NATIONAL SYNCHROTRON LIGHT SOURCE

GUIDELINES FOR THE CONDUCT OF OPERATIONS

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GUIDELINE FOR THE CONDUCT OF OPERATIONS

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NSLS OPERATIONS ORGANIZATION AND ADMINISTRATION

A.   Introduction

The organization and administration of the NSLS Operations Group, shall insure that high levels of performance in accelerator operations are achieved, through effective implementation and control of the NSLS Operations Groups activities. Brookhaven National Laboratory and NSLS division policies shall describe the philosophy of standards of excellence under which the NSLS accelerators are operated. Effective implementation and control of operating activities are primarily achieved by establishing written standards in accelerator operations, periodically monitoring and assessing performance, and holding personnel accountable for their performance. This chapter discusses the policies, resources, monitoring, and accountability required in NSLS operations.

B.   Discussion

A high level of performance in accelerator operations is accomplished by, establishment of high operating standards by management, by communicating operating standards to the working level, by providing sufficient resources to the Operations Group, by ensuring personnel are well trained, by closely monitoring performance in operations, and by holding workers and their supervisors accountable for their performance in conducting accelerator activities.

Senior management establishes accelerator operating standards, considering input from the working level when appropriate. The working level will more eagerly support the standards when they have had input into their development. These standards shall define operating objectives, establish expected performance levels, and clearly define responsibilities in NSLS accelerator operations. Standards for operating activities shall also be integrated into the Operations Group's procedures and programs. Operating standards shall also be communicated to the working level by training workers in operating practices and by supervisory monitoring and guidance of work involving accelerator operations. Sufficient staff, equipment, and funding shall be allocated so that the operations group can effectively perform its functions. Performance in operations shall be closely monitored by NSLS management, and operating reports and goals can be effectively measured. NSLS

Operations Group personnel shall be held accountable for their performance through supervisory counseling, performance appraisals and, when necessary, disciplinary measures. Remedial training shall be provided when appropriate.

C.   Guidelines
1.   NSLS Operations Group Policies

The NSLS Operations Group procedures and policies are in accordance with those incorporated in the NSLS Safety Analysis Report, BNL 51584.

2.   Resources

The NSLS Control Room is manned in accordance with the NSLS Safety Analysis Report, BNL 51584, and this staff is backed up by various support groups. These groups are responsible for the performance of the NSLS equipment. The NSLS electrical systems and mechanical system responsibilities are documented in NSLS reports SLS-08.2-1-1 and SLS-08.2-3-1.

3.   Monitoring of Accelerator Operating Performance

Operator performance is monitored by the Operations and Ring Managers. Regular meetings with the Operations Supervisor and operators are held to discuss operational problems and possible corrective actions.

4.   Accountability

Members of the operations staff are accountable to the Operations Group's head, who is, in turn, responsible to the NSLS Department Chairman. Operational errors are normally dealt with through individual counseling, more serious errors may demand an oral or written reprimand. Repeated flagrant disregard for BNL policy can result in suspension without pay and ultimately, termination.

5.   Management Training

BNL offers a supervisory development course, to which all NSLS Operations Group supervisors are sent as operational considerations permit.

CHAPTER II
SHIFT ROUTINES AND OPERATING PRACTICES

A.   Introduction

Standards for the professional conduct of operations personnel shall be established and followed so that operator performance meets the expectations of NSLS management. The guidelines of this chapter describe watchstanding practices that apply to all operating personnel. Additional guidelines for activities in the control room are delineated in Chapter III - Control Room Activities. Chapter IV - Communications, describes some communication practices applicable to all operations personnel.

B.   Discussion

Professional conduct and good watchstanding practices result in appropriate attention to accelerator conditions.

Effective accelerator equipment monitoring is necessary to detect abnormal conditions or adverse trends so that appropriate action can be taken before equipment malfunction occurs. Notifying supervisors promptly of unusual or unexpected situations helps ensure that proper attention is given to changing and off normal conditions. Equipment status and the authority to operate equipment must be understood by all operations personnel so that activities can be controlled and coordinated. Operations personnel shall follow proper industrial safety, radiological protection, and quality assurance practices. These items are key elements that should be included in an effective operator watchstanding program. A desire to conduct assigned tasks expediently shall not interfere with good watchstanding practices.

It is the responsibility of the on-shift operating crew to safely operate the accelerator through adherence to NSLS operating procedures and technical specifications, and sound operating practices. The authority for NSLS operations shall be vested in the on-duty NSLS machine operator and transferred only through formal turnover to a qualified operator.

The on-duty NSLS machine operator shall maintain authority and responsibility for all accelerator operations. If a special test, evolution, or abnormal condition arises, NSLS personnel should be aware that the responsibility and authority to determine corresponding operating conditions, system alignments, or equipment manipulations rest fully with the on-duty

machine operator. He or she will not permit any individual to bypass or overrule his or her operational judgement without bringing the matter to the attention of higher line operational authority.

C.   Guidelines

1.   Status Reports

Changes in the status of accelerator systems are normally communicated through control room alarms and displays. Any difficulties in performing assigned tasks that result in machine downtime or abnormal machine performance losing greater· than two hours will be reported to the Operations Supervisor and/or the Ring Manager. The NSLS machine operator will use control room posted call-in lists for assistance with malfunctioning equipment. Any unusual occurrance shall be reported to the Operations Supervisor and the Operations Manager. If this occurrence involves personnel safety, the Department Safety Coordinator or Safety Officer shall be notified.

2.   Safety Practices

NSLS Operations group members comply with the provisions of the BNL Safety Manual. Copies of this manual are kept in the NSLS Control Room.

3.   Operator Tours

The beamline coordinators visit most areas of the NSLS facility in the normal course of operations.

4.   Round Sheets

So-called "round sheets" are not used by the NSLS operations group.

5.   Radiological Protection

All operators are trained in proper radiation procedures and abide by the radiation safety provisions of the BNL safety manual.

6.   Response to Indications

Prompt action is always to be taken in response to alarm indications. Once the problem is identified, the operator rectifies it or a call-in list is activated.

7.   Resetting Protective Devices

A trip (beam dump, power supply, etc.) is not generally reset until the cause is investigated. The only exception will be if there is a repetitive, well-understood problem which cannot be immediately corrected, and resetting the trip will not involve any increased safety hazard.

8.   Load Changes

This item does not apply.

9.   Authority to Operate Equipment

The on-duty operator is in charge of all duties relating to operation of the accelerators. Any work by support groups which might impact the operation of the accelerators shall be approved by the on-duty operator.

10.   Shift Operating Base

The NSLS Control Room is the base of accelerator operations activities.

11.   Potentially Distractive Written Material and Devices.

The operations supervisor decides if there are any distracting influences in the NSLS Control Room which need to be removed.

CHAPTER III
NSLS CONTROL ROOM ACTIVITIES

A.   Introduction

Control Room Activities shall be conducted in a manner that achieves safe and reliable NSLS operations. This chapter addresses the important elements of Control Room activities that are necessary to support safe and efficient NSLS operations.

B.   Discussion

The Control Room is the critical NSLS operating station and the coordination point for all accelerator activities. Therefore, activities in the Control Room shall be businesslike, and a professional atmosphere conducive to safe and efficient operation shall be maintained. In addition, Control Room Operators shall not be overburdened with administrative responsibilities, and Control Room access shall be limited so that operators will not be distracted from properly monitoring accelerator parameters. For safe operation the Control Room shall be manned at all times.

C.   Guidelines

1.   Control Room Access

The NSLS is a posted "Restricted Area" with access limited to authorized personnel. The Operations supervisor/on-duty operator grants entry to the Control Room and has the authority to ask people to leave if their presence is disruptive.

2.   Professional Behavior

The Operations Supervisor enforces professional behavior in the NSLS Control Room.

3.   Monitoring the NSLS Status

Operators are always attentive to alarms from various areas of the NSLS. Distinctive audio tones are sounded from equipment requiring immediate operator action. Machine status is displayed on TV's located above the operator console and individual equipment status is available via the operations computer terminals.

4.   Control Room Operator Ancillary Duties

Operation of the NSLS accelerators is, in most cases, the only duty assigned to the on-shift operator. If administrative tasks need to be performed, the Operations Supervisor will instruct an operator to handle them only when operational conditions permit.

5.   Operation of Control Room Equipment

The Operations Supervisor ensures that operators are properly qualified and trained to operate the NSLS controls. NSLS Ring Managers and personnel designated by them to do machine studies shall in most cases request the on-duty operator to change machine parameters during machine study periods.

CHAPTER IV
COMMUNICATIONS

A.   Introduction

Communications must be highly reliable in providing accurate transmission of information within the accelerator complex. This chapter describes the important aspects of the NSLS program for audible communications.

B.   Discussion

Audible communications are used to transmit operating and emergency information within the NSLS complex. Oral (face-to-face), telephone, radio, public address, pocket pagers and special sounds (horns and bells) are examples of audible communications.

Since accurate communications are essential to the safe and efficient operation of the NSLS, guidance in the use of the various forms of audible communication is necessary. This includes repeating back of instructions to ensure the accuracy of transmission and receipt of verbal instructions. Standardized terminology and use of a phonetic alphabet are other means of ensuring that verbal communications are understood.

Many sites use horns, sirens, bells, and public address systems to alert personnel to abnormal or emergency conditions. These communications must be controlled to ensure that they do not detract from normal NSLS operations and are available in an emergency.

C.   Guidelines
1.   Emergency Comunications Systems

The NSLS Control Room monitors the BNL Plectron warning system. This system is operated by BNL Police Headquarters and gives information on BNL emergencies, evacuations, weather alerts, etc. The Control Room also has a radio receiver for use in monitoring snow storms, hurricanes, etc.

In addition, to automatic fire alarm systems, the NSLS operators or safety personnel, may activate alarm bells in the event of an emergency requiring evacuation of the building. In this situation the operator will also reinforce the evacuation by use of the public address system.

Experimental beam line coordinators on the NSLS experimental floor shall remain in contact with the Control Room via the walkie-talkie system. Primary support personnel carry personal pocket pagers so that they can be contacted by the Control Room.

2.   Public Address System

NSLS Control Room operators have direct access to the NSLS public address system. Access to the system can also be made via the telephone system by first dialing 7878.

3.   Contacting Shift Operators

The Control Room can contact operators on the floor using walkie-talkies, P.A. system, personal pocket pager or the laboratory telephone system.

4.   Radios

Walkie-talkie operation is permitted in all areas of the NSLS complex.

5.   Abbreviations and Acronys

Abbreviations and acronys used are those standardized by ten years of NSLS operating experience.

6.   Oral Instructions and Informal Communications

The Operations Supervisor/on-duty operator decides whether instructions should be in written form or if oral communications will suffice. Safety related items and special instructions shall be noted in the logbook. Detailed written instructions will be formalized by the operations supervisor, dated and signed.

CHAPTER V

CONTROL OF ON-SHIFT TRAINING

A.   Introduction

NSLS operation by personnel under instruction shall be carefully supervised and controlled so that mistakes in operation are not made by unqualified personnel and so that trainees time on-shift is effectively used. On-shift training shall be conducted so that the trainee successfully completes all of the required training objectives and receives maximum learning benefit from his or her experiences. The guidelines of this chapter relate to control of training activities by NSLS operations personnel.

B.   Discussion

On-shift training is that portion of an operator qualification program where the trainee receives training in the job environment with as much hands-on experience as possible. This period of instruction is normally controlled by the Operations Supervisor because accelerator related equipment is involved. Operations administered controls are appropriate for the following aspects of the training activities.

- On-shift training shall adhere to established training programs so that instructional uniformity is maintained.
- On-shift instructors/evaluators shall be qualified for the activities they perform to ensure both correct NSLS operation and quality training.
- Trainees shall be supervised by a qualified operator so that unqualified personnel do not make mistakes that could impact NSLS safety.
- Policies that direct how trainees may be used to support operations activities shall be developed. These policies shall ensure trainee manpower is effectively and appropriately used.
- The Operations Supervisor shall approve the training program so that it will best meet operation's needs.
- On-shift training shall be appropriately documented.

C.   Guidelines

1.   Adherence to Training Programs

Each new operator is given a training guide which outlines the training he or she is to receive during the first six months of employment; in addition, he or she receives a list of questions which he or she is expected to answer over the course of the first 12 months of employment. There is a series of reference works known as "Equipment Operations Guides" which provide an introduction to the various parts of the NSLS and its controls. Operators attend classes concerning radiation safety, electrical safety, hazard recognition, emergency procedures, interlocks and search and secure procedures, fire extinguisher use and confined spaces as required by the various sections of the "BNL Safety Manual". They are also required to attend the Laboratory "New Employee's Safety Orientation" and "Radiation Orientation Training". In addition, NSLS staff members regularly give lectures on accelerator physics, engineering and controls which operators are encouraged to attend. Understanding of the various topics by new operators is tested by periodic quizzes and "walk-arounds" conducted by the Operations Manager.

2.   On-shift Instructor Qualification

The Operations Supervisor or a trained operator acts as "mentor" to new operators.

3.   Qualified Operator Supervision and Control of Trainees

A new operator is always supervised by an experienced operator. The Operation's Supervisor or trained operator ensures that new operators do not make any changes that would adversely affect the operation of the NSLS.

4.   Use of Trainees to Support Operations

The Operation's Supervisor decides when a new operator is sufficiently trained to be trusted to do a certain procedure by himself or herself. In case of "search and secure" qualifications, there is a formal approval sheet to ensure that the new operator has the necessary experience and training to perform this procedure.

5.   <u>Operator Qualification Program Approval</u>

All operator training programs are approved by the NSLS Operations Manager.

6.   <u>Training Documentation</u>

The Operation's Supervisor maintains records of what training operators have received and the most recent training date. Results of "walk-arounds" are kept on file. New operators receive a training manual and "Equipment Operations Guides" for all areas of the NSLS. All approvals for operation shall be signed by the Operation's Supervisor.

7.   <u>Maximum Number of Trainees</u>

There shall be no more than one new trainee on any given shift.

8.   <u>Suspension of Training</u>

Training shall be immediately suspended in the event of an abnormal occurrence.

CHAPTER VI
INVESTIGATION OF ABNORMAL EVENTS

A.   Introduction

A program for the investigation of abnormal events shall ensure that such occurrences are thoroughly investigated to assess the impact of the event, to determine the root cause of the event, and to identify corrective actions to prevent recurrence of the event. The program shall include the investigation of "near miss" situations to reduce the probability of a similar situation recurring as an actual NSLS event. Abnormal events are not unique to NSLS operations. Also, not all events that affect NSLS operation are totally controlled by the NSLS operator. Therefore, the guidelines of this chapter may have applicability in areas other than operations. Required notifications associated with abnormal events are addressed in Chapter VII which covers the important aspects of the abnormal event investigation program.

B.   Discussion

An established and thorough review process shall ensure all significant aspects of an abnormal event are identified, investigated and resolved. In addition, the investigation of near miss situations can identify detrimental conditions that, if left uncorrected, can impact NSLS operations.

A comprehensive review program will identify those types of events requiring investigation, list necessary qualifications for those conducting investigations, list the necessary information that must be examined, outline the steps for performing an investigation, and establish the guidelines for assigning and completing corrective action.

It is helpful to define under what circumstances an abnormal event investigation will occur. The criteria shall be available to first line supervisors so that, following an event, the investigation can begin in a timely manner. The list of events or criteria requiring an event investigation shall be based on considerations such as personnel safety accelerator or experimental beam lines safety and reliability issues.

A manager shall have overall responsibility for the event investigation process. However, the manager may delegate specific tasks in the investigation process to other personnel as appropriate.

Investigator qualifications shall be established to ensure competency in technical aspects of the NSLS operation and investigative techniques. The credibility of the investigation process will depend heavily on the credibility of the event investigators.

The process of performing an abnormal event investigation shall be established to ensure the thoroughness of each investigation and to ensure consistency between investigations. The program shall describe the information collected, investigation techniques utilized and the final reporting format. Two important products of the event investigation are the identification of the root cause and assignment of corrective action to prevent recurrence.

The abnormal event investigation program is needed to thoroughly investigate abnormal events, verify the proper operaton of NSLS equipment, identify the root cause of events, ensure all necessary notifications are completed and ensure appropriate corrective action steps are established to minimize the chance of the event recurring. Operators shall recognize this need and their obligation to assist in performing thorough investigations.

C.   Guidelines

1.   Events Requiring Investigations

Any event which is not part of the normal operation of the NSLS is investigated to some level - this may be as simple as making an entry in the operations log, or as complex as convening a special investigative committee.

2.   Investigation Responsibility

Operational problems are investigated by the on-shift operator; if he or she cannot resolve the problem, a system expert is called in to assist. Actual or potential safety problems, or incidents involving personnel injury

are investigated by both the NSLS Safety Coordinator and the Laboratory Safety and Environmental Division Representative assigned to the NSLS. They are in charge of investigating safety and/or injury accidents. Certain abnormal events will require the preparation of an "Unusual Occurrence Report" as described in Section 1.1.0 of the BNL Safety Manual.

3.   Investigator Qualification

The Operations Supervisor is in charge of operational problem investigation; more serious or repetitive operational incidents will be investigated by the Operations Manager or his designate. The NSLS Department Safety Coordinator is in charge of investigating safety and/or injury incidents.

4.   Information to be Gathered

The person in charge of the investigation determines what information needs to be gathered. In the case of emergencies, the NSLS Emergency Plans provide guidance in the types of information that should be gathered by the operator.

5.   Event Investigation

The person in charge of the investigation determines how exhaustive the investigation needs to be; most operational problems require little in the way of formal investigation.

6.   Investigative Report

The person in charge of the investigation determines how detailed the report needs to be; most operational problems are documented by entries in the Control Room logbook, and by hardcopies sent to system personnel.

7.   Event Training

        The NSLS Safety Coordinators cooperate with NSLS Operations personnel in developing and carrying out drills dealing with emergency situations that might reasonably be expected to occur during NSLS operation. A post-mortem is conducted by NSLS Operations, Safety, Security and Fire Department personnel. Part of a new operators training is learning how to react to abnormal situations.

8.   Event Trending

        During the regular evaluation of machine downtime, any repetitive failures or trends towards more frequent failures are noted and plans are formulated to reverse the trend. Unusual occurrences at this and other sites are evaluated by NSLS operations and Safety personnel to see if they might warrant inclusion in the drill program.

9.   Sabotage

        The Operation's Supervisor reports any suspected sabotage to the Site Security Division. A standard response procedure is followed by Security.

CHAPTER VII

NOTIFICATIONS

A.   Introduction

Timely notification of appropriate management personnel, when required, shall be employed to ensure that the Laboratory is responsive to public health and safety concerns. This chapter provides guidelines to ensure uniformity, efficiency and completeness of these notifications.

B.   Discussion

Events that require notification of appropriate management may occur frequently. It is essential that information be gathered and transferred in a systematic, controlled method. Procedures that define responsibilities and provide for adequate documentation shall be used to control the process and ensure that the notification procedure is effective.

C.   Guidelines

1.   Notification Procedures

The on-shift operator normally decides when to activate a call-in list. NSLS policy dictates that the Operations/Ring Manager must be notified when the machine has been down for longer than two hours. The NSLS Emergency Plan delineates notification procedures in the event of an emergency.

2.   Notification Responsibility

The Operation's Supervisor is responsible to ensure that those individuals listed on the appropriate call-in list have indeed been notified and that any time requirements for notification are complied with.

3.   Names and Phone Numbers

Call-in lists are maintained in a loose leaf binder in the Control Room. These are broken down by both group and equipment and contain names of primary and alternate personnel, phone numbers and pager numbers (if any).

4.   Notification of Safety Related Items

The on-duty operator is responsible to ensure that any safety related occurrence is promptly brought to the attention of the appropriate personnel. The on-duty operator shall contact the Operations Supervisor, the NSLS Safety Coordinator or other NSLS safety personnel.

CHAPTER VIII
CONTROL OF EQUIPMENT AND SYSTEM STATUS

A.   Introduction

Good operating discipline shall ensure that NSLS equipment configuration is maintained in accordance with design requirements and that the on-duty shift operator knows the status of all systems. Specific applications of equipment control are addressed in Chapter IX, Lock-out/Tag-Out, Chapter XI, Logkeeping and Chapter XII, Shift Turnover.

B.   Discussion

It is imperative that equipment and systems at the NSLS be properly controlled. Not only must the shift operator be aware of how equipment and systems will function for operational purposes, but in order to satisfy the design basis and the technical specifications at the NSLS, the proper component, equipment and system configuration must be established and maintained.

Administrative control programs shall be established to handle configuration changes resulting from maintenance, modifications and testing activities. The programs shall be administered by or through the Operation's Manager/Supervisor. Typically, changes in equipment and system configuration are communicated from shift-to-shift through the shift turnover process, another method of controlling status. Turnover, checklists and equipment status boards are often used as aids for compiling and transmitting status information efficiently and accurately.

Control over equipment and systems status shall be established with formal guidance to ensure proper equipment configuration is maintained. This guidance shall include instructions for system alignments, locking of components, verification of technical specification compliance prior to NSLS operating mode changes, authorization prior to removing or restoring equipment to service and identification and documentation of equipment deficiencies.

C.   Guidelines

1.   Status Change Authorization and Reporting

System groups are required to notify the Control Room prior to making any modifications that would alter the operating configuration of the NSLS. The computer alarms and limits program notifies the operating area of changes in the status of any of the accelerator components during normal running. Changes in the operating mode of the NSLS are communicated during the shift-change briefing.

2.   Equipment and System Alignments

Computer "restore" files are used to place the NSLS in a baseline configuration for startup. "Saves" of operating conditions can be made at any time, as can full or selective "Restores".

3.   Equipment Locking

A system of Control Room controlled locks exists to lock out equipment deemed by the Safety Officer to present a hazard during open accesses to the accelerator and beam line enclosures. Written checklists are used to ensure that the proper supplies are locked off before accesses are permitted and unlocked prior to machine startup. Lock-out/Tag-out procedures for other devices are specified in the BNL Safety Manual Section 1.5.1.

4.   Technical Specification Compliance

Operating limitations are noted in the Control Room Logbook and are pointed out during shift-change briefings. Some limitations are enforced by the controls system (e.g. control software will not allow a too-large value to be sent to the equipment and an error message appears on the console). Some equipment protection is "hard-wired" into the system.

5.   Equipment Deficiency Identification and Documentation

Malfunctioning equipment is noted in the machine fault reporting log in the Control Room and is reported to systems groups for repair by the appropriate specialist who receives a copy of the fault sheet. Instances of machine downtime are recorded in a computerized downtime log, which is

distributed to management monthly when the machine is operating. This is reviewed at the monthly NSLS management meeting.

6.   Maintenance Work Authorization and Documentation

Proposed work on the NSLS equipment is listed on a "Work Request Form" which is approved by the Operation's Manager/Supervisor before work is allowed to proceed.

7.   Equipment Post Maintenance Testing and Return to Service

The NSLS Safety Officer prescribes tests to be performed as critical devices after maintenance. During machine startup after an extended down period, or when major modifications have been made to a portion of the NSLS equipment, tests are performed on all major accelerator and experimental beam line components to ensure that they function correctly.

8.   Alarm Status

Alarm screens are an integral part of each console in the Control Room; operator awareness of alarm conditions is enhanced by the use of color coding and by audio announcements.

9.   Temporary Modification Control

Temporary modifications are noted in the log book; in addition, modifications to safety and cryogenic systems are more formally documented and are approved by the NSLS Safety Officer.

CHAPTER IX
LOCK-OUT/TAG-OUT

A.   Introduction

        A lock-out/tag-out program shall provide protection for personnel and NSLS components and systems during operation, maintenance and modification activities. In addition, provisions within this program shall provide for independent verification of the removal from service of safety related and other important NSLS equipment. Other aspects of equipment control are addressed in Chapter VIII, Control of Equipment and System Status and Chapter X, Independent Verification.

B.   Discussion

        Lock-out/tag-outs are used to control equipment removal from service and return to service. They also protect workers and equipment during maintenance activities. Errors in the lock-out/tag-out process shall be prevented to ensure a high degree of personnel and equipment safety. In addition, the program shall be correctly administered so that the status and integrity of important NSLS components and systems are maintained. An effective lock-out/tag-out program shall include detailed administrative procedures, uniquely identifiable tags, and appropriate control over tag-out preparation, approval, placement and removal; and shall provide for adequate documentation. In addition to red danger (clearance, safety, out-of-service) tags that prohibit component operation, yellow caution tags that alert operators to particular situations affecting certain components shall be provided.

C.   Guidelines

1.   Clearance Lock-Out/Tag-Out Procedures

        Lock-out/tag-out procedures are delineated in Section 1.5.1 of the BNL Safety Manual.

2.   Clearance Tags

        The NSLS Control Room provides standard locks and tags.

3.   Clearance Lock-Out/Tag-Out Preparation
        The BNL Safety Manual specifies that the person actually doing the
work shall attach the lock and danger tag and shall, by conclusive test,
verify that the source of energy has been isolated from the equipment and
that no energy can be delivered from an alternate source.

4.   Clearance Lock-Out/Tag-Out Approval
        All work performed on NSLS components is approved by the
Operation's Manager/Supervisor.

5.   Clearance Lock-Out/Tag-Out Records
        NSLS work schedules are kept on file for the duration of a
maintenance period so that the operator knows of work in progress.

6.   Clearance Lock-Out/Tag-Out Placement and Verifications
        The person actually doing the work attaches the lock or tag (see 3
above).

7.   Clearance Lock-Out/Tag-Out Removal Authorization
        The person who placed the lock and tag must remove them; if that
person cannot be found, and it is necessary to operate the equipment, three
qualified persone who have studied the circumstances and are satisfied that
removal of the tag and lock is safe must authorize removal and sign the tag.

8.   Clearance Lock-Out/Tag-Out Removal and Accountability
        The person doing the work verifies that the equipment is in an
operable condition when the lock and tag are removed.

9.   Clearance Line-Up Verification
        In the case of critical devices, the NSLS Safety Officer will
specify operational checks to be made when the equipment is returned to
service. he or she will witness the test and sign-off on approval for
operation. Checks on other equipment may be made at the discretion of the
person doing the work or the Operation's Supervisor.

10.   Temporary Removal of Clearance Locks and Tags

         Temporary removal requires the same authorization as permanent removal (see 7 above).

11.   Clearance Lock-Out/Tag-Out Audits

         Equipment necessary for the operation of the NSLS must be returned to service prior to the end of a scheduled maintenance period. Other equipment may be out of service longer. Regular audits of these shall be carried out as required by the BNL Safety Manual. A log book of active tags shall be kept in the NSLS Control Room.

12.   Caution Tags

         Yellow tags are to be used in the protection of equipment in situations where equipment damage is not a personnel hazard. Red tags must be used in all personnel safety lockouts. Yellow tags are available in the NSLS Control Room.

CHAPTER X

INDEPENDENT VERIFICATION

A.   Introduction

An independent verification program shall provide a high degree of reliability in ensuring the correct position of components such as valves, switches, shutters and circuit breakers. This chapter describes the important aspects of an independent verification program. Other equipment status control programs are addressed in Chapter VIII, Control of Equipment and System Status and some applications of independent verification are addressed in Chapter IX, Lock-Out/Tag-Out. Additionally, appropriate investigations for component mispositioning events are discussed in Chapter VI, Investigation of Abnormal Events.

B.   Discussion

Independent verification is the act of checking a component position independently of activities related to establishing the components position. A comprehensive independent verification program will identify components to be included in the program, define when independent verification is required and prescribe the methods of performing independent verification.

Not all components require independent verification, because the feasibility of mispositioning may be quite remote, or because the effect of mispositioning may not be significant to safe and reliable operation. Therefore, it is important to identify those components that must be independently verified. Designing systems or components that require independent verification ensures consistent application of the program.

Definition of when independent verification is required will also help ensure consistent application of the program. The criteria shall ensure that the independent verification is performed in all cases where a reasonable potential exists for competent mispositioning.

Industry events have occurred where mispositioned components have gone undetected because of inadequate verification techniques. Developing

methods for performing independent verification on the different types of components ensures that all personnel performing the verifications can be trained to perform them in the same manner.

Independent verification recognizes the human element of component operation; that is, any operator, no matter how proficient, can make a mistake. This concept should be stressed in an independent verification program so that operators' confidence in the ability of their peers will not cause a relaxation of attentiveness to the verification tasks. Operators should understand the importance of the independent verification program and address this task with a high level of personal integrity and discipline.

C.   Guidelines

1.   Components Requiring Independent Verification
         Virtually all of the adjustable NSLS devices are independently verified through the controls system (see 3 below). All adjustable components of the NSLS safety system are verified through both hardware and software. Systems that present significant personnel hazards (flammable gas, large cryogenic systems, systems with significant stored energy, shielding, etc.) are reviewed by the NSLS Safety Committee or Beam Line Review Committee prior to installation and are inspected and authorized for operation by the NSLS Safety Officer after any modifications or extended NSLS shutdown.

2.   Occasions Requiring Independent Verification
         Systems verified through the controls system and the NSLS safety system are verified continuously during operation. As noted above, certain systems are independently verified just prior to machine start-up after an extended maintenance period.

3.   Verification Techniques
         The adjustable NSLS devices are continuously verified by means of the application program software and the previously cited "alarms and limits" software.

Positions of valves and movable components such as collimators and beam stops have microswitches to verify their "in" or "out" status.

Modulator power supplies have mechanical and electrical grounding devices to enforce proper grounding before entry into the high voltage compartment and also have microswitches on all doors or externally removable panels.

All personnel safety system devices have redundant "hardwire" and logic loops to verify that they are in the proper state. A "search and secure" procedure (as well as the presence of all access keys in the capture tree, where applicable) verifies that all personnel are out of "secured" areas prior to machine start up; the correct search procedure is enforced by the logic loop which will not allow the safety system to be reset if an incorrect procedure is used. Access door positions are monitored by redundant microswitches.

Access keys ae stored in "capture key trees" at the Control Room and, possibly, some remote access points. Removal of a key will automatically turn off the systems under control.

In some instances personnel from other than the operations group will monitor the functioning of equipment in their systems. This shall be done in consultation with the on-duty operator.

CHAPTER XI
LOGKEEPING

A.   Introduction

The NSLS Operations Group records shall contain a narrative log of the NSLS status and of all events as required to provide an accurate history of NSLS operations. This chapter describes the features needed in the operation logs to ensure they are properly maintained.

B.   Discussion

Operating logs shall be established in order to fully record the data necessary to provide an accurate history of NSLS operations. Events shall be recorded in a timely fashion in order to ensure the accuracy of the entry. The scope, type, and format for all log entries shall be determined so that the necessary data required by NSLS management is properly entered into the logs. This includes documentation of actions taken, activities completed, transfer of information among operators, and data.

C.   Guidelines
1.   Establishment of Operating Logs

An NSLS operators log is kept in the NSLS Control Room. Entries are to be made by the shift operator only, and it is the operations supervisors responsibility to ensure that the logbook is maintained as specified in the NSLS Guidelines.

2.   Timeliness of Recordings

Information is to be promptly recorded in the logbook.

3.   Information to be Recorded

All information pertaining to the safe and efficient operation of the NSLS, special instructions, call ins, unusual incidents and end of shift summary are written in the logbook.

4.   Legibility

All log entries are to be legible and made with a pen in a color that can be photocopied.

5.   <u>Corrections</u>

Incorrect entries shall not be obscured. Reference to incorrect entries will be made in the end of shift summary.

6.   <u>Log Review</u>

The Logbook is reviewed by the Ring and Operation Managers.

7.   <u>Care and Keeping of Logs</u>

The logs are permanently filed by the Operations supervisor.

Chapter XII
Shift Turnover

A.   Introduction

Shift turnovers shall provide the oncoming operators with an accurate picture of the overall NSLS status. This chapter compliments the guidelines of Chapters II and III and describes the important aspects of a good shift turnover.

B.   Discussion

Shift turnover is a critical part of NSLS operations. Inaccurate or improper (incomplete) shift turnovers can contribute to, or cause safety incidents, so it is essential that operating personnel perform turnovers such that an effective transfer of information takes place.

Personnel shall not assume operational duties unless thay are physically and mentally fit to do so, and until they and the off-going personnel have a high degree of confidence that an appropriate information transfer has taken place.

Oncoming personnel shall conduct a comprehensive review of appropriate written (logs, records) and visual (TV's, alarm boards) information before responsibility for shift position is transferred. Oncoming personnel could arrive early or off-going personnel could stay late so that adequate review time is available.

Shift turnovers shall be guided by checklists and shall include a thorough review of appropriate documents describing important aspects of NSLS status and shall include an inspection of appropriate Control Room instrumentation. These reviews shall then be complemented by a discussion between the off-going and oncoming operator.

C.   Guidelines

1.   Shift Turnover Checklists

Save and restore files are used to store machine parameters and are used in place of shift checklists. The on-coming operator will familiarize himself with the current save and restore files.

2.   Document Review

Oncoming operators are expected to use the first several minutes of their shift scanning various TV displays, alarm displays and computer pages to familiarize themselves with the current operating conditions.

3.   Control Board Walkdown

The NSLS does not use control boards.

4.   Discussion and Exchange of Responsibility

Whenever the NSLS is operating in an unusual mode or when an operational adjustment is being made the oncoming operator will sit with the off-going operator to ensure that he is fully cognizant of the operating conditions.

5.   Shift Crew Briefing

The oncoming operator is given a briefing covering what has occurred since he was last on shift, in addition, he reviews and signs the logbook after briefing. End of shift files may be made if parameters have been changed during the shift.

6.   Reliefs Occurring During the Shift

The NSLS Operations Group does not have mid-shift reliefs. The duty operator may be relieved from the Control Room by the Operations Supervisor or by a qualified Experimental Beam Line Safety Coordinator.

CHAPTER XIII
REQUIRED READING

A.   <u>Introduction</u>

        Proper use of a required reading file by NSLS operations personnel shall ensure that they are made aware of important information that is related to their job assignment. This chapter describes an effective required reading program.

B.   <u>Discussion</u>

        It is usually not necessary for a document to be read by all Control Room personnel. However, it is essential that a method be provided to ensure that each individual receives the information important to his or her position. The method shall designate which documents shall be read by whom and by when. personnel shall be required to understand assigned material. When written material is not understood, appropriate questions shall be directed to supervisor.

C.   <u>Guidelines</u>

1.   <u>Reading File Index</u>

        Operations personnel and various NSLS systems personnel generate equipment operation guides which specifically apply to machine operating procedures.

2.   <u>Reading Assignments</u>

        All operators get copies of these documents and this document.

3.   <u>Required Duties for Completion of Reading</u>

        Operators are expected to read these Equipment Operations Guides and this document at the first available opportunity.

4.   <u>Documentation</u>

Titles, document numbers, authors, etc., are stored in a central file in the Control Room. Operators can use this file to find information on a particular subject.

5.   <u>Review</u>

A list of documents and the latest revision date is included in the document file index and is updated whenever a control document is updated.

CHAPTER XIV
SHIFT ORDERS

A.   <u>Introduction</u>

The shift orders program shall provide a means for NSLS management to communicate short-term information and administrative instructions to operations personnel. Other means of disseminating guidance to operators are addressed in Chapter XV, Operations Procedures and Chapter XVI, Operator Aid Postings. This chapter describes the key features of an effective shift orders program.

B.   <u>Discussion</u>

The constantly changing requirements of NSLS operations necessitates that a formal program be implemented to disseminate information to operations personnel in a timely manner. Due to shift schedules, providing information to the operators becomes difficult and, therefore, deserves special attention. To ensure this information remains current, periodic reviews to remove outdated information shall be included in the program.

C.   <u>Guidelines</u>

1.   <u>Context and Format</u>

Any special information required on a particular shift is written in the logbook by the Operation's Supervisor and verbally emphasized during the briefing. Operating changes that are intended to become permanent may be implemented in this manner temporarily, but as soon as time permits, the changes are implemented in the applications program software.

2.   <u>Issuing, Segregating and Reviewing Orders</u>

Shift orders are generally placed in the logbook by the Operations Supervisor; occasionally special instructions or requests for operator action are entered by systems personnel, however, these have the prior approval of the Operation's Supervisor.

3.   <u>Removal of Orders</u>

Shift orders in the logbook are normally meant to be valid for not more than 24 hours; orders intended to be in effect for longer than this are issued as Equipment Operations Guides (see Chapter XIII).

CHAPTER XV
EQUIPMENT OPERATIONS GUIDES

A.   Introduction

Equipment Operations Guides are written to provide specific direction for operating systems and equipment during normal and postulated abnormal and emergency conditions.

Operation procedures shall provide appropriate direction to ensure the NSLS is operated within its design bases and shall be effectively used to support safe operation of the NSLS. Other methods of disseminating operational information are addressed in Chapter XIV, shift orders and Chapter XVI, Operator Aid Postings. This chapter describes the important aspects of operations procedure development and use.

B.   Discussion

Studies have shown that procedures are a key factor affecting operator performance. The probability of operator error increases greatly with the use of poorly written procedures. In addition, deficient procedures and failure to follow procedure are major contributors to many significant operational events. Appropriate attention shall be given to writing, reviewing and monitoring operations guides to ensure the content is technically correct and the wording and format are clear and concise. Although a complete description of a system or process is not needed, operations guides shall be sufficiently detailed to perform the required functions without direct supervision. Consistency in procedure format, context and wording is essential to achieving uniformly high standard of operator performance. Operators shall not be expected to compensate for shortcomings in procedures such as poor format or confusing, inaccurate, or incomplete information. Instead, procedures shall be written so that they can be easily used without making mistakes.

During the course of NSLS operations, technical and operational requirements change, and better ways of doing things develop. To ensure that procedures in use provide the best possible instructions for the activities involved, periodic review and feedback of information are essential.

The Laboratory policy on procedure use shall be clearly understood by all operators. Properly controlled and readily available procedures promote their use and ensure operational activities will be conducted in the manner intended.

C.   Guidelines

1.   Equipment Operations Guide Procedure Development
         Most NSLS operating procedures are enforced by the software applications programs. Needed applications are either developed by the operations group or a request is generated by the Operation's Manager/Supervisor to the development personnel for the required software.
         Safety and emergency procedures are developed by NSLS and BNL safety personnel.
         A file of written equipment operations guides for each area of the NSLS is kept in the NSLS Control Room; these are generally not step-by-step procedures, but are reference documents used by the operators when operating conditions are being changed.

2.   Equipment Operations Guide Content
         Appearance and general content of applications programs are specified in NSLS management policies for equipment guide content.

3.   Equipment Operations Guide Procedure Changes and Revisions
         Changes to system software are automatically documented when the program is loaded into the operating computers. A new revision number is assigned and a new index with data changes issued.

         Safety and emergency procedures are periodically reviewed (at least annually) to determine if changes are required; safety and emergency procedure manuals are controlled documents so changes in procedure are distributed to all document holders.

4. <u>Equipment Operations Guide Procedure Approval</u>

Proposed software changes are submitted to the Operations Supervisor for approval before they are implemented. Changes to safety and/or emergency procedures must be approved by NSLS and BNL safety personnel.

5. <u>Equipment Operations Guide Procedure Review</u>

Safety procedures are periodically reviewed by the NSLS Safety Officer to ensure that they are accurate. Since other NSLS operations are more generic, they do not undergo a formal periodic review; however, these procedures are informally reviewed each time they are used. Any difficulties with applying the procedure, or incorrect results obtained through its use are noted by the operator and repeated to the Operation's Supervisor who may direct a re-write of the procedure if necessary.

6. <u>Equipment Operations Guide Procedure Availability</u>

Applications programs for all areas of the NSLS are available at the operators console and at other conveniently located computer terminals throughout the facility. A file of written procedures is kept in the Control Room File, as is a copy of the NSLS Emergency Plan.

7. <u>Equipment Operations Guide Procedure Use</u>

All of the operations of the NSLS is done via the computer console applications pages - there is no option to quickly or easily modify the procedure contained in the software. Where many applications pages need to be accessed to perform a procedure, sequence programs may control the calling up of individual applications, thus minimizing the possibility of human error.

Operators are required to understand all NSLS emergency procedures, so that correct responses can be undertaken immediately.

CHAPTER XVI
OPERATOR AID POSTING

A.   Introduction

NSLS operator aids (information posted for personnel use) shall provide information useful to operators in performing their duties. An operator aid program shall be established that ensures that operator aids posted are current, correct and useful. This chapter describes the important aspects of an operator aid program.

B.   Discussion

Operator aids provide an important function in the safe operation of the NSLS. They may come in many forms: copies of procedures (portion or pages of), system drawings, handwritten notes, information tags, curves and graphs. It is important to make sure that these types of postings reflect the most current information available and that they do not supersede or conflict with any other controlled procedures or information.

C.   Guidelines

1.   Operator Aid Development

There may be on-line "help" programs for some applications pages; these are the product of operators and system staff personnel. Hardware and software documentation memos are written for new and modified equipment and programs. These are distributed to all operators. Dedicated graphics displays may be placed on screens in the Control Room.

2.   Approval

The Operations Supervisor approves the use of "operator aids".

3.   Posting

Help pages and graphics displays are a part of each operating console. Bulletins prepared by the Operations Supervisor are attached to the bulletin board, and listed in the operations log.

4.   Use of Operator Aids

         Help pages are only used for informational purposes, their use is
not required.

5.   Documentation

         Help pages are an integral part of all applications pages and so
are listed on the operating consoles.

6.   Review

         Incorrect information or help pages is noted in the normal course
of operations and is corrected on the spot.

CHAPTER XVII
EQUIPMENT LABELING

A.   Introduction

A well-established and maintained equipment labeling program shall help ensure NSLS personnel are able to positively identify equipment they operate. This chapter describes the important aspects of the NSLS labeling program.

B.   Discussion

Improper or inadequate component labeling has caused or been a contributor to many safety problems. A good labeling program, understood and maintained by NSLS personnel, will enhance training effectiveness and will help reduce operator and maintenance errors resulting from incorrect identification of NSLS equipment.

The accelerator labeling program shall continue throughout the life of the NSLS. Because equipment labels will be continually misplaced or damaged, an ongoing labeling program shall exist that allows for NSLS personnel to identify components needing labels, identifies a person or persons responsible for making new labels, and ensures the new labels are correct and placed on the proper equipment. In addition to equipment, doors to rooms shall be labeled so that personnel can identify the room and, if applicable, the equipment inside.

C.   Guidelines
1.   Components Requiring Labeling

All equipment built by the NSLS systems personnel is labeled according to existing laboratory conventions. Commercially built equipment is labeled by the manufacturer. Emergency locations (fire extinguishers, fire alarms, halon pull boxes, etc.) are labeled in a standard industrial format. Circuit breaker panels are labeled so as to designate which circuit they are fed from, and what devices they feed. All adjustable NSLS components are identified by a unique memonic in the central system database.

Devices on the electrical lock-out list have labels both on the supply and on the power disconnect switch. All cables, wires and cable trays are labeled and their function recorded in a cable directory.

2.   Label Information

Labels shall follow established Laboratory naming conventions.

3.   Label Placement

Labels are placed on the equipment to which they apply if feasible; otherwise they are placed as close to the equipment as possible.

4.   Replacing Labels

Operators note and report missing labels during routine activities. The fact that each device is uniquely identified and controlled through the computer system lessens the reliance on physical identification labels.

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