

Advanced Photon Source

Conduct of Operations Manual

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Conduct of Operations Manual

APS Main Control Room

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Conduct of Operations Manual

APS Main Control Room

Introduction

Purpose

A Conduct of Operations Program is implemented to support mission success and promote safety and environmental protection with a goal to minimize the likelihood and consequences of technical and organizational system failures.

This manual provides a comprehensive overview of the operations program for the Main Control Room (MCR). It is intended as a reference for anyone trying to understand the program, with links to the more detailed process that implements the program.

The operations program is the local APS implementation of DOE, Argonne, and APS requirements and standards.

Scope

The content of the Conduct of Operations Manual is based on the framework of topics set out in the [DOE Order O422.1](#) and tailored to an accelerator facility. Chapters align with the “special requirements” identified in O422.1 and the content of the chapters is guided by breakdown of the defined elements of the special requirements.

This manual is limited to the operations program for the accelerator controls handled by the MCR.

Not in the scope of this manual, except for administrative actions associated with or incidental services provided by the MCR, are beamline and user activities; accelerator systems R&D; work planning procedures of APS technical groups; and facilities work.

While this manual details MCR operations, the APS Operations Conduct of Operations Manual ([APS 2283552](#)) provides an overview of the organization of the APS and descriptions of APS-wide operational procedures, policies, and standards.

To facilitate ease of use and to avoid maintaining redundant documents, this manual provides a descriptive framework for operations program with references and links to the detailed implementing processes.

Hierarchy of Requirements and Practices:

Authority	Requirement Documents
DOE and Federal regulations, and mandatory consensus standards	DOE Orders and associated guidance Code of Federal Regulations (e.g., NFPA 101, Life Safety Code)
↓	
Argonne	Prime Contract Lab Management System (LMS)
↓	
APS	APS-wide policies, processes, and standards Safety Assessment Document Accelerator Safety Envelope
↓	
Division/Group	Division and Group policies and procedures Work task procedures & Work Control Documents (WCDs) Conduct of Operations Manuals

← This document

Maintenance of the Manual

This manual is prepared under the direction of the MCR Group Leader and is maintained in the APS electronic records system ICMS (a persistent URL is available to the latest revision). It is reviewed on an annual basis with workflows managed by the APS Policy and Procedure Administrator. Feedback can be directed to the APS Operations Directorate.

(A list of common APS acronyms is available in the APS Operations Conduct of Operations Manual [APS_2283552](#)).

Revision 4 is a rewrite of the Manual; Rev. 3 is available in ICMS for comparison. Rev 4.1 is a re-formatted version of Rev 4 with added references to the APS Operations Conduct of Operations Manual.

Chapter 1 - Organization and Administration

The Photon Science Directorate (PSC) is one of the programmatic directorates of Argonne National Laboratory. The Laboratory provides business and facility services common to programmatic organizations (HR, plant facilities maintenance, ESH support and oversight, desk-top IT support, procurement, shipping and receiving, financial services, Health Physics services, etc.)

- [Argonne Organization Chart](#)

PSC is made up of the Advanced Photon Source (APS) and the APS-Upgrade Project (APS-U).

- [APS Mission Statement](#)
- [PSC Leadership Team](#)

The APS is organized into an Office of the Director, three Divisions, and APS-U:

- [APS Organization Chart](#)

The missions and goals of the APS Divisions and the Groups that make up the Divisions and APS-U:

- APS Engineering Support Division (AES)
 - [AES Mission](#) and [Goals](#)
- Accelerator Systems Division (ASD)
 - [ASD Mission Statement & Goals](#)
 - [Groups](#)
 - [MCR](#)
- X-ray Science Division (XSD)
 - [XSD Mission Statement & Goals](#)
- APS-U
 - APS-U Mission

Cross-Divisional [Standing Committees](#) include:

- Operations Directorate (OPS Directorate) charter and members list (The Ops Directorate collectively coordinates operating decisions that affect the facility as a whole).

MCR Mission Statement

1. Provide safe, reliable, attentive, and responsive operation of APS accelerator systems, ensuring optimal machine performance, high availability, and excellent service to users.
2. Apply integrated understanding of accelerator, safety, and facility systems to provide reliable advice, decisions, and scheduling for accelerator operation, repair, maintenance, and enhancement.
3. Administer group Lock Out / Tag Out for tunnel access
4. Operate Access Control Interlock System to ensure personnel safety from ionizing radiation.
5. Support development, maintenance, and application of software for accurate, timely operation of APS accelerator systems.

MCR Roles and Responsibilities

OPERATOR

An individual who is either qualified or becoming qualified to operate all APS accelerators. This individual need not be a dedicated accelerator operator. For example, ACOs and Machine Managers, when suitably qualified, may perform as operators when circumstances require it.

CHIEFS OF OPERATIONS (CO)

The Chiefs of Operations are staff members whose responsibilities are focused on one or more portions of the accelerator complex (e.g., linac, control system). Among other duties, they are responsible for operator training and certification, assisting on-shift personnel in troubleshooting problems, and scheduling work on accelerator components.

The responsibilities of the COs include but are not limited to the following:

- Liaison between the MCR Group and technical groups.
- On-call to assist the Operators, Machine Managers, and MCR Group leader in solving operational problems as they arise.
- Assist in the development of systems, accelerator studies, software, procedures, and policies related to his/her area of responsibility.
- Assist in tracking reliability and analyzing faults to determine causes and remediation.
- Act as training and qualifications officers in the MCR Group in his/her area of expertise.

ASSISTANT CHIEF OF OPERATIONS (ACO)

A senior operator who is qualified on all APS accelerators and given significant responsibility in training other operators.

MAIN CONTROL ROOM GROUP LEADER

The Main Control Room Group Leader is authorized by the ASD Division Director to make any necessary day-to-day decisions involving minor changes to the schedule and beam parameters previously approved by the Operations Directorate. The meaning of "minor" in this context will be established by discussions with the Operations Directorate and recorded in written policies by ASD management. Identification of the need for a minor change and subsequent actions may be delegated by the MCR Group Leader to the MCR Crew Chief and Chiefs of Operations through written policies and instructions. Significant changes to schedule or beam parameters require consultation of the MCR Group Leader, Chief of Operations, or Crew Chief with the ASD Division Director or his designee.

Management and worker accountability for the safe performance of work

Argonne and the APS are committed to Providing safe and healthy working conditions for the prevention of work-related injury and ill health. See the [Argonne Safety and Health Policy \(LMS-POL-1\)](#).

Methods for the analysis of hazards and implementation of hazard controls in the work planning and execution process

The APS [Work Planning and Control Policy \(APS_1432773\)](#) establishes the requirements for a work planning and control (WPC) processes to:

- Ensure a safe working environment, protecting workers and the public.
- Ensure hazards associated with the work are mitigated or eliminated.
- Identify clear roles and responsibilities of those involved in the planning and execution of the work.
- Identify the impact of the work on the facility and the work force.
- Support highly reliable facility operations.
- Optimize the use of effort and other resources to support the mission of the APS.
- Provide a consistent framework to develop new or improve existing work practices.

Facility Technical Task (i.e., not experiments or conventional construction) work is planned using the Argonne [AWARE](#) application. See the APS [Work Planning and Control Policy](#) and Argonne [Work Planning and Control Manual](#) for complete requirements.

Methods for managing electronic operations documents

The [Managing APS Documents Policy \(APS_1273342\)](#) establishes that documents required for:

- Maintain a safe work environment;
- Maintain reliable and efficient operations; and
- Record the business and R&D activities of the APS

are maintained in an APS-approved repository. With few exceptions, these documents will be maintained in an electronic document system.

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If a document is related to the configuration, continuing operation, or institutional memory of the APS, then it shall be archived in an APS-approved repository. Administrative and R&D Documents are typically kept in the APS [Integrated Content Management System \(ICMS\)](#) or can be regenerated from the APS business database. Engineering documents may be kept in ICMS or other approved, specialized electronic document systems. See [Managing APS Documents Policy](#) for the complete policy.

Chapter 2 - Shift Routines and Operating Practices

Effective shift-operation practices require attention to facility conditions:

- Equipment and facilities are monitored to detect abnormal conditions or adverse trends so that action can be taken before a malfunction occurs.
- Supervisors are notified of unusual or unexpected situations helping to ensure that attention is given to addressing off-normal and/or changing conditions.
- The authority to operate equipment shall be understood by personnel to ensure activities are controlled and coordinated.
- MCR personnel shall follow APS, Argonne, and DOE safety and quality assurance standards and practices.

A desire to conduct assigned tasks expeditiously shall not interfere with good shift-operation practices.

Operations Limits

It is the responsibility of all APS personnel to safely operate the APS facility adhering to approved operating procedures, operational safety requirements, and sound operating practices.

MCR personnel shall operate accelerator facilities within their operating envelopes:

ACCELERATOR SAFETY ENVELOPE: A set of physical and administrative conditions that define the bounding conditions for safe operations at an accelerator facility as approved by DOE.

OPERATING ENVELOPE: A set of physical and administrative conditions that define the bounding conditions to ensure that operations are held well within the safety envelope. Operating envelopes are set by machine managers.

Shift Turnover

The authority for operations shall be transferred at shift-change through formal turnover to a qualified relief (see Chapter 12, Operations Turnover).

On-Shift Responsibilities

Crew Chief

The crew chief shall maintain authority and responsibility for all accelerator operations and shall transfer this responsibility only through formal turnover to a qualified relief. If an abnormal condition or the need for a special operating mode arises, the responsibility and authority for decisions on operating conditions, system configurations, or equipment manipulations rest fully with the responsible crew chief. The crew chief shall not permit any individual to bypass or overrule their operational judgment without higher line management authorization.

During user operations the MCR crew chief will respond to the Floor Coordinators requests.

During accelerator studies the responsible machine physicist has the authority to request operational changes; however, the crew chief maintains the responsibility to see that the machines are operated within their respective operating envelopes.

The crew chief will defer to the MCR Group Leader or his designee under the following conditions:

- If there is a request to operate the accelerator in some other mode than what has been reviewed by the Operations Directorate.
- If downtime exceeds a defined limit (presently two hours).

The crew chief always has emergency shutdown responsibilities, even before higher management, if available, is consulted.

The crew chiefs are responsible for good conduct and discipline on their shifts. This includes evaluation of personnel fitness for duty and any actions required to ensure the safety of personnel and equipment under their cognizance. Crew chiefs may require individuals to leave the MCR if they significantly interfere with safe and effective conduct of operations.

MCR Operators

MCR operators are responsible and accountable for all operations conducted on their shifts and for the status of all systems, components, and records within a defined work area. Operators are responsible for adhering to operating procedures and technical specifications, operating within the operating and safety envelopes, maintaining safe conditions within the boundaries of their work areas, and operating in a manner that enhances overall facility operation.

Operators are expected to report to work alert and prepared to carry out their duties. If, because of sudden illness or some other reason, an operator becomes unable to perform assigned duties, he or she is expected to request a relief from the crew chief.

Floor Coordinators

The Floor Coordinators have the responsibility for overseeing operations on the experiment floor and are the point of contact for the MCR. The MCR may provide limited assistance in support of the Floor Coordinators during user operations when a Floor Coordinator is on-call but not on-site.

System/Responsible Engineers

System/Responsible Engineers are responsible for ensuring the proper maintenance, repair, inspections, and improvement of their respective systems. Through the Work Request System, COs authorize work on accelerator systems (see Chapter 8).

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The MCR shall promptly notify the appropriate System/Responsible Engineer of all status changes, abnormalities, or difficulties encountered with the operation of that system or piece of equipment.

Similarly, the System/Responsible Engineer shall notify MCR personnel of any system or equipment problems that might impact operations.

After a maintenance period and before the accelerator enclosure is secured, System/Responsible Engineers or their designees are required to inspect their related equipment within the enclosure to verify that their systems are ready for operations. Tour inspection documentation is defined by the System/Responsible Engineer, and is for his/her use. Once the tour is complete, the System/Responsible Engineer or designee signs a checklist located in the MCR indicating that their system is ready for operations.

Safety

Personnel shall comply with all prescribed safety precautions and regulations. Any operation that is in violation of a safety rule shall be stopped and reported immediately to management.

Per the [Argonne Safety and Health Policy \(LMS-POL-1, Exhibit A\)](#):

- Suspend Work - Employees are authorized to temporarily cease, or suspend, their own work to immediately correct a deficiency or unsafe condition that does not pose an immediate danger. Employees may also suspend work if something unusual or unanticipated occurs and they need time to evaluate the situation. Employees may restart suspended work without seeking their supervisor's authorization.
- Stop Work - All Argonne employees, visitors, facility users, and subcontractors are empowered and obligated to stop any activity that they deem to pose an immediate danger to themselves, other employees, visitors, users, or subcontractors, the public, or the environment. This authority is referred to as "stop-work authority." Individuals who exercise stop-work authority also are obligated to immediately report their action to the division director or department head or other line supervisor of the relevant organization.

ALARA

All personnel at the APS shall keep ionizing radiation exposures As Low As Reasonably Achievable (ALARA) (see [10 CFR 835, Occupational Radiation Protection](#)). Division management shall periodically review exposure trends of division personnel to help ensure exposures of Division personnel are ALARA.

APS personnel doing non-office type work shall:

- Become familiar with and adhere to the appropriate configuration control policies for radiation shielding.
- Adhere to all posted personnel protection requirements.

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- Observe proper practices and precautions while in controlled areas.
- Correctly utilize appropriate monitoring instruments when required.
- Be aware of their own exposure levels and take appropriate action to minimize exposures.
- Be knowledgeable of the proper use of radiation work permits, safe work permits, or inhalation limits, where applicable.
- Promptly report protection deficiencies and hazards to supervisors and/or appropriate radiation protection personnel (in addition to taking appropriate immediate actions to reduce or correct the hazards).
- Inform appropriate radiation protection personnel before performing activities that have a potential to significantly change conditions in the facility.

ALARA principles should also be practiced in exposures to other hazards including chemicals, electromagnetic fields, toxic materials, and other personnel hazards as applicable.

Response to Indications

MCR personnel shall believe instrument readings and treat them as accurate unless demonstrated to be faulty. Ignoring a reading because of the belief that an instrument is faulty can cause abnormal conditions to be unaddressed. Prompt action shall be taken to investigate the cause of abnormal or unexpected indications so that prompt corrective action can occur. When possible, to gain insight into questionable readings, personnel should check other related indicators. When malfunctioning or inaccurate instruments are discovered, the instruments shall be appropriately identified to prevent subsequent confusion and instrument and control personnel should be notified to effect repairs. In situations of doubt, personnel shall give facility, personnel, and environmental safety a higher priority than uninterrupted facility operation.

Resetting Protective Devices

When protective devices (e.g., circuit breakers) trip, an attempt shall be made to understand the cause of the trip before the device is reset. Normally, before action is taken, an operator shall ensure that no abnormal condition exists that would preclude resetting. However, because the consequences of inappropriately resetting protective devices vary considerably, good judgment and specific guidance are necessary in this area. Facility trips and unplanned forced shutdowns may require a thorough investigation in accordance with the guidance of Chapter 6.

Key Control

To facilitate control over keys that are used in day-to-day operations and not permanently assigned to individuals, there shall be key accountability logs in place to record what keys are being used by which individuals. Keys shall be labeled and assigned to labeled spaces to expedite location of keys.

Kirk-Key systems are used to mechanically and electrically interlock the access to certain areas and equipment with related APS system operation. The use and control of these keys are covered by operation and access-control procedures.

Changes to Operating Parameters

Changes to major operating parameters such as circulating beam energy and maximum current shall be reviewed by the Operations Directorate. If changes to operating parameters require the operating envelope to be exceeded, the machine manager must initiate a safety review and have the changes approved via memo by the ASD-DD.

Temporary modifications are to be used sparingly and only when necessary. A graded approach shall be used for authorizing the use of temporary modifications. Simple temporary modifications may only require the authorization of a CO, crew chief, Technical Group Leader, or System/Responsible Engineer. Complex modifications or a modification to a safety system or operating mode may require the approval of an appropriate Division Director. In all cases, authorization for temporary modifications, especially those that may affect safety, accelerator operations, or beam availability, is a line management responsibility. Written procedures may be used to document temporary modifications. Accelerator-related temporary modifications or temporary configuration changes are noted in the MCR on-line log and are maintained from shift to shift until these situations have been resolved.

Authority to Operate Equipment

Skill and training requirements for operating APS equipment cover a broad range, and a graded approach must be applied to authorization for operation of such equipment. The authorization requirements for operating equipment are graded on the basis of the potential consequences of improper operation of such equipment (e.g., mishandling of an APS operations control computer could result in serious consequences to the experimental program, damage to accelerator components, or adversely impact safety). Management shall ensure that only trained and authorized personnel operate equipment.

In general, control room personnel shall be aware of all activities that have a potential for affecting machine operation (see Chapter 8).

The overall operation of the facility shall be governed by approved policies and procedures. Accelerator operations shall be directed by the crew chief or, in the case of machine development and research, by the designated physicist in charge. Non-routine operation of equipment should not be undertaken without the specific approval of the responsible crew chief, systems engineer, or machine manager.

During emergencies, the MCR shall immediately take whatever actions are required to ensure personnel, facility, and environmental safety, without obtaining prior authorization; however, the appropriate manager or supervisor shall be promptly informed of

these actions. The MCR shall be constantly aware that safety takes priority over uninterrupted facility operation.

During non-operational periods, that is, when the accelerator systems are not being operated for research or machine studies, the operational responsibility for all systems reverts to the various technical groups. During these periods, the technical groups can, with due consideration for safety procedures, operate their respective systems for maintenance, checkout, or upgrade purposes. Portions of the APS may be in an operational status while others are not. For example, the storage ring could be filled and under control of the crew chief while the linac is in a non-operational, maintenance state and under the control of technical groups.

Procedure Compliance

All operations shall be performed in compliance with approved procedures. If during an emergency there are no procedures covering the situation, operators shall take the actions necessary to place the facility in a safe condition and to protect the public, APS personnel, the environment, and facility equipment. Subsequent to such an event, an evaluation shall be made as part of the abnormal-event investigation process to ascertain the need for a procedure.

Fitness/Alertness/Attention to Duty

Activities at the APS should be performed in a businesslike manner. All personnel shall adhere to the Fitness For Duty requirement of Chapter 1. Personnel also have the individual responsibility to be alert throughout their shift assignment, and to be attentive to the work they perform and systems they monitor to ensure that it is accomplished competently.

Overtime Guidelines

Adequate shift coverage must be maintained without excessive use of overtime. Use of overtime to cover vacations should be avoided. In the event that unforeseen problems (such as emergency shutdowns, extended outages, technical problems, or weather-related occurrences) require substantial amounts of overtime to be used, the following guidelines apply:

- Scheduling personnel for overtime will be limited if fatigue or lack of rest may impair operator performance.
- A person shall not be permitted to work more than 16 consecutive hours, excluding shift turnover time.
- A person shall not be permitted to work more than 32 cumulative hours in any 48-hour period, excluding shift turnover time. The ASD division office shall be informed of any instance of an individual working more than 24 hours in a 48-hour period.
- A person shall not be permitted to work more than 88 hours in a 7-day period, excluding shift turnover time. The ASD division office shall be informed of any instance of an individual working more than 72 hours in a 7-day period.

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- Overtime will be approved for specific cases and shall be approved for the entire shift crew. Events that will be considered for overtime are extended shutdown periods, brief training sessions that occur before or after scheduled shifts, and weather-related occurrences.

Any deviation from the overtime requirements shall be authorized in advance, on a case-by-case basis, by the MCR Group Leader or designee in accordance with established procedures and with documentation of the basis for granting the deviation. Individual overtime shall be reviewed monthly by the Division Director or designee to assure that excessive hours have not been worked.

Housekeeping

The responsibility for good housekeeping rests with all APS personnel. A job shall not be considered complete until the housekeeping is completed. Any situations involving disregard for housekeeping policies shall be reported to the appropriate line manager.

Chapter 3 - Main Control Room Activities

Activities in the MCR must be businesslike, and a professional atmosphere conducive to safe and efficient operation must be maintained. In addition, MCR operators shall not be overburdened with administrative responsibilities, and the Crew Chief may limit MCR access so that operators will not be distracted from properly monitoring facility parameters.

The Main Control Room Group Leader is responsible for providing the necessary tools within the MCR in support of facility operation, and for establishing and maintaining high standards for control room conduct.

Crew chiefs and operators have the responsibility and authority to uphold the standards of conduct defined in this manual. The crew chief has the authority to restrict access or remove personnel from the MCR during routine and/or emergency operations as required, to meet this responsibility.

Control room access shall be limited to persons conducting official business. Entry shall be controlled by the responsible crew chief or designee. The crew chief will enforce professional behavior.

Alarm Status

The status of control board or local panel alarms shall be readily available to operations personnel.

Appropriate actions shall be taken to monitor equipment parameters for abnormal conditions that would be masked by malfunctioning alarms.

Monitoring the Main Control Screens

Operators shall be alert and attentive to control systems display indications and alarms. Control systems display indications shall be monitored frequently, and prompt action taken to determine the cause of and to correct abnormalities. Emphasis shall be placed on closely monitoring and trending to detect problem situations early. Operator response to alarms shall be timely, and actions shall be taken to address and correct the alarm causes. All reasonable actions shall be taken to clear conditions causing an alarm. Care will be taken when disabling alarms (for instance, when taking hardware off line) to ensure that the alarms are re-enabled when the hardware is put back on-line.

The ASD Main Control Room Group Qualification Procedure is used to determine when an individual is qualified to operate equipment. When trainees operate this equipment, they shall be supervised and controlled by an operator who is qualified, and who normally would perform the operations. No operators shall attempt any operational activity they do not feel qualified to perform.

Chapter 4 - Communication

Communications Systems for Emergency Operations

Communication systems have been implemented to ensure that all facility occupants are warned of hazards and threats and are promptly alerted to facility emergencies. When personnel are working in areas where the public address system or emergency signals cannot be heard, alternative methods for alerting these persons shall be utilized.

911

The principal mechanism to be used by individuals to report an emergency incident is to dial 911 using an ANL telephone or to call 630-252-1911 from a cellular phone. All employees and resident visitors are trained to call 911 in any emergency. If in doubt whether you should call 911, call 911.

Laboratory-Wide Alert System

Argonne maintains a site-wide notification system to provide time-urgent warnings (e.g., fire alarms, tornado warnings, and emergency alerts). The Argonne Office of Emergency Management (OEM) provides oversight of the capabilities of the Laboratory's public address system and the outdoor warning system. The Infrastructure Services (IS) organization is responsible for maintaining these systems. Periodically, but at least annually, OEM arranges for testing of the site's general notification and warning systems. Uses of the systems are detailed in the Argonne Comprehensive Emergency Management Plan (CEMP) and related Office of Emergency Management (OEM) procedures. References:

- Emergency Management Planning (OEM): [LMS-POL-4](#).
- Operating and Maintaining the Argonne Notification and Warning Systems policy: [LMS-POL-29](#).

All Argonne employees and resident visitors are trained to recognize the emergency audio-signals used by ANL (e.g., fire, tornado, and hazardous materials releases) and those used by APS to announce emergency situations, as well as the proper actions to be taken. Training is administered and managed using the Laboratory's Training Management System (TMS).

The Argonne Director of Communications and Public Affairs Division (CPA) oversees non-emergency use of these systems.

Site-wide e-mail notices include Argonne Newsroom general Campus Updates, sent for non-emergency announcements, and OEM Argonne Alert System notices.

APS Communications Systems for Normal Operations

The APS maintains local public address that is integrated into the Argonne site system. The Building manager coordinates operational and maintenance requirements for the

building's notification and warning systems and capabilities. The building manager also serves as a point of contact for activities that may affect building notification and warning system operations. The APS Facility managers may direct actions to confirm the availability of a functional notification and warning system.

The APS public address system use is controlled to maintain its effectiveness and prevent it becoming too commonplace.

APS General Announcements emails are sent for APS site-wide non-emergency notifications.

MCR Communications

All Personnel

All personnel are responsible for the following:

- Conducting verbal communications involved in facility operations in accordance with the procedures given below.
- Reporting defective communication equipment in accordance with stated procedures.

Crew Chiefs

The crew chiefs are responsible for the following:

- Ensuring that the requirements and instructions of the operations-related communications procedures are implemented.
- Ensuring that all operations-related communications are conducted in a professional manner.

Main Control Room (MCR) telephone number:

- 2-9424 from on-site land line
- (630) 252-9424 from a cell phone or from off-site.

Chapter 5 - On-shift Training

The APS has implemented a rigorous program for Operator training and testing detailed in:

- [Operator Qualification](#) procedure ([APS 1193009](#)).

The program includes the required general and accelerator machine-specific training delivered through:

- Classes
- Required Reading - see Chapter 14
- On-Shift Training (OST)

For operation of any of the four ASD accelerators, an operator qualified to safely handle all aspects of that accelerator operation must be present.

The qualification process is developed and implemented by the MCR group leader and Chiefs of Operations to ensure high operational readiness. The qualification program specifies the requirements that must be met in order to be considered qualified in the operation of each of the four accelerators. Training is assessed through written and console tests.

The program includes the required general and accelerator machine-specific training delivered through:

- Classes
- Required reading
- On-Shift Training (OST)

MCR OST is conducted by persons both qualified to operate equipment and authorized to train others. OST trainees are supervised by qualified personnel ensuring that unqualified personnel do not make mistakes that could adversely affect safety or operations. The instructor monitors the trainee closely and remains in a position to intervene or assume control. Training activities during operations are identified in the training program, including knowledge requirements and trainee actions such as perform, simulate, etc. When the qualification program is completed, it is formally documented; on-shift and classroom training activities are documented as they occur.

Chapter 6 - Investigation of Abnormal Events, Conditions, and Trends

All significant aspects of an abnormal event are to be investigated and resolved. The review process requires that abnormal events satisfying defined criteria be promptly reported to APS management. APS management must promptly investigate in accordance with guidelines identified [LMS-PROC-188](#) (Section 3.2.4 of the Lab Procedure on Accelerator Safety). Following collection and evaluation of data, line management must develop and implement a plan to prevent recurrence of the event or, alternatively, to prevent undesirable consequences that might result from or otherwise be associated with the abnormal event if it were to recur.

If the event indicates a potentially significant increase in the consequence or probability from the hazards analyzed in the Safety Assessment Document, the process described in [APS_1185831 \(Unreviewed Safety Issue Determination\)](#) shall be followed.

An occurrence is an event or condition that adversely affects, or may adversely affect, Laboratory personnel, the public, property, or the environment and is determined to be reportable as defined in [LMS-PROC-157](#), Incident Notification. In addition, “near miss” situations shall be reported for review if it is suspected that such a review might uncover circumstances that could lead to a recurrence with potentially serious consequences.

Events requiring investigation are defined in [LMS-MNL-5](#), Performance improvement.

As is appropriate to their assigned duties, all personnel have the responsibility to remain attentive to operational conditions or events indicative of hazards to:

- The safety or well-being of persons working at or visiting the APS,
- The general environment,
- The APS facility and associated equipment, and
- The reliable operation of the facility.

Individuals who find themselves engaged in an unsafe activity or observe unsafe working conditions are empowered and obligated to stop any activity that they deem to have placed them or others in immediate danger. It is also an obligation of anyone stopping work to bring such conditions immediately to the attention of the Division Director or line supervisors of the relevant organization.

Division or department management must ensure that work is not restarted until appropriate hazard control measures are in place.

Chapter 7 - Notifications

Individuals that observe conditions or events that can adversely impact APS operations, ESH, or security should report them.

Stop Work

- Per Argonne Safety & Health Policy ([Argonne LMS-POL-1](#)), everyone at Argonne is empowered and obligated to stop any activity they deem to present an imminent danger.
- After the potentially unsafe situation is secured, the person issuing the stop work shall immediately notify the AES Division Director or more senior line management. (Work may restart per [Argonne LMS-POL-1](#).)
- Stop work issued by MCR personnel shall be noted in the shift log.

911 - any emergency incidents on site

- When an emergency incident occurs, safely stabilize the situation to the extent possible (e.g., pause or stop work) and take one of the following actions:
 - Call the 911 hotline from an Argonne land line
 - or
 - 630-252-1911 from a cell phone on site
- Notify your supervisor or more senior line manager as soon as possible that you placed the 911 call.
- Any 911 calls related to MCR activities shall be noted in the shift log

Accidents and Injuries

- When an injury or accident occurs, once the situation is secured, notify your supervisor and an ESH Coordinator as soon as practical.
- The supervisor will conduct an investigation and the ESH Coordinator and the ALD ESH Program Manager will be responsible for follow-on notifications, if any, to Argonne and/or DOE.

Chapter 8 - Control of Equipment and System Status

Equipment and System Status Changes

APS has implemented practices for equipment installations and subsequent changes to ensure facilities operate with known, proper configurations. Generally, the hands-on work on accelerator equipment and systems is done by technical groups in ASD and AES with the MCR providing technical and oversight support. The MCR has key configuration management responsibilities for accelerator systems including work and start-up/restart authorization; tracking and communicating the status of work; and change control administration.

Work Request System

The primary tool for scheduling, defining the scope of work, and tracking status related to the APS accelerators is the Work Request System (WRS):

- Introduction and Use of the APS Work Request System ([APS_1302758](#), APS-PPR-ADM-000-A022-000011)

To execute a work request:

- A system/responsible engineer submits a work request for define scope of work and proposed schedule.
- The work request is approved on technical merit and operational impact (e.g., potential conflicts with other work).
- Approval does not set the priority for the tasks.
- Safety implications are considered (e.g., working on energized systems)
- Approval by the responsible authorized approver. This is ordinarily a CO or Floor Coordinator, but can be an MCR crew chief during emergent conditions.
- The work is scheduled.
- Maintenance/shutdown scheduling see: APS Maintenance Shutdown Planning procedure ([APS_2188852](#)) for details
- Machine Studies schedules - coordinated by the Accelerator Operations and Physics Group and the MCR. Studies times may be requested for work such as emergency repair of an accelerator component or system.
- **Before starting, the work must be authorized by an MCR Crew Chief.** With authorization, the status of a work request is updated to “in progress”
- Work done per approved plans. **MCR: Crew Chief tracks and updates work request status** - status is available on-line.
- At completion of the work, the system engineer certifies work complete including ensuring physical configuration consistent with approved designs; documents are updated as appropriate
- **After the work is completed, the responsible engineer closes out the work request.**

Role and Responsibilities

System/Responsible Engineer

System/Responsible Engineers submit Work Requests. It is their responsibility to see that the work takes place as defined in the Work Request, obtain crew chief authorization to begin work, and notify the Crew Chief when the work is completed.

Following maintenance or modification, the System/Responsible Engineer ensures equipment is tested for all functions that may have been affected to demonstrate that the equipment is capable of performing its intended function. For repairs, testing shall verify that maintenance work corrected the original problem, and no new problems were introduced. The System/Responsible Engineer reports to the MCR on the readiness of the system.

To ensure completeness and prevent errors, start-up checklists are used in some situations such as pre-closure tunnel inspections and safety system validations. The Save/Compare/Restore capabilities of the controls system are used to verify proper configuration control, during both startups and operation.

Following work on any system controlled by the Access Control Interlock System (ACIS) that has work done on its interlock subsystems, the repaired system shall be functionally tested according to the appropriate ACIS procedures.

MCR Crew Chiefs

The crew chiefs authorize the beginning of work based on the status of the Work Request (e.g., approved or not approved) and the status of the machine.

Since the crew chief is typically the senior accelerator operations person on shift, the crew chief is tasked with maintaining an overview of the accelerator operations according to the envelope established by the Operations Directorate. Minor variations to routine operating parameters within the approved operating envelope may be authorized by the Crew Chief. If proposed variation potentially exceeds the operating envelope or if there is a question if it is a "minor" change, the proposed change is referred to more senior management.

Typically, changes in status of safety-related equipment and systems shall not be authorized while the APS is in the operating mode.

A Crew Chief may close an open Work Request to indicate that the job is done and that the appropriate checks have been completed. In some cases, post-maintenance testing cannot be done at the time the work is completed (e.g., when waiting for the enclosure to be secured so the equipment can be turned on). In these cases, the Work Request will remain open until the testing has been performed.

Chiefs of Operation (COs)

Each of the accelerators has assigned to it a CO who is responsible for approving work during maintenance periods. The CO assists in developing the schedule and looking for potential conflicts. If proposed work affects machine design parameters, the CO will bring it to the attention of the appropriate machine manager.

Approved Designs

To ensure a proper configuration, it is the responsibility of the system/responsible engineer to ensure that if the work includes new designs or changes to an approved configuration of accelerator systems or components, the hardware cannot be installed until the system or component has been approved per the APS policy/procedure:

- [APS Design Review \(APS_000031, APS-PPR-ADM-A022-000020\)](#)

Radiation Safety Shielding (RSS)

If the work includes work on radiation safety shielding, a Configuration Control Work Permit is required prior to the start of work on the RSS per:

- [Change Control for Radiation Safety Shielding \(APS_1685081, APS-PPR-ESH-000-A021-000028\)](#)
- [Configuration Control Work Permits \(CCWP\) \(APS_1192930\)](#)

CCWPs for accelerator work are administered by MCR personnel.

Unreviewed Safety Issue

If a planned modification would create a previously unanalyzed postulated accident or condition that could result in a significant adverse impact, or a previously unanalyzed postulated accident or condition is found to exist in a system, an Unreviewed Safety Issue Determination (USID) should be made per:

- [Unreviewed Safety Issue Determination \(APS_1185831, APS-PPR-ESH-000-A021-000025\)](#)

Scheduling

The APS operates on an annual schedule that typically has three user operations runs of 11-12 weeks separated by 5-6 week maintenance periods for accelerator system installations, repairs, and accelerator studies/training. The schedule is set by the Operations Directorate (see Chapter 1). During the runs, one or two days a week are typically scheduled for machine studies and intervention for needed repairs. During runs, emergency repairs may be required to return accelerator systems to normal operation. In addition, there may be work on systems that aren't involved in or impacting machine operations.

Shutdown Planning Schedule

The shutdown planning process is described in:

- [Shutdown Planning procedure \(APS_2188852\)](#)

Changes to operating parameters

Any unscheduled changes to operating parameters (e.g., fill pattern) require the approval of the Operations Directorate and the appropriate Machine Manager(s). In emergencies, approval from the Operations Directorate may be obtained via email.

Machine studies scheduling

For work to be done during machine studies periods, a request is submitted to the ASD-AOP group leader (or designee) to use machine intervention time for work (rather than accelerator studies). If time is made available for the requested work, a Work Request is filled out and other procedures outlined above are followed

LOTO

The MCR plays critical roles in the administration of controls of potentially energized sources. See LOTO Chapter 9 for additional details.

Operational Limits

It is imperative that work on equipment and systems does not compromise the design bases or operational limits.

Operators are trained on the safety and operating envelopes. Software and hardware limits are set below the operational envelope, ensuring the safety envelope is not approached.

Management of Equipment Deficiencies

Equipment deficiencies shall be recorded by MCR personnel and reported to System/Responsible Engineers for correction. The Repair, Maintenance, and Development (RM&D) system is used for this purpose.

As described above, to closeout a work request for a repair or maintenance of a component or a system, the responsible engineer confirms that testing has been completed and it is ready to return to service.

Operator Awareness of Alarms

MCR personnel are trained on the proper responses to alarms:

- Argonne TMS-managed training for site-wide alarms
- As part of the Operator Qualification Program, operators are trained how to respond to accelerator systems alarms: [Operator Qualification \(APS_1193009\)](#)

Control of Temporary Changes

Administrative controls handle temporary configuration changes resulting from maintenance, modifications, and testing activities. Typically, such changes in equipment and system configuration are recorded in the MCR logbook and, as appropriate, communicated from shift to shift through the shift turnover process. During operational periods,

equipment status computer displays, particularly the Save/Compare/Restore program, are used as aids in maintaining configuration control of equipment status.

Document Control

An essential element of configuration management is ensuring that documents are consistent with the as-installed configuration of equipment. Such references (e.g., approved designs) for APS personnel, including MCR personnel, are typically found in the APS electronic document system ([ICMS](#)) and in facility databases per the APS policy:

- [Managing APS Documents Policy \(APS 1273342\)](#)

Chapter 9 - Lockouts and Tagouts

Lockout and Tagout (LOTO) is a practice to establish positive control over hazardous energy sources to protect personnel from injury and to protect equipment from damage while work is performed.

Workers must use LOTO when working on or near equipment that could cause injury to people if the equipment unexpectedly energizes, starts up, or releases stored energy. Hazardous energy is any form of energy that can cause personal injury including electrical, mechanical, pressure or vacuum, hydraulic and pneumatic. No matter what the source, mitigation of hazards by isolating hazardous energy and using LOTO is part of Integrated Safety Management.

There is a flow-down of LOTO requirements from national codes and standards to Argonne Lab-wide requirements, which are implemented in APS procedures.

Mandatory general National Codes and Standards

- [10 CFR 851](#), [Worker Safety and Health Program](#) (which establishes the following referenced codes and standards)
- Title [29 CFR 1910](#), [Occupational Safety and Health Standards](#)
- Title [29 CFR 1926](#), [Safety and Health Regulations for Construction](#)

National codes and standards specific to electrical safety:

- NFPA 70, National Electrical Code (NEC)
- NFPA 70E, Standard for Electrical Safety in the Workplace
- ESH-385 Switching operations for non QEW

Argonne Hazardous Energy Program

To prevent injury to personnel or damage to property that may result from hazardous energy and to implement the national codes and standards, the Laboratory has established a hazardous energy program. The program is described in:

- Hazardous Energy Program Manual ([LMS-MNL-4](#))

This Manual sets minimum standards that must be met by local APS processes.

To control the ubiquitous laboratory electrical hazards and thereby protect personnel, Argonne has established: 1) a Qualified Electrical Worker Program, 2) minimum requirements for identifying and controlling electrical hazards and 3) Laboratory-wide site-specific electrical safe work practices that meet regulatory requirements and match the types of hazards found on site. Argonne requirements and practices are detailed in

- [Electrical Safety Work Controls](#), Chapter 6 of the Argonne Electrical Safety Manual

Training

Personnel are required to complete ASD 125 and Laboratory-provided LOTO training as identified through their Job Hazard Questionnaire and managed through the Lab' Training Management System.

Accelerator Enclosure Magnet Power Supplies Lockout/Tagout

In general, before anyone can enter an APS accelerator enclosure (tunnels), the magnet power supplies and the RF systems must be locked out, with the MCR coordinating the tunnel access LOTO.

Power supplies that feed equipment in an APS accelerator enclosure and that require lockout/tagout to permit safe working conditions in the enclosures have been identified (see APS_1195951).

Prior to an Authorized Access to accelerator enclosure, the power supplies for magnets within the enclosure are locked out with a Kirk-Key system. Facilities personnel open and rack out the 480V Siemens switchgear associated with power supplies and remove the captured Kirk-Keys from the switchgear - the Siemens switchgear breakers can be closed only after their associated Kirk Key is re-installed. Facilities personnel transfer the keys to the MCR. The Keys are inserted in the appropriate MCR LOTO board bank. When all of an enclosure's Switchgear Kirk Keys are installed, the Master key can be turned capturing all of the Switchgear Kirk-Keys. The Master key is then placed in the tumbler in the enclosure LOTO box and turned to verify that it is the correct key. Each person working in the tunnel is required to over-lock the MCR LOTO box, providing assurance that the switchgears cannot be re-energized. However, the application of the Kirk keys does not obviate the need for individual zero voltage verification (ZVV). At the end of the access the process is reversed - overlocks removed, Master Key releases switchgear keys, switchgear keys returned to switchgear, and power supplies are re-energized.

Accelerator Enclosure RF Power Lockout/Tagout

When the booster or Zone F enclosures are brought to an ACIS state of Controlled Access or lesser, the associated 420 rf systems require lockout/tagout to ensure that no rf can be brought into these enclosures during the access. This lockout/tagout is performed by utilizing a Kirk-Key system that is located in Building 420. This Kirk-key system is similar to that used for power equipment. The keys to be captured and maintained at either the 420 LOTO board or the MCR. All of those working within the Booster or Zone F enclosures must overlock at the appropriate location prior to the access.

Task-Specific Lockout/Tagout

All individuals working in the tunnel are responsible for executing appropriate LOTO and ZVV for the work they are performing. In applying an accelerator enclosure LOTO, MCR Operations does not obviate the need for the technical groups to perform appropriate

LOTO when performing maintenance or repairs on the magnet power supplies or RF systems. It is the technical group's responsibility to define their own appropriate LOTO for repair or maintenance of their equipment. In many cases, this will involve overlocking at the LOTO boards in the MCR.

Alternate LOTO

There are occasions when personnel seek to work in tunnels even though some in-tunnel equipment may be energized or not LOTO'ed. A procedure describing the process is to be developed according to:

- Master Procedure for In-Tunnel Work Without LOTO ([APS 1191867](#)) and its associated sub-procedures.
- APS Alternate Lock-out/Tag-out (LOTO) ([APS 1276343](#))

Work can proceed without full LOTO only with an approved procedure that conforms to this Master Procedure.

For example, it may be that the switchgear for certain systems needs to be left energized during a maintenance shutdown, in order to permit testing. An "alternate" LOTO procedure is developed in which locks are applied to local breakers to disable equipment. The keys for these locks are either placed in the lock boxes on the MCR LOTO board, or kept by MCR staff under procedural control. In the latter case, MCR staff will provide the keys to APS staff who are authorized to run tests on the equipment during certain defined periods of time after verification by the MCR that barricades have been placed.

See the APS [Facility Technical System Procedures](#) matrix for accelerator machine-specific standing LOTO procedures.

Chapter 10 - Independent Verification

MCR operators perform independent verification of Group and Alternate LOTO for tunnel access. Also, when operators perform LOTO for power supply converter swaps, independent verification is required.

Chapter 11 - Logkeeping

MCR logbooks capture thorough, accurate, and timely recording of accelerator system information for performance analysis, trend detection, and to reconstruct important events. Information regarding activities shall be recorded promptly throughout the shift in order to ensure the accuracy of each entry. The time of each event shall be indicated by means of a uniform clock notation. Delaying the recording of activities or events often leads to incomplete or inaccurate entries.

Types of MCR logs:

- Data loggers provide real-time system performance information from accelerator controls system computers.
- Logs that reside in computer databases for use by computers and personnel to analyze events.
- Narrative logs.
- Bound (paper) logs, used for temporary log-keeping when electronic systems are unavailable.

Data loggers are used to monitor facility parameters including operational modes, alarm status, etc. From the data loggers many events can be reconstructed. Other logs that are kept in computer databases include the downtime log, which contains the duration and reasons for equipment failures. Narrative logs contain text provided by operations personnel to elaborate on, and extend, the information that has been logged by computers.

Before a shift is completed, the Crew Chief shall review his/her log for readability, completeness, and accuracy. Modifications to the electronic log after the end of the shift will only be done if information is later determined to be inaccurate or misleading. This will only be done with the approval of the Main Control Room Group Leader. Any changes to bound logs will be done using good log keeping practices (i.e., no erasures or white-outs).

MCR accelerator operations logs, including the shift logs and downtime logs, are maintained in on-line databases and will be retained for the life of the facility. The MCR uses some paper-based logs for some day-to-day activities incidental to accelerator operations (e.g., temporary logs if the database is unavailable or LOTO logs). These will be kept for five years.

Chapter 12 - Turnover and Assumption of Responsibilities

This chapter describes the controls necessary for conducting an orderly and accurate transfer of information regarding a facility's overall status at shift turnover. Shift turnover is a critical part of APS operation. Personnel should not assume operational duties unless they are physically and mentally fit to do so and until they have a high degree of confidence that an appropriate information transfer has taken place. Shift personnel shall conduct shift turnovers in a professional manner.

Each crew shall have at least one person who is fully qualified to assume the shift position.

The off-going crew chief will conduct a shift briefing with the oncoming crew at an area away from the workstations. The off-going crew members shall retain their responsibilities during the briefing and may be required to initiate a response to operational issues should any arise during the briefing. The briefing shall consist primarily of reviewing the contents of the on-line log including the shift summary and the sections entitled "Daily Orders" and "Operator Aids."

Chapter 13 - Control of Interrelated Processes

Argonne's Infrastructure Services Directorate (IS) is responsible for providing and maintaining the building and utility infrastructure that house and support the APS. IS maintains a dedicated engineering group to support APS electrical and mechanical facilities - APS maintains responsibility for technical (accelerator and experimental) systems.

The IS/APS Site Operations Group Leader is the designated point of contact between the APS and IS, is matrixed to PSC/AES Division, and is physically located at APS.

The MCR is the APS point of contact for IS to notify if work on or off-normal performance of IS-managed systems can impact accelerator operations.

A memorandum of understanding (MOU) has been jointly prepared by PSC and IS that defines the responsibilities for infrastructure to be provided to the APS by IS:

Memorandum of Understanding Between The Photon Sciences Directorate (PSC) And The Infrastructure Services (IS) Directorate For the Advanced Photon Source (APS) Complex ([APS_2030428](#)).

Chapter 14 - Required Reading

The APS has implemented a rigorous program for Operator training and testing detailed in:

- Operator Qualification procedure ([APS 1193009](#)).

The program includes the required general and accelerator machine-specific training delivered through:

- Classes
- Required reading
- On-Shift Training (OST) - see Chapter 5

The training is assessed through written and console tests.

Argonne training requirements for employees are identified via a Job Hazard Questionnaire and are tracked by the Argonne Training Management System (TMS). Some TMS training may consist of required reading with materials provided on-line through TMS.

APS accelerator-specific Operator qualification training includes required readings. The readings are listed in the qualification procedure (APS_1193009) and the materials are available through the APS Integrated Content Management System (ICMS) or APS Operations web pages. The MCR administers the OST follow-on operator qualification testing.

Chapter 15 - Timely Instructions/Orders

The changing needs and requirements of APS facility operations necessitate that a system be implemented to disseminate information to operations personnel in a timely manner. To ensure that this information remains current, periodic reviews to remove outdated information should be included.

This chapter describes the means used to transmit management direction to MCR operators and a method of periodic review to remove outdated information.

ORDER: A written communication, posted on the APS intranet, that contains information prepared by management to relay instructions to MCR operators. It is expected that MCR operators know and follow all orders. Orders are split into three categories.

STANDING ORDER: An order accessed from a Main Control Room Group Web Page that generally falls into one of two categories: 1) an order that has been in place for several runs and has been moved to this location while a procedure is prepared to replace it; 2) an order that is likely to be permanent and is of sufficient brevity that a procedure is not appropriate.

TIMELY ORDER: An order accessed from a Main Control Room Group Web Page that is considered short term, typically in place for one operational run. For example, MCR operators are instructed to perform a certain task until a problem is fixed during the next long maintenance period.

DAILY ORDER: An order maintained in the on-line logbook that is typically in place for days to weeks. For example, MCR operators are instructed to perform a special task until a piece of equipment is repaired during the next weekly repair period.

Orders shall be issued by the Main Control Room Group Leader, COs, or other APS staff whenever necessary to communicate with shift personnel. Information such as special operations, instructions on the need for and performance of specific tasks or tests, administrative directions, special data-collection requirements, requests to plot process parameters, work priorities, announcements of policy information and other similar short-term matters may be included in timely or daily orders.

Information intended to permanently change or supplement operating procedures should be evaluated for incorporation into the appropriate procedure by a procedure change or revision.

Orders shall be clearly written and marked with the date of issuance, and the name of the person making the order. Orders shall be made easily accessible to the MCR operators.

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Daily orders shall be read by appropriate shift personnel prior to assuming their shift. Daily orders shall be reviewed daily and updated as necessary by the crew chiefs and COs. Timely orders are reviewed regularly by COs and the MCR Group Leader. They are updated at least once per operational run.

Standing orders are reviewed and updated by the COs and MCR Group Leader no less than annually.

Whenever timely or standing orders are updated, all MCR operators will be notified via email.

Chapter 16 - Technical Procedures

Operations procedures provide specific directions for operating accelerator systems and equipment during normal and postulated abnormal and emergency conditions. They help ensure that the facility is safely operated and within its design bases.

APS Facility Procedures

It is the policy of the APS that each group at the APS shall maintain documented procedures to ensure a safe work environment and reliable and efficient operations. This policy applies to APS mission/safety critical procedures, namely those that are required to ensure a safe work environment and reliable, efficient operations at the APS. The APS process for the development and maintenance of facility procedures, including MCR operating procedures, is detailed in:

- [Managing APS Facility Procedures \(APS 1001409\)](#)

Facility procedures are maintained in ICMS and use ICMS workflow for review and approvals. Required minimum approvals are identified in the policy. New procedures are submitted to an APS-designated Procedure Administrator (PA). The PA works with the author and facilitates the formatting, workflow, periodic reviews, and addressing feedback ([feedback link](#)). The template used for APS procedures is available through ICMS ([APS 1191216](#)). Once approved, a procedure is released in ICMS, and a persistent URL provides the link to the latest revision—personnel should verify that all printed copies are current before using them.

In addition to search tools available in ICMS, an on-line matrixed directory of many machine/system [APS Technical Procedures](#) is available. Selecting a machine and technical area from the matrix yields a list of applicable procedures.

Work Control Documents

Work planning and control of facility technical tasks is described in the APS policy:

- [Work Planning and Control \(APS 1432773\)](#)

Facility task work may be planned using the Argonne AWARE application to generate a work control document (WCD).

MCR Procedures

MCR operations procedures:

- Should be sufficiently detailed such that they can be executed without direct supervision.
- The sequence of procedural steps shall conform to the normal or expected operational sequence.

- Shall maintain operations within the “safety envelope” defined by the [Safety Assessment Document](#) (SAD) ([APS_1188832](#)). If there is the potential that an activity will or may have exceeded the safety envelope, the [Unreviewed Safety Issue Determination](#) ([APS_1185831](#)) process is to be followed.
- Warnings, notes, and cautions shall precede the step to which they apply, shall be easily identifiable, and shall not contain action statements.
- Procedures shall be technically and administratively accurate (i.e., the instructions and information should be correct; referenced documents should be correctly identified; and necessary instructions shall be present to guide the user when transferring between procedures).
- Individual signoffs shall be provided for critical steps.
- Limits and/or tolerances for operating parameters shall be specified and shall be consistent with the readable accuracy of instrumentation.
- Acceptance criteria for surveillance or test procedures shall be easily discerned, including tolerances and units.

Procedure Changes (temporary) and Revisions

Procedure changes and revisions shall conform to the following practices:

- Changes intended for use more than one time shall be documented in a location readily available for operator reference. Within two weeks, procedure changes should be concurred with by the individuals who would normally approve a revision of the procedure.
- Revisions shall be initiated when procedure inadequacies or errors are noted.
- Revisions shall be initiated when a significant change has been outstanding for greater than six months.
- All currently effective changes shall normally be incorporated when the procedure is revised.
- Procedure updates required by temporary modifications should be handled as a procedure “change” and implemented concurrently with the temporary modification installation.
- Important information regarding changes or revised procedures shall be communicated to appropriate operations personnel via the required reading system, pre-shift briefing, or a similar method.
- Documentation of the reason for key procedure steps shall be maintained and reviewed when implementing changes or revisions that alter these steps. This practice is important to ensure that the reason for any step is not overlooked.
- The review process shall involve validation of the procedure using walkthroughs or similar methods.

Emergencies

Procedures are prepared for anticipated facility conditions. Personnel may take whatever corrective actions are necessary during emergencies to place the equipment in a safe condition, and to protect equipment, personnel, and public safety without first initi-

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ating a procedure change. Employees shall be capable of performing the immediate action steps of emergency procedures without reference to the procedure. The emergency procedure shall be reviewed after the actions are performed, verifying that all required actions have been taken.

Post-Incident Procedure Reviews

Applicable procedures shall be reviewed after an unusual incident (such as an accident, significant operator error, or equipment malfunction).

Operations Software Feedback

MCR procedures often rely on running software known as PEMs (Procedure Execution Manager) developed by the Accelerator Operations and Physics Group. While the development of this software is beyond the scope of the present chapter, cognizant CO, Machine Manager, and technical group personnel should provide feedback to the software developers, as appropriate, to ensure that the content is technically correct and the wording and formats are clear and concise. Feedback from MCR crews should be communicated through the cognizant CO.

Chapter 17 - Operator Aids

For many activities it is sometimes useful to post and use aids to assist in the operation of instruments or facilities, to call attention to key steps, or to identify critical control points or values. Operator aids serve as a convenient reminder or quick reference source for information, not as operational requirements and not as a substitute for procedures.

Useful information is recorded in the on-line logbook in the section entitled 'Operator Aids.' It is subject to the same review as the Timely Orders.

Any APS employee may suggest an operator aid. In general, these are submitted to the Main Control Room Group email. The MCR Group Leader and Chiefs of Operations will review the proposed aids for accuracy and utility and, as appropriate, may approve their posting.

Control Room personnel may develop written notes for use during their shift. Information that needs to be passed on to the next shift will be recorded in the on-line log, and no paper notes will remain on control room equipment. The appropriate Chief of Operations will review these 'on-line operator aids' for timeliness and, where necessary, establish them in other ways (e.g., context-sensitive help in application interfaces).

Operator aids shall not bypass the normal APS procedure review and approval process ([Managing APS Facility Procedures, APS_1001409](#)). Operator aids that are inconsistent with or have the effect of altering facility procedures will not be approved - instead, as appropriate, procedures should be revised per APS procedures.

Chapter 18 - Component Labeling

MCR operators are trained on and comply with various APS labeling standards.

The ASD Critical Component System Manager (CCSM) is responsible for maintaining labeling on installed accelerator RSS devices.

GLOSSARY

(An expanded glossary is available in the APS Operations Conduct of Operations Manual, [APS 2283552](#).)

ACCELERATOR ENCLOSURE

Any one of the areas that contains accelerator components through which accelerated particles pass. (ch 9)

ACCELERATOR SYSTEMS DIVISION (ASD)

The APS division responsible for the systems required for the creation and acceleration of charged particle beams at the APS, including the linac, particle accumulator ring, booster/synchrotron, storage ring, and low-energy test line. The ASD also is responsible for the operation of the particle beam, the development and operation x-ray radiation sources, and development of the next generation synchrotron radiation sources. (ch 1)

ACCIDENT

An undesired event that results in injury, illness, damage to equipment, or insult to the environment. (ch 6)

ADMINISTRATIVE CONTROLS

Broadly defined as any written policies, procedures, standards, or limits set by APS Management that must be strictly adhered to for reasons of safety or equipment protection. An Administrative Control for a power supply, for example, might include a prohibition against operating the power supply above a certain voltage and/or current because of possible damage to other equipment, even though the power supply itself is capable of such operation. (ch 8)

ALD-PSC ESH/QA PROGRAM MANAGER

An individual designated by position description as responsible for coordinating the development and implementation of the APS Environment, Safety, and Health (ESH) and Quality Assurance (QA) program. The ALD ESH/QA Program Manager provides independent oversight on behalf of the DIR-APS in the areas of ESH and QA. (ch 1)

APS ENGINEERING SUPPORT DIVISION (AES):

The AES Division provides mechanical engineering, X-ray beamline controls engineering, information technology, and database management support to the Accelerator Systems and X-ray Science Divisions. AES also manages the user ESH program and the APS radiation program, and the APS building and conventional facilities. (ch 1)

ASSISTANT CHIEF OF OPERATIONS (ACO)

A senior operator who is qualified on all APS accelerators and given significant responsibility in training other operators. (ch 1)

AUTHORIZED ACCESS

Access to an accelerator enclosure by an authorized person without MCR intervention. (ch 9)

AUTHORIZED EMPLOYEE

An employee who has approval from the supervisor and has been trained to lock out energy sources in accordance with ANL and APS procedures in order to service or maintain machines or equipment. (ch 9)

BEAMLINER PERSONNEL

Any person associated with or performing experiments on an X-ray beamline. This includes CAT/CDT members, APS personnel associated with APS-operated beamlines, general users, and partner users.

CAT DIRECTOR

An individual designated as having overall responsibility for the management of a CAT. CAT Directors are responsible for the following:

- Serving as the CAT's primary point of contact with APS management.
- Ensuring that all work carried out in the CAT's sector(s) at the APS is performed in accordance with the APS-approved CAT management Plan and the APS Users Policies and Procedures.
- Ensuring that all research and support operations performed by users at the CAT beamlines are consistent with the APS-approved CAT Safety Plan and comply with the safety and operational guidelines of the APS.

The Director of X-Ray Operations and Research (XOR) within XSD has these responsibilities for all APS operated beamlines. (ch 1)

CHIEFS OF OPERATIONS (CO)

The Chiefs of Operations are staff members whose responsibilities are focused on one or more portions of the accelerator complex (e.g., linac, control system). Among other duties, they are responsible for operator training and certification, assisting on-shift personnel in troubleshooting problems, and scheduling work on accelerator components.

The responsibilities of the COs include but are not limited to the following:

- Act as a liaison between the MCR Group and the technical groups. Be on-call to assist the Operators, Machine Managers, and MCR Group leader in solving operational problems as they arise.
- Assist in the development of systems, accelerator studies, software, procedures, and policies related to his/her area of responsibility.
- Assist in tracking reliability and analyzing faults to determine causes and remediation.
- Act as training and qualifications officers in the MCR Group in his/her area of expertise. (ch 1)

COLLABORATIVE ACCESS TEAM (CAT)

A Partner User group organized to develop and operate beamlines in a designated APS sector or sectors.

COLLABORATIVE DEVELOPMENT TEAM (CDT)

Collaborative Development Team (CDT): An external partner group that drives the development of a beamline that will be ultimately operated by the APS.

CDT DIRECTOR

Has the same roles and responsibilities as a CAT Director for CDT beamlines.

COMPUTERIZED LOGS

Logs that contain data in a format that can be used by both computers and APS personnel to reconstruct or restore operational states. Examples are Save/Compare/Restore files and downtime logs. (ch 11)

CONCERN

Matter of interest that may involve an event or condition with an adverse impact on safety, health, quality assurance, or the environment. (ch 7)

CONFIGURATION CONTROL WORK PERMIT

A CCWP is generated by the APS Work Request System for work on radiation safety systems in the accelerator, front ends, and beamlines. The CCWP is the administrative control to allow a device to be removed from service and safely returned to service. The accelerator, front end, or beamline cannot be enabled for operation until the conditions of the permit are satisfied. The criteria for return to service are defined in the APS Policy on Design, Installation, and Maintenance of Radiation Safety Systems. (ch 8)

CREW CHIEF

The operator qualified on all APS accelerators who is in charge of the MCR during a shift. The Crew Chief is often, but not always, an ACO. While on shift, the Crew Chief is the designated supervisor of the other operators. (ch 1)

CRITICAL COMPONENT SYSTEM MANAGER (CCSM)

The CCSM oversees work on radiation safety systems in the accelerator, front ends, and beamlines. The CCSM ensures that a responsible engineer is assigned to perform the work, that approved procedures are in place, and that the equipment is returned to service correctly. (ch 8)

DAILY ORDER

An order maintained in the on-line logbook that is typically in place for days to weeks. For example, MCR operators are instructed to perform a special task until a piece of equipment is repaired during the next weekly repair period. (ch 15)

DATA LOGGERS

Programs running on the APS controls system computers that record, at a prescribed frequency or under prescribed conditions, the operational state of the APS facility. (ch 11)

DIVISION DIRECTOR

An individual designated by position description as having overall responsibility for an APS division. Division Directors have the line responsibility for carrying out the program established by the Operations Directorate. They translate the decisions of the Operations Directorate into detailed programs and schedules for their technical groups. Division Directors are responsible for providing the manpower and facilities to initiate and carry out the design, development, construction, and operation of the accelerator and beamlines. The Division Directors provide ongoing programs of maintenance and improvements to facility components to improve efficiency, increase operating reliability, and add facility capabilities. (ch 1)

DIVISION ESH COORDINATOR

An individual, appointed by and reporting to a Division Director, who develops and implements that Division's ESH programs. (ch 1)

DIVISION QUALITY ASSURANCE REPRESENTATIVE

An individual, appointed by and reporting to a Division Director, who assists in the development and implementation of that Division's QA/QC programs. (ch 1)

EXPERIMENT FLOOR OPERATIONS GROUP - AES:

The User ESH Support Group (EFOG) has the responsibility of providing safety coverage on the experiment floor, overseeing user beamline readiness, operations, and safety. The coverage is provided by Floor Coordinators either being present or on-call. For times that the Floor Coordinators are on-call, MCR Operators will provide the floor coverage. To accomplish this task, the group has trained operations coordinators and safety personnel. In addition to the Floor Coordinators the safety personnel include the APS Biosafety Officer and matrixed Health Physics personnel. The individuals are described elsewhere in the Glossary. (ch 1)

EXPERIMENT FLOOR OPERATIONS GROUP LEADER

The EFOG Group Leader is authorized by the AES Division Director to make any necessary day-to-day decisions involving minor changes to user operation parameters as established by the Operations Directorate. Changes that may directly affect the user program will be discussed with the AES Deputy Division Director. The User ESH Support Group Leader also serves as the APS User Safety Officer. (ch 1)

FLOOR COORDINATORS (FCS)

Individuals responsible for monitoring the safe operations of the user beamlines. The Floor Coordinators provide the first level of oversight for user compliance with APS policies, procedures, and safety and operational guidelines. At least one Floor Coordinator is on duty (present or on-call) at all times during User Operations periods. (ch 1)

INCIDENT

An event resulting in personal injury/illness, spill or release to the environment, loss or spill of radiological material, radiation exposure or contamination, chemical or physical agent exposure that may have potential health effects, fire or explosion, near miss, regulatory noncompliance, property damage, vehicle mishap, loss of assets, or an event or condition that adversely affects or may adversely affect DOE or contractor personnel, the public, property, the environment, or DOE mission. (ch 6)

INDEPENDENT VERIFICATION

Independent verification shall locate and identify the component and determine both its required state for safe operation and its actual state. The independent verification shall not change the component state unless state changes are specified in the validation procedure. All steps involved in verification shall be performed independently to avoid a common failure mode. (ch 10)

KIRK-KEY

Common name for a key used in conjunction with a system of key-capture units. These units capture a key while a mechanical action is in one condition and release it when the mechanical action is changed. Other such units capture several keys while releasing a "master" key, thus ensuring that the captured keys cannot be used elsewhere. These units and their unique keys are used to build a system that enforces an electrical and/or mechanical procedure. (ch 9)

LOCKOUT

The application of a lock and a tag identification on an energy-isolating device in accordance with an established procedure. (ch 9)

MACHINE INTERVENTION

The term used to describe time scheduled during user operations for accelerator-related activity. The primary use of this time is accelerator studies, although if accelerator components need repair or maintenance, this work will be scheduled to be performed during machine intervention time. (ch 8)

MACHINE MANAGER

An individual designated as having responsibility for the performance of one of the APS accelerators: linac, PAR, booster, storage ring, and the Linac Extension Area (LEA). These individuals define and maintain performance parameters and must be involved in any design changes that affect performance parameters. (ch 1)

MAIN CONTROL ROOM GROUP - ASD

The Main Control Room Group has the responsibility of providing around-the-clock coverage in the MCR during periods of accelerator operation, overseeing both accelerator operations and maintenance activities. To accomplish this task, the Group includes but is not limited to crews of qualified Operators and ACOs (with additional trainees) and

several staff members. These individuals are in this glossary. The group is also responsible for developing high-level procedures and software for safe, reliable, and responsive operation of APS accelerators. (ch 1)

MAIN CONTROL ROOM GROUP LEADER

The Main Control Room Group Leader is authorized by the ASD Division Director to make any necessary day-to-day decisions involving minor changes to the schedule and beam parameters previously approved by the Operations Directorate. The meaning of "minor" in this context will be established by discussions with the Operations Directorate and recorded in written policies by ASD management. Identification of the need for a minor change and subsequent actions may be delegated by the MCR Group Leader to the MCR Crew Chief and Chiefs of Operations through written policies and instructions. Significant changes to schedule or beam parameters require consultation of the MCR Group Leader, Chief of Operations, or Crew Chief with the ASD Division Director or his designee. (ch 1)

NARRATIVE LOGS

Logs in which APS personnel enter information that describes the events of their shifts, and pass on information to subsequent shifts and other APS personnel. (ch 11)

NEAR MISS

A situation where an incident was avoided by only a single barrier or when all of the conditions necessary to cause an incident existed (i.e., when all barriers were compromised). (ch 6)

OCCURRENCE

As defined in DOE M 232.1-1A, Occurrence Reporting and Processing of Operations Information, Appendix A: An event or condition that adversely affects or may adversely affect DOE or contractor personnel, the public, property, the environment, or DOE mission. Events or conditions meeting the criteria threshold for Unusual and Off-Normal occurrences are defined in the ANL ESH Manual Chapter 1-8, Occurrence Reporting. Occurrences are reportable to DOE via the ORPS reporting system. (ch 6)

ON-SHIFT TRAINING (OST)

That portion of an operator qualification program where the trainee receives training within the job environment and with as much hands-on experience as possible. (ch 5)

OPERATING ENVELOPE

A set of physical and administrative conditions that define the bounding conditions to ensure that operations are held well within the safety envelope. Operating envelopes are set by machine managers with concurrence from the ANL Radiation Safety Officer. (ch 2)

OPERATIONS DIRECTORATE

An advisory group chartered by the Director of the Advanced Photon Source (DIR-APS) that includes the DIR-APS, the Deputy ALD for Accelerators, Deputy ALD for X-ray Science, APS Division Directors, APS Associate and Deputy Division Directors, the APS ESH/QA Oversight Manager, a representative from the Partner Users Council, a representative from the APS Users Organization Steering Committee, and other appropriate personnel. The Operations Directorate gives input on operational issues that affect the facility as a whole.

They will review:

- Long- and short-term schedules proposed by ASD, including scheduled maintenance and facility improvement periods.
- Global operating parameters, such as energy, maximum circulating beam current, and fill patterns.
- Requests for accelerator enhancements.
- Operational statistics prior to publication.

All minutes and actions taken by the Operations Directorate are recorded on the web. Important submitted material is also recorded on the Operations Directorate web page. (ch 1)

OPERATIONS PERSONNEL

Members of the ASD Main Control Room Group authorized to conduct hands-on operations of the APS accelerator systems. (ch 1)

OPERATOR

An individual who is either qualified or becoming qualified to operate all APS accelerators. This individual need not be a dedicated accelerator operator. For example, ACOs and Machine Managers, when suitably qualified, may perform as operators when circumstances require it. (ch 1)

ORDER

A written communication, posted on the APS intranet, that contains information prepared by management to relay instructions to MCR operators. It is expected that MCR operators know and follow all orders. (ch 15)

PROCEDURE CHANGE

An immediate change to a procedure, whether for permanent or one-time use, which does not involve reissuing of the procedure. (ch 16)

PROCEDURE REVISION

A reissued edition of a procedure. (ch 16)

SAFETY ASSESSMENT DOCUMENT

The document containing the results of the safety analysis of an accelerator facility pertinent to understanding the risks associated with its operation. (ch 16)

SAFETY ENVELOPE

A set of physical and administrative conditions that define the bounding conditions for safe operations at an accelerator facility as approved by DOE. (ch 2)

SECTOR

A subunit of the APS consisting of the Experiment Hall space allocated to an insertion device beamline and the preceding bending- magnet beamline, as well as that portion of the storage ring that includes these two radiation sources. (ch 1)

STANDING ORDER

An order accessed from a Main Control Room Group Web Page that generally falls into one of two categories: 1) an order that has been in place for several runs and has been moved to this location while a procedure is prepared to replace it; 2) an order that is likely to be permanent and is of sufficient brevity that a procedure is not appropriate. For example, the operating envelope is a permanent standing order. (ch 15)

SYSTEM/RESPONSIBLE ENGINEERS

Individuals designated by position description or assignment as responsible for improving and ensuring the proper maintenance and repair of a specific technical system within the APS. The System/ Responsible Engineer is a member of one of the technical groups of the APS divisions. A System/Responsible Engineer may be responsible for an entire system, such as storage ring rf or synchrotron vacuum, or for a subsystem thereof, such as storage ring rf modulators or synchrotron vacuum pumps. The System/Responsible Engineer shall ensure that a technical contact is reachable 24 hours a day during operational periods. (ch 1)

TECHNICAL GROUPS

The groups responsible for the maintenance, repair, and improvement of all APS equipment. Administratively, each technical group is part of an APS division. In most cases, these groups are organized along lines of technical expertise; for example, the Power Systems Group is responsible for all magnet power supplies. In general, all System Engineers are members of these groups. The Technical Group Leaders, working with the System Engineers, are responsible for setting up appropriate maintenance schedules for the equipment under their jurisdiction. (ch 1)

TIMELY ORDER

An order accessed from a Main Control Room Group Web Page that is considered short term, typically in place for one operational run. For example, MCR operators are instructed to perform a certain task until a problem is fixed during the next long maintenance period. (ch 15)

USER

An individual authorized to conduct research operations at an APS beamline. A user may be an employee of the APS, of an ANL division outside of the APS, or from another institution. (ch 1)

WORK REQUEST

An online form that is used to communicate the status of work. It is initiated when the work is first defined, and subsequently used to track work through the approval, execution, and final check-out phases. It also includes a variety of safety checks. (ch 8)

X-RAY SCIENCE DIVISION (XSD)

The APS division that manages x-ray science programs conducted under the XSD Associate Division Director for X-ray Operations and Research (XOR), develops and operates radiation sources, builds experimental station instrumentation for APS users and next-generation synchrotron radiation sources, and develops x-ray optics to support beamline research. (ch 1)