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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 29082-2012

Storage requirements for satellite

卫星贮存要求

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Foreword

GB/T 29082-2012 was issued on 31 December 2012 by the General Administration of Quality Supervision, Inspection and Quarantine and the Standardization Administration of the People's Republic of China, and has been in force since 1 June 2013.

The document is a recommended national standard: the /T in the designation marks it as recommended rather than compulsory.

1 Scope

China's national standard for the ground storage of satellites. Satellites spend far longer waiting than flying: a spacecraft is typically complete months or years before its launch slot, and it is stored between acceptance and shipment and again at the launch site while the campaign proceeds. The requirement is that it emerge exactly as it went in, which is harder than it sounds because a satellite is full of things that degrade while nothing is happening to them - batteries at partial charge, pyrotechnic devices, deployable mechanisms held under spring load, optical surfaces, solar arrays and multilayer insulation, all sensitive to temperature, humidity, contamination and simple time. The standard specifies the technical and management requirements for storing the complete satellite and its equipment, including the storage methods, the environmental conditions, the parallel storage specimens that are kept alongside the flight items, and the periodic inspection and retesting.

This standard specifies the technical requirements and the management requirements for the storage of satellites.

This standard applies to the ground storage, during the development of a satellite model, of the complete satellite and of general electronic equipment, electrical equipment, optical equipment, solar arrays, moving parts, multilayer insulation assemblies and similar products.

2 Terms and definitions

For the purposes of this document, the following term and definition apply.

2.1 parallel storage specimen - a specimen stored at the same time as the product, in order to follow the key characteristic parameters of optical equipment, solar arrays, moving parts and similar products that are sensitive to the storage environment and to storage life.

3 General requirements

3.1 The party issuing the product development task shall state the product storage requirements in the development task statement, and the contractor and the user shall carry out the storage of the product as required.

3.2 The storage of a complete satellite is of two kinds: the satellite placed directly in the workshop (workshop storage) and the satellite placed in a dedicated packing case (case storage). Storage for longer than three months should use case storage.

3.3 There are generally four storage methods for equipment: a) nitrogen-filled case storage, in which the product is placed in a dedicated packing case filled with high purity nitrogen of acceptable quality and kept at positive pressure; b) nitrogen-filled bag storage, in which the product is packed in an antistatic plastic bag, the air in the bag is displaced with high purity nitrogen of acceptable quality and the bag is sealed and placed in a dedicated packing case; c) vacuum storage, in which the product is packed in an antistatic plastic bag which is evacuated, sealed and placed in a dedicated packing case; d) desiccant storage, in which the product is packed in an antistatic plastic bag, placed in a dedicated packing case and a desiccant is placed as required. Equipment shall use the storage method appropriate to the characteristics of the product; generally the methods of 3.3 a) to 3.3 c) are used.

3.4 Silica gel or molecular sieve desiccant with a water content not greater than 4 % shall be placed in the antistatic plastic bag or the packing case, wrapped in gauze. A humidity indicator paper shall be used inside the bag, and only after checking at 24 h that the bag meets the relative humidity requirement may the storage procedure begin.

3.5 Parallel storage specimens are generally taken from the same batch of products or subassemblies. The retesting requirements for parallel storage specimens during storage are determined by the product designer according to the characteristics of the product and

of the environment.

3.6 Environmental conditions shall be set for the different storage methods and for the different products.

3.7 Periodic inspection and retesting shall be completed as required during the storage period.

3.8 The corresponding tests shall be completed as required during the storage period.

3.9 There shall be no strong electromagnetic fields or radioactive materials in the store or the workshop, and no corrosive liquids or gases.

4.1 Management requirements

4.1.1 The storage requirements of the product and the tools, equipment and appliances that must be provided shall be considered together at the product design stage.

4.1.2 The contractor shall draw up a storage plan according to the storage requirements.

4.1.3 Effective measures shall be taken for the storage of flammable, explosive, highly toxic, corrosive and radioactive products, to ensure safety and to prevent contamination of the environment.

4.1.4 Quality records and handover management requirements shall be established for product storage.

4.1.5 Products in storage shall be marked, including the date on which storage began and the planned storage period.

4.1.6 A store management system shall be established, with custodians who have passed assessment, and the conditions in the store shall be inspected periodically and recorded.

4.1.7 Stored products shall be counted, maintained, inspected and tested periodically as required, and the condition of the stored product recorded. Products that have exceeded the storage period shall be segregated promptly.

4.1.8 For products with electrical performance requirements, the test personnel shall enter the power-on time and the results of the power-on test in the product quality record.

4.1.9 The designer shall analyse and compare the test data and accumulate reliability and stability data for the product.

4.1.10 Information exchange during product storage shall be strengthened, so that quality problems are found and corrected promptly.

4.1.11 The product storage requirements shall be one of the items reviewed when the product design is finalised.

4.2.1 Preparation before storage

4.2.1.1 Before the complete satellite is stored, a storage programme (or storage technical requirement) shall be drawn up according to the characteristics of the product, specifying the technical state of the product, the storage environment, the inspection and retesting during the storage period, the tests and other requirements.

4.2.1.2 In general, special products such as energy storage power supplies, pyrotechnic devices, solar arrays, multilayer insulation assemblies, and optical equipment and moving parts with special requirements shall be stored separately; other products are stored with the complete satellite.

4.2.1.3 In general, parallel storage specimens shall be provided for the key components among the deployment mechanisms and other moving parts stored with the complete satellite.

4.2.1.4 Before the complete satellite is stored, an analysis shall be made to find equipment and non-metallic materials among the products fitted to the satellite that may exceed their life, and corresponding reliability assurance measures shall be taken.

4.2.2.1 Workshop storage environment requirements

Unless otherwise specified, the general requirements are: a) temperature 15 degrees C to 25 degrees C; b) relative humidity 35 % to 60 %; c) cleanliness better than class 8; d) air pressure: positive pressure.

4.2.2.2 Packing case storage environment requirements

4.2.2.2.1 The satellite is placed in a dedicated packing case for storage and the case is filled with high purity nitrogen of acceptable quality. Unless otherwise specified, the general requirements for the environment inside the dedicated packing case for the complete satellite are: a) temperature 15 degrees C to 25 degrees C; b) relative humidity 35 % to 60 %; c) air pressure controlled within the range of 500 Pa to 1500 Pa above local atmospheric pressure, with gas to be replenished promptly when the pressure inside the case falls to 500 Pa above local atmospheric pressure.