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Accelerator & Fusion Research Division

**An Overview of What is Required and When
for Developing a Beamline at the ALS**

Z. Hussain and the Beamline Review Committee

August 1995

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**AN OVERVIEW OF WHAT IS REQUIRED AND WHEN
FOR DEVELOPING A BEAMLINE AT THE ALS***

Beamline Review Committee
(Z. Hussain, Chairperson)

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An Overview of What is Required and When for Developing a Beamline at the ALS Revision 1

**Beamline Review Committee
August 22, 1995**

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Abbreviations:

BDR Beamline Design Review
BRC Beamline Review Committee
CDR Conceptual Design Review
EPS Equipment Protection System
LCW Low Conductivity Water
MOU Memorandum of Understanding
PRT Participating Research Team
PSS Personnel Safety Shutter
RGA Residual Gas Analyzer
RSS Radiation Safety System
UHV Ultra High Vacuum

Front end Front-end components serve to define beam aperture for synchrotron radiation and provide necessary beam on/off, radiation safety, and vacuum-isolation systems for each beamline for both insertion device and bending magnet sources. The front-end components generally reside inside the storage ring shielding and physically connect the ring vacuum chamber to the first valve of the beamline.

I. Reviews Required for Developing a Beamline at the ALS

The development of beamlines for use at the ALS is monitored by the Beamline Review Committee (BRC). Every beamline is subject to three reviews:

- **Conceptual Design Review** at the start of beamline development.
- **Beamline Design Review** before installation of any beamline equipment.
- **Beamline Readiness Review** following installation of the complete beamline and before first operation.

These reviews may be repeated if modifications are made that warrant re-review or if significant issues require further clarification. They are conducted to ensure that the beamline components and equipment satisfy all ALS, LBNL, and DOE requirements for safe operation.

- A. Conceptual Design Review.** Beamlines developed by the ALS or by a Participating Research Team (PRT) are required to have a Conceptual Design Review (CDR) at a very early stage. This is an informal review at which the concepts, without the engineering details, are outlined. The review may include changes due to floor space considerations and suggestions for how to design a better beamline by making best use of the special properties, such as high brightness, of the ALS synchrotron radiation source.
- B. Beamline Design Review (BDR).** This review examines the beamline design, including the design of all equipment, before installation begins. **It is recommended that the BDR be done 6 months (absolute minimum is 3 months) before the tentative date of first operation of the beamline** (and before funds are committed to fabricate expensive components). Thus, the beamline developers should schedule the BDR through the BRC well before any beamline equipment is due to be installed on the ALS floor.

As an ALS policy, all front ends are based on ALS design, and must be installed and qualified by the ALS staff. Front ends are typically built by the ALS staff, but other arrangements are possible, depending on the agreement reached in the Memorandum of Understanding (MOU) between the ALS and the PRT.

Section II lists the documents required for the BDR, and a checklist is given in Section VI. A sample BDR document package is available from the ALS Administrator (for contact information, see Section V). ALS User Advisories about the design and installation requirements of beamline equipment are in Appendix B.

After the Beamline Design Review, construction of the beamline may begin. At the BDR, a schedule is established by the BRC and the PRT for an intermediate inspection sequence and sign-off by the ALS to ensure that (a) the beamline is being built according to the design approved during the BDR, and (b) all ALS installation and LBNL safety requirements are met in the as-built equipment. It is expected that PRT members designing/installing the beamline on the ALS floor will be in close contact with the ALS staff during this period through the weekly engineering installation meetings. To ensure that the beamline being developed meets the necessary ALS safety and operational requirements, it is important that the responsible PRT member

provide details related to all aspects of the beamline to the ALS staff in a timely manner, as outlined in Section III of this document. Requests for modifications of anything approved during the BDR must be submitted to the BRC chairperson before the modification is made.

- C. Beamline Readiness Review (BRR).** The BRR is carried out before the first operation of the beamline. The BRR consists of two distinct parts: a review of documentation submitted to the BRC and a physical walkthrough of the beamline by qualified ALS staff to check key functions of the beamline.

Section IV lists the documents required for the BRR and the items inspected during the BRR walkthrough. A checklist is provided in section VI. The Beamline Readiness Review Walkthrough Procedure (#BL 08-07) and the BRR document package are available from the ALS Administrator (for contact information, see Section V).

II. Work Items and Documentation Required for the Beamline Design Review

Deadline: The BDR must be conducted 6 months before first operation of the beamline (and the Beamline Readiness Review). The Documentation Package is due two weeks before the BDR.

Before beamline components are manufactured, a BDR is held to ensure that the components and equipment satisfy all ALS, LBNL, and DOE requirements for safe operation. The BDR examines the beamline design, including the design of all equipment to be installed. It is best to prepare for and schedule a BDR while the beamline is still in the design stage and before ordering components, so that no hardware will need to be altered. Due to the time required to construct components after the BDR, the review should be held 3-6 months before the tentative first beamline operation (and the BRR).

A description of each item on the following list must be completed for the BDR. The complete document package is to be submitted about two weeks before the BDR is requested. See Section V for contact people. For detailed information about the items, consult *ALS Beamline Design Requirements*, PUB-3114, available from the ALS Administrator (for contact information, see Section V).

To schedule a BDR, please contact the head of the BRC. (This position rotates annually; please contact the ALS Administrator [510-486-6166] for the current chairperson.)

Documentation and Work Items Required for the BDR:

- A. Radiation shielding:** The final ray trace drawings for radiation shielding (required for the BDR) are prepared by the ALS Mechanical Engineering staff from the beamline layout and preliminary shielding information provided by the PRT designer. Appendix A includes guidelines for radiation shielding (LSBL #172 & #173) and sample ray trace drawings. All the information must be submitted in ample time for the ALS to prepare the final drawing. It is strongly recommended that beamline builders start communicating the information related to shielding as soon as the preliminary design

for the beamline is completed, as several iterations may be necessary before the shielding design by the ALS is finalized.

Deadline: *The overall time required is 4-12 weeks, depending on the complexity of the shielding requirement and availability of the engineering staff. Final drawings should be submitted to the BRC two weeks before the BDR.*

- B. Vacuum components:** Description of the vacuum components of the beamline and endstation, including information about fast-valve sensor locations, vacuum interlock, vacuum pumps, ion gauges, vacuum viewports, any nonstandard materials used in UHV components, etc. Refer to "Advanced Light Source Vacuum Policy and Vacuum Guidelines for Beamlines and Experiment Endstations" (LSBL 278) in Appendix A and User Advisories "Vacuum Policy for User Endstations for Protection of Beamline Components and Storage Ring Vacuum" and "ALS Policy for Exhausting of Mechanical Vacuum Pumps" in Appendix B.
- C. Electrical:** Description of all electrical equipment to show that the equipment conforms to LBNL regulations and National Electrical Codes. Refer to User Advisories "Electrical Cable Wire and Routing Requirements," "Avoiding Overloads on AC Circuits," and "Beamline Electrical Safety Guidelines" in Appendix B.
- D. Utilities:** Please provide requirements for utilities for each item, such as LCW flow, pneumatics, electrical power, distribution layouts, water temperature requirement (e.g., is a water chiller required?), etc.
- E. Fire safety measures:** Description of use of any material which may cause fire safety concern, including information about flammable chemicals used in the power supply or for routine maintenance of the beamline.
- F. Hazardous materials safety measures:** Description of use of any hazardous material, including cryogenics and biological, toxic, corrosive, and flammable materials.
- G. Seismic safety measures:** Description of measures taken for seismic restraints to ensure that the equipment could withstand a minimum of 0.7 g of lateral acceleration. It is recommended that as a design value equipment be able to withstand a lateral acceleration of 1.0 g or greater. Refer to User Advisories "Affixing Beamline and Endstation Components to the ALS Floor" and "Guidelines for Meeting Seismic Requirements for User Equipment at the ALS" in Appendix B, and to the *LBL Health and Safety Manual*, PUB-3000, Chapter 23.
- H. Mechanical safety measures:** Provide verification of compliance with LBNL requirements for mechanical systems (lifting fixtures, rigging, remote, motorized motions, pressure vessels, lasers, visible light, viewports, windows, etc.). See *LBL Health and Safety Manual*, PUB-3000, Chapters 7, 8, and 16.
- I. Equipment protection system:** Description of equipment protection interlocks and measures taken to protect the integrity of the storage ring, including information related to a separate EPS for the endstation, if required. Any gas cells with thin windows are of special interest.

- J. Survey-and-Alignment fiducials on beamline components:** Plan for fiducialization, survey, and alignment of beamline and endstations. Refer to "Survey and Alignment Information for ALS Users" in Appendix A.
- K. Beamline/endstations layout:** Drawing of the overall layout indicating all important beamline components, including walkway around the beamline and escape aisle.
- L. Hutches (if used):** Complete description of the hutch design, including all mechanical, electrical, and radiation safety measures. The ALS will design the radiation safety systems.
- M. A typical experiment:** Brief description of a typical experiment. (The BDR does not review the planned experiments. That review is requested via an "Experiment Form," available from the ALS Administrator. For contact information, see Section V.)
- N. Possible future layout:** A design layout of possible changes or additions to the beamline (so that they may be allowed for in the control system hardware and software and space considerations).

III. Information to be Communicated to the ALS Staff before the Beamline Readiness Review

When the Beamline Design Review has been completed, construction of the beamline may begin. Many of the steps to completion are sequential, and some require ALS input. Please give the ALS contact for each area as much notice as possible of your work requirements (so that scheduling of your work will be timely) and keep all contacts informed of any change in the anticipated date of first operation.

Communicate the information related to the following items to the responsible ALS contact via the weekly engineering installation meetings chaired by Tom Downs (for contact information, see Section V). Some of the installation work may be done by the PRT personnel, but in all cases the plans must be approved by the ALS (to ensure that they meet LBNL and DOE regulations).

- A. Beamline Instrumentation Diagram:** A detailed beamline instrumentation diagram, indicating the location of all vacuum valves, photon shutters, fast sensors, beam position monitors, ion gauges, vacuum pumps, residual gas analyzers, and motors is to be provided.

Deadline: Minimum of 8-12 weeks before the BRR.

- B. Electrical Requirement:** Information related to wireway layout, rack profile, cables/terminations, high voltage connectors on vacuum chamber, and electrical power requirement must be communicated to the ALS staff. Beamline utility racks should be numbered as described in "ALS Beamline Rack Numbering Scheme" (LSEE 107), available from the ALS Administrator (for contact information, see Section V).

Deadline: Minimum of 8-12 weeks before the BRR.

C. Vacuum Requirement: Vacuum needs related to the clean room facility, assembly of vacuum components, bakeout requirement, and installation of vacuum components must be communicated well in advance of the date they are needed. A RGA scan and vacuum qualification are required before the branchline isolation valve may be opened (which is required for the final branchline interlock tests).

*Deadline: Minimum of 2 weeks'notice before the specific facility is required.
The RGA scan must be carried out before final interlock test.*

D. Radiation/Personnel Safety System: The test procedure involving the Radiation Safety System (RSS) and operation of the Radiation Personnel Safety Shutter (PSS) is written and executed by the ALS staff. However, it is specific to the beamline front end and thus the PRT member must communicate the design requirement to the ALS staff. The information about procedures involved in checking hutches is available from ALS staff (for contact information, see Section V).

*Deadline: Requires 8-12 weeks of development.
Should be done before the equipment protection system tests described below.*

E. Equipment Protection System and Branchline Control System: The vacuum interlocks and beamline/branchline control system (involving both hardware and software) is developed by the PRT members and/or the ALS staff. One of the most important aspects is the electronic installation and testing of the fast valves. All final tests are checked by the ALS staff, generally through the procedures (written by ALS staff) discussed below.

Deadline: Communicate information throughout the development of the beamline.

F. Interlock Procedures for Equipment Protection System: The following three interlock procedures are developed for beamlines without hutches. These procedures are written specific to the beamline (for contact information, see Section V), from information provided by the PRT. The execution of these procedures may involve specific sequences and may be carried out only on shutdown days.

1. **Front End Equipment Protection System Procedures (FE EPS):** A procedure is required to check interlocks of the front end equipment protection system.

Deadline: Requires 8-12 weeks of development.

These procedures must be executed during shutdown days, due to the need to go inside the storage ring shield wall. Usually the FE EPS is executed one week before the BRFE EPS (see below).

2. **Branchline Front End Equipment Protection System Procedure (BRFE EPS):** One procedure is written to check interlocks for the branchline front end equipment protection system.

Deadline: Requires 8-12 weeks of development.

Procedures must be executed during shutdown days. Usually BRFE EPS is carried out after vacuum qualification of the branchline.

3. **Branchline Equipment Protection System Procedure:** Preliminary tests are carried out earlier, and the final test may be carried out on the day of the first operation.

Deadline: Requires 8-12 weeks of development, if done by the ALS staff (development may also be done by the PRT).

Tests may be carried out a week before the BRR.

4. **Endstation Equipment Protection System Procedure:** If an endstation EPS is proposed, a separate procedure is needed.

Deadline: Requires 8-12 weeks of development, if done by the ALS staff (development may also be done by the PRT).

Tests may be carried out a week before the BRR.

- G. **Key Enable Procedure:** The Key Enable Procedure, written by the PRT member with the help of ALS staff, describes final details required to get the beam through the branchline. This is carried out as a part of the final BRR Walkthrough, as discussed in Section IV.

Deadline: Information to be provided to the ALS Procedure Administrator at least one week before the BRR.

- H. **Seismic Safety:** Necessary information along with calculations are required to show that all the beamline components will withstand a minimum of 0.7g of lateral acceleration.

Deadline: Minimum of 4-8 weeks before the BRR.

- I. **Mechanical Systems Safety:** All information related to mechanical safety aspect of the beamline components (e.g., mechanical strength of the vacuum chamber or view ports to withstand atmospheric forces) must be provided.

Deadline: Minimum of 4-8 weeks before the BRR.

IV. Work Items and Documentation to be Completed for the Beamline Readiness Review

The Beamline Readiness Review (BRR) checks that the beamline has been built according to the design approved at the BDR. The BRR has two parts: a review of documentation submitted to the BRC and a walkthrough of the beamline to check key functions for first-time operation. The comprehensive, walkthrough inspection is conducted by an Operations Coordinator (see p. 10), the Beamline Coordinator (see p. 10), and members of the ALS EH&S, Electrical Engineering, and Mechanical Groups.

A sample copy of the Beamline Readiness Review Walkthrough Procedure (#BL 08-07) and the BRR document package are available from the ALS Administrator (for contact information, see Section V).

A. Documentation Required for BRR:

1. **Shielding Drawing:** A drawing showing the shielding and exclusion zone locations, so that the positions can be checked with a tape measure. This drawing must have been approved by the ALS. The positions of shielding must correspond to the locations approved in the BDR.
2. **Schematic Drawing:** A schematic drawing naming all beamline components including valves, ion gauges, pumps, windows, apertures, lead shielding, exclusion zones, and optical chambers.
3. **Equipment Protection System (EPS):** A specification of the logic of the beamline Equipment Protection System, if the system was not designed by ALS staff.
4. **Beamline Key Enable Procedure:** A checklist for the Beamline Key Enable Procedure prepared by a PRT member. This checklist should include the bremsstrahlung shielding, the exclusion zones, a RGA scan, and ion gauge readings.
5. **Beamline Modification:** Documentation of any changes to the beamline since the BDR. Each request for a modification must be submitted to the BRC chairperson before the modification is made.

B. Items Checked During the BRR Walkthrough:

This is carried out as an ALS Beamline Readiness Review Walkthrough Procedure (#BL 08-07), which is generic in nature.

1. **Radiation Shielding Qualification:** The position and size of the bremsstrahlung shielding and exclusion zones are checked against the shielding drawings.
2. **Radiation Safety System (RSS):** The RSS must have been qualified during the preceding six months. Qualification is done through an ALS RSS procedure specific to the beamline.
3. **Electrical Safety Qualification:** Electrical safety and compliance with wiring and safety standards are checked. This includes checking of proper grounding and electrical connections to vacuum vessels.
4. **Mechanical Qualification:** Seismic safety and hazards related to motorized motions are checked.
5. **Vacuum Qualification:** Ion gauge readings and the Residual Gas Analyzer (RGA) scan are checked for conformation with vacuum requirements. Protection systems must be in place for any gas cells.
6. **Equipment Protection System (EPS) Qualification:** All applicable EPS tests have been performed. This is carried out through ALS EPS procedure/s specific to the beamline.

7. **The Key Enable Procedure:** The Key Enable Procedure is executed for the first time. (Later, the Key Enable Procedure will be executed whenever the beamline is re-enabled and put on line.)
8. **Radiation Survey:** A radiation survey is conducted.

V. Contacts for Information and Technical Questions

Surface mail should be addressed to the recipient at:

Lawrence Berkeley Laboratory
1 Cyclotron Rd., MS ____
Berkeley, CA 94720

Administrator

Elizabeth Saucier (MS 80-101, phone 510-486-6166, fax 510-486-4960)

Beamline Coordinator

The Beamline Coordinator is the scientist (not necessarily an ALS employee) in charge of an individual beamline who has in-depth understanding of the beamline and who is the representative and contact person for the beamline.

Operations Coordinator

The Operations Coordinators are the first contact for questions or assistance on the experiment floor during ALS operations. They are knowledgeable about ALS operations, safety regulations and training, and beamline inspection and documentation.

ALS Policies (vacuum, radiation shielding, beamline design, etc.)

Documents: Elizabeth Saucier (MS 80-101, phone 510-486-6166, fax 510-486-4960)

Technical Direction: Beamline Review Committee; Zahid Hussain, Chair (MS 2-305, phone 510-486-7591, fax 510-486-4299, email: hussain@lbl.gov)

Beamline Controls

Alan Biocca (MS 10-110, phone 510-486-7700, fax 510-486-4960)

Beamline Design

Howard Padmore (MS 2-400, phone 510-486-5787, fax 510-486-7696)

Malcolm Howells (MS 2-400, phone 510-486-4949, fax 510-486-7696)

Wayne McKinney (MS 2-400, phone 510-486-4395, fax 510-486-7696)

Electrical (wireway, cabling, etc.)

Tom Downs (MS 46-125, phone 510-486-5824, fax 510-486-5775)

Electrical Engineering

Art Ritchie (MS 46-161, phone 510-486-4785, fax 510-486-5775)

Environment, Health, and Safety

Georgeanna Perdue (MS 80-101, phone 510-486-7407, fax 510-486-5800)

Equipment Protection System

Ken Woolfe (MS 46-125, phone 510-486-7739, fax 510-486-5775)

Laser Safety

Ken Barat (MS 90-2148, phone 510-486-7658, fax 510-486-5399)

Mechanical Engineering

Dick DiGennaro (MS 46-161, phone 510-486-6466, fax 510-486-4873)

Mechanical System Safety

William Thur (MS 46-161, phone 510-486-5689, fax 510-486-4873)

Procedures

Documents: Rita Jones (MS 80-101, phone 510-486-7723, fax 510-486-5800)

Interlock Procedures: Ken Woolfe (MS 46-125, phone 510-486-7739, fax 510-486-5775)

Key-enable procedure: Cheryl Hauck (MS 80-101, phone 510-486-7885, fax 510-486-5800)

Radiation Safety System (RSS)

Art Ritchie (MS 46-125, phone 510-486-4785, fax 510-486-5775)

Al Lindner (MS 46-125, phone 510-486-7757, fax 510-486-5775)

Radiation Shielding

Health Physics Issues: Rick Donahue, (MS 90-2148, phone 510-486-5597, fax 510-486-6608)

Ray Trace Drawings and Shielding Construction Issues: Dick DiGennaro (MS 46-161, phone 510-486-6466, fax 510-486-4873)

Scheduling a Beamline Design Review (BDR) or Beamline Readiness Review (BRR)

Zahid Hussain (MS 2-300, phone 510-486-7591, fax 510-486-4299, email: hussain@lbl.gov)

Joan Minton (MS 2-400, phone 510-486-4067, fax 510-486-7696)

Seismic

William Thur (MS 46-161, phone 510-486-5689, fax 510-486-4873)

Survey and Alignment

William Thur (MS 46-161, phone 510-486-5689, fax 510-486-4873)

Technical Assistance, Work Order Requests, Hookups and Repairs

Ray Thatcher (MS 80-101, phone 510-486-7412, fax 510-486-5800)

Operations Coordinator on duty (phone 510-486-7464)

User Information

Fred Schlachter (MS 80-101, phone 510-486-4892, fax 510-486-4960, email: fred_schlachter@lbl.gov)

Elizabeth Saucier (MS 80-101, phone 510-486-6166, fax 510-486-4960)

Vacuum

Tony Catalano (MS 80-101, phone 510-486-6484, fax 510-486-4990)
Dick DiGennaro (MS 46-161, phone 510-486-6466, fax 510-486-4873)
Ray Thatcher (MS 80-101, phone 510-486-7412, fax 510-486-5800)
John Thomson (MS 80-101, phone 510-486-7975, fax 510-486-4990)

Utilities

Tom Downs (MS 46-125, phone 510-486-5824, fax 510-486-5775)
Ken Rex (MS 46-161, phone 510-486-6826, fax 510-486-4873)

Meetings

Engineering Installation Meeting held Tuesdays, 1:00 p.m., 46-275F,
Chaired by Gary Krebs (MS 80-101, phone 510-486-7727, fax 510-486-4960)
or Tom Downs (MS 46-125, phone 510-486-5824, fax 510-486-5775)
ALS Operations Scheduling Meeting held Fridays, 3:30 p.m., Building 6 conference room,
Chaired by Bob Miller (MS 80-140D, phone 510-486-4738, fax 510-486-5800)

Additional Sources of Information (available from ALS Administrator)

ALS Beamline Design Requirements, PUB-3114
LBL Health and Safety Manual, PUB-3000
ALS Experiment Form
ALS Beamline Rack Numbering Scheme (LSEE 107)
Sample copy of the Beamline Design Review document package
Sample copy of the Beamline Readiness Review Walkthrough Procedure (#BL 08-07)
Beamline Readiness Review document package

BUILDING A BEAMLINE: STEPS FROM DESIGN CONCEPT TO USING BEAM

Step *Requires ALS Procedure	Brief Description of What is Needed	ALS Contact/Phone Number	Time needed to prepare	See Page	Check Completed
1. Conceptual Design Review (CDR)	Outline of beamline concepts, minus engineering details	Neville Smith/5423 Howard Padmore/5787		2	
2. Beamline Design Review (BDR)	Designs of beamline components and equipment presented and evaluated	Zahid Hussain/7591	3-6 months before beamline operation	2	
A. Radiation shielding	Final ray trace drawings	Rick Donahue/5997 Dick DiGennaro/6466	4-12 weeks before beamline operation	4	
B. Vacuum components	Description of vacuum components used in beamline and end station	Tony Catalano/6484	Submit with BDR	4	
C. Electrical	Description of electrical equipment	Tom Downs/5824 Art Ritchie/4785	Submit with BDR	5	
D. Utilities	Requirements for each utility	Tom Downs/5824 Art Ritchie/4785	Submit with BDR	5	
E. Fire safety measures	Description of flammable chemicals and materials of fire safety concern	Georgeanna Perdue/ 7407	Submit with BDR	5	
F. Hazardous materials safety measure	Description of cryogenics and biological, toxic, corrosive, and flammable materials	Georgeanna Perdue/ 7407	Submit with BDR	5	
G. Seismic safety measures	Description of seismic restraints to ensure equipment with-stands 0.7g lateral acceleration	Will Thur/5689	Submit with BDR	5	
H. Mechanical safety measures	Provide verification of compliance with LBL requirements for mechanical systems	Tom Downs/5824 Art Ritchie/4785	Submit with BDR	5	
I. Equipment protection system (EPS)	Description of equipment protection interlocks to maintain storage ring integrity (including fast valve)	Ken Woolfe/7739	Submit with BDR	5	
J. S&A fiducials on components	Plan for survey and alignment of beamline and end station	Will Thur/5689	Submit with BDR	5	
K. Beamline/end station layout	Drawing of overall layout showing all important beamline components, including walkway around beamline and escape aisle	Dick DiGennaro/6466	Submit with BDR	5	
L. Hutch interlocks (if used)	Description of hutch design, including access and lighting requirements	Art Ritchie/4785	Submit with BDR	5	
M. Typical experiment	Brief description of typical experiment	Zahid Hussain/7591	Submit with BDR	5	
N. Future layout	Design of possible changes or additions to beamline	Howard Padmore/5787	Submit with BDR	6	

Step *Requires ALS Procedure	Brief Description of What is Needed	ALS Contact/Phone Number	Time needed to prepare	See Page	Check Completed
3. Construction begins	During construction, attend weekly engineering installation meeting, Tuesdays, Bldg. 46, Rm. 275F, 1:00 p.m.	Tom Downs/5824	Tuesdays	2	
A. Instrumentation diagram	Detailed beamline instrumentation diagram showing location of vacuum valves, photon shutters, fast sensors, beam position monitors, ion gauges, vacuum pumps, residual gas analyzer, and motors	USER (with ALS assistance).	8-12 weeks before BRR	7	
B. Electrical wiring and power	Information about wire way layout, cables, terminations, electrical power required	Art Ritchie/4785	8-12 weeks before BRR	7	
C. Vacuum requirements	Vacuum needs related to clean room facility, assembly of components, bakeout requirements, and installation of components	Tony Catalano/6484 John Thomson/7975	2 weeks before needed	7	
D. Radiation/Personnel Safety System*	Write procedure for personnel safety system and operation of personnel safety shutter (PSS) specific to each beamline	Art Ritchie/4785 Al Lindner/7757	8 weeks before BRR	7	
E. EPS* and Branchline Control System	Operates vacuum interlocks and beamline/branchline control system	Ken Woolfe/7739	8 weeks before BRR	8	
F. Interlock Procedures for EPS	Four interlock procedures for beamlines without hutches	Ken Woolfe/7739	8 weeks before BRR	8	
i. Front end EPS* (BLFE)	Write procedure to check interlocks of beamline front end equipment protection system	Ken Woolfe/7739	8 weeks before BRR	8	
ii. Branchline front end EPS* (BRFE)	Write procedure to check interlocks of branchline front end equipment protection system	Ken Woolfe/7739	8 weeks before BRR	8	
iii. Branchline EPS* (BLBR)	Write procedure to check out PLC interlocks of branchline EPS	Ken Woolfe/7739	8 weeks before BRR	8	
iv. Endstation EPS	Write a separate procedure for any endstation EPS	Ken Woolfe/7739	8 weeks before BRR	8	
G. Key Enable* procedure	Write procedure to get beam through the branchline: check of shielding, exclusion zones, RGA scan, and ion gauges	Cheryl Hauck/7885	1 week before BRR	9	
H. Seismic safety	Information plus calculations showing that all components will withstand at least 0.7g of lateral acceleration	Will Thur/5689	4-8 weeks before BRR	9	
I. Mechanical systems safety	All information on mechanical safety aspects of beamline components	Dick DiGennaro/6466	4-8 weeks before BRR	9	
4. Checkout of Completed Systems	These systems need to be checked out for approval by the BRR committee				
A. Radiation/Personnel Safety System*	Personnel safety system and operation of personnel safety shutter (PSS) specific to each beamline	Art Ritchie/4785 Al Lindner/7757	2-3 weeks before BRR		
B. Beamline front end EPS* (BLBR)	Check of interlocks of beamline front end equipment protection system	Ken Woolfe/7739	2-3 weeks before BRR		

Step *Requires ALS Procedure	Brief Description of What is Needed	ALS Contact/Phone Number	Time needed to prepare	See Page	Check Completed
C. RGA scan and vacuum qualification	Required to open VVR1 for final branchline interlock test	John Thomson/7975	1.5 weeks before BRR		
D. Branchline front end EPS* (BRFE)	Check of interlocks of branchline front end equipment protection system	Ken Woolfe/7739	1.5 weeks before BRR		
E. Branchline EPS* (BLBR)	Check of interlocks of branchline equipment protection system	Ken Woolfe/7739	1 week before BRR		
5. Beamline Readiness Review (BRR)	Review of documentation submitted to BRC and discussion of BRR walkthrough	Zahid Hussain/7591	1 week before beam	3, 10	
A. Shielding drawing	Shows shielding and exclusion zones	Rick Donahue/5997 Dick DiGennaro/6466	Presented at BRR	10	
B. Schematic drawing	Names all beamline components, including valves, ion gauges, pumps, window apertures, lead shielding, exclusion zones, and optical chambers	Dick DiGennaro/6466	Presented at BRR	10	
C. EPS*	Document of logic specifications	K. Woolfe/7739 Ken Fowler/7172	Presented at BRR	10	
D. Key Enable*	Procedure required to get beam through the branchline: check of shielding, exclusion zones, RGA scan, and ion gauges	Cheryl Hauck/7885	Presented at BRR	10	
E. Changes	Documentation of any changes to the beamline since the BDR.	Zahid Hussain/7591	Decided at BRR	10	
6. BRR Walkthrough Performed*	Walkthrough to check key functions of beamline prior to first time operation (see checklist in procedure BL 08-07)	Zahid Hussain/7591	1-2 days before beam	10	
A. Radiation shielding	Final check of shielding and exclusion zones	Rick Donahue/5997 Dick DiGennaro/6466	1-2 days before beam	10	
B. Radiation Safety System	Final check of RSS	Art Ritchie/4785 Al Lindner/7757	1-2 days before beam	10	
C. Electrical qualification	Final check for electrical safety	Art Ritchie/4785	1-2 days before beam	11	
D. Mechanical qualification	Final check for seismic safety and motion hazards	Will Thur/5689	1-2 days before beam	11	
E. Vacuum qualification	Final check of vacuum and RGA to open to storage ring.	John Thomson/7975	1-2 days before beam	11	
F. Equip. protection system (EPS)*	Procedures completed for all required EPS tests	Ken Woolfe/7739	1-2 days before beam	11	
G. Key Enable Procedure*	Has been completed	Cheryl Hauck/7885	beam day	11	
H. Radiation survey	Check during initial operation	Piruz Vargha/6936	beam day	11	

Appendix A: Documents Related to ALS Policies and Beamline Design Guidelines:

1. Criteria for Beamline Bremsstrahlung Shielding (LSBL #172)
2. Criteria for Front-End Bremsstrahlung Shielding (LSBL #173) and ALS Front-End Shielding
3. Advanced Light Source Vacuum Policy and Vacuum Guidelines for Beamlines and Experiment Endstations (LSBL 278)
4. Survey and Alignment information for ALS Users

Appendix B: User Advisories Related to Beamline Equipment

Design, Installation, and Operation of Equipment:

- No. 1 Affixing Beamline and Endstation Components to the ALS Floor
(Location of Grade Beams and Conduits)
- No. 2 Electrical Cable Wire and Routing Requirements
- No. 4 Guidelines for Meeting Seismic Requirements for User Equipment
- No. 9 Vacuum Policy for User Endstations for Protection of Beamline Components
and Storage Ring Vacuum
- No. 10 ALS Policy for Exhausting of Mechanical Vacuum Pumps

Electrical Safety:

- No. 3 Avoiding Overloads on AC Circuits
- No. 5 Beamline Electrical Safety Guidelines

Laser Safety:

- No. 6 Laser Safety Policies for Class 3b and Class 4 Lasers