Compendium of Indian Standards on Space Systems

Prepared by:
Transport Engineering Department

Bureau of Indian Standards
New Delhi

Table of Contents:

Introduction

Space systems refer to the vehicles and infrastructure that operate in the space environment to achieve specific goals, such as exploration, communication, or defence. These systems can include spacecraft, satellites, launch vehicles, and ground control facilities.

Space systems are critical for scientific research, communication networks, and national security.

This compendium aims at providing an overview of Indian Standards on Space systems, offering insights into their varieties.

By compiling relevant standards related to Space systems in a single document, this compendium serves as a ready reference for professionals involved in this field.

List of available Indian Standards on the subject:

1. **Requirements**

i) **IS 18328 (Part 1) :2023** Space Systems — Safety Requirements Part 1 System Safety

This document explains the safety programme and the technical safety rules that must be followed to meet the safety policy in ISO 14300-2. Its purpose is to protect people working on or near space missions, the launch vehicle and its payloads, ground equipment, the public, property, and the environment from any dangers related to space systems.

Details about safety during launch site operations are covered in ISO 14620-2, and information on flight safety systems is found in ISO 14620-3.

ii) **IS 18329 (Part 2) :2023** Space Systems — Electrical, Electronic and Electromechanical (EEE) Parts Part 2 Control Programme Requirements

This document provides technical guidelines for creating and documenting a program to control electrical, electronic, and electromechanical parts. The goal is to ensure that the parts used in space flight hardware are reliable, work well, and can handle radiation and other challenges to meet system requirements. Electro-optical parts are also included in this group.

It also offers management guidelines for space system engineering and outlines the basic processes needed for this work.

These guidelines can be adjusted to fit the specific needs of each project, considering factors like performance goals, risk levels, budget, mission length, environment, and schedule.

The document is meant for all customers and suppliers providing flight hardware and can be used as a reference when preparing proposals.

iii) **IS 18333 : 2023** Space Systems — Functional and Technical Specifications

This document explains the strategy of using two key documents in a project: the Functional Specification (FS) and the Technical Specification (TS). Using these helps manage the project better by improving performance, controlling costs, keeping to the schedule, and reducing risks.

ISO 14300-1 recommends these two specifications to focus on the customer's needs and make sure enough time and resources are spent exploring different options before choosing the best solution to develop or buy.

The FS serves as the starting point for comparing and evaluating different ideas, while the TS acts as the official agreement to develop or purchase the chosen solution.

This document gives an overview of the purpose and role of each specification, what they should include, and how to create them.

It applies to all kinds of space systems, products, and projects.

iv) **IS 18334 : 2023** Space Projects — Programme Management — Dependability Assurance Requirements

This International Standard sets out the requirements for a dependability assurance programme in space projects, covering reliability, availability, and maintainability.

It defines what's needed to ensure space products and their software functions work well together and meet dependability goals.

These requirements apply throughout all stages of a space project.

v) **IS 18336 : 2023** Space Systems — Programme Management — Quality Assurance Requirements

This International Standard is designed to guide quality assurance management in space programmes and applications.

It is based on existing ISO standards like ISO 9000, ISO 9001, and ISO 9004, as well as parts of ISO 14300-1 and ISO 14300-2.

vi) **IS 18854 : 2024** Space Systems — General Test Requirements for Launch Vehicles

This document sets the basic testing rules for launch vehicles with liquid-fueled engines that are launched from fixed ground, sea, or air platforms, covering all stages of their development.

vii) **IS 18891 : 2024** Space Systems — Cube Satellites (CubeSats)

This document covers CubeSats, their launch devices called CubeSat Deployers, and related quality and testing terms. CubeSats are a special type of tiny satellite that are great for university space projects worldwide. Besides helping train space scientists and engineers, CubeSats offer a low-cost way to test new small space equipment.

A key part of these projects is the standard CubeSat Deployer, which can release multiple CubeSats as secondary payloads on many different rockets. The Deployer requires all CubeSats to meet common size and interface rules. Using shared standards like this helps cut down the time and cost of building CubeSats.

The design, testing, and acceptance of CubeSats usually follow rules from other small satellite standards, except for specific tests related to the CubeSat and Deployer launch environment.

viii) **IS 18893 : 2024** Space Systems — Structural Components and Assemblies

This International Standard sets rules for designing, choosing materials, making, testing, and inspecting all structural parts used in space systems like launch vehicles, satellites, and their payloads. Following this standard helps ensure the space system will operate safely and reliably throughout its mission.

It applies to all structural parts, including important parts that could break and cause failure, during every mission phase—except for adaptive structures, engines, and thermal protection systems.

ix) **IS 18913 : 2024** Space Systems — Simulation Requirements for Control System

This document sets the rules for simulating space control systems, covering things like goals, design, and procedures. It applies to four development stages: early design, detailed design, prototype, and full system integration.

The control system here means the flight control system that handles guidance, navigation, and control (GNC) for space vehicles like rockets, satellites, and spaceships.

This document provides a basic set of simulation requirements and helps engineers know what to simulate at each stage. The rules are general so they can be used for all kinds of simulations. Specific details are covered in project-specific guides and standards.

x) **IS 18914 : 2024** Space Systems — Spacecraft Interface Requirements Document for Launch Vehicle Services

This document gives spacecraft organizations a standard way to prepare the interface requirement document (IRD) for launch vehicle services. The IRD lists the main technical needs that spacecraft teams give to launch vehicle agencies when applying for launch services.

The IRD covers things like the spacecraft mission, mechanical and electrical connections, environmental conditions (like temperature and cleanliness), spacecraft development and testing plans, and launch site support needs.

This document applies to all commercial launch vehicles and facilities, so spacecraft teams can create one IRD for their mission, no matter which launch vehicle provider they choose.

The IRD also includes the basic spacecraft information that launch vehicle agencies need to create the interface control document described in ISO 15863

xi) **IS 19064 : 2025** Space Systems — Electromagnetic Compatibility Requirements

This document explains the process for setting performance requirements to make sure space systems work well together without causing electromagnetic interference (EMC). It highlights the engineering points needed to achieve system-wide EMC and gives advice on meeting these standards. It also shows how to create specific equipment-level requirements from overall system requirements and helps choose the right rules for a particular mission.

xii) **IS 19065 (Part 2) :2024** Space Systems — Electromagnetic Compatibility Requirements

This document explains how to set performance requirements to ensure space systems don’t interfere with each other electrically (electromagnetic compatibility, or EMC). It identifies key engineering challenges and offers guidance on meeting the necessary standards. It also shows how to turn system-level EMC requirements into specific equipment-level requirements and helps choose the right rules for each mission.

xiii) **IS 19067 : 2024** Space Systems — Requirements for Small Spacecraft

Small spacecraft often use different development and management approaches because they usually have tight budgets or weight limits, making a dedicated launch too expensive.

This document covers many types of small spacecraft — like mini-, micro-, nano-, pico-, femto-satellites, and CubeSats — and uses “small spacecraft” as a general term for all of them.

No matter how they're developed, all small spacecraft must meet certain minimum requirements. This document clearly states those requirements and points to other relevant standards. It acts as a main guide covering important stages in a small spacecraft's life, such as design, launch, deployment, operation, and disposal.

Following these rules helps ensure:

1. Safety
2. No harm to other payloads or the launcher
3. Reducing space debris

This document is meant for small spacecraft makers, dispenser suppliers, and launch operators.

xiv) **IS 18915 : 2025** Space Systems — Product Assurance Requirements for Commercial Satellites

This document offers recommended guidelines for product assurance (PA) requirements that apply to commercial satellites.

2. Guidelines

i) **IS 18895 : 2024** Space Systems — Guidelines for the Management of Systems Engineering

This document explains the rules and advice for managing systems engineering in space projects. It covers the key engineering activities and gives guidelines on working with important management areas like configuration, data, interfaces, risks, requirements, and logistics.

It provides a shared reference that helps both customers and suppliers in the space industry work together smoothly on systems engineering for all space products and projects.

ii) **IS 18896 : 2024** Space Systems — Mass Properties Control

This document explains how to manage, control, and track the weight and balance of space systems. It shows how this management connects to meeting the required mass-related performance throughout the mission. It also highlights activities like handling on the ground, analysing movement, and setting up tests that need

accurate weight and balance information. The document covers all stages of a space project, from early planning to the end of its life.

iii) **IS 18897 : 2024** Space Systems — Interface Control Documents Between Ground Systems, Ground Support Equipment and Launch Vehicle with Payload

This document sets basic rules for creating and managing interface control documents (ICDs) that define how different parts of the launch system connect and work together. It covers the following:

1. The connection between ground support equipment and the payload.
2. The connection between ground support equipment and the launch vehicle.
3. The connections between different parts of the ground support equipment.
4. The connection between ground support equipment and the launch site (like buildings and utilities).

This document is for organizations that develop ground support equipment and for operators involved in space activities.

iv) **IS 19065 (Part 3) :2024** Space Systems — Surface Cleanliness of Fluid Systems Part 3 Analytical Procedures for the Determination of Non-volatile Residues and Particulate Contamination

This document explains how to set performance requirements to ensure space systems don't interfere with each other electrically (electromagnetic compatibility, or EMC). It identifies key engineering challenges and offers guidance on meeting the necessary standards. It also shows how to turn system-level EMC requirements into specific equipment-level requirements and helps choose the right rules for each mission.

v) **IS 19065 (Part 5) :2024** Space Systems — Surface Cleanliness of Fluid Systems Part 5 Drying Processes

This part of ISO 14952 gives advice on how to dry parts and components after they've been cleaned with water- or solvent-based methods. It explains drying techniques suitable for equipment used in ground support gear, launch vehicles, and spacecraft. Vacuum drying is also covered as a way to remove trapped fluids from complex parts when regular drying methods don't work well.

vi) **IS 19069 : 2024** Space Systems — Avoiding Collisions Among Orbiting Objects

This document is a guide to creating important partnerships to protect and use the space environment safely and effectively.

It explains common methods used to detect when satellites might come too close, estimate the chances of collisions, calculate the likelihood of surviving those events, and plan maneuvers to avoid collisions.

Note: Satellite operators understand that all these methods are based on probabilities. They can sometimes give false alarms or miss real threats. The accuracy of these predictions varies depending on the satellite's orbit and timing. There's no single best method that works perfectly in all situations.

vii) **IS 19074 : 2024** Space Environment (Natural and Artificial) — Model of High Energy Radiation at Low Altitudes (300 km to 600 km)

This Indian standard explains the flow of charged particles near Earth, based on data from the PAMELA experiment. It can be used to calculate how many protons with energy above 100 MeV reach low Earth altitudes (300 to 600 km). The main purpose is to understand how these energetic particles affect spacecraft instruments and astronauts.

3. Project Management

i) **IS 18326 : 2023 Space Systems** Programme Management — Material, Mechanical Parts and Processes

The standard outlines what's needed to manage materials, mechanical parts, and processes in space projects. This includes everything from planning and designing to building, operating, and eventually disposing of space systems.

ii) **IS 18327 (Part 1) :2024** Space Systems — Programme Management Part 1 Structuring of a Project

This document gives an overview and sets out the requirements for managing space programmes, with the main goals of improving performance, reducing costs and delays, and lowering risks.

This document is meant to be used for ensuring quality and reliability (called product assurance) in space-related programmes and projects.

The requirements focus on what needs to be achieved, not on the specific steps or methods to get there. This flexible approach means organizations can use their

existing systems if they work well, and can update their methods as needed without changing the standards.

iii) **IS 18327 (Part 2) :2023** Space Systems — Programme Management Part 2 Product Assurance

This document outlines the management requirements for space programmes and projects.

It also defines the policy, goals, key principles, and requirements for setting up and carrying out product assurance (PA) programmes. These PA programmes help ensure the quality and reliability of space products throughout all stages—planning the mission, designing, developing, building, operating, and eventually disposing of them.

4. Terminology

i) **IS 18330 : 2023** Space Systems — Definition of the Technology Readiness Levels (TRLs) and their Criteria of Assessment

This International Standard explains Technology Readiness Levels (TRLs), which measure how mature a technology is. It is mainly designed for space system hardware but can also be applied to other fields in many cases.

ii) **IS 18338 : 2023** Space Systems — Programme Management and Quality — Vocabulary

This Indian Standard explains the common words and terms used in space systems and operations, especially for managing programs and ensuring quality. It does not include special terms that belong to a specific International Standard—those are explained in their own documents.

5. Management Requirements

i) **IS 18335 : 2023** Space Systems — Programme Management — Non-conformance Control System

This International Standard sets rules for handling any problems or defects in space system products, including electrical, electronic, electromechanical parts, software, and operational issues.

It applies to all products and supplies at every level that don’t meet their required specifications or design standards.

ii) **IS 18337 : 2023** Space Systems — Programme Management — Information and Documentation Management

This International Standard explains how to manage information and documentation in space programmes and projects.

The rules apply to both customers and suppliers at all levels.

Since every project is different, these requirements should be adjusted to fit the specific needs and situation of each project.

iii) **IS 18339 : 2023** Space Projects — Programme Management — Project Organization

This International Standard explains the basic rules and needs for organizing and managing space projects effectively. For overall guidelines on project organization, see ISO 14300-1.

iv) **IS 18346 : 2023** Space Systems — Off-the-Shelf Item Utilization

his document provides rules and advice for using off-the-shelf (OTS) items in space products or systems, including how to choose, buy, fit, test, and use them. However, it does not cover small parts and materials like electrical parts, connectors, fasteners, adhesives, wiring, or plumbing.

v) **IS 18890 : 2024** Space Systems — Unmanned Spacecraft Operability

This International Standard describes the key features needed for operating unmanned spacecraft. It sets out requirements and guidelines for the spacecraft's on-board systems so that ground control can operate the spacecraft during normal operations or in expected emergency situations.

vi) **IS 18329 (Part 1) :2023** Space Systems — Electrical, Electronic and Electromechanical (EEE) Parts Part 1 Parts Management

This document covers the important parts of managing electrical, electronic, and electromechanical components used in space systems. It's written in broad terms to serve as a basic guide for creating, running, checking, and assessing a programme to manage these space parts. This also includes electro-optical parts.

vii) **IS 18906 : 2024** Space Systems — Probabilistic Risk Assessment (PRA)

This document helps guide the use of quantitative risk assessment when it's needed, supporting the risk management process from ISO 17666. It explains how to carry out a probabilistic risk assessment (PRA) focused on safety. While PRA can also be used for managing project costs and schedules, this document only covers safety-related risk.

It sets the basic rules and steps for using PRA to evaluate safety or mission risks in space programs and projects. It applies to international space projects such as:

- Designing space vehicles that carry people
- Designing space stations or planetary bases where people live
- Designing space or launch vehicles that use or carry nuclear materials
- Other projects as required by authorities or clients

These projects usually involve situations that could lead to serious injury, death, or loss of important equipment. For other projects, using PRA is up to the project management's decision.

viii) **IS 18331 : 2023** Space Systems — Programme Management — Requirements Management

This document covers the management requirements for space programmes and projects, focusing on a top-down approach in contracts between customers and suppliers.

Its goal is to create a shared framework that all customers and suppliers in the space industry can use to manage requirements for all space products and projects.

ix) **IS 19075 (Part 2) :2024** Space Systems — Early Operations Part 2 Initialization Plan

Initialization generally starts when the spacecraft separates from the launcher. Sometimes, it's defined more precisely as beginning when the spacecraft changes from its launch setup to flight mode. Commissioning ends when the spacecraft and its payload are officially approved for normal mission operations. Before this approval, the spacecraft is considered a test article, as described in ISO 10784.

ISO 10784 doesn't require detailed contingency plans but highlights the importance of having them.

This part of ISO 10784 gives spacecraft makers and operators a clear format to write initialization plans. These plans show how to set up and check the spacecraft so it can start normal mission work. Since the spacecraft is treated like a test article during this phase, ISO 17566 is used as a reference to help create the plan. This helps everyone involved use a common approach to verify and document the spacecraft's initialization before regular mission operations begin.

6. Test Methods

xxv) **IS 18912 : 2024** Space Systems — General Test Methods for Spacecraft, Subsystems and Units

This document sets the basic rules for testing unmanned spacecraft at the system, subsystem, and unit levels. It also explains what test-related documents need to be prepared.

It covers qualification testing, acceptance testing, and proto-flight testing (PFT), assuming the hardware is already fully developed.