



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
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LI Safety Requirements

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PREPARED BY	ORGANIZATION	DATE
J. Bolyard, Environment, Safety, & Security Manager	ES&S, Facilities & Administration, NRAO	2020-08-25

APPROVALS	ORGANIZATION	SIGNATURES
R. Selina, Project Engineer	Electronics Division, NRAO	
T. Kusel, Systems Engineer	Program Mgmt. Div., NRAO	
M. McKinnon, Project Director	Asst. Director, NM-Operations, NRAO	

RELEASED BY	ORGANIZATION	SIGNATURE
M. McKinnon, Project Director	Asst. Director, NM-Operations, NRAO	



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
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3	2019-06-11	R. Selina	1, 2, 5	Minor edits for clarity; updated document references; updated numbering scheme to match ngVLA convention
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Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Table of Contents

1	Introduction.....	4
1.1	<i>Purpose.....</i>	4
1.2	<i>Scope</i>	4
1.3	<i>Project Background.....</i>	4
2	Related Documents and Drawings	5
2.1	<i>Applicable Documents.....</i>	5
2.2	<i>Reference Documents.....</i>	5
3	Safety Scope	5
4	Safety Across the ngVLA Lifecycle.....	6
4.1	<i>Design Activities</i>	6
4.2	<i>Risk Estimation.....</i>	6
4.3	<i>Hazard Categories</i>	6
4.4	<i>Operations Activities</i>	6
5	Essential Safety Requirements for Design.....	6
5.1	<i>General Considerations</i>	6
5.2	<i>Low-Voltage Electrical Equipment.....</i>	7
5.3	<i>Essential Health and Safety Requirements of Machinery/Equipment</i>	7
5.3.1	<i>Definitions</i>	7
5.3.2	<i>Principles of Safety Integration</i>	7
5.3.3	<i>Protection Against Mechanical Hazards.....</i>	8
5.3.4	<i>Required Characteristics of Guards and Protection Devices.....</i>	8
5.3.5	<i>Protection Against Other Hazards.....</i>	8
5.3.6	<i>Maintenance</i>	9
5.3.7	<i>Indicators</i>	9
6	Summary Table of Requirements	10
7	Appendix.....	16
7.1	<i>Abbreviations and Acronyms.....</i>	16



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

I Introduction

1.1 Purpose

This document provides the safety design requirements applicable to hardware, software, and processes/procedures through the entire ngVLA lifecycle. The document addresses the ngVLA safe design requirements through reviews and prototyping, construction, commissioning actions, operation, and ultimate decommissioning. The purpose of this document is to detail the safety requirements applicable to the products used in the ngVLA effort. Any programmatic safety requirements specific to safety are addressed in relevant Management Plans.

The essential ngVLA requirements for safety in products are described in a series of requirements listed in Section 5. These have been proposed and adopted for the ngVLA Project as the design safety requirements (Level I). Since a single device or article may contain hazards that fall into several categories, several requirements may be applicable at the same time.

A Safety Hazard Analysis is required as part of the design process to mitigate and reduce risks prior to actual product build. Details of the Safety Hazard Analysis are provided in the document, ngVLA Safety Risk Analysis Procedures, Document number 020.80.00.00.00-0002-PRO. This document supplements the programmatic requirement for Safety Hazard Analysis by addressing the requirements for product Safety Hazard Analysis.

The flow-down of the relevant essential requirements must be based on the hazards applicable to a given product. Therefore, designers must carry out a Hazard Analysis to determine the essential requirements applicable to the product. This analysis must be documented and included in the technical documentation.

1.2 Scope

This document shall be applicable to all Integrated Product Teams (IPTs), all project reviews, all work practices in labs and worksites, and all subcontractors that provide documentation, procedures, or work at any ngVLA site. This document shall be an applicable document to all product design efforts.

Each IPT should use this document to guide their primary safe design decisions. These requirements identify the hazards to mitigate and the results to be attained but do not specify the technical solutions for doing so. For a wide range of items, the designer may choose standards that meet the essential requirements. This allows flexibility in choosing which standards to apply in the ngVLA project. In the hazard analysis, the designers must document the standards they are working to and the choice of standards shall be reviewed and approved by the Safety IPT with Systems Engineering.

The hazard analysis is initially conducted as part of the design process. Based on the analysis at this level, the results are directly applied to the design in the form of design features to mitigate the hazards to an acceptable level.

1.3 Project Background

The Next Generation Very Large Array (ngVLA) is a project of the National Radio Astronomy Observatory (NRAO) to design and build an astronomical observatory that will operate at centimeter wavelengths (25 to 0.26 centimeters, corresponding to a frequency range extending from 1.2 GHz to 116 GHz). The observatory will be a synthesis radio telescope constituted of approximately 244 reflector antennas each of 18 meters diameter for the Main Array and the Long Baseline Array (LBA), plus 19 antennas each of 6 meters diameter for the Short Baseline Array (SBA). All 263 antennas will operate in a phased or interferometric mode.



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

LBA antenna locations will likely include New Mexico, Texas, Arizona, and northern Mexico, as well as all ten current VLBA locations.

2 Related Documents and Drawings

2.1 Applicable Documents

The following documents are applicable to this Safety Specification to the extent specified. In the event of conflict between the documents referenced herein and the content of this Safety Requirement, the latter shall take precedence.

Ref. No.	Document Title	Rev/Doc. No.
AD01	ngVLA Preliminary System Requirements	020.10.15.10.00-0003-REQ
AD02	NRAO Environment, Safety, and Security Policy and Program Manual	Version D, Oct. 2016
AD03	ngVLA Safety Risk Analysis Procedures	020.80.00.00.00-0002-PRO
AD04	ngVLA L0 Safety Requirements	020.10.15.10.00-0004-REQ
AD05	OSHA General Industry Standard	29 CFR 1910
AD06	OSHA Construction Standard	29 CFR 1926
AD07	Environmental Protection Agency Clean Air Act of 1963	33 U.S.C.: Navigable Waters
AD08	Environmental Protection Agency Clean Water Act of 1972	42 U.S.C. ch. 85, subch. I § 7401 et seq

2.2 Reference Documents

The following references provide supporting context:

Ref. No.	Document Title	Rev/Doc. No.
RD01	National Fire Protection Association, Consensus Standards	NFPA
RD02	National Electric Code	NFPA 70E

3 Safety Scope

The Safety IPT work package includes safety, physical security, ongoing environmental protection actions, sustainability, and identification of associated risks. In the context of this document, “safety” includes all the aforementioned program elements. The scope of the Safety IPT includes an assessment of the requirements for all phases of the ngVLA effort.

The Safety IPT crosses all IPT boundaries and is anticipated to be integrated into all design packages and operational procedures. The ngVLA Safety IPT will assist to ensure compliance with federal, state and local safety requirements. In addition, the effort will examine compliance with international standards, such as may be applicable in Mexico.

The ngVLA proposed project must require compliance with the AUI policies for safe planning and management of large facilities. Consequently, there must be significant collaboration with all other Integrated Product Teams (IPTs) as the requirements influence the safety support needed.



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFEY_REQS		Version: B

4 Safety Across the ngVLA Lifecycle

4.1 Design Activities

Operational safety assurance for personnel safe work matters must conform to the requirements defined in the NRAO Environment, Safety, and Security Policy and Program Manual [AD02], and with site-specific Safety directives.

Potential product hazards must be identified as a part of the normal design process and eliminated or reduced as far as possible. Safeguards must be determined for outstanding hazards, which shall reduce their possible effects to the lowest reasonable level in accordance with the ngVLA Safety Risk Analysis Procedures [AD03]. The Risk Analysis must be conducted so that it is possible to document the procedures and the results achieved under consideration of the whole lifecycle of the product, process, work activity, or design.

4.2 Risk Estimation

All hazards, hazardous conditions and hazardous events associated with the product design shall be identified. To identify hazards not previously recognized, additional methods covering the specific situation should be used. These may include use of working groups and brainstorming, surveys and interviews, experiential or documented knowledge, outputs from "what if" scenario analyses, historical information - lessons learned. Hazard verification includes all activities performed to demonstrate that the design meets or is capable of meeting the specified safety requirements.

4.3 Hazard Categories

The hazard severity and probability categories are defined in the AD03 document to provide a qualitative measure for mishap classification. Upon completion of the product hazard analysis, the project must determine if any identified residual risks are acceptable or additional mitigation is required. Any safety hazards that cannot be eliminated during the design process must be reported to the Safety IPT Lead at the design review and to the ngVLA Project Office. Any progress shall be reported, including necessary proof that the relevant requirements have been satisfied.

4.4 Operations Activities

Operations activities are not addressed in this document and must follow the NRAO ES&S Policies governing operational safety as described in the Environment, Safety, and Security Policy and Program Manual [AD02].

5 Essential Safety Requirements for Design

The following requirements must be fulfilled *as a minimum* to achieve acceptable levels of safety across the ngVLA project.

5.1 General Considerations

The design of the ngVLA system and subsystems must comply with the essential safety requirements given in this document. It should be noted that additional ngVLA specifications on electrical design, environmental conditions, and environmental protection may have been prepared for specific safety



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

requirements adopted for the ngVLA project. Each design must meet the requirements contained in these additional ngVLA specifications.

A risk analysis must be done for each subsystem. See the Applicable Documents for specific documents on the Risk Analysis procedures.

Requirements on workplace and construction safety that affect the subsystem design must be in compliance with applicable OSHA safety standards, National Electric Code requirements, and applicable construction codes.

5.2 Low-Voltage Electrical Equipment

These requirements seek to ensure that electrical equipment within certain voltage limits provides protection for workers and visitors. It should be noted that these voltage ratings refer to the voltage of the electrical input or output, not to voltages that may appear inside the equipment.

OSHA requirements, 29 CFR 1910.303, generally requires "live parts of electric equipment operating at 50 volts or more" to be "guarded against accidental contact by use of approved cabinets or other forms of approved enclosures" or by other specified means. The guarding requirement does not distinguish between AC and DC voltages. Therefore, the requirement applies to live parts operating at 50 volts or more AC or DC. The International Electrotechnical Commission (IEC) defines *supply system low voltage* as voltage in the range 50 to 1000 V ac or 120 to 1500 V dc.

IEC Voltage Range	AC (V)	DC (V)
High Voltage	>1000	>1500
Low Voltage	50–1000	120–1500
Extra Low Voltage	<50	<120

5.3 Essential Health and Safety Requirements of Machinery/Equipment

This section identifies essential safety requirements for health and safety for operators and persons near machinery/equipment. These essential requirements are applicable to all ngVLA machines and equipment.

5.3.1 Definitions

Machinery: An assembly of linked parts or components, which may move, with the appropriate actuators, control and power circuits, etc., joined together for a specific application.

Danger Zone: Any zone within and/or around machinery/equipment in which an exposed person is subject to a risk to his health or safety.

Exposed Person: Any person wholly or partially in a danger zone.

Operator: The person or persons given the task of installing, operating, adjusting, maintaining, cleaning, repairing, or transporting machinery/equipment.

5.3.2 Principles of Safety Integration

Machinery/equipment must be constructed and fitted for its function, and able to be adjusted and maintained without putting persons at risk when operations are carried out under the conditions foreseen by the designer. The measures taken must eliminate risk of accident throughout the foreseeable lifetime of the machinery/equipment, including the phases of assembly and dismantling, even where risks of accident arise from foreseeable abnormal situations.



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

In selecting the most appropriate methods, the designer must apply the following principles in the order given:

- Eliminate or reduce risks as far as possible (inherently safe machinery/equipment design and construction).
- Take the necessary protection measures in relation to risks that cannot be eliminated.
- Inform users of the residual risks due to any shortcomings of the protection measures adopted, indicate whether any particular training is required, and specify any need to provide personal protection equipment.

5.3.3 Protection Against Mechanical Hazards

Machinery/equipment, components, and fittings must be so designed and constructed that they are stable enough for use without risk of overturning, falling or unexpected movement. If the shape of the machinery/equipment itself or its intended installation does not offer sufficient stability, appropriate means of anchorage must be incorporated and indicated in the instructions.

Where appropriate, indicate the parts subject to wear and the criteria for replacement. Precautions must be taken to ensure that no risk is posed by a rupture in pressure lines. In cases where a blockage may occur, specific protection devices or tools, the instruction handbook and possibly a sign on the machinery/equipment should be provided by the designer to enable the equipment to be safely unblocked.

5.3.3.1 Choice of Protection Against Risks Related to Moving Parts

Guards or protection devices to protect against moving parts must be selected on the basis of the type of risk. The following guidelines must be used to help make the choice. Guards designed to protect exposed persons against the risks associated with moving transmission parts (such as pulleys, belts, gears, shafts, etc.) must be either fixed or removable. Removable guards should be used where frequent access is foreseen.

Guards or protection devices designed to protect exposed persons against the risks associated with moving parts contributing to the work (such as cutting tools, moving parts of presses, cylinders, parts in the process of being machined, etc.) must be, where possible, fixed guards. Otherwise use movable guards or protection devices such as sensing devices (e.g., non-material barriers, sensor mats), remote-hold protection devices (e.g., two-hand controls), or protection devices intended automatically to prevent all or part of the operator's body from encroaching on the danger zone.

When moving parts directly involved in the process cannot be made completely or partially inaccessible during operation owing to operations requiring nearby operator intervention, where technically possible such parts must be fitted with fixed guards preventing access to the parts that are not used in the work, or adjustable guards restricting access to the sections of the moving parts that are strictly for the work.

5.3.4 Required Characteristics of Guards and Protection Devices

Where possible, guards must be unable to remain in place without their attachment fixings.

5.3.5 Protection Against Other Hazards

Errors likely to be made when fitting or refitting certain parts that could be a source of risk must be made impossible by the design of such parts or by information given on the parts themselves and/or the housings. The same information must be given on moving parts and/or their housings where the direction of movement must be known to avoid a risk.

5.3.5.1 Laser Equipment

Where laser equipment is used, the following provisions should be taken into account:



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFEY_REQS		Version: B

- Laser equipment on machinery/equipment must be designed and constructed so as to prevent any accidental radiation.
- Laser equipment on machinery/equipment must be protected so that effective radiation, radiation produced by reflection or diffusion and secondary radiation do not damage health.
- Optical equipment for the observation or adjustment of laser equipment on machinery/equipment must be such that no health risk is created by the laser.

5.3.6 Maintenance

5.3.6.1 Access to Operating Position and Servicing Points

As an exception to the LI Safety requirements, certain circuits may remain connected to their energy sources in order, for example, to hold parts, protect information, light interiors, etc. In this case, special steps must be taken to ensure operator safety.

The machinery/equipment must be designed and constructed so it is possible to clean internal parts without entering. If it is absolutely impossible to avoid entering the machinery/equipment, the designer must take steps during its construction to allow cleaning to take place with the minimum of danger.

5.3.7 Indicators

5.3.7.1 Warning of Residual Risks

Where risks remain despite all the measures adopted or in the case of potential risks which are not evident (e.g., electrical cabinets, radioactive sources, bleeding of a hydraulic circuit, hazard in an unseen area, etc.), the designer must provide warnings. Such warnings should preferably use readily understandable pictograms.

5.3.7.2 Marking

All machinery/equipment must be marked legibly and indelibly with the following minimum particulars:

- Name and address of the designer
- Designation of series or type
- Serial number, if any
- The year of construction
- Electric power data

All machinery/equipment must be accompanied by instructions including at least the following:

- A repeat of information with which the machinery/equipment is marked, except the serial number, with any appropriate additional information to facilitate maintenance (e.g., addresses of the importer, repairers)
- Foreseen use of the machinery/equipment
- Workstation(s) likely to be occupied by operators
- Instructions for safe service, use, handling, assembly, dismantling, adjustment, maintenance, along with training instructions
- Instructions should draw attention to ways in which the machinery/equipment should not be used. The instructions must contain the drawings and diagrams necessary for putting into service, maintenance, inspection, checking of correct operation and, where appropriate, repair of the machinery/equipment and all useful instructions in particular with regard to safety.

5.3.7.3 Instructions

Where necessary, the instructions must give the requirements relating to installation and assembly for reducing noise or vibration (e.g., use of dampers, type and mass of foundation block). The instructions



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

must give the information concerning airborne noise emissions by the machinery/equipment, either the actual value or a value established on the basis of measurements made on identical machinery/equipment.

If the designer foresees that the machinery/equipment will be used in a potentially explosive atmosphere, the instructions must give all the necessary information. In the case of machinery/equipment that may also be intended for use by non-professional operators, the wording and layout of the instructions for use, while respecting the other essential requirements mentioned above, must consider the level of general education and acumen that can reasonably be expected from such operators.

6 Summary Table of Requirements

Req. No.	Parameter	Value/Detailed Descriptions	Trace-ability
SAF0065	Electrical equipment safe use labelling	Electrical Equipment shall be marked to indicate the conditions of its safe application/use. Where such marking on product is not practical, the marking shall refer to applicable user documentation.	SAF0029
SAF0060	Safe marking requirements	In cases where electrical equipment is supplier safety certified (e.g. CE), such equipment shall be marked with the certification.	SAF0029
SAF0070	Safe electrical connections	Electrical equipment, together with its component parts, shall be safe to disconnect, disassemble, assemble and connect.	SAF0029
SAF0080	Safe under hazardous conditions	Equipment shall be designed to be used and operable under expected conditions as identified in the hazard analysis.	SAF0031, SAF0032, SAF0039, SAF0042
SAF0090	Electrical contact protection	Equipment shall provide adequate protection to prevent injury from direct or indirect electrical contact.	SAF0029, SAF0031, SAF0032
SAF0100	Dangerous temperatures prohibited	Equipment shall provide adequate protection to prevent injury from high/low temperature, arcs and radiation.	SAF0031, SAF0042
SAF0120	Safe appropriate wiring	Electrical equipment wiring shall be insulated according to electrical safety standards, for the environmental conditions under which it will be operated, transported and stored.	SAF0031, SAF0042
SAF0140	Electrical equipment: environmental considerations	Electrical equipment shall be safe for use in all operational environmental conditions, for the expected life of the product (e.g. UV radiation).	SAF0029, SAF0031, STK0302, STK0304
SAF0150	Electrical overload conditions	Electrical equipment shall not endanger persons, when exposed to supply power voltage overload.	SAF0031, SAF0042



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Req. No.	Parameter	Value/Detailed Descriptions	Trace-ability
SAF0190	Ergonomic principles	The equipment, under the intended conditions of use, shall minimize discomfort, fatigue, and psychological stress faced by the operator, by taking into account ergonomic principles.	SAF0029, SAF0031, STK1502
SAF0200	Use of PPE	Equipment that requires the use of Personal Protective Equipment (PPE) to operate or maintain, shall be labelled with the PPE requirements.	SAF0029
SAF0230	Design lighting for safe operation	Equipment shall be fitted with integral lighting suitable for operations. This includes the requirement to ensure there is no area of shadow likely to cause nuisance, no irritating dazzle, and no dangerous stroboscopic effects due to the lighting provided. Similarly, the designer must include consideration for lighting of internal parts requiring frequent inspection, adjustment, and maintenance must be provided with appropriate lighting.	SAF0029, SAF0039, STK5005, STK2001
SAF0240	Design for safe storage of machinery	Packaging for equipment shall be designed to enable its safe transportation and storage, including stabilization and supports.	SAF0029, SAF0031
SAF0250	Design for safe lifting rigging	Equipment exceeding a weight of 50 pounds or where the size, or shape of machinery or equipment or its various component parts prevents them from being moved by hand, the machinery or equipment, or each component part, is fitted with attachments for lifting gear, or designed so it can be fitted with such attachments (e.g., threaded holes), or shaped so that standard lifting gear can easily be attached.	SAF0029, SAF0031
SAF0260	Hand movable equipment	Equipment to be moved by hand shall be fitted with means to make the machinery easily movable or equipped for picking up (e.g., hand grips) and ease of handling.	SAF0029, SAF0031
SAF0261	Hand movable equipment labelling	Equipment exceeding 50 pounds to be moved by hand shall be labelled with a warning stating heavy equipment and its weight.	SAF0029, SAF0031
SAF0470	Design for stability	Equipment shall be stable under all operating conditions without risk of overturning, falling or unexpected movement.	SAF0029, SAF0031, SAF0039
SAF0480	Design for operation stresses	Equipment shall withstand all stresses imposed on it during operational conditions.	SAF0031



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Req. No.	Parameter	Value/Detailed Descriptions	Trace-ability
SAF0490	Design for material durability	Equipment shall have material durability to prevent mechanical failure due to fatigue, aging, corrosion, and abrasion.	SAF0031
SAF0500	Identify inspection requirements	Equipment shall be delivered with instructions specifying the frequency of inspection and maintenance required for safety reasons.	SAF0029, SAF0030,
SAF0520	Pressurized pipes	Pressurized pipes and connections shall have sufficient pressure safety margins for all operating conditions and shall be protected against external stresses and strains.	SAF0029, SAF0031
SAF0530	Falling or ejected parts	Equipment design shall address risks from falling or ejected objects.	SAF0029, SAF0032
SAF0540	Limit sharp edges	Equipment shall not have sharp edges, sharp angles, or rough surfaces likely to cause injury.	SAF0029, SAF0032
SAF0580	Prevent blockage of moving parts	Equipment design shall address requirements to prevent accidental blockage of moving parts.	SAF0029, SAF0032
SAF0640	Requirements for fixed guards	Fixed guards that are installed to prevent injury shall be removable only with the use of tools and not by hand.	SAF0029, SAF0032
SAF0650	Requirements for removable guards	Removable guards shall be fitted with an interlock to deactivate or deenergize parts before allowing access.	SAF0029, SAF0037,
SAF0670	Adjustable guards on machinery	Guards that can be adjusted during use, shall be adjusted automatically according to the type of work involved, or readily adjustable without the use of tools.	SAF0029
SAF0710	Safe discharge of built-up static	Equipment design shall address the means to prevent or limit the build-up of potentially dangerous electrostatic charges and/or be fitted with a discharging system.	SAF0032
SAF0720	Energy source safety	Equipment design shall avoid hazards associated with all energy sources, including hydraulic, pneumatic and thermal.	SAF0029
SAF0730	Address error of fit	Equipment shall prevent injury or damage due to errors in the fit and replacement of parts, preferably by means of physical installation guides or alternatively by means of clear labelling or coloring.	SAF0032



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Req. No.	Parameter	Value/Detailed Descriptions	Traceability
SAF0770	Prevent risk of fire: substances used	Equipment design shall avoid the risk of fire or overheating posed by the equipment itself or by gases, liquids, dust, vapors, or other substances produced or used by the equipment.	SAF0029, SAF0031
SAF0780	Prevent risk of explosion	Equipment design shall avoid any risk of explosion posed by the equipment itself or by gases, liquids, dust, vapors or other substances produced or used by the equipment.	SAF0029, SAF0031
SAF0800	Reduce/control noise	Equipment shall not emit noise in excess of accepted health and safety levels during maintenance and operation.	SAF0029, SAF0031
SAF0810	Reduce and control machinery vibration	Operation of equipment shall not result in unacceptable risks due to vibrations.	SAF0029, SAF0031, SAF0037
SAF0840	Safe use of laser equipment	Equipment design shall prevent risks due to exposure to laser emissions during operations and maintenance.	SAF0029, SAF0031
SAF0850	Safe use of gases, liquids, and vapor waste material	Equipment design shall prevent health risks from emitted gases, liquids, dust, vapors, and other waste materials.	SAF0029, SAF0031
SAF0870	Prevent enclosed traps in machinery	Buildings and equipment shall have mechanisms to ensure that persons cannot be trapped inside. or, if impossible, with a means of summoning help.	SAF0029, SAF0031
SAF0880	Walking surfaces free from slip, trip, or fall	All walking surfaces shall have mechanisms to prevent persons from slipping, tripping, or falling on or off.	SAF0029, SAF0031
SAF0890	Machinery maintenance areas	Locations used for adjustment, lubrication, cleaning, and maintenance shall be outside danger zones and maintenance shall be capable with equipment at a standstill.	SAF0029, SAF0032, SAF0041, SAF0042, STK5005, STK2001
SAF0920	Ensure safe access	Equipment shall provide means of safe access (stairs, ladders, catwalks, etc.) to all areas used for adjustment and maintenance operations.	SAF0029, SAF0039, STK5005
SAF0930	Energy source isolation	Equipment shall be fitted with means to isolate it from all energy sources. Such isolators shall be clearly identified. Isolators shall be lockable in cases where isolation is provided for extended maintenance areas.	SAF0029, SAF0037



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Req. No.	Parameter	Value/Detailed Descriptions	Traceability
SAF0940	Dissipation of energy stored in circuits	In cases where stored energy poses a risk, equipment shall have mechanisms to safely dissipate stored energy prior to maintenance.	SAF0029, SAF0037
SAF0960	Safe cleaning without entry	In cases where internal cleaning is required, equipment should have safe means to clean and unblock it from the outside.	SAF0029, SAF0031, SAF0037
SAF0970	Clarity of control information	Information required to control machinery shall be easily accessible, understandable, unambiguous and not overloading.	SAF0036, SAF0040
SAF0980	Warning signals	In cases where moving machinery may cause injury, it shall give appropriate acoustic and light signal warning before such movement.	SAF0029, SAF0032, SAF0040,
SAF0990	Warning devices	Warning signals shall be unambiguous and easily perceived during all maintenance and operating conditions.	SAF0029, SAF0032, SAF0040
SAFI000	Color code safety identifiers	Safety signs and labelling shall be colored according to standard safety coloring standards.	SAF0029, SAF0032
SAFI010	Identify residual risks	Equipment that imposes a residual risk to operators and maintainers shall be labelled to indicate such risks using standard pictograms.	SAF0029, SAF0045, SAF0032, SAF0038
SAFI050	Lifting eye location	Lifting hooks and handles shall be located in such a way to prevent injury or damage during lifting due to a shift in its center of gravity.	SAF0029, SAF0030, SAF0036
SAFI110	Noise measurement data	Equipment that has a risk of exceeding the safe noise level threshold shall be delivered with measured noise level data.	SAF0029, SAF0036
SAFI120	Explosive atmospheres	The designer shall ensure that where machinery is anticipated for use in an explosive atmosphere, the design and instructions are complete.	SAF0030, SAF0036, SAF0037, SAF0039
SAFI150	OSHA standards	Equipment shall be complaint with applicable regulations from OSHA.	SAF0046, SAF0047
SAFI160	Determine applicable standards	The designer is responsible to identify applicable standards for their design.	SAF0046, SAF0047, SAF0048, SAF0049, SAF0050, SAF0052



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

Req. No.	Parameter	Value/Detailed Descriptions	Trace-ability
SAFI170	Use of building codes	Buildings shall be compliant with all applicable building codes and standards.	SAF0046, SAF0047, SAF0048, SAF0049, SAF0050, SAF0052
SAFI190	Acceptance of residual risks	The designer shall identify and report any residual risks remaining after design modifications to assure a safe component for review and acceptance by the Safety IPT	SAF0045
SAFI210	Safety –critical Software	No parts of the system shall solely rely on software to prevent a failure or malfunction that may result in death, severe damage to equipment, or environmental harm.	SAF0045, SAF0051, STK0302
SAFI220	Remote activation	Remote activation of a system shall not be possible where the potential for harm to persons or equipment exists.	SAF0051
SAFI230	Remote startup override	Equipment, when in a state of local control, shall prevent the override by a remote control.	SAF0051



Title: LI Safety Requirements	Owner: Bolyard	Date: 2021-05-05
NRAO Doc. #: 020.80.00.00.00-0001-REQ-B-LI_SAFETY_REQS		Version: B

7 Appendix

7.1 Abbreviations and Acronyms

Acronym	Description
AD	Applicable Document
CDR	Critical Design Review
ES&S	Environmental Safety and Security
ICD	Interface Control Document
IPT	Integrated Product Team
LBA	ngVLA Long Baseline Array
ngVLA	Next Generation VLA
OSHA	Occupational Safety and Health Administration
RD	Reference Document
RFI	Radio Frequency Interference
SBA	ngVLA Short Baseline Array
TBD	To Be Determined
VLA	Jansky Very Large Array
VLBA	Very Long Baseline Array