source Beam Permit
- d. Main Ring Beam Permit
- e. Tevatron Beam Permit
- f. Switchyard Beam Permit

3.3 SIGN-OFFS & CHECKLISTS

The complete list of sign-off and checklists needed for this procedure are

- a. Accelerator System Restart Sign-off (see Attachment 2)
- b. AD Mechanical Support Department Procedure ADDP-ME-0101
"Mechanical Support Department Quality Assurance Sign-off for
Maintenance and Upgrade Tasks on the Accelerator Complex"
- c. AD Cryogenics Department Procedures
 - ADDP-CR-9203 "Cryogenic Checklist Following Cold Tevatron
Component Change Procedure"
 - ADDP-CR-9204 "Cryogenic Checklist Following Cold Proton
Bend Component Change Procedure"
 - ADDP-CR-9205 "Cryogenic Checklist Following Cold Muon Bend
Component Change Procedure"
 - ADDP-CR-9206 "Cryogenic Checklist Following Cold Meson
Bend Component Change Procedure"
- d. AD EE Support Department Procedures
 - ADDP-EE-4011 "TEV QPM End of Shutdown Start-up Procedure"
 - ADDP-EE-4013 "Low Beta QPM End of Shutdown Start-up
Procedure"
 - ADDP-EE-4014 "Low Beta 1 kA Quad End of Shutdown or End of
Repair Start-up Procedure"

A valid Beam Permit and a valid Accelerator System Restart Sign-off (see Attachments 1 and 2) are required before a given accelerator system may accept and/or accelerate beam.

By their signatures they are indicating that the work was indeed completed and that to their knowledge the system is ready to accept beam. In addition, the signature of the department head responsible for a particular system indicates that the radiation shielding for the system is configured as described in the current shielding assessment.

3.4 SYSTEM TURN-ON

3.4.1 Generic Conditions

A valid Beam Permit and a valid Accelerator System Restart Sign-off (see Attachments 1 and 2) are required before a given accelerator system may accept and/or accelerate beam.

System startup is initiated by a memo that is sent by the AD Division Head to the AD Operations Department Head indicating that it is ready for beam transport. The memo will also indicate the maximum beam power that can initially be run through the system. If this beam power is not that given in the system beam permit, the conditions that will have to be fulfilled before the beam permit become fully operational are included in the memo.

3.4.2 Tevatron

In addition to the generic conditions given above, the following specific conditions apply to the Tevatron.

- a. The mechanical and cryogenics groups that work on the Tevatron do the walk-through following ADDP-ME-0101 and ADDP-CR-9203. After the walk-through, a meeting is convened that is attended by the AD Division Head (or designee), AD Cryogenics, Mechanical, MAD Department Heads or their designees. The walk-through data is examined to ensure that all of the work was done properly and everything has been restored properly. At this point, the walk-through procedure is signed-off and permission can be given to initiate Tevatron cool down. This permission, with any conditions if necessary, is formally transmitted by a memo from the AD Division Head to the AD Operations Department Head. The permission can be verbally transmitted by the AD Division Head, but has then to be followed by the written memo within seventy-two hours.
- b. The AD EE Support Department carries out an electrical walk-through inspection following ADDP-EE-4011, 4013, 4014. After the walk-through, a meeting is convened that is attended by the AD Division Head (or designee), the AD MAD Department Head and EE Support Department Head or their designees. The walk-through checklists and data are examined to ensure all the work was done correctly and that everything has been restored properly. At this point, the walk-through procedure is signed-off and permission can be given to power the Tevatron when it is cold. This permission, with any conditions if necessary, is formally transmitted by a memo from the AD Division Head to the AD Operations Department Head. The permission can be verbally transmitted by the AD Division Head, but has then to be followed by the written memo within seventy-two hours.

3.4.3 Switchyard

In addition to the generic conditions given above, the following specific conditions apply to the Switchyard.

The mechanical and cryogenics groups that work on the Switchyard do a walk-through following ADDP-ME-0101 and ADDP-CR-9204, 9205, 9206. After the walk-through, a meeting is convened that is attended by the AD Division Head (or designee), AD Cryogenics, Mechanical, MAD Department Heads or their designees. The walk-through data is examined to ensure that all of the work was done properly and everything has been restored properly. At this point, the walk-through procedure is signed off and permission can be given to initiate Switchyard cool down. This permission, with any conditions if necessary, is formally transmitted by a memo from the AD Division Head to the AD Operations Department Head. The permission can be verbally transmitted by the AD Division Head, but has then to be followed by the written memo within seventy-two hours.

4.0 DOCUMENTATION

Copies of all beam permit authorization memos, Accelerator System Restart Sign-off forms, beam power permit forms, and cooldown forms will be retained by AD Headquarters for a period of four years. In addition the currently active beam power permit forms for all accelerator systems will be prominently displayed in the Main Control Room.

5.0 EXTRA-DIVISION DISTRIBUTION

None.

BEAM PERMIT EXAMPLE



Antiproton Source Beam Safety Envelope

The maximum hourly beam power transmitted by the Main Ring accelerator to the Antiproton production target is limited to that provided by 1800 pulses of 3×10^{12} protons per pulse at a kinetic energy of 120 Gev.

The maximum hourly beam power transmitted by the Main Ring accelerator to the Antiproton source is limited to that provided by 360 pulses of 1×10^{11} protons per pulse at 8 Gev kinetic energy in any one hour.

The maximum hourly beam power transmitted by the Booster accelerator to the Antiproton source is limited to that provided by 360 pulses of 1×10^{11} protons per pulse at 8 Gev kinetic energy in any one hour.

No accelerator or beam line will transmit beam without an operational beam interlock safety system.

Antiproton Source Operating Beam Limits

The maximum beam intensity transmitted by the Main Ring accelerator to the Antiproton target will be limited to 3×10^{12} protons per pulse .

The maximum charge transmitted by the Main Ring to the Antiproton target will be limited to 5.1×10^{15} protons per hour at 120 Gev kinetic energy.

The maximum beam intensity transmitted by the Booster or Main Ring to the Accumulator or Debuncher will be limited to 1×10^{11} protons per pulse.

The maximum charge transmitted by the Booster or Main Ring to the Accumulator or Debuncher will be limited to 3.42×10^{13} protons per hour at 8 Gev kinetic energy.

Examples: Charge/hr = number of pulses/hr \times number of protons/pulse

#1 1700 pulses per hour at 3×10^{12} protons per pulse to the target = 5.1×10^{15} protons/hr

#2 2100 pulses per hour at 2.42×10^{12} protons per pulse to the target = 5.1×10^{15} protons/hr.

#3 360 pulses per hour at 9.5×10^{10} protons per pulse to the Accumulator = 3.4×10^{13} protons/hr.

#4 360 pulses per hour at 9.5×10^{10} protons per pulse to the Debuncher = 3.42×10^{13} protons/hr

Special conditions and comments:

Prepared By _____
Antiproton Source Department Heads/Date

Reviewed by _____
Operations Department Head/Date

Approved by _____
Accelerator Division Head/Date

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