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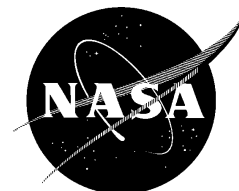
Safety Requirements Document

International Space Station Program

December 12, 1995

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**National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058**



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1.1 PURPOSE

The purpose of SSP 50021 is to provide a single repository for the safety requirements found in the ISS System Specification, International Partner Segment Specifications and the United States Prime Item Development Specifications. The majority of the safety requirements are labeled as such in each specification section 3.3.6. There are, however, safety requirements scattered throughout the specifications. This repository of the safety requirements brings all the safety requirements into a single source and allows the Safety Review Panel to use it for assessing flight hardware compliance to the program safety requirements.

1.2 SCOPE

This document provides the requirements which are intended to protect flight and ground personnel, the ISS, the STS, payloads, GSE, the general public, public-private property, and the environment from ISS-related hazards. This document contains technical requirements applicable to ISS LP's during ground processing, launch, on-orbit flight operations, and return.

The requirements contained herein apply to ISS (USOS, NASA, RSA, ESA, NASDA, ASI, CSA) flight hardware and flight support equipment. Appendix C contains those implementations of the safety requirements for the International Partner implementation.

1.2.1 GSE DESIGN AND GROUND OPERATIONS

The requirements for ground support equipment design and operational safety are contained in Joint Space and Missile Test Organization (SAMTO)/Kennedy Space Center (KSC) Handbook, SAMTO HB S-100/KHB 1700.7, and SSP 50004 Ground Support Equipment Design Requirements.

1.2.2 MISSION RULES

Mission Rules will be prepared for each ISS mission that outline preplanned decisions designed to minimize the amount of real-time rationalization required when anomalous situations occur. These mission rules are not additional safety requirements, but do define actions for completion of the ISS consistent with crew safety. Compliance with minimum safety requirements of this document will not insure the mission success of an ISS operation.

1.3 PRECEDENCE

In case of conflict between this document and an ISS Prime Item Development Specification or an International Partner Segment Specification, the applicable ISS specification shall take precedence.

1.4 DELEGATION OF AUTHORITY

Establishment and maintenance of this document is the responsibility of the Safety and Mission Assurance Office within the International Space Station Program Office (ISSPO). This document is subject to Joint Program Requirements Control Board (JPRCB) change control.

1.4.1 ISS

It is the responsibility of each ISS Program Participants (NASA, RSA, ESA, NASDA, ASI, CSA) to assure the safety of its end items and to implement the requirements of this document and identify any non-compliances with the applicable specification requirements or the requirements herein. The ISS Safety and Mission Assurance Office within the ISS Program Office is responsible for assuring the requirements herein are properly and completely included and allocated in the ISS specifications and requirements documents. The ISS Prime contractor will show traceability of the requirements herein to the corresponding requirement(s) in the ISS specifications and will evaluate compliance to this document. OE is responsible for maintenance and configuration control of this document.

1.5 WAIVERS AND DEVIATIONS

Requirements are imposed on flight hardware through the Segment Specifications for the International Partners and the Prime Item Development Specifications for the United States (US) hardware. Any request for waiver or deviation from the safety requirements in the Segment Specifications for the International Partners and the Prime Item Development Specifications for the US hardware will be considered as a waiver/deviation to the requirements herein. Request for waiver or deviation from this document shall be made to the ISS Program Office, in accordance with Configuration Management Requirements.

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2.0 APPLICABLE AND REFERENCE DOCUMENTS

2.1 APPLICABLE DOCUMENTS

The documents identified below are applicable to the extent specified herein. The references show where each applicable document is cited in this document.

DOCUMENT NO.	TITLE
JSC 28322	ISS Acoustic Requirements and Testing Document for ISS Non-Integrated Equipment
Reference 3.2.6.2	

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2.2 REFERENCE DOCUMENTS

The documents identified below are referenced in this document and form a part of this document to the extent specified herein. The locations of each reference are identified.

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DOCUMENT NO.	TITLE
ANSI-Z-136.1 Reference 3.3.6.7.1	American National Standard for Safe Use of Lasers
KHB 1700.7B Reference 1.2.1, 3.3.6.14	Space Transportation System Payload Ground Safety Handbook
MIL-STD-1522 Reference 3.2.10.11, 4.4.11	Standard General Requirements for Safe Design and Operation of Pressurized Missile and Space Systems
MIL-STD-1576 Reference 3.3.6.5.1.2	Electroexplosive Subsystem Safety Requirements and Test Methods for Space Systems
MSFC-DWG-20M02540 Reference Appendix C	Assessment of Flexible Line for Flow Induced Vibration
NSTS 07700, Vol. XIV Reference 3.3.6.6 3.3.6.13.6.4 3.3.6.13.7 3.3.6.13.8 3.3.6.12.3.1	System Description and Design Data - Extravehicular Activities Attachment 1 (ICD 2-19001) Appendix 7, Paragraph 2.3, Crew and equipment safety, and Tables II.2-IIa and II.2-IIIb
NSTS 08060 Reference 3.3.6.5.1.3	Space Shuttle System Pyrotechnic Specification
NSTS 08307 Reference 3.2.10.12	Criteria for Preloaded Bolts
NSTS 20793 Reference 3.3.6.8.4	Manned Space Vehicle, Battery Safety Handbook

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The purpose of this function is to illuminate general areas of the USL. The USL shall illuminate general activity areas at a minimum of 10 foot-candle (108 lux) of white light. The USL shall illuminate the passageways at a minimum of 5 foot candles (54 lux) of white light.

3.2.5.2 Illuminate emergency egress area

The purpose of this function is to illuminate the emergency egress areas of the <END ITEM>.

The <END ITEM> shall illuminate the emergency egress area at a minimum of 0.05 foot candle (0.5 lux) for pressurized module exits. The <END ITEM> shall illuminate the emergency controls at a minimum of 0.01 foot candle (0.108) lux for emergency controls.

3.2.5.3 Control emergency egress lighting

The purpose of this function is to control the automatic turn on of the emergency egress lighting when an emergency is recognized.

3.2.6 Noise

3.2.6.1 Acoustic emission limits

The integrated acoustic environment in habitable areas in the ISS Modules/elements shall not exceed the US Noise Criteria (NC)-50 criterion during normal operating conditions when averaged over a minimum of 10-second time intervals. In areas where crewmembers must communicate by voice, the reverberation time shall not exceed 0.5 +/- 0.1 seconds at 1000 Hertz.

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3.2.6.2 Non-Integrated Hardware Acoustic Emission Limits

All non-integrated hardware to be flown in the ISS Modules shall not exceed NC-40 as measured at 0.6 meters from the noisest point on the hardware as in accordance with JSC 28322, ISS Acoustic Requirements and Testing Document for ISS Non-Integrated Equipment. All non-integrated equipment providers shall comply with JSC 28322 as the ISS Program Acoustic Requirement document.

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3.2.7 Radiation

3.2.7.1 Ionizing radiation crew limits

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The design of the USL shall limit the ionizing radiation dose in habital volumes to 40 rem (BFO) per year.

3.2.7.2 Ionizing radiation emission limits

Ionizing radiation emissions from USL equipment shall not exceed 2 millirads silicon per day, one centimeter from any surface.

3.2.7.3 Support radiation exposure monitoring

The <End Item> shall monitor crew environment exposure to radiation.

3.2.7.4 Reserved

3.2.7.5 Meteoroids and orbital debris (M/OD)

The <End Item> M/OD critical items shall meet the requirements specified herein when exposed to the M/OD environments defined in SSP 30425, Meteoroids and Orbital Debris. Parameters of International Space Station M/OD environments definition are given in Table IX.

TABLE IX. Parameters for M/OD environments definition.

Altitude	215 nautical miles (400 km)
Orbital inclination	51.6 degrees
Space Station attitude	LVLH 10% of the time (Orbiter attached) TEA 90% of the time (Orbiter not attached)
Solar flux	70×10^4 Jansky ($F_{10.7} = 70$)
Orbital debris density ⁽¹⁾	2.8 gm/cm^3
Maximum debris diameter	20 cm

Note:

(1) For M/OD critical items only

3.2.7.6 Probability of no penetration

The Space Station shall have a 0.81 (minimum) combined Probability of No Penetration (PNP) of M/OD critical items (See Appendix B) in the M/OD environment defined in 3.2.6.1.8 [of SSP 41000B], for 10 years from First Element Launch (FEL). [SSP 41000B, 3.3.12.1.1]

5.0 OPERATIONAL SAFETY REQUIREMENTS

5.1 EVA Activity Safety

All ISS requirements for EVA shall be defined and documented in the MIP Operations Approval (from Space Shuttle Astronaut AIT, EVA System AIT, and Space Shuttle Missions AIT) and shall be required for any EVA task. (Ref. COU SSP 50011-01 Rev. B; Para. 4.2.2; Oct. 19, 1994)

5.1.3.1 For Shuttle Loads

The International Space Station structural design and verification requirements for the transport phases to and from orbit shall be consistent with the requirements for Shuttle payloads specified in NSTS 14046. ISS elements shall be verified by test and/or analysis to the ascent vibro-acoustic environment defined in ICD 2-19001.

5.1.3.6 Verification Of Beryllium Structures

Verification of Beryllium structures shall be in accordance with NSTS's 14046, section 5.1.1.1.

Appendix A - Acronym Listing

AC	Alternating Current	
BFO	Blood Forming Organs	
CETA	Crew and Equipment Translation Aids	
CO2	Carbon Dioxide	
dB	Decibel	
DC	Direct Current	
EVA	Extravehicular Activity	
ICD	Interface Control Document	DCN 001
ISS	International Space Station	
IVA	Intravehicular Activity	
IMV	Intermodule Venitlation (System)	
MDP	Maximum Design Pressure	
MEQ	Milliequivalents	
MPE	Maximum Permissible Exposure	
MT	Mobile Transporter	
NC	Noise Criteria	DCN 002
NSI	NASA Standard Initiator	
NSTS	National Space Transportation System	
ORU	Orbital Replacement Unit	
OSE	Orbital Support Equipment	
PBA	Portable Breathing Apparatus	
PFE	Portable Fire Extinguisher	
PIP	Payload Integration Plan	
RMS	Remote Manipulator Subsystem	
RTM	Real-Time Monitor	
SMAC	Spacecraft Maximum Allowable Concentration	DCN 001
SRMS	Shuttle Remote Manipulator System	
STS	Space Transportation System	
US	United States	DCN 002