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(September, 2011)

c. Accelerator Commissioning Process

d. Shielding Assessment Review

B. Accelerator Facility Operations

1. Operational Planning and Procedures - Salient Features from COO of Value to Accelerator Safety
   a. Operational Organization and Administration
      - *Goals and means to achieve them*
      - *Controls necessary to implement policy*
      - *Roles, responsibility, accountability, authority*
      - *Physical security*
      - *Ensuring sufficient human and material resources for operations*
      - *Monitoring operations performance*
      - *Operations goals*
      - *Holding people accountable for performance*
      - *Training of managers and supervisors for operations*
   b. Operations Management
      - *Work planning and control of experiments and operations*
      - *Authorizing changes to equipment*
      - *Assuring systems are in proper alignment*
      - *Assuring compliance with ASE limits*
      - *Assuring proper status information on control panels and alarms*
      - *Documenting equipment deficiencies*
      - *Documenting maintenance activities*
      - *Assuring operational tests are performed following maintenance or modifications*
      - *Controlling temporary modifications*
      - *Assuring a document control system is in place*
   c. Training, Communications and Notifications
      - *Operator qualifications and periodic re-training*
      - *On-shift training*
      - *Explaining the safety analysis and ASE to operations personnel*
      - *Providing guidance to operators so that they understand safety requirements*
      - *Training policy*
      - *Documenting training*
      - *Assuring both normal and emergency communications*
      - *Methods of communications*
      - *Procedures to ensure appropriate notifications for ESH and mission concerns*
      - *Documenting notifications*

- *Graded approach to training and communications programs*

d. Abnormal Events
   - *Investigating near miss situations and specific events*
     1. *Evaluating near miss using a USI Determination*
   - *Allowing deviations from ASE if no other way to protect people or environment*
   - *Qualifications of investigators*
   - *Collecting information*
   - *Structured root cause analyses and extent of condition*
   - *Ensuring corrective actions are implemented*
   - *Graded approach to investigating abnormal events*

e. Configuration Management
   - *Control of equipment and system status*
     1. *Authorizing changes to equipment status*
     2. *Checking for proper equipment and system lineup*
     3. *Identifying equipment deficiencies and documenting*
   - *Assuring ASE limits are maintained and USI determination process is used*
     1. *Operator responsibilities*
     2. *Assurance methods*
   - *USI determination process and change control of safety related systems*
   - *Configuration Control*
     1. *Identifying components that require labeling*
     2. *Label information and placement*
     3. *Replacing labels*
   - *Graded approach to configuration management*

f. Credited Controls
   - *Training operations personnel on the safety analysis*
   - *Assigning operators responsibility for Credited Controls*
   - *Using approved alternatives for Credited Controls*
   - *Assuring Credited Controls are implemented*
   - *Assuring testing and surveillances are completed*

g. Credited Controls Certification and Maintenance
   - *Documenting the bases for Credited Controls*
   - *Testing Credited Controls*
   - *Bypassing Credited Controls*
   - *Performing maintenance on Credited Controls*
   - *Returning Credited Controls to service*

h. Machine Guarding
   - *Controlling access to accelerator enclosures*
     1. *Access control systems (ACSs) for different modes of operation and maintenance periods*

2. *Writing and reviewing sweep procedures*
3. *Assuring the ACS is operable*
4. *Radiological posting for accelerator enclosures*
5. *Training*

i. Ancillary Operations
- *Applies to operation of cryogenic plants, motor-generator sets, accelerator-watch, etc.:*
  1. *Operator responsibilities*
  2. *Operator knowledge and qualifications*
  3. *Operator response to process problems*
- *Communications between ancillary operators and Main Control Room*

j. Human Performance and Procedures
- *Human performance training*
- *Feedback on procedures and processes*
- *Minimum procedures*
  a. *Operations startup*
  b. *Normal operation*
  c. *Emergency conditions*
  d. *Conduct of maintenance*
  e. *Approval and conduct of experiments*
  f. *Review and approval of facility modifications*
  g. *Management of safety-related changes*
  h. *Control of facility access*
- *Procedure development*
- *Procedure content*
- *Procedure changes and revisions*
- *Procedure review and approval*
- *Procedure availability*
- *Procedure use*

k. Work Planning and Control for Safety Related Systems
- *Work planning for operations and maintenance*
- *Work authorization and documentation*
- *Post maintenance testing and returning equipment to service*
- *Alarm status (e.g., alarms disabled, set-point changes, masking)*
- *Coordinating work during maintenance days*
- *Control of temporary modifications*
- *Continuous improvement/feedback programs*

l. Contractor Assurance System
- *Independent verification to assure reliable operation of Credited Controls*
- *Occasions requiring independent verification*

- *Verification techniques*
- *Contractor oversight*

2. Safety Systems Unique to Accelerators
   a. Beam-Interlock Systems
      - *Responding to beam-loss alarms and radiation-monitor alarms*
      - *Controlling access to accelerator enclosures*
      - *Responding to human machine interface issues*
      - *Assuring radiation monitors are operable during operations*
   b. Superconducting Magnet Systems
      - *Responding to oxygen deficiency alarms*
      - *Controlling access to oxygen deficiency hazard areas*
      - *Assuring oxygen sensing devices and ventilation fans are operable*
   c. Re-using Accelerator Components and Other Legacy Hazard Issues
      - *Methods to systematically identify legacy hazards*
3. Experimental Activities and Ancillary Operations
   a. General Considerations
      - *Experimenter (user)responsibilities*
      - *User knowledge and qualifications*
      - *User response to equipment problems*
      - *Communications between users and watch personnel or Main Control Room*
   b. Electrical Safety
      - *Lock Out Tag Out (LOTO) program (OSHA, NFPA 70E)*
        a. Use on all energy sources, not just electrical
        b. Implementation of LOTO program
        c. Hardware (locks, tags, chains, other devices)
        d. Procedures
        i. For LOTO of equipment
        ii. For shutdown periods
        iii. For verifying isolation
        iv. For releasing equipment
        v. For periodic inspection of the LOTO program
        e. Use of Caution Tags
        f. Training and communications
        g. Group operations lockouts
        h. Shift changes
        i. Outside contractors
   c. Flammable and Non-Flammable Compressed Gas Safety
      - *Combustible loading programs*
      - *Inspections*
      - *Training*
      - *Fire protection/suppression systems*

- *Emergency smoke removal ventilation in accelerators*
- *Fire Hazards Analysis*

d. Cryogenic Safety
- *Analyzing ODH hazards and determining controls*
- *Use of portable or fixed alarming oxygen concentration monitors*
  a. Responding accurately to gas of interest
- *Training*
- *Assuring cryogenic pressure vessels meet ASME Code or equivalency*
- *Monitoring and limiting electrical energy in superconducting circuits*
- *Emergency procedures*
- *Active ventilation systems*

e. Special-Materials Safety
- *Beryllium, lead and asbestos programs*
- *Special nuclear materials programs*
- *What to do if criticality safety is an issue*
- *What to do if not critical but beam can increase power by forcing fission*

f. Safety Software QA and Cyber Security for ACS Networks
- *Classifying software based on risk level*
- *The graded approach for QA requirements*
- *Cyber security requirements for isolated networks like an ACS*
- *Implementing a cyber-security variance process*
- *Reporting cyber-security incidents*

C. Accelerator Facility Post-Operations

1. Post-Operations Planning Activities

a. Post-Operations Plans
- *Facility Level Accelerators Follow DOE Orders/Guides (Disposition & Long Term Stewardship Plans; Written Plan; Ten Year Site Plan)*
- *Transition from Operations (all size accelerators)(Access Control, USID of Changing Mode of Ops)*
- *Facility Remains Under ASO*

b. Revisions to the ASE - (*does not happen instantaneously)*

c. Review/Approval Needs - *(Risk Based End States agreements w/ stakeholders needed for Cost/Schedule Planning. DOE approval of Plans/ASE.)*

d. Project and Task-Specific Hazards and Controls - (*Concentrate on Unique accelerator hazards, S&M and Operability Re-definition of selected Credited Controls-ODH,…)*

e. Identification of Records

f. *Legal and Other Documents* (*Agreements w/ State,OSHA Requirements, Contract obligations, Regul. rqrmts)*

g. *Operational Records, Rad. Monitoring/Survey Records, Major Spill/Release Event Records, et'al.*

2. Concurrent Operations (*Co-located work planning)*

a. Safety impacts….

b. Possible disruption of shared safety systems…

c. Structural impacts….

d. Operational impacts…

3. Completion of Post-Operations *(Facility Re-Use, Demolition, Removal)*

a. Long-Term Records Retention

b. Final Verification

Appendix A History of Accelerator Safety Order and Guide
Appendix B Access Control and/or Credited Controls
Appendix C Vacuum Vessel Pressure Safety
Appendix D Bibliography of Useful Standards